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Situational and dispositional indicators of performance:

Competing models in education

by

Ingrid Nielsen (B.A. Hons (Psych))

Submitted in fulfilment of the requirements for the degree of

Doctor of Philosophy

Deakin University (February, 2003)
I certify that the thesis entitled **SITUATIONAL AND DISPOSITIONAL INDICATORS OF PERFORMANCE: COMPETING MODELS IN EDUCATION**

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is the result of my own work and that where reference is made to the work of others, due acknowledgment is given.

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ACKNOWLEDGMENTS

I would like to thank the following people and organisations for their assistance in the preparation of this thesis:

Dr Kate Moorc for assistance with theoretical and statistical matters.

The Australian Government for supporting me with an APA scholarship and the Deakin RAGS Committee for financial support of this research.

The Catholic Education Office for permission to undertake this research in Victorian Catholic secondary schools; along with the principals and parents who consented for their students and children to take part in this research, and the many teachers involved in co-ordinating the studies.

The hundreds of students who donated their time to completing these questionnaires.

I would also like to acknowledge the kind support of:

Jill Smith, who invented several jobs for me so that I might pursue my academic hoopla!

John Maguire, who sparked my initial academic interest; and Dr Kevin Brown, who helped me to reclaim it many years later.

Professor Carla Lipsig-Mummé who has supported me in so many ways and it is now my great pleasure and privilege to be working alongside her.

Many of my family and friends who have followed the course of this research with interest – especially Chris Nicolson, Richard Lee, Dianne Lee, Gabby Hanson, Christine Lucas-Pannam, Flora Bell, Frank Nelson, Robert Lee, André Nielsen, Troodin Nicolson, Shiny McShine and McBee.

My sister Ketti, who shipped her PC to me when mine collapsed in the home straight. Whatever would I have done without that computer?

My Mum, Barbara, who has always helped me to achieve my dreams – but would be equally proud should I fall short of them.

The ever-shining light in my life, my son Patrick, who has shared his mother with a PC all his life – with understanding and patience beying his eight years.

 Lastly, but mostly, my partner, Andrew, who has worked tirelessly to see me through degree after degree (and PC after PC). His unconditional support, his love, his dependability, his humour, his patience, his frank optimism and his pride in my every small achievement have all helped to carry me to this point. Finding you will always be my greatest achievement - and this is for you.
ABSTRACT

The attainment of high grades on the Victorian Certificate of Education (VCE) is critical to the future study and employment prospects of many Australian adolescents. Thus it is important to understand the factors that contribute to performance in the VCE. The aims of this study were twofold: the main aim was to test competing models of academic performance, subsuming a range of situational and dispositional variables based on a) self-efficacy theory, b) target and purpose goals, c) cognitive skills and self-regulatory strategies, and d) positive psychology. These models were each tested in terms of English performance and mathematics performance as these units contribute proportionally the most to overall VCE scores. In order to study whether pressures peculiar to the VCE impact on performance, the competing models were tested in a sample of Victorian students prior to the VCE (year 10) and then during the VCE (year 11). A preliminary study was conducted in order to develop and test four scales required for use in the major study, using an independent sample of 302 year nine students. The results indicated that these new scales were psychometrically reliable and valid. Three-hundred and seven Australian students participated in the year 10 and 11 study. These students were successively asked to provide their final years 9, 10 and 11 English and mathematics grades at times one, three and five and to complete a series of questionnaires at times two and four. Results of the year 10 study indicated that models based on self-efficacy theory were the best predictors of both English and mathematics performance, with high past grades, high self-efficacy and low anxiety contributing most to performance. While the year 10 self-efficacy models, target goal models, positive psychology models, self-regulatory models and cognitive skill based models were each robust in the sample in year 11, a substantial increase in explained variance was observed from year 10 to year 11 in the purpose goal models. Results indicated that students' mastery goals and their performance-approach goals became substantially more predictive in the VCE than they were prior to the VCE. This result can be taken to suggest that these students responded in very instrumental ways to the pressures, and importance, of their VCE. An integrated model based on a combination of the variables from the competing models was also tested in the VCE. Results showed that these models were comparable, both in English and mathematics, to the self-efficacy models, but explained less variance than the purpose goal models. Thus in terms of parsimony the integrated models were not preferred. The implications of these results in terms of teaching practices and school counseling practices are discussed. It is recommended that students be encouraged to maintain a positive outlook in relation to their schoolwork and that they be encouraged to set their VCE goals in terms of a combination of self-referenced (mastery) and other-referenced (performance-approach) goals.
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CHAPTER ONE
INTRODUCTION

Academic performance, or the attainment of high academic grades, is the most frequently reported concern for young Australians between the ages of 16 and 18 years (Hibbert, Caust, Patton, Rossier & Bowes, 1996; Frydenberg & Lewis, 1996) and is seen among students as the most critical determinant of their future career choices (Calderon, Dobson & Wentworth, 2000; Frydenberg & Lewis, 1998). In the state of Victoria, Australia, students in this age bracket are undertaking their final two years of secondary schooling, years 11 and 12, which together are termed the Victorian Certificate of Education (VCE).

Grades on the VCE contribute to an overall Equivalent National Tertiary Entrance Rank ('ENTER') score, which is the main criterion for entry into most tertiary courses in Australia, other than skill-based and mature-aged entry¹. In an economic climate where apprenticeship numbers are declining (Worland & Doughney, 2002) and the work situation for young Australians is becoming increasingly casualised, deregulated and precarious (Lipsig-Mummé & Nielsen, 2003), obtaining a high ENTER score has become one factor that is critical to the short- and long-term labour prospects of Victorian adolescents, who are applying for limited tertiary places in increasing numbers (Birrell, Rapson, Dobson, Edwards & Smith, 2002).

¹ See http://www.vtac.edu.au/general/enter.html for an explanation of ENTER.
Approximately seven percent of Victorian students do not pass their VCE (Victorian Curriculum and Assessment Authority, 2001), and many more do not obtain high enough ENTERs for them to be offered a place at a tertiary institution. While a 93% pass rate in the VCE might appear pleasing, the failure of some 11,000 VCE students, and poor grades among others, is concerning, particularly in light of the fact that VCE grades are critical determinants of the career paths of many students (Birrell et al., 2002).

In order to enhance the future prospects of many Victorian adolescents, it is important to identify factors that contribute to higher VCE grades, and thus higher VCE ENTER scores. The identification of such factors will inform school counseling practices and academic support programs aimed at reducing the levels of VCE student failures and improving the ENTER scores of students who do perform poorly. Therefore, the aim of this thesis is to investigate factors that predict high grades, or high ‘performance’, in the VCE.

While researchers have investigated factors that contribute to poor performance and to failure in the VCE (e.g., Birrell et al., 2002; Calderon et al., 2000), there has been scant attention paid to the conditions that promote high VCE performance. Although factors that lead to poor VCE performance might also be implicated in the attainment of high VCE performance levels, it cannot be assumed that the determinants of high performance levels are simply the inverse of the determinants of poor performance. The current study, with its focus on factors that facilitate VCE performance, rather than contribute to VCE failure, is in the spirit of a recent call in the psychological literature for researchers to focus their interests on “positive psychology” variables.
(Scigman & Csikszentmihalyi, 2000, p.5). Positive psychology is characterised by a focus on optimal functioning and well-being and espouses the roles that positive thinking and positive personal traits have on behaviour and behavioural outcomes (Pajares, 2001). By investigating factors commensurate with this philosophy, it will be possible to identify the situational and dispositional variables that facilitate the attainment of high VCE performance levels, and hence high ENTER scores.

Despite there being a substantial volume of previous research focusing on factors that typically predict school performance levels and hence help to explain why some students succeed while others fail, this past research has, by and large, considered the effect on performance of one or other of three classes of variables in isolation, namely: motivation, self-beliefs and skills. While these past models have taught us much, three major limitations of these past studies are apparent:

Firstly, the bulk of theoretical and empirical papers have been derived from theoreticians and data from either European nations or the United States, with scant work in this area coming from Australian sources². The lack of a comprehensive body of Australian literature is concerning because Boekaerts (1998) explicitly warned that most research findings in educational research are culture bound and may not generalise to classrooms in different cultures. It is important therefore to replicate even the most well-supported findings from overseas studies to ensure their ecological validity in Australian settings.

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² An exception is the extensive research program undertaken by Marsh and his colleagues on the role of the self-concept in academic achievement (e.g., Marsh, Byrne & Shavelson, 1988; Marsh, Byrne & Yeung, 1999; Marsh, Smith & Barnes, 1985; Marsh & Yeung, 1998; 1997).
According to Boekaerts (1998), our socialisation and enculturation affect fundamentally the ways in which we construe our social and personal identities. Thus, in terms of Boekaerts' thesis, if our self-construals of ourselves and of our social worlds are inextricably linked to our environments, we cannot assume that the ways in which Australian students think, feel and behave will be analogous to their European and North American counterparts. It is therefore critical that the situational and dispositional indicators of school performance among Australian students be studied in Australian settings.

Secondly, researchers who have modeled academic performance in Europe and North America, as well as those who have undertaken the limited Australian studies, have tended to focus on specific classes of situational and dispositional predictor variables in isolation, without comparing the predictive values or explanatory efficacy of competing models. For instance, researchers have assessed the impact on performance of (only) motivational variables (e.g., McInerney, Hinkley, Dowson & Van Etten, 1998; Urdan & Machr, 1995) or (only) self-belief variables (e.g., Bouffard-Bouchard, 1990; Cole & Hopkins, 1995) or (only) skills (e.g., Canobi, Reeve & Pattison, 1998; Hecht, 1998), however we do not know which of these classes of situational and dispositional variables best predict and explain the academic performance of Australian students when assessed concurrently.

Thirdly, in terms of Australian studies, we have no data that comprehensively and concurrently assesses the situational and dispositional indicators of high performance among senior level VCE students. Neither is it known whether the situational and dispositional variables that best predict and
explain VCE performance themselves change temporally, though it would seem possible that temporal changes in situational and dispositional performance indicators might occur as a function of the changing pressures and conditions of VCE versus pre-VCE years.

In this study several competing models of academic performance will be presented and evaluated. These models will be operationalised in terms of English performance and mathematics performance, which are those subject units considered the fundamental bases of the school curriculum. While English is a compulsory subject for all Australian students, mathematics is the most commonly taken non-compulsory unit in the VCE, thus these are the two units that together contribute the most, proportionally, to ENTER scores.

The competing performance models for English and mathematics will be tested in a sample of students during their pre-VCE year 10 studies, and 12 months later during their VCE year 11 studies. By re-testing each of the competing year 10 models in year 11, it will be possible to assess the robustness of each model both prior to and during the VCE. In the spirit of positive psychology, it is anticipated that this evaluation will contribute to a better understanding of the situational and dispositional variables critical to the attainment of high VCE performance levels, and hence high ENTER scores.

To achieve this aim, several new scales will first be developed in an independent sample. These scales are necessary to test constructs within the models, but for which tests are currently unavailable in the literature. It is expected that these scales will also provide a useful and important resource for other researchers.
CHAPTER TWO

ENGLISH AND MATHEMATICS PERFORMANCE OF
AUSTRALIAN STUDENTS: AN OVERVIEW

Literacy and numeracy skills, the skills reflected respectively in English and mathematics performance, have long been recognised as providing the basic skills required for successful functioning at school, at work and in everyday life (Lokan, Greenwood & Cresswell, 2001). Literacy and numeracy were defined by the Australian Federal Government’s Australian Bureau of Statistics (ABS) as “the skills needed to communicate ideas and to make sense of the world through language and numbers” (ABS, 2001, p.1). As such, the literacy and numeracy skills of Australian students are measured regularly and reported upon by the ABS. The following sections of this chapter detail the literacy and numeracy standards of Australian secondary school students both prior to, and since, the turn of the 21st century.

2.1 English and mathematics performance of Australian students prior to 2000

In 1975, twenty-eight percent of 14 year-old Australian students failed the basic reading test undertaken as part of the national Longitudinal Surveys of Australian Youth (Commonwealth Schools Commission, 1975), a large-scale longitudinal project that still continues annually under the direction of the Australian Federal Government’s Department of Education, Science and Training. As a response to this somewhat startling figure, the Australian Federal Government increased spending on education by nearly 100% per
student over the next two decades. But despite this increase in education funding, much of which was channeled specifically into addressing Australian students' poor levels of literacy, Ainley (1997) reported that in 1995, thirty percent of 14 year-old Australian students still failed this basic reading test.

While results from the Longitudinal Surveys have indicated poor literacy standards among Australian youth, a national study in 1990 of more than 4,000 Australian year nine students also indicated that Australian youth were struggling in some areas of mathematics (Gannicott, 1997). For instance, Gannicott reported that the year nine students in this national study were competent in the execution of arithmetic procedures, however they experienced difficulties applying these procedural skills to mathematics word problems. To illustrate, the students were able to subtract if presented with a subtraction number problems (e.g., 6,539 - 408 = ?), but only half of the students were able to describe and execute a correct procedure to calculate how long they would have to wait for the 5:06 train if they arrived at the station at 3:45. This latter difficulty might suggest that these Australian students could remember how to execute mathematics procedures (that is, they knew how to subtract), but half of them did not necessarily understand what it was that they were doing. In other words, half of these students appeared to miss the conceptual link between the subtraction procedure and the time differences inherent in the train station problem, and thus they were unable to apply a subtraction procedure in order to solve the train station word problem.

Statistics relating to the poor literacy skills and inconsistent numeracy skills of Australian students prior to 1995 prompted further action at both State
and Federal levels in Australia to generate a plan to improve these national literacy and numeracy figures. In the mid-1990s, this plan was viewed as particularly important if Australia was to compete in a world that was becoming increasingly more technologically dependent. The long-term platform for this plan was viewed as the increasing demands of a labour market that would require employees to have higher levels of education - in which literacy and numeracy would be seen as basic, but essential, components.

In 1997, then Australian Commonwealth Education Minister, Senator Amanda Vanstone, along with each of Australia’s State and Territory Education Ministers met to draft a plan for the literacy and numeracy development of Australian students into the 21st century. This plan, the National Literacy and Numeracy Plan, advocated a ‘back to basics’ approach, and set down as its main goal that every child leaving primary school in Australia should meet a nationally agreed-upon minimum standard in both literacy skills and numeracy skills. These standards, or Benchmarks, refer to minimum acceptable standards of literacy and numeracy, without which a student would have difficulty making sufficient progress at school (Ministerial Council on Education, Training and Youth Affairs, 1999). With such a plan in place, literacy and numeracy achievement of Australian students was expected to improve. Recent figures show that since the turn of this century, the picture has improved for Australian students, and in terms of international comparisons, Australian secondary students are well placed. These current figures are presented in the following section.
2.2 English and mathematics performance of Australian students in the 21st century

In 2000, the Programme for International Student Assessment (PISA) was conducted by the Organisation of Economic Co-operation and Development (OECD). This programme was an international study that assessed, among other things, the literacy and numeracy of secondary students from several OECD nations, including Australia. PISA results are scaled so that a score of 500 is the OECD average, with 66% of students scoring between 400 and 600 (OECD, 2000).

Among the Australian students in the PISA study, the average score for literacy was 528, with 66% of students scoring between 426 and 630 (OECD, 2000). For numeracy, the average score for Australian students was 533, with 66% scoring between 443 and 623 (OECD, 2000). Australian girls scored higher on average than Australian boys in literacy skills (546 Vs 513 respectively), but Australian boys scored higher on average than Australian girls in numeracy skills (539 Vs 527 respectively) (OECD, 2000). This latter difference was consistent with Oakes' (1990) review of the literature on gender differences in mathematics performance some ten years earlier.

Australian students fared well in comparison to students from some other OECD countries, including the United States. Australian students’ average scores for literacy and numeracy were 528 and 533, compared to the U.S.'s 504 and 493. Closer to home, Japanese and Korean students fared better than Australian students in numeracy (557 and 547 respectively Vs 533), but
these students fell just short of Australian students in literacy (522 and 525 respectively Vs 528).

As it is now five years since the implementation of the Australian Government's National Literacy and Numeracy Plan in 1997-1998, and those students who were among the first to leave primary school under the Plan are now in mid to senior level high school, between years nine to eleven, it is an appropriate time to conduct the current study into the situational and dispositional indicators of English and mathematics performance among these students. The results of the current longitudinal study will indicate the current levels of literacy and numeracy skills among a sample of Victorian mid to senior level high school students, and will also document a range of factors that contribute to English and mathematics performance among Victorian students.

Significantly, the current study is the first time that Victorian, or indeed any Australian secondary students have been assessed at two time points across a range of situational and dispositional factors related to performance in English and mathematics, beyond demographic factors (e.g., Birrell et al., 2002; Lamb & McKenzie, 2001). Results of the current study will provide the most comprehensive picture yet available in this country of the complex interplay of a range of situational and dispositional factors, subsuming self beliefs, motivation, personality and skills in the performance of pre-VCE and VCE students. The theoretical relevance and past empirical findings related to each of these four areas with respect to English and mathematics performance will be discussed in more detail in the following four chapters. Specifically, these four chapters will relate to the effects on performance of 1) the self belief
construct self-efficacy; 2) the motivational variables target goals and purpose goals; 3) the personality variables optimism and perfectionism; and 4) self-regulatory skills and strategies based on conceptual and procedural knowledge.
CHAPTER THREE

THE EFFECTS OF SELF-EFFICACY

ON PERFORMANCE IN ENGLISH AND MATHEMATICS

In this chapter, competing models of performance based on self-efficacy theory will be proposed. In the following sections, the literature on self-efficacy in relation to its applications in educational research, and in particular, in English and mathematics performance will be reviewed.

3.1 What is self-efficacy?

According to Bandura (1986), self-efficacy perceptions are part of a class of self-referent thoughts, or beliefs, that people have about themselves. While people might hold a wide range of self-referent thoughts, from broad beliefs about their roles (e.g., McCall & Simons, 1978; Turner, 1987) and their relationships (e.g., Hatfield & Walster, 1981; Thibaut & Kelley, 1959) to more particularised beliefs about their self-image (e.g., Higgins, 1987), their attitudes and opinions (e.g., Tesser & Shaffer, 1990), self-efficacy beliefs are particular to beliefs about specific task competencies (Bandura, 1986; 1997).

Bandura (1997) defined self-efficacy as "people's judgments of their capabilities to organize and execute courses of action required to attain designated types of performances" (p. 391). In other words, self-efficacy perceptions are the beliefs people have about how well they can perform certain tasks, where the task itself is quite specific in nature and where the designated outcome of performing the task is clearly defined. While some researchers have measured more global self-efficacies, such as academic self-
efficacy (e.g., Vrugt, 1994; Wood & Locke, 1987), and general self-efficacy (e.g., Hart, Gilner, Handal & Gfeller, 1998; Landine & Stewart, 1998; Sherer, Maddux, Mercandante, Prentice-Dunn, Jacobs & Rogers, 1982; Tipton & Worthington, 1984; Watt & Martin, 1994) in relation to academic performance, measurement of self-efficacy at a general, rather than task-specific, level is at theoretical odds with Bandura's (1986; 1997) conceptualisation of self-efficacy as task-specific. While it remains informative to know how students perceive their scholastic abilities in a general sense, this type of measurement is not truly reflective of self-efficacy insofar as Bandura (1986) has conceptualised and defined the construct. On this basis, it can be argued that conclusions about the effects of 'general' or 'academic' self-efficacies on school performance should be interpreted with some caution.

In order to demonstrate the way in which self-efficacy perceptions are particularly sensitive to differences in the task under consideration, it is useful to consider a case where students might be quite confident of their abilities in one academic area, but are less confident in another. For instance, it is possible that some students might have a very favourable perception of their writing competence, and hence have high writing self-efficacy; yet these same students might have a far less favourable perception of their mathematics competence, and hence have low mathematics self-efficacy. Certainly some students may have uniformly high or low self-efficacy across the academic spectrum, but as argued by Pajares (1996), it is the potential specificity of self-efficacy perceptions that sets self-efficacy apart from more generalised beliefs about the
self, such as self concept (see e.g., Marsh, 1990; Rosenberg, 1979 for discussions on the nature of self concept).

Self-efficacy perceptions are frequently used as predictors of subsequent performance in the academic arena. In the current thesis, which in the spirit of positive psychology is focused on the predictors of high levels of performance in English and mathematics, self-efficacy will be used as a predictor of English and mathematics performance in accordance with Bandura’s (1997) proposal that self-efficacy can greatly facilitate performance outcomes. Such is the power Bandura afforded self-efficacy that he stated, “children with the same level of cognitive skill development differ in their intellectual performances depending on the strength of their perceived efficacy” (p. 216).

Pajares (1996) argued that if self-efficacy is to be a valid predictor of performance then it is important to measure self-efficacy in terms of a fairly homogenous set of performance items which themselves closely resemble the performance criteria on which students are to be subsequently assessed. According to Pajares’ argument, items that measure, say, mathematics self-efficacy should correspond fairly closely to the mathematics items from which performance indices will be calculated. For instance, if mathematics performance is to be subsequently measured as a grade across tests in algebra and geometry, then mathematics self-efficacy items should ask students about their beliefs concerning their perceived competence specifically in algebra and geometry tests. If self-efficacy scales are constructed with respect to a high
degree of correspondence with performance items, Pajares argued that they will be a valid and effective tool with which to predict performance.

Unfortunately, as Pajares (1996) also observed, self-efficacy mismeasurement has “plagued” (p.547) educational studies. Pajares made particular reference to educational research in which he argued that self-efficacy measures typically “reflect global or generalized attitudes about capabilities bearing slight or no resemblance to the criterial task with which they are compared” (p.547). It is important that the correspondence between self-efficacy and performance measures is strong because Bandura (1997) argued that scores on self-efficacy measures that do not correspond to performance criteria may bear little or no relation to the particular performance indicator. Accordingly, there should be no reason to assume a correspondence between students’ perceived competence to solve algebra problems and their actual performance on a range of Australian history items.

However, in order to be a useful predictor of performance, just how specific the correspondence between a self-efficacy measure and its outcome criteria should be is a question of concern in the literature (e.g., Pajares & Miller, 1995; Pajares, 1996). Pajares (1996) suggested that self-efficacy beliefs should be measured at the level of specificity that corresponds exactly to the criterial task. This recommendation might be construed as suggesting that when measuring, for instance, mathematics self-efficacy, an exact level of self-efficacy / performance correspondence needs to be achieved whereby self-efficacy is measured for each of the individual problems that, taken together, measure mathematics performance. However, such close correspondence is not
that to which Pajares alluded. Indeed, he also stated that “domain specificity should not be misconstrued as an extreme situational specificity that reduces efficacy assessment to an atomistic level” (p.563). In fact, it has been empirically demonstrated that measurement correspondence at this latter level leads to positively biased estimates of the relationship between self-efficacy and performance. Marsh, Roche, Pajares and Miller (1997) likened using items to assess self-efficacy that are identical to items that will be used to assess performance to the same effect experienced when standing too close to trees in a forest, whereby people cannot see the proverbial ‘wood for the trees’. Marsh et al. argued, and empirically demonstrated, that by using identical self-efficacy and performance items, the relations between these two constructs become positively biased and furthermore, the use of identical self-efficacy and performance items also negatively biases relations between performance and other constructs, like self concept.

Practicality also precludes the identical measurement correspondence of self-efficacy and performance items. In terms of practical considerations, a vast number of items contribute to an overall final grade over the course of a semester, or a year. For instance, a final mathematics grade might comprise scores on several tests taken throughout the year, each of which might have contained twenty or thirty individual items. Therefore, in order for an efficacy measure to achieve exact correspondence with a final grade calculated in this way, the self-efficacy measure may have to be comprised of up to a hundred items, with all items corresponding exactly to the individual performance items across all tests taken in the year. Such strict correspondence would deem that
every self-efficacy study require its own tailored instrument, ensuring that every self-efficacy item matched every performance item. Clearly this degree of correspondence between self-efficacy and performance items would make self-efficacy research costly, time consuming and ultimately unattractive.

As well as the impracticality of devising self-efficacy measures that correspond precisely with performance measures, it seems unnecessary considering that it is probably unlikely that a student with high self-efficacy for one Year 11 algebra problem will have low self-efficacy for another Year 11 algebra problem. A more likely scenario may be students who have diversity among self-efficacy levels for various branches of mathematics. For instance, students may have either high or low self-efficacy across the mathematics spectrum, or high self-efficacy for, say, algebra, but low self-efficacy for geometry. According to this latter argument, the measurement of mathematics self-efficacy might be achieved best by adherence to a level of self-efficacy / performance correspondence that can be referred to as criterial domain correspondence.

In order to achieve such criterial domain correspondence, self-efficacy items would not have to measure students' perceived competence with regard to individual items, but rather, they should assess perceived competence with regard to each domain that contributes to final performance indices. Subject domains themselves are easily identifiable through reference to prescribed texts and outcome objectives for particular courses. Thus it might be that a measure of, say, mathematics self-efficacy should ask students to rate their competence across the ten or twelve branches of mathematics that comprise their
mathematics course, such as algebra, geometry, trigonometry, mensuration, and so forth. As there is no current scale to assess the mathematics self-efficacy of Victorian secondary students at the level of criterial domain correspondence\textsuperscript{3}, in the first study of the current thesis, a new self-efficacy measure will be developed to achieve this aim. It is expected that this scale will yield acceptable validity and reliability indices and will provide the current and future researchers with an instrument to assess mathematics self-efficacy and to predict performance outcomes in mathematics among senior secondary students.

An issue that has not received attention in the literature, but which will be addressed in the development of the Mathematics Self-efficacy Scale in Study 1, is the importance of context differentiation in the perception of self-efficacy. Bandura (1986) argued that a behavioural outcome, or performance, is affected not only by personal factors, such as self-efficacy, but also by environmental factors. One common environmental, or contextual, distinction that can be made in relation to school activities is the distinction between testing and non-testing conditions. While some students may thrive when working under test conditions, others do not cope well in examinations where time constraints and restrictions or bans on the use of references and textbooks are present. So, while students might have a particular perception of their self-efficacy to successfully complete certain mathematics tasks in their mathematics classes, they might have entirely different perceptions of their

\textsuperscript{3} Items on the Mathematics Self Efficacy scale (Cooper & Robinson, 1991) and the Mathematics Self-Efficacy Scale (Betz & Hackett, 1983) are not written in accordance with mathematics item content in Victorian secondary schools.
self-efficacy to successfully complete the same mathematics tasks in the context of a mathematics test or examination. While the differentiation between class and test conditions is not the only differentiation relating to school tasks, it is probably a particularly salient contextual differentiation for many students because many students feel threatened in tests (Onwuegbuzie & Seaman, 1995; Zohar, 1998). For the many students who are subject to negative affectivity associated with tests, it is entirely likely that such potentially debilitating reactions to tests may attenuate their sense of self-efficacy in test situations that might not occur to the same extent, or at all, in a less threatening classroom scenario. Self-efficacy studies have not routinely concurrently assessed students' self-efficacy for tasks in both test and classroom conditions. However, it is clearly important for the validity of self-efficacy measurement that students understand the contexts in which they are asked to make self-efficacy judgments, as these judgments, across contexts, may be quite diverse.

The measurement of self-efficacy that is simultaneously content (domain) and context specific, and that bears criterial domain correspondence to mathematics performance will be a significant step forward in Australian self-efficacy studies. It is particularly significant that the mathematics self-efficacy measure will be able to be used in Study 2 and Study 3 in the current thesis where it will be possible to model the relationship between mathematics self-efficacy and actual mathematics performance both prior to and during the VCE.
The design of Studies 2 and 3 will also enable questions of causality arising from the previous body of cross-sectional studies to be addressed. That is, the current studies will be able to ascertain to what extent good performance fosters good feelings about oneself, as well as to what extent these good feelings are responsible for future good performance?

In the following section, the ways in which self-efficacy can affect academic behaviours and academic performance, according to Bandura’s (1997) theory of self-efficacy, are discussed.

3.2 Effects of self-efficacy in relation to schoolwork and performance

Bandura (1986) proposed that through self-referent thought processes, such as self-efficacy, people can alter both their thinking and their subsequent behaviour. It is important that researchers gain a clear understanding of self-efficacy as it pertains to academic pursuits, because if Bandura’s theory is applied to the academic arena, it might be that self-efficacy has the potential to affect the ways students think about school tasks, the ways in which students approach, or avoid, school tasks and the ways in which students react to tasks, task contexts and performance outcomes.

According to Bandura (1997), there are at least three ways in which self-efficacy can affect school performance outcomes, such as grades. Firstly, self-efficacy can influence actual behavioural choices. For example, Bandura argued that people are more likely to engage in tasks in which they feel competent and avoid tasks in which they feel incompetent. Self-efficacy therefore can be said to promote behaviour that is either approach-oriented or avoidance-oriented. With respect to school, perceptions of competence might
promote approach or avoidance behaviours that are reflected in students’ rates of school attendance, classwork completion, homework completion or further non-compulsory out-of-school hours’ study. Favourable self-efficacy perceptions can thus be seen to go hand-in-hand with beliefs in the instrumentality of approach behaviours. Certainly previous empirical studies have demonstrated that self-efficacy influences a range of school behaviours such as task choice, effort expenditure and persistence (Schunk, 1996; Zimmerman, 2000), which can also be considered as approach behaviours. Bandura, Barbaranelli, Caprara and Pastorelli (1996) found that children’s self-efficacy contributed to academic performance by promoting high academic aspirations. Lent, Brown and Hackett (1994) reported that college students with higher self-efficacy had higher career aspirations and demonstrated a greater persistence in pursuit of the academic success required to attain their aspirations. Clearly, self-efficacy is related to people’s actual aspirations, or goals, and to the steps that they take to fulfil their goals. Goals and goal-setting are themselves complex constructs and processes respectively and will be elucidated further in the next chapter.

Apart from actual behavioural implications, Bandura (1997) proposed that self-efficacy can also influence people’s cognitions and emotions. For instance, many educational studies have demonstrated that students who hold favourable self-efficacy perceptions approach their schoolwork with interest and enthusiasm (e.g., Landine & Stewart, 1998; Wolters, 1998). On the other hand, their classmates with less favourable self-efficacy perceptions are more likely to experience debilitating affective reactions, such as anxiety, toward
their schoolwork (e.g., Pajares & Graham, 1999; Pajares & Valiante, 1999). The cognitive and affective implications of self-efficacy are, to a large extent, self-fulfilling prophecies: the self-efficacious, who approach their schoolwork with interest and confidence, and who believe in the instrumentality of their efforts, regularly reap the rewards of this effort which, in turn, confirms the validity of their efficacy beliefs. But their classmates with low self-efficacy, who perceive themselves as incompetent, who avoid situations and behaviours through which their competence might actually be enhanced, regularly confirm the validity of their efficacy beliefs via poor performance.

Taken together, the affective, cognitive and behavioural effects of self-efficacy can explain how self-efficacy can influence performance at school. In the following section, the literature with respect to empirical studies of the relationship between self-efficacy and performance in English and mathematics is reviewed.

### 3.3 Self-efficacy and performance in English and mathematics

In studies of mathematics self-efficacy prior to the 1990s, most analyses of the relationship between mathematics self-efficacy and mathematics performance were correlational. Studies conducted by Adams and Holcomb (1986), Cooper and Robinson (1991) and Lussier (1996) each reported significant positive correlations between levels of mathematics self-efficacy and mathematics performance in the order of .25, and this level of relationship is representative of a large body of literature that appeared in the decade or so spanning the time frames of these studies (e.g., Betz, 1978; Dew et al., 1983; Mcceco, Wigfield & Eccles, 1990; and see Schwarzer, Seip & Schwarzer, 1989
for a meta-analysis of results prior to the 1990s.). Although statistically significant, correlations between mathematics self-efficacy and mathematics performance in the order of .25 are lower than would be expected if one considers the considerable weight afforded by Bandura (1997) to self-efficacy in terms of the prediction of performance.

One explanation for the low correlations obtained between mathematics self-efficacy and mathematics performance in studies such as those cited above is that there was often a low degree of correspondence between performance tasks and self-efficacy criteria. Yet, as discussed at the beginning of this chapter, it is critical that self-efficacy items bear a strong resemblance to performance items if self-efficacy is to be a valid performance predictor. In studies such as those cited above, students were asked to assess their competence in areas of mathematics that did not always comprise latter performance measures. In more recent studies, where efficacy and performance measures have been more closely aligned in terms of criterial similarity, their relationship is stronger, as Pajares (1996) suggested it would be. For instance, correlations have been reported between mathematics self-efficacy and mathematics performance which are typically in the order of $\gamma = .70$ (e.g., Hackett, 1985; Hackett & Betz, 1989; Pajares & Kranzler, 1995). In self-enhancement models, in which mathematics self-efficacy is presumed to contribute to mathematics performance, standardised regression coefficients range from $\beta = .27$ (Pajares & Graham, 1999) to $\beta = .55$ (Pajares & Miller, 1994), with other studies also reporting path weights within this range (e.g., Pajares & Kranzler, 1995; Pajares & Miller, 1994; 1995).
Research findings from recent self-enhancement models in English have also consistently shown a positive relationship between writing self-efficacy and writing performance. More recent models (e.g., Pajares & Johnson, 1996; Pajares & Valiante, 1997; Shell, Colvin & Bruning, 1995; Zimmerman & Bandura, 1994) have reported path co-efficients in the order of $\beta = .40$, suggesting that higher writing self-efficacy contributes to higher essay marks and higher grades in writing-based subjects.

Since self-efficacy, and particularly task-specific self-efficacy, has been demonstrated to be significantly related to performance outcomes, it is important to understand how self-efficacy itself develops. Bandura (1997) proposed four factors that contribute to the development of self-efficacy. He termed these efficacy sources enactive mastery, vicarious experience, persuasive experience and physiological and affective states. Research that empirically verifies either the theoretical four-factor structure of the sources of self-efficacy, or which tests the contribution of these proposed sources to actual self-efficacy is scant. However, it is important that researchers understand better how self-efficacy develops because experimental studies have shown that self-efficacy can be manipulated (e.g., Cole & Hopkins, 1995; Schunk, 1983; 1984). A better understanding of the factors that inform self-efficacy thus has the potential to inform counseling practices aimed at enhancing impoverished self-efficacy or tempering self-efficacy that is not in accordance with reality. These processes, in theory, should facilitate academic performance. In the following section, the limited literature pertaining to understanding the sources of self-efficacy is reviewed.
3.4 Sources of self-efficacy

Despite Bandura's (1997) clear theoretical direction with regard to the sources of self-efficacy, little research has tested either his proposed four-factor structure or modeled the effects of his proposed sources of self-efficacy on an actual self-efficacy measure (e.g., Hampton, 1998; Lent, Lopez, Brown & Gore, 1996; Lopez, Lent, Brown & Gore, 1997; Nielsen, 1998). It is important to extend this limited body of work to investigate the sources of self-efficacy, because a clearer understanding of the structure of the sources of self-efficacy, as well as a better understanding of the influential power of these sources on existing self-efficacy, have the potential to inform counseling and educational strategies with respect to reshaping inaccurate efficacy perceptions. While Lent et al. (1996) have published a scale to measure the sources of mathematics self-efficacy, there have been no reports of such a scale to measure the sources of writing self-efficacy. Therefore, a scale to measure the sources of writing self-efficacy will be developed and psychometrically evaluated in Study 1 of this thesis.

Bandura (1997) argued that the strongest source of self-efficacy is enactive mastery. While enactive mastery refers broadly to past performance information, Bandura (1991) stated that "performance information is just raw data that is not inherently enlightening. Rather, it becomes instructive only through cognitive processing" (p.184). Bandura's (1997) argument that cognitive processing is important in the translation of past performance data into enactive mastery can be used to explain why similar performances do not always provide different people with similar satisfaction. For example, while
one student might interpret a B grade favourably, another student may be disappointed with a B grade. It is important to understand the types of cognitive processes that influence how students subjectively view objective performance, because it may be that some students under-appreciate grades that are objectively favourable (such as B grades) while others are happy to settle for lower grades than they might be capable of achieving. Factors that might be important in the cognitive processing of performance information include motivational factors, such as grade goals and broader goal orientations (see Chapter 4), personality factors, such as perfectionism and optimism (see Chapter 5) and skills, such as self-regulatory behaviours and actual stores of knowledge (see Chapter 6). These factors will all be considered in the chapters to follow.

In terms of how enactive mastery moulds self-efficacy, Bandura (1986) predicted that positive mastery experiences generally contribute to a positive sense of self-efficacy, providing that success is not always too easily obtained. For instance, if students know that success on a test was due simply to the test comprising extremely simple items, success such as this does not enhance self-efficacy, neither does such success impact negatively on self-efficacy; it just does not contribute to perceptions of competence at all. In fact when mastery information is integrated, Bandura (1997) argued that people consider both the ability and non-ability factors that contributed to the success or failure. Ability factors are internally situated, such as intelligence, while non-ability factors can be either internally situated factors, such as effort, or externally situated factors, such as task difficulty. The attribution of success or
failure to both ability and non-ability factors explains why success or failure, per se, do not always enhance or compromise self-efficacy.

Bandura (1997) observed that failures have their greatest impact on self-efficacy when they occur early on in people’s experience with a task. He explained that early failures are particularly potent because they constitute a large proportion of the mastery information. Thus it is important that instructors of young students, or instructors of students just beginning their exposure to certain courses, are aware of the impact that early failures might have upon students’ long-term attitudes in those subjects and be instructed in ways to help students manage negative thinking about early negative experiences.

Bandura (1997) proposed that when success is attributed to internal factors such as ability and effort, a robust sense of self-efficacy is likely to result. Thus if students believe that their academic success is due to their intelligence or to their efforts, or to both, then these beliefs foster favourable perceptions of competence. However, success that is attributed solely to the ease of a task does not enhance self-efficacy. Similarly, failure that is solely attributed to task difficulty does not diminish one’s sense of self-efficacy.

Some empirical studies have provided support for the influential power of enactive mastery on self-efficacy perceptions. Lopez et al. (1997) reported path co-efficients of $\beta = .34$ and $\beta = .55$ from perceived past performance to self-efficacy in algebra and geometry respectively. Hampton (1998) and Nielsen (1998) reported similar path profiles from enactive mastery to self-efficacy with respect to academic self-efficacy ($\beta = .41$) and statistics self-
efficacy ($\beta = .61$). In each of these three studies, enactive mastery was the strongest predictor of self-efficacy. The relative strength of enactive mastery as an informant of self-efficacy in these studies is consistent with Bandura's (1997) contention that mastery is the strongest source of self-efficacy perceptions.

The second source of self-efficacy information to which Bandura (1997) referred was vicarious experience, or the propensity of people to learn by merely watching others. In terms of vicarious learning as an efficacy source, Bandura argued that by observing the performance accomplishments of others, people gauge whether they too would be able to attain the same performance levels. If people conclude that they could attain the same performance level then self-efficacy can be enhanced, providing that the performance is viewed favourably. But if people conclude that they could not attain the same performance level then self-efficacy might be compromised, particularly if the performance level is desired or if it is judged to be poor.

Bandura (1986) had referred to the human capability to learn vicariously in earlier work using the term observational learning, or modeling. Bandura argued that in order to learn a behaviour by observing another person, the learner needs to pay close attention to the person exhibiting the behaviour. He termed this latter person the model. Bandura proposed that the degree to which learning occurs vicariously is in fact a direct function of the attention one affords a model.

Attention to a model is in part determined by the model's own characteristics. Some models are particularly noticeable and demand our
attention, such as prestigious or attractive models, or those who use dramatic gestures or colourful language. Bandura (1997) argued that people desire to be like prestigious models, hence their propensity to behave in similar ways and adopt similar beliefs. Another characteristic that helps to make models more salient to an observer is demographic similarity. Bandura argued that people take particular account of a model’s personal demographics and stable social variables in the vicarious assessment of self-efficacy. Because models who are perceived as similar to the observer might reasonably be expected to perform similarly on a range of tasks, Bandura argued that surpassing models considered similar to the self typically raises self-efficacy beliefs because people believe they have performed above expectations. Conversely, being outperformed by a model with similar demographic attributes typically lowers self-efficacy, because people believe that they have performed below expectations.

Despite these strong theoretical arguments, empirical support for modeling as a source of self-efficacy has been equivocal. Lopez et al. (1997) found no significant contribution of modeling to either algebraic or geometric self-efficacy, and Nielsen (1998) found no contribution of modeling to statistics self-efficacy. Hampton (1998) reported a path coefficient of $\beta = .30$ from vicarious influence to academic self-efficacy, however as discussed in Chapter 3.1, such global measures of self-efficacy are not consistent with the specific nature of self-efficacy and thus their validity is questionable. Therefore, while modeling appears to be a reliable factor in measures of the sources of self-efficacy (Lopez et al., 1997; Nielsen, 1998), it is unclear
whether modeling is a valid contributor to students' self-efficacy perceptions. Despite Bandura’s (1997) conviction otherwise, it might be that modeling is simply not an influential process, at least in the assessment of quantitative (mathematics/statistics) self-efficacies. Parallel research in non-quantitative domains, such as English, will help to clarify whether this assertion is relevant to broader educational areas.

Bandura’s (1997) third source of efficacy information, persuasive experiences, or verbal persuasion, refers to the differences in self-efficacy that can be attributed to task feedback. People are involved with many others in their day-to-day functioning, however Bandura argued that people construct their self-efficacy beliefs contingent upon the way they interpret the credibility of the person to whom they are listening. In general, Bandura proposed that "The more believable the source of information, the more likely are efficacy expectations to change" (p.202). Thus in education, students’ self-efficacy might be particularly influenced by feedback from teachers, but rather less so from feedback from a doting parent or a friend who only ever lavish praise or "empty homilies" (Bandura, 1997, p.106) upon them. When feedback does come from a respected and credible source, Bandura argued that positive feedback contributes to a high sense of self-efficacy. In particular, encouragement that is framed in terms of self-improvement, rather than triumphs over others, is most beneficial for self-efficacy because triumph over others might not always reflect the standard of one’s own performance.

As with studies that have investigated the power of modeling on self-efficacy, empirical evidence for the role of persuasion as a source of self-
efficacy has also been mixed. Neither Hampton (1998) nor Nielsen (1998) found any relationship between persuasion and academic or statistics self-efficacy respectively. While Lopez et al. (1997) reported a significant path from persuasion to self-efficacy among algebra students, they failed to replicate this finding in geometry students. One possible explanation for the discrepancy in Lopez et al.'s results is that students in their geometry sample undertook geometry as part of their regular course requirement, while their algebra students were advanced students continuing with the subject as an elective. It is possible that this element of choice and, indirectly, ability may explain Lopez et al.'s contradictory findings. This distinction warrants investigation in future studies. It might be that for students who pursue elective units, such as VCE mathematics, feedback from teachers is particularly important since it is likely to provide information vital to performance in a subject that students either like or require. To test this assertion, the differential impact of persuasion on self-efficacy will be assessed between students undertaking (compulsory) VCE English and (elective) VCE mathematics in Study 3 of this thesis.

Bandura's (1997) final proposed source of self-efficacy information, physiological and affective state experiences, refers to somatic arousal while engaging in or thinking about a task. Somatic arousal may be positive or negative in nature. For instance, somatic arousal may take the form of excitement or of nervousness. It is important to differentiate between those people who interpret somatic arousal negatively and those who interpret it positively. Bandura proposed that high achievers tend to see moderate levels of
somatic arousal as a performance facilitator, hence even mild to moderate feelings of nervousness might be interpreted by such people in a favourable way. If arousal is interpreted positively, Bandura argued that self-efficacy will not be compromised.

Somatic arousal, whether positive or negative can be mild, moderate or extreme. In its extreme, somatic arousal may present as exuberant excitement or as a pounding heartbeat, perspiration and trembling. Of course some vigorous physical tasks might be expected to produce somatic arousal like an elevated heartbeat and perspiration, hence Bandura (1997) argued that only those activities that evoke departures from homeostasis not expected by the nature of the task, and those that are interpreted negatively, are likely to lead to low self-efficacy.

This last source of self-efficacy, physiological and affective states, is conceptually similar to the phenomenon Beck and Emery (1985) called anxiety. Beck and Emery defined anxiety as “the unpleasant feeling state evoked when fear is stimulated” (p.9), hence anxiety is somatic arousal that is interpreted negatively, rather than positively, and which is extreme, rather than low or moderate. The strong degree of similarity between anxiety and Bandura’s (1997) notion of affective states was observed by Lent et al. (1996), as they used the items from a measure of mathematics anxiety to measure the contribution of physiological and affective states as a source of mathematics self-efficacy. The current studies also acknowledge the similarity between physiological state experiences and anxiety and in accordance with Lent et al., physiological state is operationalised in this study using anxiety measures. To
measure physiological state experiences in English a measure of writing anxiety will be used and to measure physiological state experiences in mathematics, the same mathematics anxiety items used by Lent et al. will be used.

In studies evaluating the impact of arousal, or anxiety, on performance, Betz and Hackett (1983), Cooper and Robinson (1991) and Lussier (1996) all have reported strong correlations between mathematics self-efficacy and mathematics anxiety ($r = .56$ and $r = -.41$ (reverse scored); $r = .86$ respectively), indicating that higher mathematics anxiety is related to lower mathematics self-efficacy. A path analysis by Nielsen (1998) showed that arousal contributed negatively to statistics self-efficacy ($\beta = -.29$). Similar results have been obtained between writing self-efficacy and writing anxiety where Pajares and Valiante (1997) and Pajares and Johnson (1996) have reported a path coefficient of $\beta = -.45$ and a correlation of $r = -.47$ respectively between writing self-efficacy and writing anxiety.

Apart from influencing self-efficacy, it has been long observed that somatic arousal can have a negative impact on school performance. Nearly twenty-five years ago Johnson (1979) estimated that up to 30% of students experience school-related somatic arousal, or anxiety, which is severe enough to debilitate performance. In their study where they developed the Mathematics Anxiety Rating Scale, Richardson and Suinn (1972) reported that over one-third of students seeking help at a University counseling service indicated that their main problem was related to mathematics anxiety. These figures indicate that it is important to identify students who may be susceptible to performance-
related anxiety at school so that school counselors and teachers can help them to alleviate their anxiety with the aim of facilitating and improving their academic performance.

In the following sections a review of the nature of anxiety and a review of the literature with respect to the relationship between anxiety and performance in English and mathematics will be presented.

3.5 What is anxiety?

Anxiety has been conceptualised as a two-dimensional affective construct comprising both generalised and situational components, which Spielberger (1970) termed respectively trait anxiety and state anxiety. People susceptible to trait anxiety have a propensity to experience anxiety in a wide range of situations, while people susceptible to state anxiety only experience anxiety in certain contexts (Eysenck, 1991; Spielberger, 1970). For many people who experience state anxiety, it is school, or more commonly particular school subjects, that trigger their anxiety (Kiselica, Baker, Thomas & Reedy, 1994).

Spielberger (1970) argued that state anxiety can either be cognitive or somatic. Somatic anxiety is physiologically based and involves increased heart rate, shortness of breath and muscle tenseness (Morris & Summers, 1995), similar to Bandura's (1997) conceptualisation of physiological state experiences. Cognitive anxiety involves fear, worry and apprehension (Zeidner, 1991). Cognitive anxiety in the academic context frequently takes the form of ruminations about failure and its consequences (Bandalos, Yates & Thorndike-Christ, 1995; Zeidner, 1991). While it is not unusual to think about
failure to some degree, Beck and Clark (1991) observed that people with cognitive anxiety both "overestimate the threat associated with situations and underestimate their own abilities to cope with such threat" (p.42).

Eysenck (1991) suggested that anxiety causes a narrowing of the attention towards a perceived threat. If this is so, narrowing the attention towards a perceived threat such as, say, mathematics, would theoretically reduce the cognitive processing capacity that is available for use when students tackle mathematics problems, making cognitive processing less efficient and hence increasing error rates (Wine, 1980). A reduction in cognitive processing capacity as a result of anxiety is consistent with empirical evidence that demonstrates that as anxiety about mathematics increases, mathematics performance indeed decreases (Adams & Holcomb, 1986; Cooper & Robinson, 1991; Lussier, 1996). It is thus possible that decrements in mathematics performance that occur with anxiety are the result of inefficiencies in cognitive processing brought about by the reduction of processing space.

3.6 Anxiety in English and mathematics

Anxiety, like self-efficacy, is often measured in specific contexts (i.e., as a state anxiety). Specific measurement of anxiety has been found to have greater predictive power, in terms of the prediction of academic performance, than measures of general trait anxiety (Bandalos et al., 1995).

In cross-sectional studies, Pajares and Graham (1999) and Pajares and Kranzler (1995) each reported correlations of $r = -.40$ and $r = -.46$ between mathematics anxiety and mathematics performance. These findings mirror many correlational studies spanning over 40 years (e.g., Adams & Holcomb,

In the context of English writing, some inconsistent findings have emerged with respect to the relationship between writing anxiety and writing performance. In an early cross-sectional study, Daly and Miller (1975) reported a weak correlation (r=-.19) between writing anxiety and performance, yet in later work, Pajares and Johnson (1996) reported a much stronger relationship between these two constructs (r = -.48). Contrary to these two studies, neither Pajares and Valiante (1999) nor Faigley, Daly and Witte (1981) observed any significant relationship between writing anxiety and writing performance.

As Pajares and Valiante (1997) observed, there have been differences between studies in the ways in which writing performance has been measured. For example, Daly and Miller (1975) used a standardised measure (SAT verbal score) of writing performance, while Faigley et al. (1981) and Pajares and Valiante (1997) used more subjective essay assessments. These measurement inconsistencies may underlie differences in findings with respect to the relationships between writing anxiety and writing performance. Such measurement inconsistencies are less usual in studies of the relationship between mathematics anxiety and mathematics performance where the assessment of performance in mathematics relies almost without exception on objective indices like standardised test scores or final grades that reflect performance on a range of tests or assignments over a semester or year. While it is important that researchers come to agreement upon the best method of assessing writing performance in empirical studies so that a more integrative
body of literature can be built, in the current studies, students’ final grades in mathematics and in English will be used as mathematics and writing performance measures.

Inconsistencies in the relationship reported between anxiety and performance in writing may also reflect a third variable effect. Bandura (1986) contended that it is not necessarily life’s pressures that cause anxiety. He, among others, has argued that the ways in which people perceive stressors determine their reactions to them. Bandura stated that “stress reactions are governed largely by beliefs of coping efficacy” (p.262) and he contended that perceived threats can be transformed from hazardous to benign if coupled with efficacious coping strategies.

Moore and Burrows (1996) echoed Bandura’s (1986) position when they said that “individual perceptions...may partially explain why some people succumb to psychological distress more than others” (p.97), as did Beck and Emery (1985) who suggested that an individual “feels vulnerable if he believes he lacks the important skills necessary to cope with a particular threat” (p. 69). In the assessment of the relationship between anxiety and performance it is important therefore to consider the coping strategies that students adopt if their schoolwork creates anxiety for them. The following section describes two traditional conceptualisations of coping and a more recent formulation that draws together aspects of each of these traditional models.

3.7 What is coping?

Lazarus and Folkman (1984) argued that when faced with a stressor, people who perceive their resources to be compromised use particular
strategies to manage these demands - or to cope. Stressors, or threats, were defined by Lazarus and Folkman as perceived demands that outweigh the perceived resources available to deal with these demands and that involve the belief that a situation can be harmful either physically or psychologically. In the school context, stressors might be such things as tests, which student believe will contain items that they cannot answer; or it might be a particular class in which students believe they may be asked information for which they cannot provide an answer. Either of these circumstances might result in psychological harm such as feelings of incompetence or embarrassment.

Lazarus and Folkman (1984) defined coping as "constantly changing cognitive and behavioural efforts to manage specific internal and/or external demands that are appraised as exceeding the resources of the person" (p.141). Coping is thus a dynamic process that is mediated by the environment. At school, coping may include strategies such as avoiding class. On the other have, it might include more proactive, or approach-type, strategies such as gathering the required information for the class.

There have been several conceptualisations of coping. Pearlin and Schooler (1978) argued that coping has three dimensions which serve to protect the person by either changing or removing the source of the problem, allowing for perceptual control over the problem so that its meaning can be manipulated, or allowing for affective reactions to the problem to be managed adequately. Viewed in this way, coping not only refers to the things that people do when faced with a threat, but also to the ways that people think when faced with a threat.
Folkman and Lazarus (1985) argued that coping has two main dimensions: a problem-focused dimension and an emotion-focused dimension. Problem-focused coping is directed towards solving the problem itself and is conceptually similar to Pearlin and Schooler's (1978) dimension: changing or removing the source of the problem. Folkman and Lazarus' emotion-focused coping is directed towards reducing anxiety surrounding the threat. Emotion-focused coping is conceptually similar to Pearlin and Schooler's third coping dimension: allowing for affective reactions to the problem to be adequately managed.

Moore (2003) noted that despite Pearlin and Schooler (1978) identifying three coping domains, Folkman and Lazarus' (1985) popular conceptualisation of coping failed to include a component relating to perceptual control. Moore argued that coping is not only problem- and emotion-focused, but may also be "the strategies by which people reframe their experiences in a way that diminishes the stress" (p.5). This argument revisits Pearlin and Schooler's original description of coping. Moore named four coping factors: an appraisal process (e.g., get more information), the utilisation of resources (e.g., seek advice from others), a solution-oriented, or challenging/proactive approach to dealing with the problem (e.g., take control of the situation), and the use of avoidance strategies (e.g., keep my fingers crossed that it will go away).

In Moore's (2003) coping model, the utilisation of resources, appraisal and proactivity can be broadly interpreted as approach-oriented coping, while avoidance strategies can be interpreted as avoidance-oriented coping. While
Moore's coping model has not been applied in an educational setting it would seem to be well-suited considering that students' approach and avoidance tendencies have been consistently implicated in academic performance for over thirty years (e.g., Atkinson, 1957; Diener & Dweck, 1978; 1980; Middleton & Midgley, 1997; also see Chapter 4), and since self-efficacy itself elicits approach and avoidance behaviours (see section 3.2, this Chapter). In the following sections, differences in self-efficacy based models of performance as a function of approach and avoidance coping are explored.

3.8 Relationships between self-efficacy, anxiety and school performance as a function of approach and avoidance coping

Bandura (1997) argued that "stressful situations that can be controlled are construed as less threatening, and ... further reduce anticipatory emotional arousal" (p.199). The ways that students cope with school-related anxieties, such as mathematics anxiety and writing anxiety should therefore moderate the impact that these anxieties have on self-efficacy and on performance.

Firstly, for students who use approach-coping strategies, anxiety is not expected to adversely affect self-efficacy or performance. Students who use approach-coping strategies, such as getting more information (appraisal coping) seeking advice (utilisation of resources) or taking control of the situation (proactive coping) are clearly exhibiting efficacious coping behaviours based on a belief in themselves to "organize and execute courses of action required to attain designated types of performances" (Bandura, 1997, p. 391). According to Bandura, efficacious coping strategies should diminish any threat associated with the stressor that caused the anxiety. Therefore, the
anxiety elicited by mathematics or writing tasks should be diminished if students are approach-copers. Because approach-coping should theoretically diminish the effects of anxiety, mathematics and writing anxiety would not be expected to debilitate the performance students who use approach-coping strategies.

For students who predominantly use avoidance-coping strategies, the picture is less encouraging. For avoidance-copers, mathematics and writing anxiety is expected to cause decrements in self-efficacy and to have a debilitating effect on performance. Avoidance coping (e.g., keep my fingers crossed that it will go away) is indicative of a conviction that one is neither able to organise nor to execute a course of action required to attain a designated type of performance. Avoidance-coping can be argued to be characteristic of low self-efficacy, so further decrements in self-efficacy could reasonably be expected if students fear a subject to the extent that they execute avoidance coping. The lack of a strategy instrumental in approaching and diminishing a stressor is also expected to impact negatively on performance because the existing anxiety associated with the stressor will, according to Eysenck’s (1991) theory, reduce the cognitive capacity available to work mathematics tasks or write English essays.

The proposed causal paths in models of performance that comprise self-efficacy and its sources are presented in Figures 1 and 2. While it has been argued that the most stringent tests of the contribution of self-efficacy to performance are those that control for past performance (e.g., Pajares &
Graham, 1999), in the current models, past performance is included as a direct path to enactive mastery, as discussed in Chapter 3.4.

Figure 1 contains the proposed paths for students who have an approach-coping orientation; while in Figure 2, the proposed paths are predicted for students with an avoidance-coping orientation. These models differ in that the effects of anxiety on self-efficacy and performance are proposed to differ according to coping orientation. These generic performance models will be tested in mathematics and English performance domains in studies two and three and represent competing models 1A and 1B.

Figure 1. Competing model 1A: Predicted paths for approach-oriented copers in a self-efficacy based model of performance
Figure 2. Competing model 1B: Predicted paths for avoidance-oriented copers in a self-efficacy based model of performance.

In the next chapter, competing models of English and mathematics performance based on students' self-set (target) goals and (purpose) goal orientations will be presented.

3.9 Chapter summary

Bandura (1986) proposed that one's self-beliefs of competency, or self-efficacy, have important implications for performance at school. Empirical studies have demonstrated that high self-efficacy can facilitate high performance, while low self-efficacy can impede performance. Self-efficacy is also related to other variables implicated in school performance including anxiety and coping. The relationship between self-efficacy and anxiety is negative, although coping efforts can ameliorate the effects that low self-efficacy has on performance through reducing the threat associated with
anxiety. Coping can be viewed in terms of approach and avoidance strategies. While approach coping strategies are predicted to reduce the negative impact that anxiety has on self-efficacy and performance, avoidance coping is expected to exacerbate anxiety and thus reduce self-efficacy and impede performance.
CHAPTER FOUR

THE EFFECTS OF TARGET GOALS AND PURPOSE GOALS
ON PERFORMANCE IN ENGLISH AND MATHEMATICS

In this chapter competing models of performance based on a) target goals and b) purpose goals will be proposed. In the following sections the literature on target goals and purpose goals and the effects that these two different types of goals have on performance in English and mathematics will be reviewed.

4.1 What are goals?

According to Boekaerts and Ncamivirta (2000), goals can be regarded as “concrete anchor points for directing our actions in fulfillment of our needs” (p.421). Schunk (1996) proposed that goals help to direct our actions by providing people with standards against which they can compare their performances. In education, goals can be set according to standards that are either externally defined or self-set (Schunk, 2001). At school, the most common externally defined standards are letter-grades, or simply ‘grades’.

When students set goals for themselves, these goals can be made either in terms of absolute standards, such as I want to get an A, or in terms of relative standards, such as I want to do better than average, I want to do better than my last report or I want to do better than Sam. All of these instances are examples of specific outcome goals, which Punitich (2000) termed “target goals” (p.473). In the following section, the role of target goals in school performance is discussed.
4.2 Target goals in school performance

According to Pintrich (2000), target goals represent a person's aim for a specific outcome. In educational research, specific target goals have also been referred to as grade goals (e.g., Zimmerman, Bandura & Martinez-Pons, 1992; Zimmerman & Bandura, 1994), because goals in the form of particular grades are often the target for students. In this thesis, target goals will also be referred to as grade goals, because both grade goals and actual grades (performance) will be measured in the current studies.

Bandura (1997) proposed that personal goal setting, which includes grade goal setting, is partly influenced by perceptions of self-efficacy. Bandura argued that people will set higher grade goals if they believe in their ability to attain them, that is, if their self-efficacy perceptions are favourable - a proposition that has received empirical support (e.g., Zimmerman et al., 1992).

Furthermore, other researchers have reported that setting higher grade goals actually leads to higher performance (e.g., Hollenbeck & Brief, 1987; Locke & Bryan, 1968; Phillips & Gully, 1997). Zimmerman et al. (1992) reported that students' grade goals for social studies significantly contributed to their subsequent actual grades for social studies grades ($\beta = .43$), while their self-efficacy for academic achievement significantly contributed to their initial grade goals ($\beta = .36$), as predicted in Bandura's (1997) self-efficacy theory. Similarly, Zimmerman and Bandura (1994) reported that in a writing course, both grade goals and self-efficacy (combined $\beta = .38$) impacted upon writing course grades. Clearly it is important that grade goals are not neglected in
educational research because grade goals are directly related to performance (Zimmerman & Bandura, 1994). Bandura and Jourden (1991) and Zimmerman and Bandura (1994) have suggested that grade goals are even more influential than some self-evaluative reactions, such as self-satisfaction and dissatisfaction.

Although most students set their grade goals based on a reasoned criterion such as an inherent sense of self-efficacy, ultimately grade goals represent the grades students aim to accomplish, whether these aims are realistic or unrealistic. It is, however, important that students set realistic grade goals because students who have doubts about their competence are easily discouraged by failure to attain their goals (Bandura & Cervone, 1983). Accordingly, it is important that educators guide students towards realistic grade goal setting. While students should be discouraged from setting grade goals that are too high, and ultimately unattainable, they should also be discouraged from setting grade goals that are too low because this might result in students not attaining their full potential, or in low grades becoming a self-fulfilling prophecy. Locke and Latham (1990) argued that challenging goals, which are set marginally higher than prior attainments, serve best to enhance performance because they neither encourage stagnation, nor do they raise the bar too high.

It is important that educators play an active role in their students' grade goal setting because there is evidence that suggests that many students are unable to set realistic target goals. Jones, Slate and Marini (1995) reported that for a group of 265 students, 138 expected an A grade, 90 expected a B grade,
expected a C grade and only four expected a D grade. Considering that grading usually approximates a normal curve, it appears that some students are unduly optimistic when it comes to grade expectations. While grade expectations are not exactly the same as grade goals (one might be aiming for an A, but expecting a C), Locke and Bryan (1968) argued that expected grades are a component of grade goals, thus a high degree of concordance would be expected between these two measures.

Why such an optimistic pattern of grade expectancies emerges should be questioned because many students will fall short of their expectations and the failure to attain grade goals may have implications for their future career choices, students’ self-efficacy and their future goal setting (Bandura & Cervone, 1983). One explanation for overly optimistic expectancies might be that students do not have a realistic idea of their capabilities. In other words, students’ perceptions of efficacy might not be in accordance with reality. Inaccurate efficacy perceptions might occur because students do not have past performance information on which to base their assessments of self-efficacy. Or it may be that some students use less authentic efficacy sources, such as modeling or social persuasion, as the basis of their self-efficacy. A further explanation for variations in students’ optimistic goal setting may be that some students have more optimistic personality dispositions (see Chapter 5).

Aside from personality factors such as optimism, it might be that differences in students’ use of particular types of knowledge (see Chapter 6) affect their target goal setting. Jones et al. (1995) reported that students setting lower grade goals focused heavily on rote learning, whereas those setting
higher grade goals focused more on meaningful learning. Rote learning is one facet of a class of knowledge termed *procedural knowledge*, while meaningful learning is a facet of a class of knowledge termed *conceptual knowledge* (Hiebert & Lefevre, 1986). Conceptual knowledge has been demonstrated as particularly facilitative for learning and performance (Hecht, 1998) (see Chapter 6), thus it might be that some students set higher grade goals because they believe in the instrumentality of meaningful learning. While procedural knowledge does not always hinder learning, it can do if it is not accompanied by conceptual knowledge (Hiebert & Lefevre, 1986) (see Chapter 6), thus some students might set lower grade goals because they doubt the intellectual power of rote learning alone.

Due to differences in content between school subjects such as English and mathematics, it might also be that the instrumentality of conceptual and procedural knowledge is a function of the subject. For instance, procedural knowledge might have benefits for mathematics performance where knowledge of correct procedures assists performance outcomes. While the role of conceptual and procedural knowledge in mathematics and English performance will be considered fully in Chapter 6, at this juncture it is important to note that because grade goals might be affected by variables that are potentially sensitive to school subject differences, it is imperative that grade goals be measured in terms of individual subjects. Thus in Studies 2 and 3, students will be asked to nominate separately their grade goals for English and for mathematics.
4.3 Goals as “what” and “why”

There is a limitation of looking at goals in education exclusively as grade goals. This limitation is that grade goals only provide information about a desired outcome. Grade goals tell us nothing about why students might desire a particular grade. It is important to understand why students aim for particular grades because the reasons students have for their grade goals, according to Pintrich (2000), are also influential in grade outcomes, as will be discussed below.

As well as considering goals as targets, Eccles, Adler, Futterman, Goff, Kaczala, Meece and Midgley (1983) proposed that goals in the academic context can also be considered as the purposes that people have for learning. The distinction between goals as targets, such as grade goals, and goals as purposes represents a general demarcation made in the literature between different types of goals (e.g., Harackiewicz, Barron & Elliot, 1998; Pintrich & Schunk, 1996). While target goals represent the what of goal-setting, for example What grade am I aiming for?, purpose goals represent the why of goal-setting. Like target goals, purpose goals also help to direct action by providing standards for performance. Purpose goals refer to three main performance standards. Students can employ absolute standards for purpose goals, such as Why do I want an A? Students can employ internal relative standards for purpose goals, such as Why do I want to do better than last time? Or students can employ external relative standards for purpose goals, such as Why do I want to do better than Sam?
Elliot and Dweck (1988) termed purpose goals in education achievement goals and they described them as “cognitive processes that have affective and behavioral consequences” (p.11). More recently, Pintrich and his colleagues (e.g., Garcia & Pintrich, 1994; Pintrich & Schunk, 1996; Wolters, Yu & Pintrich, 1996) termed purpose goals goal orientation. Beyond viewing goal orientations as merely predictors of beliefs and behaviour, Pintrich (2000) argued that goal orientations reflect reasons for behaving in certain ways or doing certain things.

Two distinct classes of goal orientation have been identified, which in this thesis will be termed mastery goals and performance goals, although these are not always the terms used in the past literature. In fact, the adoption of several different terms across different research programs has made integration of the literature a somewhat confusing task. Therefore, similar to Pintrich’s (2000) cross-tabulation of goal orientations and their approach and avoidance forms, it is useful to summarise the influential models of goal orientations (see Table 1), in order to more easily identify the type of orientation to which each model refers.
Table 1. A Summary of the Taxonomy of Goal Orientations in Past Studies

<table>
<thead>
<tr>
<th>Research program</th>
<th>Mastery goal orientation</th>
<th>Performance goal orientation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ames(^a)</td>
<td>Mastery goals</td>
<td>Performance goals</td>
</tr>
<tr>
<td>Dweck(^b)</td>
<td>Learning goals</td>
<td>Performance goals</td>
</tr>
<tr>
<td>Harackiewicz(^c)</td>
<td>Mastery orientation</td>
<td>Performance orientation</td>
</tr>
<tr>
<td>Midgley(^d)</td>
<td>Task goals</td>
<td>Performance goals</td>
</tr>
<tr>
<td>Nicholls(^e)</td>
<td>Task-involved goals</td>
<td>Ego-involved goals</td>
</tr>
<tr>
<td>Pintrich(^f)</td>
<td>Mastery goals</td>
<td>Performance goals</td>
</tr>
<tr>
<td>Schunk(^g)</td>
<td>Learning goals</td>
<td>Performance goals</td>
</tr>
<tr>
<td>Turner(^h)</td>
<td>Learning-oriented goals</td>
<td>Success-oriented goals</td>
</tr>
</tbody>
</table>


\(^{b}\) Dweck, 1986; Dweck & Elliot, 1983; Dweck & Leggott, 1988; Elliot & Dweck, 1988; Heyman & Dweck, 1992

\(^{c}\) Elliott & Harackiewicz, 1996; Harackiewicz, Barron, Carter, Lehto & Elliot, 1997; Harackiewicz, Barron & Elliot, 1998; Harackiewicz & Sansone, 1991

\(^{d}\) Midgley, Anderman & Hicks, 1995; Midgley, Arunkumar & Urdan, 1996; Midgley & Urdan, 1995; Middleton & Midgley, 1997

\(^{e}\) Jagniacinski & Nicholls, 1987; Nicholls, 1975; 1979; 1984; 1989; Nicholls, Cheung, Lauer and Fatashnick, 1989; Thorkildsen and Nicholls, 1998

\(^{f}\) Pintrich, 1989; Pintrich & DuGroot, 1990; Pintrich & Schunk, 1996; Wolters et al., 1996

\(^{g}\) Pintrich & Schunk, 1996; Schunk, 1996; 2001

\(^{h}\) Meyer, Turner & Spencer, 1997; Turner, Thorpe & Meyer, 1998

In the remainder of this thesis, the terms 'mastery' and 'performance' will be used to subsume the terms in Table 1.

4.3.1 Mastery goals

Students who adopt mastery goals have a focus on learning and on the development of new skills and competencies (Ames & Archer, 1988; Dweck, 1986; Turner, Thorpe & Meyer, 1998). Bockaerts (1993) observed that students with mastery goals, or “intentions to learn” (p. 150), report positive affect and are optimistic in their appraisals of learning outcomes. The general positive disposition towards learning and performance adopted by students with mastery goals is highly facilitative for learning, and hence for
performance. For instance, even in the face of error, students with mastery goals typically remain positive and even exploit errors that other students may find disappointing or threatening (Heyman & Dweck, 1992; Meece, Blumenfeld & Hoyle, 1988; Pintrich & DeGroot, 1990).

Clifford (1984) explained that students with mastery goals are able to exploit error because, through their focus on developing new skills, they utilise error constructively. For students with mastery goals, error necessitates a re-evaluation of work and work procedures. As a byproduct, this re-evaluation provides information about what not to do in the future and hence lessens the likelihood of repeating the same mistakes. Because students with mastery goals accept error as a valuable part of learning, they are not afraid to tackle challenging tasks where there may be a risk of error (Meyer et al., 1997). By regularly tackling challenging tasks, students with mastery goals provide themselves with further opportunities to learn (Middleton & Midgley, 1997; Pintrich & DeGroot, 1990; Wolters et al., 1996).

As Pintrich and Schunk (1996) observed, few studies have examined gender differences in goal orientations; but for those that have, girls reportedly espoused a mastery goal orientation more than did boys (Anderman & Young, 1994; Kaplan & Maehr, 1999; Middleton & Midgley, 1997). Why girls apparently value learning and task mastery more than boys is unclear. It may be that girls believe in the instrumentality that learning has for grades more so than do boys. The current studies will help to consolidate the limited literature on gender differences in mastery goals.
Through the design of the current studies it will also be possible to assess the stability of a mastery goal orientations over time. It is important to ascertain whether mastery goals are stable over time because their benefits for learning and performance make mastery goals a valuable attribute that should be nurtured throughout the school years. The stability of Australian students’ goal orientations has not been reported upon in the previous literature.

4.3.2 Performance goals

Students who adopt performance goals have a focus on outperforming others or exceeding normative standards (Ablard & Lipschultz, 1998; Dweck, 1986; Turner et al., 1998). Covington (1992) argued that students with performance goals interpret success in terms of their own self-worth, because they believe self-worth is comparative. Students with performance goals compare their grades to their classmates’ grades, or to grade averages, to determine their performance success. If the grades of students with performance goals exceed those of their peers, or exceed the average, this comparative success has positive implications for self-worth for performance goal oriented students.

Unlike students with mastery goals, who view failure or error as opportunities for reflection and self-improvement, students with performance goals view failure or error as indicators of low ability because it threatens their normative position within a group (Covington, 1992; Turner et al., 1998). Not surprisingly, it has been reported that students with performance goals experience negative affect after failure, which is accompanied by decrements in self-efficacy (Jagacinski & Nicholls, 1987).
As well as interpreting failure as an indicator of low ability, students with performance goals also tend to view effort as an indicator of low ability. While students with mastery goals see challenge as an opportunity to learn (Pintrich & DeGroot, 1990), and increased effort as progress towards learning (Middleton & Midgley, 1997), students with performance goals interpret the extra effort required to meet a challenge as a threat to their self-worth (Middleton & Midgley, 1997). Covington (1992) and Nicholls (1989) argued that students with performance goals interpret extra effort as a threat to their self-worth because the possibility of failure accompanies challenging tasks. Students with performance goals thus tend to prefer less challenging tasks, because the quick success that readily accompanies easy tasks enhances their feeling of self-worth (Turner et al., 1998). However, by regularly choosing easy tasks, students with performance goals limit their opportunities to surpass others at school and thus add to their own sense of impoverished self-worth.

Rather than focusing on performance outcomes, such as exceeding others' grades, some students with performance goals simply seek to avoid failure (Covington, 1992; Elliot & Harackiewicz, 1996; Nicholls, 1989; Middleton & Midgley, 1997). The study of performance goals in terms of the motivation to avoid failure has received scant attention in the literature. However, when taken in conjunction with the traditional view of performance goals as wanting to exceed others, performance goals bear resemblance to the distinction between approach and avoidance motives proposed by Atkinson (1957) in his theory of motivation. Furthermore, this distinction is also similar
to the behavioural effects of self-efficacy (Bandura, 1997) and to coping strategies as conceptualised by Moore (2003).

Atkinson (1957) argued that people are generally motivated either by the tendency to approach success or the tendency to avoid failure. Consistent with this theory, Middleton and Midgley (1997) proposed that while people with performance goals may be motivated to approach success (e.g., to win or to outperform others), they may also be motivated to avoid failure. Middleton and Midgley separated a performance goal orientation in terms of approach and avoidance tendencies and termed the performance goal representing a desire to approach success a performance-approach goal, and the performance goal representing a desire to avoid failure a performance-avoid goal. Middleton and Midgley's study is discussed in more detail in the following section.

4.4 Middleton and Midgley's tripartite model of goal orientation

Middleton and Midgley (1997) described students who are oriented towards mastery goals as those who “define success as mastering something new and who see effort as contributing to success” (p. 711). They described students who are oriented towards performance-approach goals as “oriented to demonstrating ability relative to others” (p. 711). Finally, Middleton and Midgley described students who are oriented towards performance-avoid goals as those who “want to avoid looking unable” (p. 712). While the motivation of students to avoid looking incompetent had previously been proposed by Covington (1992), and while Elliot and Harackiewicz (1996) had described some students as "striving to avoid incompetence" (p. 461), Middleton and
Midgley were the first to look simultaneously at mastery goals, performance-approach goals and performance-avoid goals in an educational setting.

Middleton and Midgley (1997) found no correlation between students' mastery goals and performance-approach goals ($r=.04$). While orthogonality between mastery and performance goals (in general) had also been observed in several previous studies (e.g., Ablard & Lipschultz, 1998; Thorkildsen & Nicholls, 1998), other studies by Pajares (2001) and Pajares, Britner and Valiante, (2000) reported moderate positive correlations ($r=.30$ to $r=.40$) between mastery goals and performance-approach goals. Pajares et al. observed that these two constructs should be positively related, since both are grounded in self-regulatory practices (see Chapter 6) that lead to positive outcomes, thus it is unclear why Middleton and Midgley failed to find a similar relationship between mastery goals and performance-approach goals, particularly since they used the same measures as Pajares and Pajares et al.

In terms of the relationship between mastery goals and performance-avoid goals, Middleton and Midgley (1997) reported no significant correlation ($r=.01$), while Pajares (2001) reported a low, but significant, negative correlation ($r=-.18$) between these measures and Pajares et al. (2000) reported low, and non-significant, positive correlations ($r=.10$, $r=.07$) in two separate studies. It is unclear why differences between all three studies emerged with respect to the relationship between mastery goals and performance-avoid goals. All three studies appear to have employed student samples of approximately equivalent age, gender and socioeconomic backgrounds; all studies used the same items to measure mastery, performance-approach and performance-avoid
goals; and all studies reported similar internal reliability indices for each goal subscale. It might be that the data from Pajares et al.’s studies were not bivariate normal, hence truncating the correlations between mastery goals and performance-avoid goals, however this possibility is entirely speculative. The current study will attempt to clarify the limited and equivocal data on the relationship between mastery goals and performance-avoid goals and will determine whether this relationship is indeed linear.

After separating the approach/avoidance locus of performance goals, Middleton and Midgley (1997) reported that performance-approach and performance-avoid goals were moderately related ($r = .56$). This result indicated that even when the locus of performance standards are separated, the fundamental focus on performance is sufficiently strong to result in a substantial degree of concordance between the two constructs. Pajares (2001) and Pajares et al.’s (2000) studies reported similar correlations ($r = .48$ to $r = .57$) between these two performance goals.

Middleton and Midgley (1997) found that boys reported a higher level of support for performance-approach goals in mathematics than did girls. Pajares et al. (2000) found that boys reported a higher level of support for performance-approach goals in language arts (writing) than did girls, however this result was not observed in the context of a science class. The findings from the current studies will help to clarify the findings on gender differences in performance-approach and performance-avoid goals. These findings will also provide data on the temporal stability of students’ performance goal orientations, an issue yet to be addressed in the literature.
4.5 Grade goals, goal orientations and academic performance

As discussed in Chapter 4.1, grade goals are directly related to school performance (Bandura & Jourden, 1991; Zimmerman et al., 1992; Zimmerman & Bandura, 1994). Students who set higher grade goals generally receive higher grades, perhaps because the setting of grade goals is informed partly by self-efficacy, which itself is partly informed by prior grades (Bandura, 1997).

A positive relationship between a mastery goal orientation and academic performance has been consistently reported in the literature (e.g., Kaplan & Machr, 1996; Midgley & Urdan, 1995; Pintrich & DeGroot, 1990; Roeser, Midgley & Urdan, 1996; Schunk, 1996; Zimmerman & Martinez-Pons, 1986), suggesting that students who value learning and who display a positive and persistent approach to their school work reap the rewards of their efforts.

Results of studies that have investigated the relationship between performance goals and academic grades have been equivocal. While some studies have reported a positive relationship between performance goals and grades (e.g., Roeser et al., 1996), other studies have reported a negative relationship (e.g., Kaplan & Machr, 1996). One explanation for the contradictory findings with respect to performance goals and grades may be that, as observed earlier, many researchers have not differentiated performance goals in terms of the approach and avoidance tendencies proposed in traditional theories of motivation (e.g., Atkinson, 1957; Dweck & Leggett, 1988). In both Middleton and Midgley’s (1997) and Pajares’ (2001) studies, where the approach/avoidance distinction was made with respect to performance goals, performance-approach goals and performance-avoid goals were associated
with lower prior academic performance in the former study, but were unrelated in the latter. The relationship between performance goals and prior performance remains equivocal.

A limitation of Middleton and Midgley (1997), Pajares et al. (2000) and Pajares' (2001) studies was that in their design they did not include any prospective measure of academic performance; thus it is unclear whether performance goals impact upon future grades. Clearly, longitudinal designs are required to assess the impact that purpose goals have on subsequent performance, and in turn, the impact that performance has on subsequent purpose goals. The design of the current study will enable cycles of prior (year 9) performance / (mid-year year 10) goal orientation / (end year 10) prospective performance / (mid-year year 11) prospective goal orientation / (end year 11) final performance to be analysed. Results from this design will allow a significant step to be made in the understanding of causality in the relationships between purpose goals and school performance. This study will represent an important advancement because Middleton and Midgley acknowledged that their cross-sectional data prevented inferences of causality or bidirectionality.

The design of the current study will also allow for a study of the temporal stability of students' approach and avoidance goal orientations. Particularly, this study will investigate whether students' pre VCE goal orientations significantly differ from their goal orientations during the VCE. Considering that normative performance is ultimately the most critical factor with respect to students' ENTER scores, it might be expected that students'
orientations towards performance-approach goals in the VCE year will be
significantly greater than in the pre VCE year.

4.6 Why do people have different goal orientations?

There have been several theories explaining why people adopt a
particular goal orientation. From an individual differences perspective, Dweck
(1986) and Dweck and Leggett (1988) proposed that people's goal orientations
are derived from their implicit theories about the very nature of intelligence.
Dweck and Leggett argued that people hold either an incremental view of
intelligence, in which they believe that intelligence is malleable and able to be
increased; or an entity view, in which they believe that intelligence is a fixed
characteristic.

According to Dweck and Leggett (1988), people with an incremental
view of intelligence are likely to hold a mastery goal orientation because they
believe they can improve their ability through learning. But people with an
entity view of intelligence are, according to Dweck and Leggett, likely to have
a performance goal orientation because people with an entity view believe that
their intelligence is fixed and thus their focus is on receiving positive
judgments, and avoiding negative judgments, about their fixed ability.

Empirical studies (e.g., Bandura & Dweck, 1985) reporting that people
with an incremental view of intelligence were likely to have a mastery goal
orientation while those with an entity view were likely to have a performance
goal orientation have supported Dweck and Leggett's theoretical contentions.
However, suggestions that people display patterns of multiple goals (e.g.,
Pintrich & Schunk, 1996; Turner et al., 1998; Wolters et al., 1996) run counter
to both entity and incremental theories, since entity and incremental theories explain only why people hold either performance goals or mastery goals respectively.

One explanation for the observations that people display patterns of goals comes from Henderson, Cain and Dweck's (1983, in Dweck & Leggett, 1988) suggestion that some people have a view of intelligence that is a blend of entity and incremental theories. For example, some people might believe that while their intelligence is a stable personal attribute, situational variables may impact upon it. One situational variable that may be particularly salient in terms of students' beliefs about the nature of intelligence is the specific school subject in question. For instance, it is possible that some students might believe that they can improve their ability in certain subjects, but not in others. This suggestion is supported by the proposal outlined in Chapter 3 that self-efficacy judgments might be affected by contextual differences.

From a different perspective, Wentzel (1998) and Turner et al. (1988) argued that students adopt mastery goals simply because they value the by-products of learning; while others hold performance goals because they place a high value on objective success. Turner et al. argued that since students with performance goals have a focus on external comparison they define success in terms of high rankings, whereas students with mastery goals define success in terms of the progress towards task mastery. The proposition that students with mastery goals define success in terms of progress has been supported by studies that have demonstrated that students who hold mastery goals are more interested in learning, are more enthusiastic towards schoolwork and are more
persistent in the event of failure than students who do not hold mastery goals (e.g., Meece, Blumenfeld & Hoyle, 1988; Pintrich & DeGroot, 1990).

4.7 Contributions of the current thesis to the study of purpose goals

In his recent review of the current state of research on goal orientations, Pintrich (2000) set out several recommendations for future studies. One aim of the current studies is to address three of those recommendations as follows:

4.7.1 A general taxonomy of goal orientations

Pintrich (2000) observed that one of the obstacles hindering advancement in goal orientation research is the lack of a generally agreed upon taxonomy of goal orientations. The array of different terms that have been adopted across the most influential research programs in the field of goal orientation research were summarised in Table 1 at the beginning of this chapter. This table helps to clarify the proliferation of terms from the literature that have been used to describe what are essentially well agreed-upon constructs.

The labels mastery and performance have been adopted for use in this thesis to describe the two goal orientations summarised in Table 1. These terms have been adopted because they each appear to be the most commonly used terms, but more importantly because they each seem to describe best the general orientations of students towards standards based either on personal progression or on objective outcomes. The separation of performance goals in terms of approach and avoidance tendencies follows a long history of motivation research, most notably that of Atkinson (1957).
4.7.2 Multiple goals

A further limitation of the past literature observed by Pintrich (2000) will also be addressed in the current study: namely, the possibility that students do not hold either discrete mastery or performance goals, but instead might be simultaneously in pursuit of multiple goals. As several authors (e.g., Pintrich, 2000; Schunk, 1996; Turner, et al., 1998) have suggested, it is possible that some students are in simultaneous pursuit of more than one goal and some researchers have in fact reported different patterns of goals among students of varying ages (e.g., Ainley, 1993; Meece & Holt, 1993; Pintrich, 1989). Conversely, it is also possible that some students might not be in pursuit of any type of goal - that is, some students might simply be at school because they are too young to leave school, they have no job, or they remain at school at their parents' insistence.

In the current study, the simultaneous effects of mastery goals, performance-approach goals and performance-avoid goals on grades in English and mathematics both prior to and during the VCE will be analysed. Using this design, students' levels of each of the three purpose goals will be considered, since it may be that students have low levels of all three goals, no particular goals at all, or various combinations of goals.

4.7.3 Cross-cultural generalisability

Both Pintrich (2000) and Bockaerts (1998) have warned that research findings in education are culture bound and may not generalise to classrooms in different cultures. Practically all of the research on grade goals and goal orientations comes from European and US sources, with an Australian research
program yet to appear. While much of the European and US research has been well replicated in the northern hemisphere, it remains important to replicate these findings in Australian samples to ensure their ecological validity in this setting.

4.8 Goal based models of school performance

While self-efficacy is hypothesised to be one predictor of grade goals, there are further personal characteristics that may be influential in the setting of target (grade) goals. The current studies will investigate the direct impact on grade goals of several personal characteristics, including perfectionism and optimism (Chapter 5) and the use of different skills and strategies (Chapter 6). However, because these variables will not be discussed until Chapters 5 and 6, presentation of the competing model of performance based on target goals (competing model 2A) will be held over until the end of Chapter 6.

Figure 3 depicts the proposed causal paths in the competing model of performance based on purpose goals (competing model 2B). Where solid paths are drawn, the actual direction of the relationship is predicted. Where dotted paths are depicted, the relationship is to be explored. In Figure 3, gender is expected to predict both mastery and performance-approach goals, while the impact of gender on performance avoid goals will be explored. The ways in which past performance informs students' goal orientations will also be explored. A mastery goal-orientation is expected to contribute positively to performance, while the contributions of performance-approach and performance-avoid goals will be explored. The impact that performance has on subsequent goal orientations will be assessed when the model is re-tested in
Study 3. While these models show performance as a generic outcome variable, they will each be tested in terms of mathematics and English performance at mid-year year 10 and at mid-year year 11.

Figure 3. Competing model 2B: Proposed paths in a purpose goal model of performance

In the next chapter, competing models of performance in English and mathematics based on personality variables consistent with the emerging paradigm of positive psychology will be presented.

4.9 Chapter summary

Goals can be conceptualised as target goals or purpose goals. A target goal, also called a grade goal, is a person's aim for a specific grade outcome. Students who set higher grade goals generally achieve higher grades. Purpose goals, or goal orientations, represent the reasons why people set particular target goals. Middleton and Midgley's (1997) tripartite model describes three
goal orientations: mastery goals, performance-approach goals and performance-avoid goals. Students with mastery goals are oriented towards learning and task mastery and prefer challenging work, where any error is used constructively. Mastery students tend to perform well at school. Students with performance-approach goals are oriented towards beating others, while students with performance-avoid goals are oriented towards avoiding the demonstration of a lack of ability. Performance students dislike challenging tasks, as the failure that can accompany challenge is threatening to them. The relationships between school performance and performance-approach and -avoid goals are unclear, because previous studies have concentrated on how prior performance relates to performance goals. The current study will investigate the relationships between all three goals and prospective performance as well as future goal setting post performance.
CHAPTER FIVE

THE EFFECTS OF ‘POSITIVE PSYCHOLOGY’ VARIABLES ON PERFORMANCE IN ENGLISH AND MATHEMATICS

In this chapter, a further competing model of performance will be proposed based on the personality variables optimism and active perfectionism, which are two variables that will be argued to be consistent with the emerging paradigm of ‘positive psychology’.

5.1 What is ‘positive psychology’?

Positive psychology is characterised by a focus on optimal functioning and well-being, which espouses the roles of positive thinking and positive personal traits (Gillham, 2000; Pajares, 2001; Schmuck & Sheldon, 2001; Sheldon & King, 2001). Recently in psychology, there has been a call for researchers to focus their interests on positive psychology variables (e.g., Gillham & Seligman, 1999; Schigman & Csikszentmihalyi, 2000). Sheldon and King suggested that psychologists should try to cultivate a more appreciative perspective on positive human nature because the negative bias that has pervaded much of theoretical psychology may limit the understanding of successful human functioning. Fredrickson (2001) suggested that the capacity to experience positive human emotions may be a fundamental human strength and thus should be central to the study of human flourishing.

In the context of educational research, a focus on positive psychology will help to determine factors that promote high levels of performance at school, rather than to focus on why students fail. Furthermore, a positive psychology
model of school performance will not assume that the determinants of academic success are necessarily the inverse of the determinants of academic failure. While the current focus on positive psychology may have implications for the identification of high-achieving students, Miller and Harvey (2001) cautioned that positive psychology researchers must acknowledge that suffering and loss are also inherent to the human condition. Thus, an emphasis on the positive psychology of education will also benefit those students who suffer at school, because an understanding of why some students perform well at school will inform teaching and counseling practices aimed at assisting students who do not perform so well. Clearly it is important that students perform as well as they can at school because good school grades may enable many Victorian VCE students to obtain sufficiently high ENTER scores to gain entry to tertiary and other courses and are viewed favourably by potential employers.

As Pajares (2001) observed, one of the chief constructs of positive psychology is optimism. Although there have been several conceptualisations of optimism (e.g., see Buchanan & Seligman, 1995; Freud, 1928; Tiger, 1979), Scheier and Carver's (1985) proposed personality variable dispositional optimism is distinctive because it is cast in terms of the understanding of goal-directed behaviour. Since goal setting and the pursuit of goals are especially relevant behaviours in education (see Chapter 4), Scheier and Carver's theory is an apt framework within which to view optimism from the perspective of academic performance.
5.2 What is optimism?

Scheier and Carver (1985) argued that people differ considerably from one another in the ways that they approach the world. Some people, they argued, approach things with a generally favourable outlook and these people, by and large, tend to expect that good things will happen to them and that things will go their way. Scheier and Carver proposed that individual differences in the ways that people approach the world are relatively stable across both time and context. Scheier and Carver termed people who generally have expectations of favourable outcomes optimists, which followed their conceptualisation of optimism as a global expectation of positive outcomes.

According to Scheier and Carver (1985), optimism has important behavioural consequences that arise from the goal-directed nature of human behaviour (see also Snyder, 1995). The most fundamental of these consequences is the engagement in effort towards the pursuit of a goal or standard. Effort that is geared towards the pursuit of a goal or standard is characteristic of engagement in strategies that Zimmerman (1989) termed self-regulatory skills. These self-regulatory skills and their relationships to academic performance will be discussed in Chapter 6.

Since Scheier and Carver proposed that optimists tend to undertake behaviours that are geared towards the attainment of goals, the behavioural effects of optimism are thus similar to the behavioural effects of self-efficacy (see Chapter 3) and purpose goals (see Chapter 4). Scheier and Carver argued that dispositional optimism promotes the engagement in goal directed behaviours through a belief in the positive consequences of those behaviours. The reasons
why optimistic people engage in goal directed behaviour are similar to the reasons why the self-efficacious engage in such behaviours: both the optimistic and the self-efficacious believe in the instrumentality of their efforts. While the effects of optimism and self-efficacy are similar, and as such it might appear superfluous to speak of both optimism and self-efficacy, an important dimension separates these constructs: self-efficacy perceptions relate to specific task competencies while optimism relates to a global positive outlook. Thus even optimists may doubt their abilities in some areas as was demonstrated by the positive, but far from perfect correlation ($r = .38$) obtained between measures of optimism and self-efficacy by Pajares (2001).

Nevertheless, like the self-efficacious, optimists' engagement in goal directed behaviours can facilitate the realisation of their goals. For instance, Gibbons, Blanton, Gerrard, Buunk and Eggleston, 2000 reported that optimists typically perform well at school, though as Pajares (2001) observed, there has been scant use of optimism as a predictor of academic performance. While the effects of optimism on the actual behaviours that promote high performance have not been systematically studied, it is reasonable to assume that optimists might undertake such goal-oriented behaviours as regular studying or concentrating in class, in order to facilitate performance and move closer to their academic goals. These types of behaviours have been termed self-regulatory skills (e.g., Zimmerman, 1989) and will be considered more fully in Chapter 6. The following section reviews the limited literature that has linked optimism to academic performance and to other academic behaviours.
5.3 The effects of optimism on academic behaviour and performance

Where optimism has been assessed in the classroom, its proposed facilitative role in performance has been supported. Gibbons et al. (2000) reported that optimists outperformed pessimists in terms of future grade-point average. Pajares (2001) reported a significant, but weak, positive correlation between prior grade-point average and optimism ($r = .16$). If one considers that optimism is a fairly stable trait, it might thus be expected that optimism would also be positively related to future grades, although clearly Pajares’ study was unable to replicate Gibbons et al.’s findings since the former did not assess students’ grades prospectively. In the current studies, students’ levels of optimism will be assessed at mid-year in year 10 and again at mid-year in year 11, with grade data for English and for mathematics being collected at the end of year ten and at the end of year 11, approximately six months after each administration of the optimism scale. With optimism and performance data being collected at these four time points it will be possible to model causal relationships from optimism to year 10 performance, from year 10 performance to future year 11 optimism, and finally, from year 11 optimism to final performance in the VCE at year 11, thus testing the bidirectional relationship between optimism and school performance.

Considering that Scheier and Carver (1985) argued that a sense of optimism leads to the conviction that goals can be achieved, optimism should have implications not only for performance, but also for the setting of grade goals. Those students who are more optimistic should set higher grade goals due to their beliefs in their generally positive outcomes. Thus it is expected that
optimism will contribute to performance though its effects on grade goals as well as through its effects on self-regulatory skills like studying and concentrating (see Chapter 6).

In terms of purpose goals, researchers have only recently linked optimism with academic purpose goals (see Pajares, 2001). This gap in the literature is surprising given that Scheier and Carver (1985) argued that practically all of human activity can be understood in terms of goal directed behaviour. Nevertheless, Pajares (2001) recently assessed the relationship between optimism and students’ approach and avoidance goals (see Chapter 4). He reported that optimism was positively related to mastery goals ($r = .39$) and negatively related, albeit weakly, to performance-avoid goals ($r = -.13$). Pajares observed that students who espoused a mastery goal orientation and who were motivated to learn and to master school material, had optimistic expectations with regard to their academic outcomes. Also, students who espoused a performance-avoid goal and who were motivated to avoid looking incompetent, also had optimistic expectations with regard to their academic outcomes, though the effect size for this latter relationship was small, explaining less than two percent of the variance.

While no definitive causal implications can be drawn from Pajares (2001) cross-sectional data - it may be that optimistic tendencies derive in part from a person’s mastery goal orientation, or it may be that optimism informs students’ mastery goals. Pajares tested the former assertion by conducting an hierarchical regression to predict optimism from task goals, performance-approach goals and performance-avoid goals while controlling for prior grade-
point average, age and gender. After controlling for prior GPA, age and gender, achievement goals added a significant percentage of the explained in optimism ($R^2 = .20; \Delta R^2 = .17$). Task goals were positively associated with optimism ($\beta = .40$), while performance-avoid goals were negatively associated with optimism ($\beta = -.21$). While it may indeed be true that purpose goals inform optimism, it seems more likely, despite Pajares’ regression analysis, that any causal relationship will actually operate in the opposite direction, considering that optimism is a broad-reaching, stable and enduring characteristic of the personality that effects goal-directed behaviour (Scheier & Carver, 1985; 1992). Boekaerts (1993) argued that an optimistic attitude can encourage students’ intentions to learn, at least in the short term, supporting a proposed causal relationship from optimism to purpose goals. Of course, over time these behaviours and motivations will become dynamically reinforcing.

Optimism can explain, at least theoretically, why students might adopt approach-type mastery goals. For instance, consider the internal conditions that might prompt students to aim for an understanding of algebra. To begin with, by adopting a mastery goal students are demonstrating a belief in the malleability of skill (they may not understand algebra now, but they believe they can understand it by next week). Secondly, they are demonstrating belief in the utility of their efforts towards understanding algebra (if they study algebra enough, eventually they will understand it). Thirdly, their belief in the utility of their efforts is characteristic of an expectation of a positive outcome (studying algebra will lead to understanding). One explanation for such students’ expectations of a positive
outcome from studying algebra is that they have stable and global positive outlooks – simply, they are optimists.

This explanation of students' algebra mastery goals, along with Pajares' (2001) results with regard to the relationships between optimism and goals, illustrates the effectiveness of incorporating theoretically consistent paradigms in the endeavour to gain a richer understanding of academic performance. Indeed several years ago Pajares encouraged researchers to incorporate constructs from theoretically consistent paradigms into integrated models, and referred to this practice as "intertheoretical crosstalk" (Pajares, 1996, p.688). Clearly the approach-type nature of optimism and mastery illustrate the commensurability of these constructs within a model of academic performance. In the following sections, the integration of an unlikely personality variable into a positive psychology model of performance will be discussed.

5.4 Putting a positive spin on a traditionally negative variable

As discussed in the introduction to this chapter, positive psychology concerns itself with those variables that contribute to well-being and favourable outcomes. It might therefore seem unusual to propose a study of the contributions of perfectionism to performance under the umbrella of positive psychology. After all, perfectionism has long been associated with neuroses (Freud, 1928), "impossible goals" (Burns, 1980, p.34) and "turmoil" (Pacht, 1984, p.386). However, a recent conceptualisation of perfectionism has moved away from the assumption that perfectionism is necessarily maladaptive. The following section traces the history of perfectionism from its exclusive focus on negative outcomes to its re-focus on some positive outcomes.
5.4.1 What is perfectionism?

Burns (1980) defined perfectionists as "those whose standards are high beyond reach or reason ... who measure their own worth entirely in terms of productivity and accomplishment ...[and] ... who strain ...towards impossible goals" (p.34). Pacht (1984) argued that perfectionists are constantly "striving for nonexistent perfection that keeps people in turmoil" (p.386). Slaney and Ashby (1996) observed recently that much of the literature on perfectionism is based on the premise that perfectionism is problematic and pathological, giving rise to definitions that depict the tendency to impose excessively high personal standards and excessively harsh self-evaluation.

Freud (1928) for instance, argued that perfectionism arises due to the demands of an overly punitive superego. He argued that in some cases, the superego can impose demands that are so stringent they give rise to neuroses. According to Freud, these neuroses manifest as obsessional strivings for exceptional behaviour and performance outcomes, which people call perfectionism.

Hewitt and Flett (1991) argued that perfectionistic standards can be imposed on the self by the self, or by others, and can be directed both inwards and outwards. In Hewitt and Flett's conceptualisation, perfectionism may be self-oriented, in which perfectionistic thinking is directed towards the self (e.g., "I must always be successful at school"); it may be other-oriented, in which perfectionistic thinking is directed towards others (e.g., "If I ask someone to do something, I expect it to be done flawlessly"); or socially-prescribed, in which perfectionists believe others expect perfection from them (e.g., "The people
around me expect me to succeed at everything I do"). Although different to earlier ideas about the nature of perfectionism, Hewitt and Flett continued to view perfectionism as inherently negative.

Not surprisingly, most empirical studies of perfectionism have considered only its maladaptive consequences. For example, Flett, Blankenstein, Hewitt and Koledin (1992) and Saddler and Buley (1999) reported positive relationships between perfectionism and procrastination. Hewitt and Dyck (1986) reported a positive relationship between perfectionism and depression. Hewitt and Flett (1991) reported a higher incidence of perfectionism in people with personality disorders. In educational studies, Frost and Marten (1990) reported that perfectionistic students displayed greater writing anxiety than nonperfectionistic students, Onwuegbuzie and Daley (1999) reported that a high level of perfectionism was associated with statistics anxiety, while Jiao and Onwuegbuzie (1998) reported a higher incidence of library anxiety among graduate students with higher levels of socially-prescribed perfectionism. While these findings may indeed be valid, it is important to take a broader view of perfectionism.

Frost, Marten, Lahart and Rosenblate (1990) argued that perfectionism is multidimensional and, while acknowledging that some components align themselves with maladaptive functioning, other dimensions actually align themselves with adaptive functioning. In particular, Frost et al. claimed that high personal standards are aligned with adaptive functioning. They argued that the setting of high standards promotes behaviours aimed at reaching those standards. This view was not new, as Scheier and Carver (1985) had earlier suggested that
optimists, who tend to set high goals, go about attaining these goals through facilitative behaviours. While no empirical reports of a relationship between optimism and perfectionism are available in the literature, it is reasonable to suggest that there might be a degree of correspondence between optimism and the setting of high personal standards.

While Frost et al.'s (1990) model has been adopted by several researchers in recent years (e.g., Ablard & Parker, 1997; Brown, Heimberg, Frost, Makris, Juster & Leung, 1999; Cheng, Chong & Wong, 1999; Lynd-Stevenson & Hearne, 1999; Parker & Mills, 1996; Parker & Stumpf, 1995; Purdon, Antony & Swinson, 1999; Sinden, 1999) they were not the first to move away from an interpretation of perfectionism as exclusively maladaptive. Hamachek's (1978) earlier dichotomy of normal and neurotic perfectionism differentiated between the neurotic perfectionist who is motivated by the fear of failure, and the normal perfectionist who is motivated by the need for achievement. Perhaps Hamachek's model was less influential than Frost et al.'s has been because no measure of perfectionism existed to differentiate between adaptive and maladaptive perfectionism until 1990. In 1990, the Multidimensional Perfectionism Scale (MPS) was developed based on Frost et al.'s model. However in recent times, Frost et al.'s six-factor model has undergone some further structural examination. These studies have led to the extraction of a new factor termed active perfectionism, which is conceptualised as having adaptive consequences, and which has been demonstrated as adaptive in relation to the depressive affect (Lynd-Stevenson & Hearne, 1999). The brief history and development of the active perfectionism construct will be discussed in the following section.
5.4.2 Active perfectionism

In a recent reformulation of Frost et al.’s (1990) model, Adkins and Parker (1996) proposed that the dimensions of perfectionism contained in the MPS represent two orthogonal factors: active and passive perfectionism. They argued that passive perfectionism is characterised by concern over mistakes and doubts over actions, while active perfectionism is characterised by high personal standards, organisation, perceptions of parental expectations and perceptions of parental criticism. Adkins and Parker defined active perfectionism as the motivation to succeed which spurs achievement. They defined passive perfectionism as the fear of failure and procrastination, which creates impediments to action. While passive perfectionism is reminiscent of earlier conceptualisations of perfectionism as a maladaptive characteristic, active perfectionism views perfectionistic strivings in a positive light and is therefore consistent with the tenets of psychology’s recently emerged paradigm of positive psychology.

Lynd-Stevenson and Hearne (1999) also conceptualised perfectionism in terms of active and passive dimensions, however, they argued that organisation is not a component of active perfectionism because it is negatively correlated with the other three aspects of active perfectionism. Stöber (1998) and Stöber and Joorman (2001) argued that organisation was only “loosely related” (Stöber & Joorman, 2001, p.50) to the other components of the MPS. Furthermore, the organisation factor failed to correlate significantly with personal standards in Frost et al.’s (1990) original study. Lynd-Stevenson and Hearne concluded that active perfectionism comprises personal standards, parental evaluation and
parental criticism and that active perfectionism can have adaptive qualities. It is these adaptive qualities of perfectionism that will be investigated in the current thesis as possible contributors to high grades in VCE English and mathematics.

Even though researchers have had a framework and a tool with which to study the adaptive aspects of perfectionism for several years, such study has not been undertaken in relation to academic performance. However, it is now appropriate to undertake an investigation of the role of active perfectionism in academic performance under the auspices of the current interest in positive psychology. Furthermore, as Parker and Stumpf (1995) argued, despite the wealth of research linking perfectionism to maladaptive functioning, findings from this body of literature do not lead to the inescapable conclusion that perfectionism is inherently destructive.

5.4.3 The proposed role of active perfectionism in English and mathematics performance

Active perfectionism is proposed to have adaptive consequences (Adkins & Parker, 1996; Lynd-Stevenson & Hearn, 1999), therefore it is expected that active perfectionism will contribute positively to performance in English and mathematics. Specifically, it is expected that active perfectionism will affect performance through its behavioural effects on goals and on self-regulatory skills (see Chapter 6). These relationships are predicted because, as suggested earlier, the high personal standards characteristic of those with a sense of active perfectionism, are also characteristic of optimists, thus active perfectionism is predicted to affect performance through the same behavioural channels as optimism. However, because self-regulatory skills have yet to be discussed, the
full competing model of performance based on positive psychology (competing model 3) will be presented at the end of Chapter 6.

In the next chapter, the final competing models of performance in English and mathematics based on a) self-regulatory skills and b) conceptual and procedural knowledge will be presented.

5.5 Chapter summary

There has been a recent call for psychologists to re-focus their research efforts away from pathology and towards those positive psychology variables characteristic of well-being and optimal performance. A key variable in the field of positive psychology is optimism. Although Scheier and Carver (1985) proposed that optimism would facilitate performance, there have been few applications of this theory in education. Recently, Pajares (2001) found that optimism is positively related to grades. Pajares also found that optimism is related to mastery goals. Another variable that may be considered theoretically consistent with the tenets of positive psychology is perfectionism. Although early conceptions of perfectionism accentuated its negative characteristics, certain dimensions of perfectionism can be seen as positive. This positive perfectionism is called active perfectionism and is characterised by high personal and parental standards and favourable parental criticism. It is proposed that optimism and active perfectionism will each contribute positively to high grades in English and mathematics through their behavioural effects on goal setting, mastery goals and finally, on self-regulatory strategies to be discussed in the next chapter.
CHAPTER SIX

THE EFFECTS OF SELF-REGULATORY AND COGNITIVE SKILLS ON PERFORMANCE IN ENGLISH AND MATHEMATICS

In this chapter two final competing models of performance will be proposed. These models are based on a) self-regulatory skills, as modeled by Zimmerman (1989), and b) cognitive skills, which are operationalised as skills and strategies based on the use of either conceptual knowledge or procedural knowledge.

6.1 What are self-regulatory and cognitive skills?

Cognitive skills refer to actual abilities that when executed, directly affect students’ educational performance, such as counting skills or spelling skills (e.g., see Shumway, 1980). However, skills can also refer to the behavioural abilities that affect performance, such as effective learning and study skills. Zimmerman (1989) termed these latter skills self-regulatory skills and these are discussed more fully in the following sections.

6.2 Self-regulatory skills

Self-regulation, in general terms, refers to the self-initiated processes that individuals undertake during the execution of a task in order to facilitate the successful performance of that task (see e.g., Bandura, 1986; Scheier & Carver, 1985). Specifically, self-regulated learning refers to the application of self-initiated processes to learning, either within the context of the classroom, or in relation to other school-related learning activities, such as homework, in order to facilitate successful learning (Pintrich, 2000).
The self-regulatory skills involved in self-regulated learning are used to regulate the planning, organisation, self-instruction and self-evaluation of one's own learning (Zimmerman, 1986; Zimmerman & Martinez-Pons, 1988). The skills employed in the purposeful regulation of processes aimed towards successful learning are termed self-regulatory skills because the regulatory processes are undertaken by the self and are of one's own volition. Pintrich (2000) proposed that learning is self-regulated when learners initiate their own forthought, monitoring, regulation and reflection processes, with the aim of facilitating learning.

Pintrich (2000) observed that self-regulation stands in contrast to other-regulation, which refers to processes imposed upon individuals by others. Boekaerts and Niemivirta (2000) observed that other-regulation is expected in traditional school settings. That is, it is largely expected that teachers will be and should be in control of the learning context and learning process. Nevertheless, some students do self-regulate their own learning, even when conditions do not actively promote it. Boekaerts and Niemivirta proposed that students who identify, interpret and appraise particular conditions as learning opportunities are self-regulated learners. It is important to understand the factors that lead to active self-regulation both within and outside of the classroom because students who self-regulate their own learning tend to perform at higher levels than students who do not self-regulate (Ablard & Lipschultz, 1998), suggesting the benefits of the process of self-regulation for school outcomes.
6.2.1 Self-regulatory skills in the school context

Zimmerman (1986) identified three classes of self-regulatory skills that students use in relation to their schoolwork: personal self-regulation, behavioural self-regulation and environmental self-regulation. Though these dimensions of self-regulation are distinct, they generally operate in concert to produce students who are “metacognitively, motivationally, and behaviourally active participants in their own learning” (Zimmerman, 1989, p.329), or more simply, to produce students who are “active learners” (Wolters, 1998, p.224).

Personal self-regulation involves rehearsal, planning and organisation, which, according to Zimmerman (1989), are strategies focused on optimising personal functioning. For example, rehearsal focuses on optimising the recall of material, planning focuses on the sequencing, timing and completion of activities, while organising focuses on arranging materials appropriate for learning. Behavioural self-regulation involves processes of self-evaluation (e.g., checking over one's work) and self-conseuation (e.g., treating oneself to rewards) (Zimmerman, 1989) and are aimed towards optimising behavioural functioning. Environmental self-regulation involves strategies aimed at optimising the learning environment and involves seeking information and reviewing notes, environmental structuring (e.g., isolating oneself from distractions) and seeking social assistance (Zimmerman, 1989). In the preceding chapter, a competing performance model based on positive psychology variables was introduced, however this model required a discussion of self-regulatory skills in order to fully explain the proposed indirect effects of
these variables on performance. The positive psychology model is depicted in the following section.

6.2.2 The role of self-regulatory skills in the model of performance based on positive psychology

Figure 4 shows the proposed causal paths in the competing model of academic performance based on the positive psychology variables optimism and active perfectionism (competing model 3) that was proposed in the previous chapter. Both optimism and active perfectionism are expected to contribute to performance indirectly through their effects on grade goals (Chapter 3), mastery goals (Chapter 3) and the self-regulatory skills discussed in this chapter. The model in Figure 4 is a generic performance model, but it will be tested in both English and mathematics in Studies 2 and 3.

Figure 4. Competing model 3: The indirect effects of optimism and active perfectionism on academic performance
While it has been proposed in the competing performance model based on positive psychology (competing model 3) that students' use of self-regulatory skills will in part be driven by positive psychology variables, Zimmerman (1986) argued that the degree to which students employ self-regulatory skills is driven by students' interest in their work and their satisfaction with performing well. While self-regulation may be driven by interest and by satisfaction, the self-regulatory model to be proposed in Figure 5 (competing model 4A) reflects Zimmerman and Bandura's (1994) and Zimmerman et al.'s (1992) proposal that self-efficacy is also important in the maintenance of strategic self-regulation. The self-efficacy for self-regulation is discussed in the following section.

6.2.3 Self-efficacy for self-regulation

Self-efficacy for self-regulation was defined by Pajares (2001) as the perceived confidence to use self-regulated learning strategies. The theoretical link between the self-efficacy for self-regulation and one's use of self-regulatory strategies implies that students only self-regulate their learning to the extent that they believe they can competently self-regulate it. The self-efficacy for self-regulation is itself partly informed by prior grades (Zimmerman et al., 1992). This relationship is not surprising since many students probably link their grades to their prior self-regulatory efforts.

Ablard and Lipschultz (1998), Pajares (2001) and Zimmerman and Martinez-Pons (1990) have all demonstrated that higher levels of strategic self-regulation are associated with higher levels of academic performance. Though these results do not imply causality, they can be interpreted to suggest that
performance is a by-product of using highly facilitative self-regulatory skills. The self-efficacy for self-regulation also correlated directly with academic performance (Schunk & Zimmerman, 1994; Zimmerman et al., 1992; Zimmerman & Martinez-Pons, 1990). Evidently, it is not just self-regulatory skills themselves that facilitate performance at school, but the belief that one can successfully execute self-regulatory skills is also important.

The use of self-regulatory strategies has also been linked to students' purpose goals (see Chapter 4). Several studies have reported a positive relationship between mastery goals and self-regulated learning (Ablard & Lipschultz, 1998; Ames & Archer, 1988; Anderman & Young, 1994; Meece et al., 1988; Middleton & Midgley, 1997; Nicholls et al. 1989; Nolen, 1988; Pintrich, 1996; Wolters et al., 1996), as discussed in the following section.

6.2.4 Self-regulatory strategies and purpose goals

Ablard and Lipschultz (1998) stated that in their study, mastery goals "accounted for most of the variance in self-regulated learning" (p.99), suggesting that purpose goals also partly inform the propensity to employ self-regulatory skills. Ablard and Lipschultz and Wolters et al. (1996) demonstrated that students with mastery goals used more self-regulatory strategies than students with performance-approach (beating others) goals, which is not surprising given that Turner et al. (1998) argued that mastery-focused students primarily aim to develop and utilize skills.

Ablard and Lipschultz (1998) and Turner et al. (1998) explained the differences in self-regulation between students with mastery or performance-approach goals in terms of those students' different responses to error. They
argued that while mastery-focused students consider effort to be positive, performance-approach students consider effort to be an indicator of low ability. Mastery-focused students therefore engage in high levels of self-regulation because the extra effort required to engage in these strategies is interpreted favourably. On the other hand, performance-approach students shy away from self-regulation because the extra effort required in strategic self-regulation is interpreted unfavourably.

While both mastery and performance-approach goals have been looked at in several studies in relation to strategic self-regulation at school, the assessment of self-regulation as a function of Middleton and Midgley's (1997) tripartite model of goal orientation is limited. Pajares et al. (2000) reported significant positive correlations between self-efficacy for self-regulation and both types of approach goals (task goals $r=0.50$; performance-approach goals $r=0.14$) in the context of language arts (writing), but no relationship emerged between the self-efficacy for self-regulation and performance-avoid goals in language arts. A slightly different profile emerged in relation to science in Pajares et al.'s study: the self-efficacy for self-regulation was positively related to task goals ($r=0.45$) but not to performance approach goals. Also, performance-avoid goals were negatively related to the self-efficacy for self-regulated learning ($r=-0.15$). Another study by Pajares (2001) reported relationships between self-efficacy for self-regulated learning and achievement goals for writing similar to those in Pajares et al.'s (2001) study.

Overall, the literature to date suggests that students whose main aim is to master material have more favourable conceptions of their competency to
undertake self-regulated learning. This relationship may arise because a task
goal orientation fosters self-regulation, which itself facilitates performance
thereby reinforcing perceptions of self-regulatory efficacy. Conversely, it may
be that students whose main aim is to beat others have more favourable
conceptions of their self-regulatory efficacy, though this relationship, even
when significant, is not strong. Conversely, students whose main aim is to
avoid looking incompetent may have low self-efficacy, but again, this
relationship, even when significant, is weak. Clearly further empirical evidence
is required to strengthen the claim that performance goals are related to self-
efficacy for self-regulation.

In the following section the competing performance model based on
self-regulatory skills (competing model 4A) is depicted.

6.2.5 Proposed effects in a self-regulatory based model of performance

The proposed paths in the competing model of performance based on
self-regulatory is shown in Figure 5. Both self-regulatory skills and self-
regulatory efficacy are predicted to contribute positively to performance.
While self-regulatory skills are expected to be direct contributors to
performance, self-regulatory efficacy is expected to contribute to performance
both directly and indirectly, though its effects on self-regulatory skills. It is
hypothesised that past performance (past grade) will inform the self-efficacy
for self-regulation, while current performance (current grade) will inform
future self-efficacy for self-regulation, because students’ performance levels
will provide information about the usefulness of their prior self-regulatory
efforts. As there is no body of work on which to predict the causal effects of
purpose goals on self-regulatory skills or self-regulatory efficacy, these relationships will be explored in the current model. The model depicted in Figure 5 is a generic performance model, which will be tested in terms of both mathematics performance and English performance.

![Diagram of self-regulatory model]

Figure 5. Competing model 4A: Proposed paths in a self-regulatory model of performance

While the propensity to self-regulate one’s academic behaviours has been considered as one class of skills that predict school performance, the use of another class of skills – cognitive skills – are also implicated in high academic grades. These skills will be discussed in the following section and from this discussion, the final competing model of performance, based on cognitive skills (competing model 4B) will be proposed.

6.3 Cognitive skills

Akin to students’ purpose goals (Chapter 4), the cognitive skills that students employ at school can be seen as either performance-oriented or mastery-oriented. For instance, skills and knowledge aimed at getting the job done, such as knowing a mathematics formula, or knowing how to punctuate a sentence, can be thought of as performance-oriented skills, or doing skills. On
the other hand, skills and knowledge focused towards the strong comprehension of school material, such as knowing why it is that two halves, rather than two quarters, make a whole, or why it is that a small dot occurs at the end, rather than at the beginning, of English sentences, can be thought of as mastery-oriented skills, or understanding skills. This proposed demarcation between cognitive skills as understanding skills and cognitive skills as doing skills reflects a distinction in the cognitive psychology literature between knowledge as conceptual and procedural (e.g., Hiebert & Lefèvre, 1986.)

Hiebert and Lefèvre (1986) observed that in the literature concerning the conceptualisation of knowledge, distinction is commonly made between the understanding of content and the execution of relevant skills or procedures. Hiebert and Lefèvre used the terms conceptual knowledge and procedural knowledge to differentiate respectively between knowledge that demonstrates understanding and knowledge that demonstrates skill.

Various authors have used a range of terms in their discussions of conceptual and procedural knowledge (e.g., conceptual understanding and successful action [Piaget, 1978]; semantic memory and procedural memory [Schacter, 1989]; declarative knowledge and procedural knowledge [Rumelhart & Norman, 1981]). Nevertheless, Hiebert and Lefèvre (1986) observed that the meaning inherent in these terms are basically interchangeable, and thus the discussion of the nature of conceptual and procedural knowledge, presented below, can be validly extrapolated to studies that have utilised these alternative taxonomies.
6.3.1 The nature of conceptual and procedural knowledge

Hiebert and Lefevre (1986) characterised conceptual knowledge as a knowledge network, or a "web of knowledge" (p.3) and distinguished between primary and reflective levels of conceptual knowledge. According to Hiebert and Lefevre, primary level conceptual knowledge is knowledge that is low in abstractness, meaning that primary level conceptual knowledge is tied to a specific context. For example, knowledge that only fractions with like denominators can be added, and that one adds only a numerator to a numerator, is primary level conceptual knowledge because it is tied to the context of fraction addition. The contextual restraints upon primary level conceptual knowledge mean that it cannot be employed in the understanding of contextually different information. For instance, primary level conceptual knowledge of fraction addition will not help a student to understand a complex English text, or to interpret a statistical analysis printout. However, Hiebert and Lefevre proposed that under certain conditions, primary level conceptual knowledge can become free from contextual constraints. When primary level conceptual knowledge becomes free of its original context it becomes reflective conceptual knowledge.

Hiebert and Lefevre argued that reflective conceptual knowledge is at a more abstract level than its primary counterpart and can be called upon in the understanding of multiple concepts. For instance, primary level conceptual knowledge of fraction addition might become reflective if the logic of adding (only) halves to halves, or (only) quarters to quarters, is extrapolated to the domain of decimal number addition such that students' recognise the related
logic behind lining up decimal points whereby tenths are added to tenths, and so on. Hiebert and Leferve (1986) described this type of knowledge extrapolation as the recognition that "you always add things that are alike in some crucial way" (p.5). Consistent with Hiebert and Leferve's proposal that conceptual knowledge can be either bound by or free from contextual restraint, Hecht (1998) described conceptual knowledge as information that either gives referent meaning to an idea, or information that consolidates isolated ideas to provide meaning. For example, a representation of the expression "0.5" as a pie cut in half is conceptual knowledge because it provides referent meaning for the expression "0.5" and sets it apart from other expressions of pie quantity. Also, the symbolic representation of a pie cut in half as both "0.5" and "1/2" is conceptual knowledge because this consolidates three ideas of quantity to provide meaning.

According to Hecht (1998) and to Hiebert and Leferve (1986), the development of conceptual knowledge occurs when two (or more) unrelated pieces of information are somehow linked together to enhance understanding. This process might occur when a newly acquired piece of information is linked to an existing network, to a piece of previously isolated information, or through the process of linking two existing knowledge networks, or pieces of information. For instance, conceptual knowledge may develop in mathematics when a student makes a link between the conceptual similarity of fractions and decimals; while conceptual knowledge may develop in English writing when a student makes a link between paragraphing and the existence of multiple ideas.
The counterpart to conceptual knowledge, termed procedural knowledge, was characterised by Hiebert and Lefevre (1986) as instructive information. Hiebert and Lefevre proposed that while conceptual knowledge promotes understanding, procedural knowledge allows for the correct manipulation of independent units of knowledge in order to form more complex information, or to answer specific questions.

Hiebert and Lefevre (1986) identified two classes of procedural knowledge: knowledge of form and knowledge of rules. According to Hiebert and Lefevre, knowledge of form refers to knowledge of the symbols used to represent different ideas, such as knowledge of the symbols that stand for certain mathematical functions or grammatical functions. The knowledge of form also refers to knowledge of the syntax associated with a symbolic system, such as the conventional ordering of mathematical symbols (e.g., 1+1=2; not 11+=2 etc), or to the correct positioning of a full stop in an English sentence.

Hiebert and Lefevre (1986) argued that the knowledge of form can be mastered in the absence of any sense of its meaning. While it may be possible to master knowledge of form in the absence of meaning (one can know that a "2" is a "two" without knowing what either "two" or "2" mean) this is not the case with regard to the knowledge of rules. For instance, when students learn the syntax of simple equations, it may be possible to simply teach them that an operation (e.g., a plus sign) is placed between each expression of quantity; and further, that the last operation is an equals sign. However with no sense of the meaning of these signs, chance alone will dictate whether students place the largest expression of quantity at the end of the equation. Even if students are
merely instructed to form equations such that 'smaller quantity + smaller quantity = largest quantity', then the meanings of the plus and equals signs are immediately implied.

It is also difficult to see how linguistic syntax might be mastered in the absence of meaning. For instance, if students are simply taught that a small dot occurs at the end of English sentences, the meaning of this small dot is immediately implied by its position. This type of implication is also true for other expressions of punctuation. For example the meaning of a question mark is immediately implied by its position at the end of a sentence beginning with an interrogative pronoun, regardless of whether the interrogative pronoun is understood or simply recognised as such by its own symbolic properties. So, while theoretically it may be possible for syntax to be mastered independent of meaning in mathematics, it is not possible to see how this could be the case in the context of English, or language learning.

The second type of procedural knowledge identified by Hiebert and Lefevre (1986) is the knowledge of procedural rules, or algorithms. They described procedural rules as the recipes for solving different classes of problems and argued that these algorithms are typically executed in a predetermined, linear sequence. One example of a procedural rule is the acronym BOMDAS (or BODMAS) that students are taught with regard to the correct execution of arithmetic procedures. Hiebert and Lefevre proposed that procedural rules can be applied to form knowledge (e.g., numbers) or to physical entities (e.g., blocks). The knowledge of rules is therefore often
dependent upon the knowledge of form. Clearly a student would be unable to utilise BOMDAS without knowledge both of digits and of functions.

It is important to distinguish between conceptual and procedural knowledge in educational research, not simply because concepts and procedures are theoretically distinct forms of knowledge, but because as Byrnes and Wasik (1991) argued, procedures and concepts serve different cognitive functions. For example, Byrnes and Wasik argued that concepts serve to create order, organisation, categorics and relationships; whereas procedures are the "means to an end" (p. 777). Byrnes and Wasik also reported that some people have high levels of conceptual knowledge while having relatively low levels of procedural knowledge and further, that some children typically utilise procedural information while others typically utilise conceptual information. These observations demonstrate that conceptual and procedural knowledge are to some degree independent, and as such the possible effects of their use on mathematics and English performance should also be considered independently.

The use of these particular classes of knowledge at school can be thought of in terms of the utilisation of particular types of academic strategies. In the current thesis, two types of academic strategies are proposed: conceptual strategies, in which students attend more to conceptual knowledge, and procedural strategies, in which students attend more to procedural knowledge. The division of academic strategies on the basis of a distinction between concepts and procedures is consistent with Felder's (1996) research, which demonstrated that some students attend more to algorithms (procedural
knowledge), while others focus more on models and theories (conceptual knowledge). However, since Hecht (1998) and Rittle-Johnson and Alibali (1999) reported that some students tend to use both concepts and procedures, it is important that these strategies, and their impacts, be assessed concurrently. There are no reports of instruments to measure the degree to which students use conceptual and procedural strategies in mathematics and in English. To address this gap, two scales will be developed in Study 1 of the current thesis.

The Mathematics Strategies Scale will be written to measure the degree to which students utilise particular strategies in mathematics based on either conceptual knowledge or procedural knowledge. The Writing Strategies Scale will be written to measure the degree to which students utilise particular strategies in English writing based on either conceptual knowledge or procedural knowledge. It is expected that work on the psychometric properties of these two new instruments will provide valid and reliable measures that can be used in the major study to assess the degree to which students utilise conceptual and procedural strategies in mathematics and in English writing.

In Chapter 3, a competing performance model based on target goals was proposed, however this model required a discussion of both optimism (Chapter 5) as well as conceptual and procedural skills in order to fully explain the proposed predictors of target goals. The target goal model (competing model 2B) is depicted in the following section.

6.3.2 The target goal model of performance

The target goal model of performance (competing model 2B) is shown in Figure 6. It is hypothesised that grade goals (the target goal) will be
positively influenced by high self-efficacy and by a sense of optimism as these perceptions of competence and a positive outlook should direct students to expect and to desire high grades. It is hypothesised that the use of conceptual strategies will contribute positively to grade goals while the use of procedural strategies will contribute negatively to grade goals. It is expected that students who use conceptual strategies will set high grades because they are using strategies that demonstrate understanding of school material. Thus, if students believe they understand their material, they are likely to set high grades. However, it is expected that students who use procedural strategies will set lower grade goals, because students who rely on procedural strategies, such as rote learning, might use these strategies because they either do not have, or do not trust their understanding. If students either lack, or doubt, their own understanding, they are likely to set lower grade goals. Grade goals, in turn, are predicted to influence performance. Thus self-efficacy, optimism and conceptual and procedural knowledge use are predicted to contribute indirectly to performance through target (grade) goals.
As well as the proposed indirect effects of conceptual and procedural knowledge on grade goals, in the final competing model of performance, conceptual and procedural knowledge are predicted to directly inform actual grades. These relationships will be discussed in the following section.

6.3.3 The proposed direct effects on performance of conceptual and procedural knowledge

While the past research has focused mainly on the developmental nature of knowledge acquisition (e.g., Rittle-Johnson & Alibali, 1999), the roles that conceptual and procedural strategies play in school performance are not well understood. By investigating the different types of strategies used by Australian students, the current work will determine the contributions of conceptual and procedural skills to academic performance in English and mathematics. It is important to assess the contributions of these strategies to
different school subjects because the nature of curricula can differ substantially from one subject to another and it is possible that differences in the type of curricula (e.g., concrete versus abstract) may be influential in determining the types of academic strategies that facilitate performance.

For instance, Bruner (1960) argued for an emphasis on the understanding of mathematical content, implying that conceptual knowledge is paramount for successful mathematics performance. On the other hand, Gagné (1977) argued that the teaching of mathematical skills (or procedures) was fundamental to success in mathematics. Another approach by Hiebert and Lefevere (1986) advocated that academic competence involves both broad bases in conceptual knowledge and procedural knowledge. While some work has attempted to ascertain which type of knowledge best facilitates performance in mathematics, there has not been any systematic discussion of the role of concepts and procedures in English writing. It is therefore unclear whether individual students tend to use the same types of strategies across different academic domains, such as writing and mathematics.

Despite Hiebert and Lefevere's (1986) argument that both concepts and procedures are important for cognitive competence, the demonstration of academic competence is also intrinsically linked to methods of assessment. It might therefore be expected that some students at least will approach their school subjects using those strategies most linked to the method of assessment. The demonstration of mathematical skill is typically operationalised in mathematics testing as measures of procedural competence. Hiebert and Lefevere (1986) argued that procedural knowledge of mathematics can be
mastered independent of its meaning. Such mastery is referred to as rote learning. Since mathematics procedures can be rote learned, and since the demonstration of procedural competence is most characteristic of mathematics assessment, it is possible that some students might rely heavily on the rote memorisation of procedures in mathematics.

Despite the fact that mathematics can be rote learned, Hecht (1998) argued that the conceptual underpinnings of mathematics can assist in the selection and execution of correct procedures. Byrnes and Wasik (1991) proposed that conceptual knowledge is required to form a basis on which sound procedural knowledge can be built. In the formation of procedural knowledge, Byrnes and Wasik proposed that procedures initially refer to conceptual knowledge for their critique and that without reference to conceptual knowledge, procedural 'bugs', such as the rote learning of incorrect algorithms, may infiltrate, which will lead to incorrect procedures and hence, incorrect outcomes.

Following the arguments of Hecht (1998) and Byrnes and Wasik (1991), it is proposed that performance in mathematics will be facilitated by the use of both conceptual and procedural strategies. Despite the overriding focus on procedural competence in mathematics assessment, students who rely exclusively on procedural knowledge may be liable to encounter the procedural 'bugs' proposed by Byrnes and Wasik. Those students who rely exclusively on conceptual knowledge are also likely to be at a disadvantage in mathematics because continual reference to the conceptual knowledge base is inefficient (Byrnes & Wasik, 1991).
The main focus of assessment in English is different to mathematics in that it addresses students' interpretations of text meaning. Performance in English is often assessed by written essays in which students must demonstrate conceptual understanding of a text or subject. In English, it is likely that the use of conceptual strategies will facilitate performance over and above that generated by procedural strategies. Another focus of assessment in English is on creative writing. For example, students may be given a broad topic on which to write, or they may merely be given an essay title, in which case the possibilities for creativity are practically endless. In the assessment of creative writing, consideration is focused on how well students write. For example, the assessment of creative writing considers not only creativity, but also how competently students can weave their ideas and words together, as well as how competent students are in the use of English grammar. It is further proposed that that the use of procedural strategies will also facilitate performance in English.

In Figure 7, the final competing model of performance (competing model 4B) is presented. This figure presents a generic performance model that will be tested in both English and mathematics in the current thesis. Previous empirical investigations of conceptual and procedural strategy use have been confined to experimental laboratory research (e.g. Rittle-Johnson & Alibali, 1999) and rarely studied in natural school settings. It is important to assess students' use of these cognitive skills in a natural school setting in order to increase ecological validity. The proposition that a focus on both conceptual and procedural strategies will contribute to higher performance in mathematics
and in English reflects Hiebert and Leferve's (1986) position that both concepts and procedures are important for cognitive competence.

![Diagram](image)

Figure 7. Competing model 4B: Proposed paths in a cognitive skills based model of performance

### 6.4 Chapter summary

Self-regulatory skills comprise strategies designed to optimise personal functioning, behavioural functioning and environmental conditions. The engagement in self-regulatory skills is predictive of high academic performance (Zimmerman & Martinez-Pons, 1990). Zimmorman and Bandura (1994) proposed that self-efficacy beliefs help to maintain self-regulation. The self-efficacy for self-regulation also contributes directly to performance. While there may be a positive relationship between self-efficacy for self-regulation and a mastery goal orientation, it is not yet clear whether performance goals are related to self-regulation. A useful way to conceptualise skills and strategies in education is on the basis of a distinction between conceptual and procedural knowledge. Conceptual knowledge is focused on understanding. Procedural knowledge is focused on the application of skills. It was proposed that students
may tend to use the type of skills most characteristic of assessment, but that the
use of both concepts and procedures will lead to high academic grades both in
English and mathematics.
CHAPTER SEVEN

MODELS AND HYPOTHESES TO BE TESTED IN THIS THESIS

The aim of this thesis is to compare competing models of performance in English and mathematics and to ascertain the robustness of each of these models in a sample of students both prior to and during their VCE.

Following from the literature reviewed in Chapters 3 to 6, the specific hypotheses, as they relate to models in the baseline study (study 2) and follow-up study (study 3) are presented below. Where there are gaps in the past literature, or where findings are equivocal, the investigative approach of these studies will be exploratory. While the models depicted in this chapter are generic performance models, replicated from the preceding chapters, each will be tested in two subject contexts: English performance and mathematics performance, and at mid-year year 10 and mid-year year 11.

7.1 Self-efficacy based models of performance

The first two competing models to be tested (model 1A and model 1B) are simple self-efficacy based models of performance that differentiate students on the basis of their coping orientation (approach coping Vs avoidance coping). It is hypothesised that for students who use approach-coping strategies (competing model 1A), anxiety will not affect self-efficacy or performance in either English or mathematics (see Figure 8, replicated from Figure 1). For students who use avoidance-coping strategies (competing model 1B), it is hypothesised that anxiety will cause decrements in self-efficacy and to have a
debilitating effect on performance in both English and mathematics (see Figure 9, replicated from Figure 2).

Figure 8. Competing model 1A: Predicted paths for approach-oriented copers in a self-efficacy based model of performance

Figure 9. Competing model 1B: Predicted paths for avoidance-oriented copers in a self-efficacy based model of performance
7.2 Goal based models of performance

The next two competing performance models to be tested are based on target goals (competing model 2A) and purpose goals (competing model 2B). According to the target goal model, it is hypothesised that self-efficacy, levels of optimism, and the use of conceptual and procedural strategies will contribute to performance through their effects on grade goals (see Figure 10, replicated from Figure 6).

Figure 10. Competing model 2A: Predicted paths in a target goal model of performance

According to the purpose goal model (competing model 2B), it is hypothesised that mastery goals will contribute positively to performance, while the contributions of performance-approach and performance-avoid goals to performance will be explored. It is hypothesised that gender (being male) will contribute positively to performance-approach goals and negatively to
mastery goals, while the contribution of gender to performance-avoid goals will be explored. The contributions of past performance to all three purpose goals will be explored, as will the contributions of performance-avoid goals to performance. Finally, the ways in which performance affects future purpose goals will also be explored (see Figure 11, replicated from Figure 3).

![Diagram](image)

Figure 11. Competing model 2B: Predicted paths in a purpose goal model of performance

7.3 A model of performance based on positive psychology

The next competing performance model to be tested is the model based on positive psychology (competing model 3). It is hypothesised that self-regulatory skills, mastery goals and grade goals will each contribute positively to performance. It is hypothesised that active perfectionism and optimism will contribute positively to performance through their effects on self-regulatory skills, mastery goals and grade goals (see Figure 12, replicated from Figure 4).
7.4 Skill based models of performance

The final competing models of performance to be tested are those based on a) self-regulatory skills (competing model 4A) and b) cognitive skills (competing model 4B). According to the self-regulatory model, it is hypothesised that past performance will contribute positively to self-regulatory skills and to the self-efficacy for self-regulation. The effects of purpose goals on self-regulatory skills and on the self-efficacy for self-regulation will be explored. It is hypothesised that self-regulatory skills and the self-efficacy for self-regulation will each contribute positively to performance and that performance, in turn, will inform future self-regulatory efficacy (see Figure 13, replicated from Figure 5).
According to the cognitive skill-based model, it is hypothesised that use of conceptual and procedural strategies will contribute positively to performance (see Figure 13, replicated from Figure 7).

Figure 13. Competing model 4A: Proposed paths in a self-regulatory model of performance

Figure 14. Competing model 4B: Proposed paths in a cognitive skills based model of performance
In order to test these models it is necessary to develop four scales that are not currently available in the literature: a mathematics self-efficacy scale specific to the senior high school curriculum in Australian schools; a measure of the sources of writing self-efficacy; and scales to measure the degree to which students use conceptual and procedural strategies in mathematics and in writing.

The aim of Study 1 will be to develop and confirm the psychometric properties of these new scales in a Victorian high school sample, to enable their use in Studies 2 and 3 with a second, independent, Victorian high school sample.
CHAPTER EIGHT

STUDY ONE - METHOD

8.1 Design

This cross-sectional study is designed to construct and evaluate the psychometric properties of four scales required to test the proposed competing models of performance (see Chapter 7). Scales to measure mathematics classroom and test self-efficacy among Australian secondary students, the sources of writing self-efficacy among Australian secondary students, and measures of the degree of use of conceptual and procedural strategies in both writing and mathematics will be developed. A second function of this study is to determine the construct validity of the Writing Skills Self-efficacy Scale (Shell, Murphy & Bruning, 1989) when administered in different contexts in the classroom and in tests. The construct validity of this instrument across different contexts has not been reported previously but this validation is essential in order to test the self-efficacy based performance models in two domains.

8.2 Scale development

In the following sections, the development and psychometric evaluation of the four new scales is discussed.

8.2.1 The Mathematics Self-efficacy Scale

A review of the literature revealed two instruments designed to measure mathematics self-efficacy, but neither of these scales was considered appropriate for use in testing the proposed models. The Mathematics Self Efficacy scale (Cooper & Robinson, 1991) was designed to measure the
mathematics self-efficacy of students undertaking advanced-level university mathematics and the items are consistent with the curriculum of such a course in that it assesses students' perceived competence in areas such as advanced statistics and stochastic processes. These problems are well beyond the types of curricula encountered in secondary school mathematics in Australia. The second instrument, the Mathematics Self-Efficacy Scale (Betz & Hackett, 1983) is long (52 items) and these items are also not in accordance with mathematics item content at years 9, 10 and 11 in Australian schools.

The items on the current Mathematics Self-efficacy Scale (MSES) were designed to assess students' perceived confidence, in the classroom and in tests, to successfully solve a comprehensive range of mathematics problems appropriate to years 9, 10 and 11 in Australian secondary schools. Three main theoretical issues were considered in the development of the MSES: 1) self-efficacy judgments may be sensitive to differences in content (i.e., students' mathematics self-efficacy might be different to their writing self-efficacy) and should be assessed in terms of content-specific items; 2) self-efficacy judgments may be sensitive to context (i.e., students' mathematics self-efficacy ratings in the classroom may differ from their ratings in a mathematics test) and should be assessed with specific reference to performance context; and 3) self-efficacy judgments are ratings of perceived, rather than demonstrated competence. These theoretical issues were discussed in detail in Chapter 3 and their influence on the design of the MSES are discussed next.

In order to address empirically Bandura's (1997) argument that self-efficacy perceptions should be made in terms of fairly specific and
homogenous performance items (see Chapter 3), the items on the Mathematics Self-efficacy Scale were written to incorporate the separate domains of study within the standard mathematics curriculum common to years 9, 10 and 11 in the Victorian school system in Australia.

To achieve measurement correspondence between mathematics self-efficacy and performance domains (see Chapter 3), the curriculum common to years 9, 10 and 11 was drawn from the material contained in the textbooks prescribed for those three year levels (i.e., Evans, Lipson, Jones, McKay & Blanee, 1999; McSevny, Conway & Wilkes, 2000). Only curriculum common to these three years was included because it was intended that adolescents from these three years form the samples for the studies comprising this thesis. Nine separate subject domains were common across the three year levels: decimals, fractions, algebra, simultaneous equations, trigonometry, curve sketching, geometry (angles), geometry (2D shapes) and geometry (3D shapes). One question was written to assess self-efficacy according to each of these nine areas (e.g., “How confident are you that you can successfully solve a simultaneous equation”) (see Appendix D1).

In line with Bandura’s (1997) argument that self-efficacy is a self-judgment of perceived competence and not a measure of actual competence, items on the MSES were designed to measure only perceived competence. None of the items required students to actually solve a mathematics problem. Students’ perceived confidence to solve a problem was assessed via the prompt: “How confident are you that you can perform each of the following mathematics tasks in the classroom” or “How confident are you that you can
perform each of the following mathematics tasks in a mathematics test”. All items were answered on a five-point Likert scale (1 = not at all confident to 5 = completely confident). High scores are indicative of a high level of mathematics self-efficacy.

8.2.2 The Mathematics Strategies Scale

Eight items were written to assess the extent to which students use conceptual and procedural mathematics knowledge when solving mathematics problems (e.g., conceptual strategies: “When working maths problems, I usually try to understand an example so I can apply it to other problems”; procedural strategies: “In maths I try to memorise what to do rather than understand what it means”. See Appendix D1). Together these eight items formed the Mathematics Strategies Scale (MSS). In line with the literature concerning the conceptual and procedural knowledge in mathematics (e.g., Hiebert & Lefevre, 1986), two questions were written to assess each of primary and reflective level conceptual mathematics knowledge and two questions were written to assess each of mathematical procedural form knowledge and mathematical procedural rules knowledge. Questions were answered on a five-point Likert scale (1 = I use this strategy very much to 5 = I never use this strategy). High scores indicated high usage of mathematics concepts and mathematics procedures.

8.2.3 The Writing Strategies Scale

Eight items were written to assess the extent to which students use conceptual and procedural writing knowledge when writing stories or essays in English (e.g., conceptual knowledge: “When I write an essay I concentrate on
relating the ideas to each other”; procedural knowledge: “When I write an essay I concentrate on whether I have followed the rules of English, like punctuation”. See Appendix D1). Together these eight items form the Writing Strategies Scale (WSS). While the content domains pertaining to conceptual and procedural knowledge in mathematics are well defined, these content domains with regard to writing in English have not been explored. In the current study, the domains of English writing concepts and procedures were extrapolated from the nomological network pertaining to mathematics concepts and procedures (see e.g., Hiebert & Lefevre, 1986). For the procedural items in the WSS, four questions were written that address strategies based on students’ consideration of form and rules, such as spelling and syntax. For the conceptual items, four questions were written that address strategies based on students’ consideration of overall meaning, such as argument and the exploration of ideas. Questions were answered on a five-point Likert scale (1 = I use this strategy very much to 5 = I never use this strategy). High scores indicated high usage of writing concepts and writing procedures.

8.2.4 The Sources of Writing Self-efficacy Scale

The Sources of Writing Self-efficacy Scale, comprising 12 items, was written to assess the contributions to writing self-efficacy of enactive mastery, modeling, verbal persuasion and physiological state. Three items were written to assess each of enactive mastery (e.g., “Getting good essay marks boosts my writing confidence”), modeling (e.g., “If my classmates struggle with an essay I feel I will struggle too”) and verbal persuasion (e.g., “I can always write better when others believe in me”). The fourth source of writing self-efficacy,
physiological state, was assessed using the three items with the highest loadings taken from Pajares and Valiante's (1997) revised Writing Apprehension Test (e.g., "I'm nervous about writing"). Measurement of the latter source of writing self-efficacy by using items from an existing measure of writing anxiety replicated the procedure used by Lent et al. (1996) when they measured the contribution of physiological state to the sourcing of mathematics self-efficacy (see Appendix D1).

Questions were answered on a five-point Likert scale (1 = I do not agree at all with this statement to 5 = I agree very much with this statement). A high score indicated an item to be a greater source of writing self-efficacy.

8.3 Participants

Three hundred and two students in year 9 who were attending either Victorian Catholic or Independent schools across metropolitan Melbourne and surrounding districts volunteered to participate in this study. There were 163 females (54%) and 139 males. Students' mean age was 14 years, 9 months (SD = 3 months). Sampling was confined to Catholic and Independent schools because these schools use subject grading systems from A+ through F- where each grade represents a percentage range, thus providing approximate interval level data for grades. The use of performance data in the form of letter grades is consistent with the performance data obtained in many recent empirical studies of school performance from the United States (e.g., Zimmerman &

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4 In Victoria, State run secondary schools do not use letter grading systems. Instead these schools report in accordance with the Department of Education's Curriculum and Standards Framework II (CSFI). Under the CSFI, assessment is made in terms of progress indicators that provide a qualitative assessment of progress towards expected outcomes for each year level. Assessment data from State schools was inappropriate for this study as interval level performance data were required.
Bandura, 1994; Zimmerman, Bandura & Martinez-Pons, 1992), Europe (e.g., Scgebors & Boekaerts, 1993; Zeidner, 1992) and Australia (e.g., Marsh & Yeung, 1997; McInerney et al., 1998), thus the results obtained in the current studies will be able to be discussed in terms of current trends in educational research.

8.4 Instruments

All students provided demographic data and completed the same questionnaires as follows:

8.4.1 Demographic and self-report performance data

A demographic sheet was provided which required students to report their gender and age (in years and additional months); and to circle the grades they had received for English and for mathematics at the end of year 8, their previous year of schooling, to be used as indicators of the convergent validity of the Mathematics Self-efficacy Scale and the Writing Skills Self-efficacy Scale (Chapter 8.3.7) (see Appendix D1). While it could be argued that students may not have an accurate memory of their past grades, Gibbons et al. (2000) reported a correlation of r = .96 between self-reported past grades and subsequently cross-checked actual grades provided by secondary school students. This recent evidence can be interpreted to indicate that the self-reported past grades of secondary students are accurate and thus their use in the current studies is validated.

Students were also asked to state their grade goals for English and for mathematics at the end of year 9. Specifically, students were asked "What grade are you aiming for (in English / in mathematics) at the end of year 9".
Students' grade goals were used as indicators of criterion-related validity for the Mathematics Self-efficacy Scale and the Writing Skills Self-efficacy Scale (Shell et al., 1989) (Chapter 8.3.7) respectively, because it was considered that there should be a reasonable degree of correspondence between the grades that students are aiming for and how competent they feel about their abilities for each subject domain.

The grading system ranges from A+ through to F- (18 intervals). Both students' actual grades and grade goals were converted to numerals (from A+ = 18 to F- = 0) and were subsequently treated as interval level data in the analyses.

Students then completed the following questionnaires:

8.4.2 The Mathematics Self-efficacy Scale (see Chapter 8.2.1)
8.4.3 The Mathematics Strategies Scale (see Chapter 8.2.2)
8.4.4 The Writing Strategies Scale (see Chapter 8.2.3)
8.4.5 The Sources of Writing Self-efficacy Scale (see Chapter 8.2.4)
8.4.6 Self Description Questionnaire III (Mathematics subscale) (Marsh, 1990)

The Mathematics subscale of the Self-Description Questionnaire III (SDQIII-M) (Marsh, 1990) was selected from the literature as providing the most appropriate measure to assess the convergent validity of the Mathematics Self-efficacy Scale. The SDQIII-M comprises 10 items that assess mathematics self-concept (e.g., “Mathematics makes me feel inadequate”. See Appendix D1). Although self-concept is a broader assessment of the self in relation to mathematics than is the assessment of self-efficacy, Pajares and Urdan (1996)
argued that self-concept subsumes the intuitions that accompany self-efficacy, thus there is likely to be a high degree of concordance between measures of self-concept and self-efficacy. Questions were answered on a five-point Likert scale (1 = definitely false to 5 = definitely true). A high score indicated a more favourable mathematics self-concept. Marsh and O'Neill (1984) reported a single-factor solution for the 10 items (item loadings .74 to .91) and high internal reliability ($\alpha = .95$).

8.4.7 The Writing Skills Self-efficacy Scale (Shell et al., 1989)

The Writing Skills Self-efficacy Scale (Shell et al., 1989) is a nine-item scale that assesses students' confidence that they can perform fundamental skills in the English writing domain (e.g., "Correctly punctuate a one-page passage"). See Appendix D1). Questions were answered on a five-point Likert scale (1 = not at all confident to 5 = very confident). Higher scores indicated higher writing self-efficacy.

Shell et al. (1989) reported high internal consistency of scores ($\alpha = .95$) and a one-factor solution (all item-total r's >.40) in an undergraduate sample. Pajares and Johnson (1996) reported high internal reliability of scores ($\alpha = .91$) in a high-school sample, while Pajares and Valiante (1997) reported internal score reliability of $\alpha = .88$ and a single-factor solution (all item-total r's >.68) in a sample of fifth graders.

8.5 Procedure

The Deakin University Ethics Committee granted approval to conduct this study subject to approval from school authorities (see Appendix A1). The Catholic Education Office and the Independent Schools Association of Victoria
were approached for approval to invite principals of Victorian Catholic and Independent schools to participate in the study. The Catholic Education Office granted approval for the researcher to approach principals of Catholic schools in the Melbourne Diocese (see Appendix B2). The Independent Schools Association of Victoria advised that responsibility for the approval of research projects is delegated to individual schools so the researcher was able to approach the principals of Independent schools in Victoria directly. The principals of 20 Catholic schools in the Melbourne Diocese and 10 Independent schools in Melbourne and surrounding districts were invited to participate in the study. The principals of seven of the Catholic schools and four of the Independent schools agreed to allow parents and students to be invited to participate in the study.

Once formal permission to conduct the study had been obtained from principals, the researcher issued a Plain Language Statement (see Appendix C1) and parental consent form (see Appendix C3) to all year nine students at these schools. The Plain Language Statement set out the purpose of the study and the participation requirements. Parents and students were informed that participation was voluntary and that all data would be anonymous and confidential. Parents and students were also informed that only group data would be analysed and published and that all data would be stored securely in a locked cabinet at Deakin University for a minimum of six years to comply with University policy.

Students received their Plain Language Statement and consent form either during morning assembly or in a homegroup meeting. The researcher
was given the opportunity during these times to talk to the students about the study and to respond to questions from students and teachers. A limit of two weeks was imposed in which parents could return the signed consent form to the co-ordinating teacher. Response rates varied considerably for individual schools (22% to 97%), depending largely on differences between the ways in which schools followed-up the collection of consent forms. For instance, one school obtained a 97% response rate because the study was advertised in the school newsletter and the coordinating teacher telephoned the parents of any student who had not replied after the first week.

During the student recruitment process, one Catholic school withdrew from the study due to a very poor response rate from students (9%). The poor response rate from this school may have been related to the fact that the school enrolled students from predominantly non-English-speaking backgrounds. While the students themselves were generally proficient in English, many parents reported experiencing difficulty understanding the Plain Language Statement and the conditions outlined on the parental consent form. As a result, many parents of students at this school were understandably reluctant to consent for their child to participate in the study.

Despite the loss of this latter school, a total of 302 students from ten schools returned their consent forms signed by a parent or guardian and all 302 of these students subsequently completed the questionnaires. The questionnaires were completed in a single sitting at each participating school
within the first month of term three (August 2000).\footnote{The school year in Victoria, Australia runs from approximately the first Monday in February until the Friday immediately preceding Christmas. The year is divided into four terms of approximately eight to nine weeks, with breaks of two weeks between terms one and two, two and three, and three and four. There is a longer break in the summer months of approximately six weeks, which coincides with the end of both the calendar and school years.}

In order to address Bandura's (1986) argument that self-efficacy perceptions are sensitive to environmental stimuli, and thus are potentially sensitive to common contextual differences experienced at school, students were asked to complete the Mathematics Self-efficacy Scale and the Writing Skills Self-efficacy Scale (Shell et al., 1989) twice, with reference to two different environmental contexts. In the first instance, students were asked to rate their confidence to solve the problems in a classroom situation (e.g., "How confident are you that you can successfully solve a simultaneous equation in the classroom?"; "How confident are you that you can correctly punctuate a one-page passage in the classroom"). In the second instance, students were asked to rate their confidence to solve the problems during a mathematics test or an English examination (e.g., "How confident are you that you can successfully solve a simultaneous equation in a mathematics test?"; "How confident are you that you can correctly punctuate a one-page passage in an English examination"). Half of the students answered the MSES in the classroom condition prior to the test condition, while the other half answered the MSES in the test condition prior to the classroom condition to counter any possible order effects of these conditions (see Appendix D1). The order of presentation of the versions of these two scales was counterbalanced in order to counteract any possible order effects of context.
In every case, the students completed the questionnaires in a classroom during school hours. The researcher and a teacher from each participating school supervised the students while they completed the questionnaires. Students were instructed to work alone, not to put any identifying information on their questionnaires and to respond to all questions as quickly and as accurately as possible. There was no time limit on completion of the items, although all students completed the questionnaires in less than twenty minutes.
CHAPTER NINE

STUDY ONE - RESULTS

Data were analysed using SPSS/PC (version 9.05) and Amos (version 4.0). Demographic and descriptive data were analysed using summary statistics and chi-square analysis to assess whether there was any association between school denomination and whether schools were co-educational or single-sex. Principal Components Analyses (PCA) were performed on each of the scales developed for this study in order to explore underlying component structures. Following PCA, the internal reliability of each of the scales was assessed by computing Cronbach’s alpha co-efficients. The analyses that were used to demonstrate the convergent validity and construct validity of these new scales included Pearson’s correlations and a regression analysis. Confirmatory factor analyses of the Writing Skills Self-efficacy Scale (Shell et al., 1989) were conducted for both the classroom and test conditions.

9.1 Distributions of students within school denomination and co-educational / single-sex schools categories

The percentages of students sampled by school denomination (i.e., Catholic versus Independent) and co-educational versus single-sex school category are presented in Table 2. Seventy-seven percent of students were recruited from Catholic schools. The remaining 23% of students were recruited from Independent schools. Fifty-seven percent of the students in this study attended co-educational schools, and the remaining 43% attended single-sex schools with an approximately even distribution of students from girls’ schools.
and boys' schools (24% girls' schools, 19% boys' schools). Chi-square analysis revealed no association between school denomination and co-educational / single-sex school category ($\chi^2 = 7.85, p > .05$).

Table 2

<table>
<thead>
<tr>
<th>Catholic (73%)</th>
<th>Other independent (23%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Co-educational</td>
<td>Single sex</td>
</tr>
<tr>
<td>34.0</td>
<td>42.8*</td>
</tr>
</tbody>
</table>

*23.6% of students were from girls' schools; 19.2% of students were from boys' schools.

9.2 Distributions and gender differences among students' past grades and grade goals in English and mathematics

The mean grade for year eight mathematics was B in a range of E- to A+, while the mean grade for year eight English was B+ in a range of D- to A+. There were no significant gender differences in past grades for either English or mathematics (see Table 3).

Table 3

Means and Standard Deviations for Self-Reported Past Grades (Year 8) for English and Mathematics by Gender

<table>
<thead>
<tr>
<th></th>
<th>English</th>
<th>Mathematics</th>
<th>t(df)</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>M</td>
<td>14.80 (B+)</td>
<td>14.37 (B)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>SD</td>
<td>2.24</td>
<td>3.04</td>
<td>.297</td>
</tr>
<tr>
<td>Females</td>
<td>M</td>
<td>15.15 (B+)</td>
<td>14.36 (B)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>SD</td>
<td>2.04</td>
<td>3.14</td>
<td>.501</td>
</tr>
</tbody>
</table>
The mean grade goal for year nine English was B+ in a range of A+ to B-, while the mean grade goal for year nine mathematics was B in a range A+ to C-. Independent t tests revealed significant effects of gender with respect to grade goals in both English and mathematics. For mathematics, males reported significantly higher grade goals than females, while in English, females reported significantly higher grade goals than males (see Table 4).

Table 4

<table>
<thead>
<tr>
<th>Gender</th>
<th>English</th>
<th>Mathematics</th>
<th>t_{df}</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Males</td>
<td>15.05 (B+)</td>
<td>15.11 (B+)</td>
<td>2.12_{300}</td>
<td>&lt;.05</td>
</tr>
<tr>
<td></td>
<td>2.01</td>
<td>1.73</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Females</td>
<td>16.18 (A-)</td>
<td>14.14 (B)</td>
<td>2.51_{300}</td>
<td>&lt;.05</td>
</tr>
<tr>
<td></td>
<td>2.42</td>
<td>2.34</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

9.3 Data screening for all scales

Data for all scales were assessed for missing values, univariate outliers and univariate normality. Less than two percent of the data were missing. Columnwise mean substitution was employed to replace the missing data. This conservative procedure was chosen because it did not change the distribution of means, however does did attenuate the variance slightly. However, as less than two percent of the data were subject to columnwise mean substitution, this procedure was not expected to reduce the variances to such an extent that correlations with other scales would be substantially truncated.

Three univariate outliers >±3SD were present on the Mathematics Self-efficacy Scale when administered in the test context. Following the
recommendation of Tabachnick and Fidell (1996), these three outliers were recoded to 3SD. Kolmogorov-Smirnov tests and skewness indices revealed that all variables were normally distributed according to the parameters suggested by Tabachnick and Fidell.

9.4 Exploratory analyses of scales under development

9.4.1 The Mathematics Self-efficacy Scale

9.4.1.1 Principal component analysis

As would be expected, summated scores from the class and the test conditions of the MSES were highly correlated (r = .74 [55% shared variance]). Therefore, item data from both conditions were analysed together. Scores from all items of the MSES revealed acceptable pairwise linear relationships across both contexts when assessed through SPSS GRAPHS.

A principal component analysis, which provides an empirical summary of the data, was performed on the combined MSES data with 302 cases. The correlation matrix revealed that all items correlated at least ≥.40 with one other item. The Kaiser-Meyer-Olkin measure of sampling adequacy (KMO=.82) and Bartlett’s Test of Sphericity ($\chi^2_{274}=6,958.52, p<.001$) both indicated the factorability of the data (Tabachnick & Fidell, 1996).

While three components exhibited Kaiser’s criterion of eigenvalues >1.00, Cattell’s scree plot and the number and the structure of items weighting on the components indicated that a unifactorial solution was to be preferred. Therefore, one component was extracted which explained 49% of the total score variance and the items on this factor were homogenous ($\alpha=.93$). This component was labeled mathematics self-efficacy. The communalities showed
that the percentages of variance explained in each MSES item ranged from 28% to 58%. The component coefficients ranged from .53 to .78 (see Table 5).

Table 5

Mathematics Self-efficacy Scale (MSES) Component Co-efficients and Communalities

<table>
<thead>
<tr>
<th>Item Content</th>
<th>Component Co-efficients</th>
<th>Communalities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Determine the value of a missing side length - test</td>
<td>.78</td>
<td>61</td>
</tr>
<tr>
<td>Work with decimals - test</td>
<td>.77</td>
<td>60</td>
</tr>
<tr>
<td>Calculate values of area and volume - test</td>
<td>.75</td>
<td>58</td>
</tr>
<tr>
<td>An algebra problem - test</td>
<td>.75</td>
<td>57</td>
</tr>
<tr>
<td>Determine the degrees of a missing angle - test</td>
<td>.76</td>
<td>57</td>
</tr>
<tr>
<td>A simultaneous equation - test</td>
<td>.73</td>
<td>54</td>
</tr>
<tr>
<td>Work with fractions - test</td>
<td>.73</td>
<td>53</td>
</tr>
<tr>
<td>An algebra problem - class</td>
<td>.72</td>
<td>52</td>
</tr>
<tr>
<td>Work with fractions - class</td>
<td>.72</td>
<td>51</td>
</tr>
<tr>
<td>Determine the degrees of a missing angle - class</td>
<td>.71</td>
<td>51</td>
</tr>
<tr>
<td>Calculate values of area and volume - class</td>
<td>.70</td>
<td>49</td>
</tr>
<tr>
<td>Work with decimals - class</td>
<td>.69</td>
<td>47</td>
</tr>
<tr>
<td>Determine the value of a missing side length - class</td>
<td>.69</td>
<td>47</td>
</tr>
<tr>
<td>A simultaneous equation - class</td>
<td>.66</td>
<td>44</td>
</tr>
<tr>
<td>A problem in trigonometry - test</td>
<td>.65</td>
<td>43</td>
</tr>
<tr>
<td>Sketch a curve - test</td>
<td>.64</td>
<td>40</td>
</tr>
<tr>
<td>Sketch a curve - class</td>
<td>.53</td>
<td>28</td>
</tr>
<tr>
<td>A problem in trigonometry - class</td>
<td>.53</td>
<td>28</td>
</tr>
<tr>
<td>( \alpha )</td>
<td>.93</td>
<td></td>
</tr>
</tbody>
</table>

\( a: \) Students were asked to consider how confident they were that they could successfully complete each item type either in class or in a mathematics test (1 = not at all confident to 5 = completely confident)

\( 6 \) Separate factor analyses of the class and test items also revealed a unifactorial solution for the MSES in each context, with class data explaining 47% of the variance (\( \alpha = .86 \)) and test data explaining 50% of the variance (\( \alpha = .90 \)).
9.4.1.2 Gender differences and mean differences between MSES class and MSES test scores

Independent samples t tests revealed that there were no gender differences on the MSES in either the class or the test context (see Table 6).

Table 6

MSES Class and Test Scores by Gender

<table>
<thead>
<tr>
<th>Gender</th>
<th>MSES (class)</th>
<th>MSES (test)</th>
<th>t</th>
<th>df</th>
<th>p</th>
<th>CLo95%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Males</td>
<td>M</td>
<td>35.99</td>
<td>33.38</td>
<td>6.72</td>
<td>8.92</td>
<td>1.75</td>
</tr>
<tr>
<td></td>
<td>SD</td>
<td>6.72</td>
<td>8.92</td>
<td>1.75</td>
<td>&gt;.05</td>
<td>-.16</td>
</tr>
<tr>
<td>Females</td>
<td>M</td>
<td>34.71</td>
<td>31.90</td>
<td>6.07</td>
<td>7.55</td>
<td>1.55</td>
</tr>
</tbody>
</table>

As there were no gender differences within each context, the entire sample was used when comparing students' scores across contexts. Students reported higher scores on mathematics self-efficacy in the classroom (M = 35.30; SD = 6.40) than in a test context (M = 32.58; SD = 8.23) (t = 10.54, p < .05).

9.4.1.3 Percentile Ranks for mathematics self-efficacy

Percentile ranks by context were investigated for mean score differences between test and class self-efficacy as a function of efficacy level to determine whether levels of efficacy were discriminated by context. Scores from both contexts of the MSES were divided into four groups on the basis of percentile ranks (0 - 25; 26-50; 51-75; 76-100) and mean differences between these are presented in Table 7.
Table 7

Confidence Intervals for Mean Differences in Class versus Test Self-efficacy
by Percentile Levels of Self-efficacy

<table>
<thead>
<tr>
<th>Level of Efficacy</th>
<th>0-25th</th>
<th>26-50th</th>
<th>51st-75th</th>
<th>76-100th</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percentile</td>
<td>Very low</td>
<td>Low</td>
<td>Moderate</td>
<td>High</td>
</tr>
<tr>
<td>M difference&lt;sup&gt;a&lt;/sup&gt;</td>
<td>4.81</td>
<td>3.36</td>
<td>1.89</td>
<td>.76</td>
</tr>
<tr>
<td>95% confidence</td>
<td>3.60 : 6.03</td>
<td>2.75 : 3.97</td>
<td>1.45 : 2.33</td>
<td>.04 : 1.48</td>
</tr>
</tbody>
</table>

<sup>a</sup> Positive mean differences indicate that mean scores for the class context are higher than mean scores for the test context.

A positive mean difference indicates that scores for the class context were higher in each instance than were scores for the test context. These differences were statistically significant between class and test self-efficacy for each of the four groups. The level of mean difference decreases as a function of increasing scores on self-efficacy. In fact, the 95% confidence interval for the mean difference indicated that the difference in the high self-efficacy group between class and test contexts was of little practical significance as this interval was almost twice the mean difference.

9.4.1.4 Internal reliability of the MSES

The combined items from both contexts of the MSES administration demonstrated strong internal reliability (Cronbach $\alpha = .93$) with item-total correlations ranging from .48 to .74. The internal reliability of the MSES in each context was also high (MSES (class) and MSES (test) Cronbach $\alpha = .86$ and .90 respectively).
9.4.1.5 Construct validity of MSES

Convergent validity of scores on the MSES in both contexts was indicated by significant positive correlations with students' self-reports of their immediate past grades for mathematics: MSES - Class and immediate past mathematics grade \( r = .51, p < .001 \) \( (r^2 = .26) \) and MSES - Test and immediate past mathematics grade \( r = .58, p < .001 \) \( (r^2 = .34) \). Convergent score validity was indicated further by positive correlations between scores on the Self Description Questionnaire III (Math) and the MSES in the class context \( (r = .72, p < .001; r^2 = .52) \) and the MSES administered in the test context \( (r = .79, p < .001; r^2 = .62) \).

Discriminant score validity of the MSES in both contexts was indicated by their lack of correlation with self-reported desired English grades and the MSES - Class \( (r = .01, p > .05) \) and the MSES - Test \( (r = .02, p > .05) \).

9.4.1.6 Criterion-related validity

Concurrent validity of scores for the MSES in both contexts was indicated by correlations between students' end of year nine grade goals for mathematics and the MSES - Class scores \( (r = .76, p < .001; r^2 = .58) \) and MSES - Test scores \( (r = .78, p < .001; r^2 = .61) \).

9.4.2 The Mathematics Strategies Scale

9.4.2.1 Principal component analysis

Scores from all items of the Mathematics Strategies Scale (MSS) revealed acceptable pairwise linear relationships when assessed through SPSS GRAPHS. A principal component analysis was performed on the MSS with 302 cases. The correlation matrix revealed that all items correlated at least ≥.40
with one other item. The Kaiser-Meyer-Olkin measure of sampling adequacy (KMO=.72) and Bartlett’s Test of Sphericity ($\chi^2_{28} = 413.21$, $p<.001$) both indicated the factorability of the data (Tabachnick & Fidell, 1996).

Using Kaiser’s criterion of eigenvalues >1.00, two components were extracted which explained 62.25% of the total variance. This two-component structure was supported by Cattell’s scree plot and the number and structure of items weighting on the components. After oblique rotation, item loadings on component one ranged from .63 to .74, while loadings on component two ranged from .57 to .74. Component one was labeled Mathematics Concepts and it comprised the items designed to measure conceptual mathematics strategies. This component explained 39.25% of the variance. Component two was labeled Mathematics Procedures and it comprised the items designed to measure procedural mathematics strategies. This component explained 23% of the variance (see Table 8). The correlation between the components was minimal ($r=.14$).
Table 8

**Item Loadings on the Mathematics Strategies Scale**

<table>
<thead>
<tr>
<th>Item Content</th>
<th>Concepts</th>
<th>Procedures</th>
</tr>
</thead>
<tbody>
<tr>
<td>If I forget how to solve maths problems, I can think my way through them.</td>
<td>.74</td>
<td></td>
</tr>
<tr>
<td>In maths tests, I try to understand an example so I can apply it to other</td>
<td>.74</td>
<td></td>
</tr>
<tr>
<td>problems.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I think of decimals in much the same way as fractions.</td>
<td>.70</td>
<td></td>
</tr>
<tr>
<td>In maths I can use one problem to help me work out another.</td>
<td>.63</td>
<td></td>
</tr>
<tr>
<td>In maths tests, I try to memorise the steps required to solve different sorts</td>
<td>.74</td>
<td></td>
</tr>
<tr>
<td>of problems.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Working out maths problems is like remembering a recipe.</td>
<td>.68</td>
<td></td>
</tr>
<tr>
<td>In maths, I try to memorise what to do rather than understand what it</td>
<td>.61</td>
<td></td>
</tr>
<tr>
<td>means.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maths is about remembering, not understanding.</td>
<td>.57</td>
<td></td>
</tr>
<tr>
<td>% variance explained</td>
<td>39.25</td>
<td>23.00</td>
</tr>
<tr>
<td>M</td>
<td>14.04</td>
<td>12.03</td>
</tr>
<tr>
<td>SD</td>
<td>3.46</td>
<td>3.31</td>
</tr>
<tr>
<td>α</td>
<td>.60</td>
<td>.69</td>
</tr>
<tr>
<td>r</td>
<td>1.00</td>
<td>.14</td>
</tr>
</tbody>
</table>

*Students were asked to consider the degree to which they use each strategy when approaching mathematics problems on a scale of 1 (not at all) to 5 (very much).*

9.4.2.2 Gender differences in Mathematics Concepts and Mathematics Procedures

Independent samples t tests revealed that there was no difference between scores for males and females on either component of the MSS (see Table 9).

Table 9

**MSS Component Scores by Gender**

<table>
<thead>
<tr>
<th></th>
<th>MSS concepts</th>
<th>MSS procedures</th>
<th>Lr</th>
<th>p</th>
<th>CI α95%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Males</td>
<td>M</td>
<td>14.12</td>
<td>12.24</td>
<td>.82300</td>
<td>&gt;.05</td>
</tr>
<tr>
<td></td>
<td>SD</td>
<td>4.15</td>
<td>4.03</td>
<td>-.46 : 1.11</td>
<td></td>
</tr>
<tr>
<td>Females</td>
<td>M</td>
<td>13.89</td>
<td>11.77</td>
<td>1.50300</td>
<td>&gt;.05</td>
</tr>
<tr>
<td></td>
<td>SD</td>
<td>2.75</td>
<td>2.51</td>
<td>-.18 : 1.32</td>
<td></td>
</tr>
</tbody>
</table>
9.4.2.3 Differences between mean scores on Mathematics Concepts and Mathematics Procedures

As there were no gender differences within either components of the MSS, the entire sample was used when comparing students' scores on Mathematics Concepts and Mathematics Procedures. There was a significant between mean scores for Mathematics Concepts and Mathematics Procedures ($t (df = 301) = 6.55$, $p < .001$) with students reporting higher usage of Mathematics Concepts ($M = 14.04$; $SD = 3.46$) than Mathematics Procedures ($M = 12.03$; $SD = 3.31$).

9.4.2.4 Internal reliability of the components

The internal reliability of scores on both components of the MSS was adequate (Mathematics Concepts: Cronbach $\alpha = .60$; item-total $r$s .29 to .51; Mathematics Procedures: Cronbach $\alpha = .69$; item-total $r$s .44 to .54).

9.4.2.5 Construct validity of the components

The convergent validity of scores for each component of the MSS will be assessed by correlations with the corresponding component of the Writing Strategies Scale (see Chapter 9.4.3.5). The discriminant validity of scores for each component of the MSS will be assessed by correlations with the non-corresponding component of the Writing Strategies Scale (see Chapter 9.4.3.5).

9.4.3 The Writing Strategies Scale

9.4.3.1 Principal component analysis

Scores from all items of the Writing Strategies Scale (WSS) revealed acceptable pairwise linear relationships when assessed through SPSS GRAPHS. A principal component analysis was performed on the WSS with
302 cases. The correlation matrix revealed that all items correlated at least \( \geq 0.40 \) with one other item. The Kaiser-Meyer-Olkin measure of sampling adequacy (KMO=.77) and Bartlett’s Test of Sphericity (\( \chi^2_{28} = 452.41, \ p < .001 \)) both indicated the factorability of the data (Tabachnick & Fidell, 1996).

The percentages of variance explained in each item ranged from 40% to 72%. Using Kaiser’s criterion of eigenvalues >1.00, two components were extracted which explained 65.64% of the total variance. This two-component structure was supported by Cattell’s scree plot and the number and structure of items weighting on the components. After oblique rotation, item loadings on component one ranged from .65 to .85, while loadings on component two ranged from .60 to .80. Component one was labeled Writing Procedures and it comprised the items designed to measure procedural writing strategies. This component explained 39.87% of the variance. Component two was labeled Writing Concepts and it comprised the items designed to measure conceptual writing strategies. This component explained 25.77% of the variance (see Table 10). The correlation between the components was minimal (\( r = .13 \)).
Table 10

Item Loadings on the Writing Strategies Scale

<table>
<thead>
<tr>
<th>Item Content</th>
<th>Procedures</th>
<th>Concepts</th>
</tr>
</thead>
<tbody>
<tr>
<td>When I write I consider all the grammar and punctuation rules</td>
<td>.85</td>
<td></td>
</tr>
<tr>
<td>When I write I think about whether I have followed the rules of English, like punctuation</td>
<td>.80</td>
<td></td>
</tr>
<tr>
<td>When I write I stick to a proven formula</td>
<td>.65</td>
<td></td>
</tr>
<tr>
<td>I use past essays 'examples' or 'guides' for my work</td>
<td>.65</td>
<td></td>
</tr>
<tr>
<td>When I write I consider the arguments I am trying to make</td>
<td>.80</td>
<td></td>
</tr>
<tr>
<td>When I write I try to relate the ideas to each other</td>
<td>.69</td>
<td></td>
</tr>
<tr>
<td>When I write I give myself room to explore many issues</td>
<td>.67</td>
<td></td>
</tr>
<tr>
<td>I think more about the subject matter of my essays than whether</td>
<td>.60</td>
<td></td>
</tr>
<tr>
<td>all the commas are in the right spots</td>
<td></td>
<td></td>
</tr>
<tr>
<td>% variance explained</td>
<td>39.87</td>
<td>25.77</td>
</tr>
<tr>
<td>M</td>
<td>11.85</td>
<td>15.47</td>
</tr>
<tr>
<td>SD</td>
<td>3.53</td>
<td>2.74</td>
</tr>
<tr>
<td>α</td>
<td>.73</td>
<td>.72</td>
</tr>
<tr>
<td>r</td>
<td>1.00</td>
<td>.13</td>
</tr>
</tbody>
</table>

*Students were asked to consider the degree to which they use each strategy when approaching mathematics problems on a scale of 1 (not at all) to 5 (very much).

9.4.3.2 Gender differences in Writing Concepts and Writing Procedures

Independent samples t tests revealed that there was no difference between scores for males and females on either component of the WSS (see Table 11).

Table 11

WSS Component Scores by Gender

<table>
<thead>
<tr>
<th></th>
<th>WSS concepts</th>
<th>WSS procedures</th>
<th>tdr</th>
<th>p</th>
<th>CLα95%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Males</td>
<td>M</td>
<td>15.46</td>
<td>12.08</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>SD</td>
<td>2.99</td>
<td>3.68</td>
<td>.02</td>
<td>&gt;.05</td>
</tr>
<tr>
<td>FEMALES</td>
<td>M</td>
<td>15.54</td>
<td>11.67</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>SD</td>
<td>2.44</td>
<td>3.41</td>
<td>.97</td>
<td>&gt;.05</td>
</tr>
</tbody>
</table>
9.4.3.3 Differences between mean scores on Writing Concepts and Writing Procedures

As there were no gender differences within either component of the WSS, the entire sample was used when comparing students' scores on Writing Concepts and Writing Procedures. There was a significant difference between scores for Writing Concepts and Writing Procedures ($t$ (df = 301) = 14.21, $p < .001$) with students reporting higher usage of Writing Concepts ($M = 15.47$; $SD = 2.75$) than Writing Procedures ($M = 11.86$; $SD = 2.53$).

9.4.3.4 Internal reliability of the components

The internal reliability of scores on both components of the WSS was adequate (Writing Concepts: Cronbach $\alpha = .72$; item-total $r$s .44 to .59; Writing Procedures: Cronbach $\alpha = .73$; item-total $r$s .42 to .64).

9.4.3.5 Construct validity of the components of the MSS and WSS

The convergent validity of scores for each component of the WSS and the MSS were assessed by their intercorrelations with the corresponding components of each of these scales (see Chapter 9.4.2.5). The correlation between Writing Concepts and Mathematics Concepts was $r = .60$. The correlation between Writing Procedures and Mathematics Procedures was $r = .68$.

The discriminant validity of scores for each component of the WSS and MSS were assessed by correlations with the non-corresponding component of each of these scales (see Chapter 9.4.2.5). The correlation between Writing Concepts and Mathematics Procedures was $r = -.03$. The correlation between Writing Procedures and Mathematics Concepts was $r = .07$. 
9.4.4 The Sources of Writing Self-efficacy Scale

9.4.4.1 Principal component analysis

Scores from all items of the Sources of Writing Self-efficacy Scale (SWSS) revealed acceptable pairwise linear relationships when assessed through SPSS GRAPHS. A principal component analysis was performed on the SWSS with 302 cases. The correlation matrix revealed that all items correlated at least \( \geq 0.40 \) with one other item. The Kaiser-Meyer-Olkin measure of sampling adequacy (KMO=0.70) and Bartlett's Test of Sphericity \((\chi^2_{66}=484.55, p<0.001)\) both indicated the factorability of the data (Tabachnick & Fidell, 1996).

Using Kaiser’s criterion of eigenvalues > 1.00, four components were extracted which explained 68.36% of the total variance. This four-component structure was supported by Cattell’s scree plot and the number and structure of items weighting on the components. After oblique rotation, item loadings on component one, labeled Physiological State, ranged from 0.85 to 0.72 and explained 33.24% of the score variance; loadings on component two, labeled Enactive Mastery, ranged from 0.78 to 0.73 and explained 18.52% of the score variance; loadings on component three, labeled Vicarious Learning, ranged from 0.83 to 0.62 and explained 9.58% of the score variance; and loadings on component four, labeled Social Persuasion, ranged from -0.62 to -0.45 and explained 7.02% of the score variance.
The inter-correlations among the scores were low except for the correlation between Physiological State and Enactive Mastery ($r = -.54$) (see Table 12).

Table 12

<table>
<thead>
<tr>
<th>Item Loadings on the Sources of Writing Self-efficacy Scale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Item content</td>
</tr>
<tr>
<td>I am afraid of writing essays</td>
</tr>
<tr>
<td>My mind goes blank when I start writing</td>
</tr>
<tr>
<td>I'm nervous about writing</td>
</tr>
<tr>
<td>If I'm pleased with an essay I submit, I</td>
</tr>
<tr>
<td>feel ready to do another</td>
</tr>
<tr>
<td>Getting good essay marks boosts my writing confidence</td>
</tr>
<tr>
<td>I write well if I have just received a good mark</td>
</tr>
<tr>
<td>I expect to score the same on essays as the rest of the</td>
</tr>
<tr>
<td>class</td>
</tr>
<tr>
<td>I can tell how well I will score on an essay by how well</td>
</tr>
<tr>
<td>others score</td>
</tr>
<tr>
<td>If classmates struggle with an essay, I</td>
</tr>
<tr>
<td>will struggle too</td>
</tr>
<tr>
<td>It is hard to write when people criticise</td>
</tr>
<tr>
<td>I write better when others believe in me</td>
</tr>
<tr>
<td>If I can't start an essay, nobody can</td>
</tr>
<tr>
<td>boost my confidence</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>% variance explained</th>
<th>33.24</th>
<th>18.52</th>
<th>9.58</th>
<th>7.02</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>15.28</td>
<td>16.06</td>
<td>12.37</td>
<td>14.22</td>
</tr>
<tr>
<td>SD</td>
<td>2.56</td>
<td>2.68</td>
<td>2.90</td>
<td>2.74</td>
</tr>
<tr>
<td>$\alpha$</td>
<td>.82</td>
<td>.76</td>
<td>.74</td>
<td>.71</td>
</tr>
<tr>
<td>Correlation matrix</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physiological State</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Enactive Mastery</td>
<td>-.54*</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vicarious Learning</td>
<td>.09</td>
<td>.11</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Social Persuasion</td>
<td>-.02</td>
<td>.04</td>
<td>.01</td>
<td>1</td>
</tr>
</tbody>
</table>

* Students were asked how much each statement applied to them (1—not at all to 5—very much).

* Loadings < .20 were suppressed.
9.4.4.2 Internal reliability of the components

The internal reliability of scores on all components of the SWSS was adequate (Physiological State: Cronbach $\alpha = .82$; Enactive Mastery: Cronbach $\alpha = .76$; Vicarious Learning: Cronbach $\alpha = .74$; Social Persuasion: Cronbach $\alpha = .71$).

9.4.4.3 Construct validity of the components

The four components of the SWSS were regressed onto scores from both versions of the Writing Skills Self-efficacy Scale (Shell et al., 1989) (see Chapter 9.5) in order to assess the construct validity of the SWSS, as Bandura (1997) argued that each of these four components inform self-efficacy.

Thirty percent of the variance in writing self-efficacy - class was explained by the four components ($F(4,277) = 30.02$, $p<.001$). However, only three of the components contributed significantly to the model (Physiological State $\beta = .36$; Enactive Mastery $\beta = .26$; and Vicarious Learning $\beta = -.18$). Social Persuasion failed to contribute to writing self-efficacy in the class context.

Thirty-three percent of the variance in writing self-efficacy - test was explained by the four components ($F(4,277) = 32.84$, $p<.001$). The same three of the four components contributed significantly to the model (Physiological State, $\beta = .41$; Enactive Mastery, $\beta = .23$; and Vicarious Learning, $\beta = -.17$), with Social Persuasion failing to contribute to the solution.
9.5 Exploratory principal component analysis of the Writing Skills Self-efficacy Scale in classroom and test contexts

Shell et al.'s (1989) Writing Skills Self-efficacy Scale (WSSS) was administered twice: once prompting students to assess their writing competence in an English class and once prompting them to assess their writing competence during and English examination.

9.5.1 Principal component analysis

As would be expected, summated scores from the class and the test conditions of the WSSS were highly correlated ($r = .79$ [62% shared variance]). Therefore, item data from both conditions were factor analysed together. Scores from all items of the WSSS revealed acceptable pairwise linear relationships across both contexts when assessed through SPSS GRAPHs.

A principal component analysis, which provides an empirical summary of the data, was performed on the combined WSSS data with 302 cases. The correlation matrix revealed that all items correlated at least $\geq .40$ with one other item. The Kaiser-Meyer-Olkin measure of sampling adequacy (KMO=.86) and Bartlett's Test of Sphericity ($\chi^2_{276}=7,935.22$, $p<.001$) both indicated the factorability of the data (Tabachnick & Fidell, 1996).

While three components exhibited Kaiser's criterion of eigenvalues >1.00, Cattell's scree plot and the number and the structure of items weighting on the components indicated that a unifactorial solution was to be preferred. Therefore, one component was extracted which explained 55% of the total score variance and the items on this component were homogenous ($\alpha=.95$). This component was labeled writing self-efficacy. The communalities showed
that the percentages of variance explained in each WSSS item ranged from 55% to 81%. The component coefficients ranged from .63 to .84 (see Table 13).

Table 13

<table>
<thead>
<tr>
<th>Item Content*</th>
<th>Component co-efficients</th>
<th>Communalities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Write a well organised paragraph – test</td>
<td>.84</td>
<td>81</td>
</tr>
<tr>
<td>Write a paragraph to support a main idea – class</td>
<td>.82</td>
<td>78</td>
</tr>
<tr>
<td>Write a well organised paragraph – class</td>
<td>.81</td>
<td>77</td>
</tr>
<tr>
<td>Write a paragraph to support a main idea – test</td>
<td>.80</td>
<td>76</td>
</tr>
<tr>
<td>Organise sentences to clearly express an idea – test</td>
<td>.77</td>
<td>75</td>
</tr>
<tr>
<td>Write a strong paragraph with a ‘main idea’ – class</td>
<td>.76</td>
<td>72</td>
</tr>
<tr>
<td>Write a simple sentence with good grammar – test</td>
<td>.76</td>
<td>70</td>
</tr>
<tr>
<td>Correctly punctuate a one-page story – class</td>
<td>.74</td>
<td>68</td>
</tr>
<tr>
<td>Write a simple sentence with good grammar – class</td>
<td>.74</td>
<td>68</td>
</tr>
<tr>
<td>Write a strong paragraph with a ‘main idea’ – test</td>
<td>.73</td>
<td>65</td>
</tr>
<tr>
<td>Correctly use parts of speech, like nouns/verbs – test</td>
<td>.72</td>
<td>62</td>
</tr>
<tr>
<td>Correctly use parts of speech, like nouns/verbs – class</td>
<td>.70</td>
<td>61</td>
</tr>
<tr>
<td>Correctly spell all words in a one-page story – test</td>
<td>.70</td>
<td>60</td>
</tr>
<tr>
<td>Correctly use singulars, plurals and tenses – test</td>
<td>.68</td>
<td>60</td>
</tr>
<tr>
<td>Correctly use singulars, plurals and tenses – class</td>
<td>.68</td>
<td>59</td>
</tr>
<tr>
<td>Correctly spell all words in a one-page story – class</td>
<td>.67</td>
<td>58</td>
</tr>
<tr>
<td>Organise sentences to clearly express an idea – class</td>
<td>.55</td>
<td>56</td>
</tr>
<tr>
<td>Correctly punctuate a one-page story – test</td>
<td>.63</td>
<td>55</td>
</tr>
</tbody>
</table>

α .95

*a Students were asked to consider how confident they were that they could successfully complete each item type either in class or in an English examination (1 = not at all confident to 5 = completely confident)

9.5.2 Gender differences and mean differences between class and test scores

Independent samples t tests revealed that there were no gender differences on the WSSS in either the class or the test context (see Table 14)

* Separate factor analyses of the class and test items also revealed a uniform solution for the WSSS in each context, with class data explaining 49% of the variance (α=.90) and test data explaining 51% of the variance (α=.91).
Table 14

WSSS Class and Test Scores by Gender

<table>
<thead>
<tr>
<th></th>
<th>WSSS (class)</th>
<th>WSSS (test)</th>
<th>t(df)</th>
<th>p</th>
<th>CLα95%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Males</td>
<td>35.44</td>
<td>32.10</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SD</td>
<td>7.77</td>
<td>8.29</td>
<td>1.73</td>
<td>&gt;.05</td>
<td>-3.06 : .10</td>
</tr>
<tr>
<td>Females</td>
<td>34.98</td>
<td>33.10</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SD</td>
<td>6.47</td>
<td>7.34</td>
<td>1.10</td>
<td>&gt;.05</td>
<td>-2.99 : .79</td>
</tr>
</tbody>
</table>

As there were no gender differences within each context, the entire sample was used when comparing students' scores across contexts. Students reported higher scores on writing self-efficacy in the classroom (M = 34.32; SD = 7.12) than in a test context (M = 32.64; SD = 7.79) (t(301)=7.38, p<.05).

9.5.3 Percentile ranks for writing self-efficacy

Percentile ranks by context were investigated for mean score differences between test and class self-efficacy as a function of efficacy level to determine whether levels of efficacy were discriminated by context. Scores from both contexts of the WSSS were divided into four groups on the basis of percentile ranks (0 – 25; 26-50; 51-75; 76-100) and mean differences between these are presented in Table 15.
Table 15

Confidence Intervals for Mean Differences in Class versus Test Self-efficacy
by Percentile Levels of Self-efficacy

<table>
<thead>
<tr>
<th>Level of Efficacy</th>
<th>Very low</th>
<th>Low</th>
<th>Moderate</th>
<th>High</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percentile</td>
<td>0.25&lt;sup&gt;th&lt;/sup&gt;</td>
<td>26-50&lt;sup&gt;th&lt;/sup&gt;</td>
<td>51&lt;sup&gt;st&lt;/sup&gt;-75&lt;sup&gt;th&lt;/sup&gt;</td>
<td>76-100&lt;sup&gt;th&lt;/sup&gt;</td>
</tr>
<tr>
<td>M difference&lt;sup&gt;a&lt;/sup&gt;</td>
<td>4.54</td>
<td>3.03</td>
<td>1.92</td>
<td>.53</td>
</tr>
<tr>
<td>95% confidence interval of difference</td>
<td>3.72 : 5.91</td>
<td>2.62 : 3.86</td>
<td>1.57 : 2.41</td>
<td>.05 : 1.29</td>
</tr>
</tbody>
</table>

<sup>a</sup> Positive mean differences indicate that mean scores for the class context are higher than mean scores for the test context.

A positive mean difference indicates that scores for the class context were higher in each instance than were scores for the test context. These differences were statistically significant between class and test self-efficacy for each of the four groups. The level of mean difference decreases as a function of increasing scores on self-efficacy. In fact, the 95% confidence interval for the mean difference indicated that the difference in the high self-efficacy group between class and test contexts was of little practical significance as this interval was almost twice the mean difference.

9.5.4 Internal reliability of the WSSS

The combined items from both contexts of the WSSS administration demonstrated strong internal reliability (Cronbach $\alpha = .95$) with item-total correlations ranging from .52 to .81. The internal reliability of the WSSS in each context was also high (WSSS (class) and WSSS (test) Cronbach $\alpha = .90$ and .91 respectively).
9.5.5 Construct validity of WSSS

Convergent validity of scores on the WSSS in both contexts was indicated by significant positive correlations with students' self-reports of their immediate past grades for English: WSSS - Class and immediate past English grade \( r = .56, p < .001 \) \( (r^2 = .31) \) and WSSS - Test and immediate past English grade \( r = .58, p < .001 \) \( (r^2 = .34) \).

Discriminant score validity of the WSSS in both contexts was indicated by their lack of correlation with self-reported desired mathematics grades and the WSSS - Class \( (r = .02, p > .05) \) and the WSSS - Test \( (r = .06, p > .05) \).

9.5.6 Criterion-related validity

Concurrent validity of scores for the WSSS in both contexts was indicated by correlations between students' end of year nine grade goals for English and the WSSS - Class scores \( (r = .72, p < .001; r^2 = .52) \) and WSSS - Test scores \( (r = .74, p < .001; r^2 = .55) \).

9.6 Chapter summary

The results of these analyses confirmed the component structures of the instruments under investigation. Results revealed the homogenous structure of the Mathematics Self-efficacy Scale across class and test contexts. There were no gender differences in mathematics self-efficacy in either context. Construct and concurrent validity of the MSES class and test scale scores were demonstrated. Principal component analyses supported two-component structures for the Mathematics Strategies Scale and the Writing Strategies Scale. There were no gender differences on either component for mathematics
strategies or writing strategies. Internal reliability of all components was demonstrated. Convergent and discriminant validity of both scales were also demonstrated. The Sources of Writing Self-efficacy Scale yielded four reliable components. No gender differences were detected on any of the four components. The construct validity of three of these four components was demonstrated in a regression analysis in which the self-efficacy source scores were regressed onto a measure of writing self-efficacy. Exploratory principal component analysis revealed a unifactorial structure of the Writing Skills Self-efficacy Scale across class context and test contexts. There were no gender differences in writing self-efficacy in either context. Internal consistency was present in both contexts. Construct and concurrent validity was demonstrated.
CHAPTER TEN

STUDY ONE - DISCUSSION

The aims of study one were to develop and psychometrically evaluate four questionnaires for use in the subsequent studies. These four new questionnaires are: the Mathematics Self-efficacy Scale, the Mathematics Strategics Scale, the Writing Strategies Scale and the Sources of Writing Self-efficacy Scale. A further aim was to psychometrically evaluate an existing scale, the Writing Skills Self-efficacy Scale (Shell et al., 1989), when used in two different contexts: in the English classroom and in an English test situation.

10.1 The Mathematics Self-efficacy Scale

The Mathematics Self-efficacy Scale (MSFS) was developed to measure the mathematics self-efficacy perceptions of students in middle and upper level secondary school. Items were written to reflect the curriculum in prescribed text books and students answered these items in terms of their perceived confidence to successfully solve each of the problems.

A distinctive feature of the MSFS is that it is robust when the context in which students' self-efficacy judgments are to be made is manipulated by altering the prompt at the beginning of the questionnaire. This contextual feature is important because, according to Bandura (1997), judgments of self-efficacy are sensitive to environmental influences. In the measurement of academic self-efficacies, there are two typical contexts within which self-efficacy perceptions are likely to operate: in the classroom and in tests or
examinations. In this study, students were asked to rate their confidence to successfully solve a comprehensive range of mathematics problems a) in the classroom, and b) in a mathematics test.

Due to the high correlation between scores for the class and test versions of the MSES (r = .74) principal component analysis of the scale scores was undertaken using combined data from both contexts. Results revealed a single-component solution with a high degree of internal reliability (Cronbach α = .93). Item loadings on the single component were reasonably homogeneous ranging from .53 to .78 with 'confidence to determine the value of a missing side length' in the test context the strongest contributor and 'confidence to solve a problem in trigonometry' in the class context exhibiting the lowest loading.

As expected from Bandura's (1997) argument, scale scores were statistically significantly different when scored for the test and the class contexts. Students reported statistically significantly higher mathematics self-efficacy in responding to the items in a classroom context than in a test context. The fact that a difference emerged between these two contexts supports Bandura's (1997) argument that self-efficacy should be measured in terms of context specificity. This contextual element is, he argued, important as perceptions of competence can be sensitive to personal and environmental factors which themselves may alter in response to contextual differences.

The large mean differences between class and test self-efficacy scores in the lower efficacy groups are further evidence in support of the need for contextual differentiation in the measurement of self-efficacy. The reported
percentile ranks suggest that the mean difference in total scores for mathematics class and test self-efficacy might be a function of the lower, rather than higher efficacy scores. When scores were broken down into groups comprising those in the first 25% (very low efficacy), those from the 26th to the 50th percentile (low efficacy), those from the 51st to the 75th percentile (moderate efficacy) and those in the 75th and above percentile (high efficacy), this suggestion was borne out by the data. Scores on the two forms of the MSSES differed by 4.81 for students in the very low efficacy group. The 95% confidence intervals of this difference were 3.60 : 6.03, a difference of 2.43 which suggests that this difference is meaningful at this level. On the other hand, for the very high efficacy students, the difference between the scores was minimal at 0.76. Although this figure represented a statistical difference between students’ scores in the different contexts, the confidence interval was almost twice the mean difference and can be interpreted to suggest that this difference is of little practical relevance at this level. While contextual differentiation in self-efficacy research is important, these results suggest that it is of particular utility for low efficacy students. Conversely, those students who have high self-efficacy in one domain may be more likely to have high self-efficacy in other academic domains.

The construct validity of MSSES scale scores in each context was demonstrated by convergent and discriminant methods using students' reports of past grades, the SDQIII Mathematics subscale and self-reported English grade goals. Moderate amounts of shared variance between MSSES scores and past mathematics grades (26% - class; 34% - test) along with substantial
amounts of shared variance between MSES scores and SDQIII scores (52% -
class; 62% - test) suggest that in the current sample, the MSES is a valid
indicator of perceived mathematics competence. There was little shared
variance between MSES scores and students’ English grade goals suggesting
that, in the current sample, MSES scores discriminate well between students’
perceptions of their mathematics competence and desired English outcomes.

Criterion-related score validity was assessed against an independent
indicator of perceived mathematics competence, that is, year nine mathematics
grade goal, and revealed a moderately high degree of shared variance in both
MSES contexts (58% - class; 61% - test). In the current sample, this suggests
that the MSES scores are useful indicators of perceived mathematics
competence and, in Bandura’s (1997) terms, are context specific.

In summary, it can be suggested that scores on the MSES are a valid
and reliable indicator of mathematics self-efficacy in the current sample of
middle level high school students in at least two contexts. Although designed
as an instrument specific to the curriculum of year 9 and 10 Victorian students,
the replication of these results in more diverse samples would provide evidence
for the generalisability of this scale. The applicability of this instrument to
screen students in need of additional tutoring or counseling and the sensitivity
of the instrument to detect any improvements post tutoring or counseling also
warrants investigation.
10.2 The Mathematics Strategies Scale

The Mathematics Strategies Scale (MSS) was developed to measure the extent to which students use conceptual and procedural strategies in mathematics.

Principal component analysis revealed two independent components \((r=.14)\) that together explained 62.25\% of the score variance. These components were named Mathematics Concepts and Mathematics Procedures and comprised those items originally intended for each component. Mathematics Concepts explained 39.25\% of the score variance while Mathematics Procedures explained 23\%.

There were no gender differences in terms of the degree of usage of either Mathematics Concepts or Mathematics Procedures, but the overall sample reported using a significantly higher degree of conceptual mathematics strategies. The fact that students seemed to utilise concepts more than procedures in mathematical problem solving in this sample suggests that they focus more highly on the understanding of mathematical content than on the memorisation of mathematical facts and formulae. This is a pleasing result as it indicates that these students rely more heavily on strategies that facilitate learning (Byrnes & Wasik, 1991), and hence performance. This result is particularly significant in the mathematics context where the temptation for students to try to simply memorise formulae, at the expense of understanding, is strong.

Internal reliability of scores on both the components was at the lower level (Concepts: \(\alpha = .60\); Procedures: \(\alpha = .69\)), but both were acceptable
relative to item number (Anastasi & Urbina, 1999). While increasing the number of items for each component might increase Cronbach alpha coefficients, the components were statistically and theoretically unambiguous in the current data. As the MSS will be used in structural equation models in studies two and three, it will be possible to specify the error terms for each component in these models and hence partial out their effects.

The MSS demonstrated convergent and discriminant validity against the two corresponding components and the two non-corresponding components of the Writing Strategies Scale (see section 10.3). These correlations will be discussed in the following section pertaining to the Writing Strategies Scale.

Overall, results revealed that the MSS is a valid and reliable instrument to measure the extent to which students use mathematics strategies based on conceptual and procedural knowledge. Scores on these components could be used to help students understand their strengths, in terms of working with maths, and to promote their development of less utilised strategies.

10.3 The Writing Strategies Scale

The Writing Strategies Scale (WSS) was developed to measure the extent to which students use conceptual and procedural strategies when writing essays or stories in English.

Principal component analysis revealed two independent components ($r=.21$) that together explained 65.64% of the score variance. These components were named Writing Procedures and Writing Concepts and comprised those items originally intended for each component. Writing Procedures explained 39.87% of the score variance while Writing Concepts
explained 25.77%. The correlation between Writing Procedures and Writing Concepts components was $r = .21$, suggesting that while they are independent components, there was a tendency for the to be more strongly related than are Mathematics Concepts and Mathematics Procedures.

No gender differences emerged in terms of the degree of usage of either Writing Concepts or Writing Procedures, but the overall sample reported using a significantly higher degree of conceptual writing strategies. The fact that students seemed to utilise concepts more than procedures in writing exercises in this sample suggested that they focus more highly on the content of their stories and essays than they do on more superficial aspects such as spelling and grammar. This result seems to indicate a degree of intellectual maturity among this young sample. While correct spelling, punctuation and grammar are important in writing, it is pleasing to see that even these pre VCE students are concerned with the content they are trying to convey, rather than being fixated on, or limited by, the rules of English writing. Of course it may be that at this stage of their academic lives that writing procedures come fairly naturally to these students, thus enabling them to focus more on the conceptual underpinnings of their writing.

Internal reliability of scores on both components was adequate relative to the number of items (Anastasi & Urbina, 1999) (Concepts: $\alpha = .72$; Procedures: $\alpha = .73$). Like the Mathematics Strategies Scale, increasing the number of items may increase Cronbach alpha co-efficients, however the components were statistically and theoretically unambiguous in the current data. Also like its mathematics counterpart, it is intended that the WSS be used
in structural equation models in studies two and three where individual error terms for each component can be specified and partialled out.

The convergent and discriminant validity of components from the Mathematics Strategies Scale and the Writing Strategies Scale were assessed respectively by correlations between the corresponding components and correlations between the non-corresponding components. Mathematics Concepts and Writing Concepts correlated significantly ($r = .60$) as did Mathematics Procedures and Writing Procedures ($r = .68$), suggesting that students' propensity to use a particular class of knowledge (either conceptual or procedural) transcends academic context and might even be seen as characteristic of a particular style of academic behaviour. No significant correlation was revealed between either Mathematics Concepts and Writing Procedures or between Writing Concepts and Mathematics Procedures. These results indicated that scores on each of these four components both converge with scores on similar constructs and discriminate between scores on dissimilar constructs.

Results revealed that the Writing Strategies Scale is a valid and reliable instrument with which to measure the extent to which students use writing strategies based on conceptual and procedural knowledge. As well as the purpose for which it is intended in this thesis, this scale might be used to assist students identify and improve particular areas of weakness in their writing.
10.4 The Sources of Writing Self-efficacy Scale

The Sources of Writing Self-efficacy Scale was developed to measure the four sources of self-efficacy proposed by Bandura (1997) with specific reference to students' perceptions of their writing competence. Following Bandura's theory, items on the scale were written to reflect Enactive Mastery, Vicarious Learning and Social Persuasion. Items reflecting Physiological State were taken from Pajares and Valiante's (1997) revised Writing Apprehension Test.

Principal component analysis revealed four components that together explained 68.36% of the score variance. These components reflected Bandura's (1997) theoretical sources of self-efficacy and were named accordingly. Physiological State explained 33.24% of the score variance, Enactive Mastery explained 18.52% of the score variance, Vicarious Learning explained 9.58% of the score variance while Social Persuasion explained 7.02% of the score variance. Internal reliability of scores on all components was adequate (all αs > .70) (Anastasi & Urbina, 1999). The correlation matrix revealed a moderate correlation (r = .54) between Physiological State and Enactive Mastery, suggesting that as perceptions of enactive mastery increase, debilitating physiological reactions decrease. The other correlations confirmed the independence of the components. These results suggest that while the sources of writing self-efficacy are, by and large, independent, past writing performance information has some relation with current affective reactions in the writing domain. This result is probably not surprising if one considers that Enactive Mastery is most strongly aligned with self-efficacy, while the
Physiological State component bears a strong similarity to anxiety, which itself is quite strongly related to self-efficacy in the writing context (e.g., Pajarec & Valiante, 1997). It may be that these two sources of self-efficacy share a degree of common variance, thus it is important that future studies look at partial correlations between these constructs.

Support for these components as sources of self-efficacy comes from the results of the regression analyses, which provide support for Bandura's (1997) theory of self-efficacy sourcing in the context of writing. These analyses demonstrated that significant percentages of the variance in scores on the Writing Skills Self-efficacy Scale in both classroom and test contexts were explained by the components of the Sources of Writing Self-efficacy Scale. In both contexts of the Writing Skills Self-efficacy Scale, Enactive Mastery contributed positively to writing self-efficacy; while Vicarious Learning and Physiological State contributed negatively.

Bandura (1997) proposed that Enactive Mastery is the strongest informant of self-efficacy, although the regression models in this study revealed that Physiological State made the greatest contributions to writing self-efficacy both in the classroom and in tests. It is possible that the students recruited for this study, who had only two years of secondary school past performance information upon which to draw, did not have well established mastery stores and thus drew more heavily upon their affective reactions to writing when assessing their writing self-efficacy. Further research with alternate and older student samples is required to investigate this proposal and this will be undertaken in the major study with students in years 10 and 11.
Another finding from the regression analyses that were not in line with Bandura’s (1997) theory was that Social Persuasion failed to contribute to writing self-efficacy either in the classroom or in the test context. While these results do not necessarily indicate that Social Persuasion is not ever influential in the formation of self-efficacy, they do suggest that, at least for this sample of adolescents, their own past experiences, feelings and beliefs, rather than the influence of others, are more important in the self-assessment of writing competence. These experiences, feelings and beliefs can be seen as being more authentic sources of efficacy, compared to social persuasion, in that they are self-determined, rather than imposed. It might be, therefore, that the age of this student sample can explain why social persuasion did not impact on their efficacy perceptions. These young adolescents were at the age where many of them were perhaps just beginning to rely more on their own judgments about themselves and the world, than on the advice and judgments of others. It will thus be interesting to see in the two studies to follow whether the impact of social persuasion on self-efficacy increases with age, remains stable, or decreases further.

10.5 The Writing Skills Self-efficacy Scale

The Writing Skills Self-efficacy Scale (Shell et al., 1989) (WSSS) was administered twice in this study. Firstly, students were prompted to assess their writing competence “in the classroom”; and secondly, students were prompted to assess their writing competence “in an English examination”.

Due to the high correlation between scores for the class and test versions of the MSES (r = .79) principal component analysis of the scale scores
was undertaken using combined data from both contexts. Results revealed a
single-component solution with a high degree of internal reliability (Cronbach
$\alpha = .95$). Item loadings on the single component were reasonably homogeneous
ranging from .63 to .84 with 'confidence to write a well-organised paragraph'
in the test context the strongest contributor and 'confidence to punctuate a one-
page story' in the test context exhibiting the lowest loading.

As expected, total summated scale scores were significantly different in
the test and class contexts. Nevertheless, the large amount of shared variance
between the scores for the different contexts (62%) confirms a degree of
commonality that also is to be expected. Students reported statistically
significantly higher writing self-efficacy in responding to the items in a
classroom context than in a test context. As with results for the Mathematics
Self-efficacy Scale, the fact that a difference emerged between these two
contexts in writing also supports Bandura's (1997) argument that self-efficacy
should be measured in terms of context specificity, since perceptions of
competence can be sensitive to personal and environmental factors which
themselves may alter in response to contextual differences.

Also mirroring results for the Mathematics Self-efficacy Scale, the
relatively large mean differences between class and test self-efficacy scores in
the lower writing self-efficacy groups are further evidence in support of the
need for contextual differentiation in the measurement of self-efficacy,
especially at the lower end of the efficacy ratings. The reported percentile
ranks suggest that the statistically significant mean difference in total scores for
writing class and test self-efficacy may have emerged as a function of the
lower, rather than higher efficacy scores. When scores were divided into groups by percentiles: those in the first 25% (very low efficacy), those from the 26th to the 50th percentile (low efficacy), those from the 51st to the 75th percentile (moderate efficacy) and the upper 25% (high efficacy), this suggestion was borne out in the data. Scores on the two forms of the WSSS differed by 4.54 for students in the very low efficacy group. The 95% confidence intervals of this difference were 3.72 : 5.91, a difference of 2.19 which suggests that this difference is meaningful at this level. On the other hand, for the very high efficacy subjects, the difference between the scores was reduced to 0.53. Although this figure represented a statistical difference between students’ scores in the different contexts, the confidence interval was almost twice the mean difference and can be interpreted to suggest that this difference is of little practical relevance at this level. While context differentiation in self-efficacy research is important, these results, like those for the Mathematics Self-efficacy Scale, suggest that it is of particular utility for low efficacy students.

The construct validity of WSSS scale scores in each context was demonstrated by convergent and discriminant methods using students' reports of past grades and self-reported desired mathematics grades. Moderate amounts of shared variance between WSSS scores and past English grades (31% - class; 34% - test) suggested that in the current sample, the WSSS is a valid indicator of one's perceived writing competence. There was little shared variance between WSSS scores and students' desired mathematics grades suggesting that, in the current sample, the WSSS scores discriminate well between
students' perceptions of their writing competence and desired mathematics outcomes.

Criterion-related score validity was assessed against an independent indicator of perceived writing competence, that is, year nine English grade goal, and revealed a moderately high degree of shared variance in both WSSS contexts (52% - class; 55% - test). In the current sample, this suggests that the WSSS scores are useful indicators of perceived writing competence.

In summary, the current data indicated that scores on the WSSS are a valid and reliable indicator of writing self-efficacy in the current sample of middle level high school students in at least two contexts. Although designed as an instrument specific to the curriculum of year 9 and 10 Victorian students, the replication of these results in more diverse samples would provide evidence for the generalisability of this scale. The applicability of this instrument to screen students in need of additional tutoring or counseling and the sensitivity of the instrument to detect any improvements post tutoring or counseling also warrants investigation. The results suggested that environmental influences are salient in students' perceptions of their writing competence. This interpretation supports Bandura's (1997) recommendation for the specificity of context in self-efficacy measurement, especially below the 75th percentile.

10.6 Chapter summary

The aim of Study 1 was to develop and establish the psychometric properties of four new scales for use in the longitudinal study. A further aim was to establish the psychometric properties of the Writing Skills Self-efficacy Scale (Shell et al., 1989) when administered in two different contexts. Detailed
analysis confirmed the proposed component structures, reliability and validity of each of these instruments. As well as indicating their use in the current thesis, these new scales have broader applications in educational research where the measurement of those constructs is intended. As such they will provide an important resource for other researchers.
CHAPTER ELEVEN

STUDIES TWO AND THREE - METHOD

11.1 Aims of Studies 2 and 3

One aim of Study 2 was to confirm the factor structures of the scales developed in Study 1, using a sample of year 9 students, in a second sample of students who were undertaking year 10. The major aims of Study 2 and Study 3 were to test the competing models of English and mathematics performance that were derived from the literature and presented in Chapter 7 in a pre-VCE year 10 sample (Study 2) and then re-test them 12 months later when these same students were in VCE year 11 (Study 3).

11.2 Design of Studies 2 and 3

Studies 2 and 3 were conducted using a repeated measures design. Data were collected at five points from a sample of Victorian students from Catholic and Independent schools (see Table 16). There were 307 year 10 students in the study at the first three time points (pre Time 1, Time 1, post Time 1/pre Time 2). By the fourth and fifth time points (Time 2, post Time 2), 280 of these students remained, and were now in VCE year 11. This decrease represents an 8.8% attrition rate, which is favourably comparable to estimates (Moser & Kalton, 1979).
Table 16
Sample Properties and Data Collection for each Time Point

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Year level</th>
<th>Mean Age</th>
<th>Data collected</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre Time 1</td>
<td>307</td>
<td>End year 9</td>
<td>15 years, 4 months</td>
<td>Self-reported end year 9 grades</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(December 1999)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time 1</td>
<td>307</td>
<td>Mid-year year 10</td>
<td>16 years</td>
<td>All study variables (minus grades)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(June 2000)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Post Time 1/</td>
<td>307</td>
<td>End year 10</td>
<td>16 years, 8 months</td>
<td>Self-reported end year 10 grades</td>
</tr>
<tr>
<td>Pre Time 2</td>
<td></td>
<td>(December 2000)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Timc 2</td>
<td>280</td>
<td>Mid-year year 11</td>
<td>17 years</td>
<td>All study variables (minus grades)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(June 2001)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Post Time 2</td>
<td>280</td>
<td>End year 11</td>
<td>17 years, 8 months</td>
<td>End year 11 grades</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(December 2001)</td>
<td></td>
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</tr>
</tbody>
</table>

11.3 Participants

Three hundred and seven year 10 students from Victorian Catholic and Independent schools\(^7\) agreed to participate in this study. There were 158 males (52%) and 149 females. Eighty-seven students were from co-educational schools (28%) and 220 were from single-sex schools. By the fourth data collection point (Time 2), 280 students remained in the study (151 males (54%), 129 females). Sixty-eight (24%) were from co-educational schools and 212 were from single sex schools. There was no association between type of school (Catholic Vs Independent) and whether a school was co-educational or single sex ($\chi^2=5.63$, $p>.05$).

At the end of year nine, the mean age of the students was 15 years, 4 months ($SD = 4.5$ months). At mid-year in Year 10 the mean age of the students agreed to participate in this study. There were 158 males (52%) and 149 females. Eighty-seven students were from co-educational schools (28%) and 220 were from single-sex schools. By the fourth data collection point (Time 2), 280 students remained in the study (151 males (54%), 129 females). Sixty-eight (24%) were from co-educational schools and 212 were from single sex schools. There was no association between type of school (Catholic Vs Independent) and whether a school was co-educational or single sex ($\chi^2=5.63$, $p>.05$).

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students was 16 years ($SD = 4.5$ months). At mid-year in year 11 the mean age of the remaining students was 17 years ($SD = 4.2$ months).

11.4 Procedure

The Deakin University Ethics Committee granted approval to conduct these studies pending approval from school authorities (see Appendix A1). The Catholic Education Office and the Independent Schools Association of Victoria were approached for approval to invite principals of Victorian Catholic and Independent schools to participate in the study. The Catholic Education Office granted approval for the researcher to approach principals of Catholic schools in the Melbourne Diocese (see Appendix B2). The Independent Schools Association of Victoria advised that responsibility for the approval of research projects is delegated to individual schools so the researcher was able to approach the principals of Independent schools in Victoria directly. The principals from the five Catholic schools and the five Independent schools who agreed to participate in Study 1 were also asked for permission to conduct Study 2 and Study 3. These principals agreed to allow parents and students to be invited to participate.

Once formal permission to conduct the study had been obtained from principals, a Plain Language Statement (see Appendix C1) and parental consent form (see Appendix C3) were distributed to all year nine students at these schools. The Plain Language Statement set out the purpose of the study and the participation requirements. Parents and students were informed that participation was voluntary and that all data would be anonymous and confidential. Parents and students were also informed that only group data
would be analysed and published and that all data would be stored securely in a locked cabinet at Deakin University for a minimum of six years to comply with University policy. Students received their Plain Language Statement and consent form either during morning assembly or in a homegroup meeting. The researcher was given the opportunity during these times to talk to the students about the study and to respond to questions from students and teachers. A limit of two weeks was imposed in which parents could return the signed consent form to the co-ordinating teacher.

Response rates varied for individual schools (37% to 94%), depending on differences in the ways that each school followed up the collection of consent forms. For instance, one school obtained a 94% response rate because a competition was conducted to see which homegroup could bring back the most consent forms, with students in the winning homegroup each receiving a can of soft-drink from the school canteen.

A total of 307 students from ten schools returned their consent forms signed by a parent or guardian. All 307 of these students provided data on the first three occasions (pre Time 1, Time 1, post Time 1/pre Time 2), while only 280 students remained in the study for the final two occasions (Time 2, post Time 2). The loss of 27 students for the Time 2 and post Time 2 collection represented less than a 10% attrition rate (8.8%) and was mainly due to students leaving school after year 10, or changing schools after year 10. The questionnaires were completed in five single sittings at each participating school. The timeline for the data collection was presented in Table 16.

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8 This competition was originated by the school and all costs were met by the school.
All students completed the questionnaires in a classroom during school hours. The researcher and a member of staff from each school supervised the students while they completed the questionnaires. Students were instructed to work alone, not to put any identifying information on their questionnaires and to respond to all questions as quickly and as accurately as possible. There was no time limit on completion of the items, though all questionnaires for each sitting were completed within a single period (45 to 50 minutes).

Data from all schools were pooled for the analyses. After analysis, a report on the studies was sent to all participating schools.

11.5 Materials

11.5.1 Demographic information, immediate past grades for English and for mathematics, and English and mathematics grade goals

At the first data collection, students were also asked to supply a codeword comprising the first three letters of their mother’s name and the first three letters of their father’s name (e.g., Mary and Robert = MARROB) so that their anonymous data could be matched with future responses. At each of the five data collections, students were asked to provide their gender and age to assist in the matching process and to track age changes. At data collections one, three and five, students were asked to provide the actual final grades that they had received for both English and mathematics in years 9, 10 and 11 respectively. At data collections two and four, students were asked to nominate their grade goals for year 10 and 11 English and mathematics respectively, as well as to complete the following questionnaires:
11.5.2 The Mathematics Self-efficacy Scale

See Study 1.

11.5.3 The Mathematics Strategies Scale

See Study 1.

11.5.4 The Writing Strategies Scale

See Study 1.

11.5.5 The Sources of Writing Self-efficacy Scale

See Study 1.

11.5.6 The Writing Apprehension Test (Revised) (Pajares & Valiante, 1997)

The Writing Apprehension Test (Revised) is a 10-item scale designed to measure writing anxiety, which was adapted by Pajares and Valiante (1997) from Daly and Miller's (1975) original 26-item Writing Apprehension Test. In this study, items are answered on a five-point Likert scale where 1 = 'not at all' and 5 = 'very much'. There are four positively-worded items (e.g., I like to write my ideas down) and six negatively-worded items (e.g., I avoid writing). Positively-worded items are reverse scored so that a high score indicates high writing anxiety.

Pajares and Valiante (1997) reported a unifactorial solution among a sample of fifth graders with all factor loadings ≥.45. A high level of internal consistency of the scale scores has been reported in a sample of elementary (primary) students $\alpha = .83$ (Pajares & Valiante, 1997), and a sample of high school students $\alpha = .93$ (Pajares & Johnson, 1996).
11.5.7 The Fennema-Sherman Mathematics Anxiety Scale (Fennema & Sherman, 1976)

The Fennema-Sherman Mathematics Anxiety Scale is a stand-alone subscale of the Fennema-Sherman Mathematics Attitudes Scale (Fennema & Sherman, 1976) designed for use with high-school students. This 10-item instrument is intended to assess "feelings of anxiety, dread, nervousness and associated bodily functions related to doing mathematics" (Fennema & Sherman, 1976, p.4). In this study, items are answered on a five-point Likert scale where 1 = 'not at all' and 5 = 'very much'. The scale comprises five positively-worded items (e.g., It wouldn't bother me at all to take more maths courses) and five negatively-worded items (e.g., mathematics makes me feel uneasy and confused). Negatively-worded items are reverse-scored so that higher scores indicate higher mathematics anxiety.

Frary and Ling (1983) reported a one-factor solution that explained 89% of the variance in scores. Dew et al. (1983) reported that internal consistency of the scale scores is acceptable across a combined gender sample ($\alpha = .72$), for males alone ($\alpha = .74$) and for females alone ($\alpha = .74$). Construct validity of the scale scores has been indicated by correlations with Richardson and Suinn's (1972) Mathematics Anxiety Rating Scale ($r = .68$) and with the Sandman Anxiety Toward Mathematics Scale ($r = .79$) (Dew et al., 1983). Fennema and Sherman (1976) and Betz (1978) reported split-half reliability for the scale scores of $r = .89$ and $r = .92$ respectively. Dew et al. reported two-week test-retest reliabilities of $r = .87$ for a combined gender sample, $r = .88$ for males and $r = .86$ for females.
11.5.8 The Writing Skills Self-Efficacy Scale (Shell et al., 1989)

The Writing Skills Self-Efficacy Scale is a nine-item instrument which assesses students' confidence that they can perform fundamental writing skills (e.g., correctly punctuate a one-page passage). In this study, items are answered on a five-point Likert Scale where 1 = 'not at all confident' and 5 = 'very confident'. A high score indicates a high level of writing self-efficacy.

Shell et al. (1989) reported high internal consistency of scores for the nine items (α = .95) and a one-factor solution (all item-total rs > .40) in an undergraduate sample. Pajares and Johnson (1996) also reported high internal reliability of the scale scores (α = .91) in a high-school sample. Pajares and Valiante (1997) reported internal reliability of the scores of α = .88 and a single-factor solution (all item-total r's ≥ .68) in a sample of fifth-graders.

In this study, the Writing Skills Self-efficacy Scale will be administered twice. In the first version students will be asked to assess their confidence to perform each writing task "in the classroom" while in the second version they will be asked to assess their confidence to perform each task "during an English examination".

11.5.9 The Sources of Mathematics Self-Efficacy (Lent et al., 1991)

The Sources of Mathematics Self-Efficacy scale is a 40-item scale that forms four subscales which reflect the sources of self-efficacy proposed by Bandura (1977): Personal Performance Accomplishments (PPA) (e.g., I get high scores on maths tests), Vicarious Learning (VL) (e.g., Some of my closest friends are great at maths), Social Persuasion (SP) (e.g., Teachers have discouraged me from careers which involve maths) and Physiological
State/Emotional Arousal (PS/EA) (e.g., I get really uptight during maths tests). Due to the conceptual similarity of mathematics-related PS/EA and mathematics anxiety, the PS/EA subscale from the Sources of Mathematics Self-efficacy Scale consists of the 10 items contained in the Fennema-Sherman Mathematics Anxiety Scale (see section 11.5.7). The PS/EA subscale was omitted from the Sources of Mathematics Self-Efficacy Scale to avoid redundancy.

In this study, items are answered on a five-point Likert scale where 1 = 'not at all' and 5 = 'very much'. Half of the items are negatively-worded and these are reverse scored so that higher scale scores indicate favourable efficacy information. A high subscale score indicates a high degree of informative power of that efficacy source.

Lent et al. (1996) confirmed the four factor structure in a college sample ($\chi^2_{48}= 63.70, p >.01; \text{NNFI}=.99; \text{CFI}=.99$) and in high school students ($\chi^2_{48}= 175.16, p <.01; \text{NNFI}=.95; \text{CFI}=.96$). Alpha co-efficients for scores on the four subscales in an algebra sample and a geometry sample revealed acceptable to high levels of internal consistency (PPA: $\alpha = .87$ and .86; VL: $\alpha = .62$ and .74; SP: $\alpha = .64$ and .76; PS/EA: $\alpha = .91$ and .90) (Lent et al., 1991). Lent et al. reported two-week test-retest reliabilities of the subscale scores ranging from $r=.85$ to $r=.96$.

11.5.10 Academic Purpose Goals (Middleton & Midgley, 1997)

The items to measure academic purpose goals were derived by Middleton and Midgley (1997) from Midgley et al.'s (1996) Patterns of Adaptive Learning Survey. The 16 items form three subscales: task goals (e.g.,
I like assignments I can learn from, even if I make mistakes), performance-approach goals (e.g., I want to do better than other students in my class) and performance-avoid goals (e.g., It is important to me that I don't look stupid in class). In this study, items are answered on a five-point Likert scale where 1 = 'very false' and 5 = 'very true'. High subscale scores indicate an orientation toward each particular academic goal type.

Middleton and Midgley (1997) reported a three factor solution which accounted for 61% of the variance in scale scores, although a correlation of \( r = .56 \) was reported between performance-approach and performance-avoid goals. Pajares (2001) and Pajares et al. (2000) also reported high correlations between performance-approach and performance-avoid goals (\( r = .48 \) to \( r = .57 \)). Cronbach's alphas for scores on the three subscales ranged from .83 to .86 (Middleton & Midgley, 1997). Pajares et al. (2000) and Pajares (2001) reported similar internal reliability in high school samples (as ranged from .77 to .89 and from .80 to .86 respectively).

11.5.11 Self-regulated Learning Strategies (Zimmerman & Martinez-Pons, 1986)

Cognitive, behavioural and environmental self-regulation strategies were measured by a pencil-and-paper version of Zimmerman and Martinez-Pons' (1986) Self-Regulated Learning Interview Schedule. The Self-Regulated Learning Interview Schedule is a structured interview that requires students to describe the learning methods they employ in a variety of academic contexts. Responses to the scheduled interview were tabulated by Zimmerman (1989), who then made recommendations regarding their translations into statements
for pencil-and-paper administration (e.g., I check over my work to make sure I did it right).

In this study, items on the pencil-and-paper scale are answered on a five-point Likert scale where 1 = 'never' and 5 = 'always'. A high score indicates greater use of academic self-regulation. Using the pencil-and-paper version, Ablard and Lipschultz (1998) reported similar mean scores for the use of each self-regulatory strategy to those reported by Zimmerman and Martinez-Pons (1986).

11.5.12 Self-efficacy for Self-regulated Learning Scale (Bandura, 1989)

The Self-efficacy for Self-regulated Learning Scale is an 11-item stand-alone subscale from the Children's Multidimensional Self-Efficacy Scales. The Self-efficacy for Self-regulated Learning Scale measures students' perceived capabilities to utilise a range of academic self-regulatory strategies (e.g., How well can you arrange a place to study without distractions?).

In this study, items are answered on a five-point Likert scale where 1 = 'very well' and 5 = 'not well'. A high score indicates a high level of perceived self-efficacy for academic self-regulation. Zimmerman, Bandura and Martinez-Pons (1992) reported high internal reliability of scale scores (α = .87) in a middle school sample.

11.5.13 The Multidimensional Perfectionism Scale (Frost et al., 1990)

The Multidimensional Perfectionism Scale is a 35-item scale designed to measure dispositional perfectionism. The scale yields six subscale scores, however in this study only those subscales which comprise the dimension of Active Perfectionism will be used, as active perfectionism was conceptualised
as a “positive psychology” variable. Therefore, the subscales used in the
current study were Personal Standards (e.g., I have extremely high goals),
Parental Expectations (e.g., My parents set very high standards for me) and
Parental Criticism (e.g., My parents never try to understand my mistakes)
which, together, comprise 24 items.

In this study, items are answered on a five-point Likert scale where 1 =
‘strongly disagree’ and 5 = ‘strongly agree’. Scores are summated across the
three subscales to yield a total score for active perfectionism. A high score
indicates a high level of active perfectionism. Lynd-Stevenson and Hearne
(1999) reported Cronbach alpha coefficients across the three active
perfectionism subscales ranging from $\alpha = .77$ to $\alpha = .90$.

11.5.14 The Life Orientation Test - Revised (Schrier et al., 1994)

The Life Orientation Test - Revised is a 10 item questionnaire, of
which two items are filler questions, designed to assess dispositional optimism.
The scale is a revision of the original Life Orientation Test of Scheier and
Carver (1985) and addresses the original scale's failure to focus explicitly on
future expectations.

In this study, items are answered on a five-point Likert scale where 1 =
‘not at all’ and 5 = ‘very much’. There are four positively-worded items (e.g.,
I’m always optimistic about my future) and four negatively-worded items (e.g.,
I rarely count on good things happening to me). Negatively-worded items are
reverse scored so that a high score indicates more optimistic expectations.
Schier et al. reported a one-factor solution (factor loadings .49 to .74) and a
Cronbach alpha coefficient for the scale scores of $\alpha = .82$. 
11.5.15 The Deakin Coping Scale (DCS) (Moore, 2003)

The Deakin Coping Scale is a 19-item scale measuring four components of the management of demands: the appraisal process (e.g., identify the source of the problem), utilisation of resources (e.g., seek help from others), proactivity (e.g., take control of the situation), and avoidance (hope for a solution to appear). In this study, items are answered on a five-point Likert scale where 1 = 'never' and 5 = 'always'. A high score on any component indicates a high frequency of use of that particular coping strategy.

Moore (2003) reported a four-factor solution that explained 57% of the variance in scale scores. Scores on each factor demonstrated adequate internal reliability (α = .64 to .88). Confirmatory factor analysis revealed the data provided a good fit to the model (χ²₁₄₇ = 501.81, p = .000; normed χ² = 3.41; GFI = .91; AGFI = .88; IFI = .90; CFI = .90; RMSEA = .06).
CHAPTER TWELVE
STUDY TWO - RESULTS

The results presented in this chapter relate to data from end year 9 (pre Time 1), mid-year year 10 (Time 1) and end year 10 (post Time 1 / pre Time 2). The results are divided into two parts that reflect the chronological order of the data collection.

Pre Time 1 data: This section contains:

- the descriptive analysis of pre Time 1 data, which consists of students' final year 9 English and mathematics grades

Time 1 data: This section contains:

- the results of the screening of all scales administered at Time 1 (mid-year year 10)
- the confirmatory factor analyses and Cronbach alpha co-efficients of all scales developed in Study 1 when administered in the current year 10 sample at Time 1
- descriptive statistics and internal reliability indices of all scales administered at Time 1
- results of the analyses of each of the competing models of English and mathematics performance proposed in Chapter 7. These models subsume data from pre Time 1 (end year 9), Time 1 (mid-year year 10) and post Time 1 / pre Time 2 (end year 10). Each model has been operationalised in both English and mathematics contexts
Pre Time 1 Data: Analysis of the pre Time 1 Grade Data (end year 9 grades)

12.1 Self-reported final year nine grades for English and mathematics

The mean grade that students reported they had received for English at the end of year 9 was a B ($M = 14.22$; $SD = 3.04$) from an actual range of D- to A+. The mean grade for mathematics at the end of year 9 was also B ($M = 14.06$; $SD = 2.66$) from a range of F to A.

A matched t-test revealed no difference between students' self-reported grades for English and for mathematics at the end of year 9 ($t_{106} = 1.60$, $p > .05$). Independent t-tests revealed that girls scored higher grades than boys both for year nine English and for year nine mathematics (see Table 17).

Table 17

**Gender Differences in Self-reported Final Year Nine Grades for English and Mathematics**

<table>
<thead>
<tr>
<th>Final grades</th>
<th>Males (n=158)</th>
<th>Females (n=149)</th>
<th>$t_{106}$</th>
<th>$p$</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
<td>M</td>
<td>SD</td>
</tr>
<tr>
<td>Year 9 English Grade</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>English Grade</td>
<td>13.84</td>
<td>2.77</td>
<td>15.87</td>
<td>2.11</td>
</tr>
<tr>
<td>(B)</td>
<td></td>
<td></td>
<td>(A-)</td>
<td></td>
</tr>
<tr>
<td>Year 9 mathematics grade</td>
<td>13.78</td>
<td>2.54</td>
<td>15.01</td>
<td>2.52</td>
</tr>
<tr>
<td>(B+)</td>
<td></td>
<td></td>
<td>(B+)</td>
<td></td>
</tr>
</tbody>
</table>

Univariate normality of these two past grades was assessed through skewness indices, Kolmogorov-Smirnov tests and histograms. Distributions for both past grades were normal.

---

6 Grades from F- to A+ were recoded 1 to 18 and treated as interval level data.
12.2 Data screening of all scales from Time 1

All scales administered at Time 1 were examined for missing values, univariate and multivariate outliers, normality and linearity. Except for on the Multidimensional Perfectionism Scale (MPS) (Frost et al., 1990), there were less than 5% missing data. As there was no evidence of systematic omission among this missing data, all missing values were substituted with columnwise mean values, which is the preferred method according to Tabachnick and Fidell (1995). While this method allows for retention of the entire sample, it does reduce the variance and might possibly attenuate results.

For the three Active Perfectionism subscales (Personal Standards, Parental Expectations, Parental Criticism) of the MPS, over 7% of the data were missing. Furthermore, practically all of these missing data were confined to two items from the Parental Criticism subscale. These items were: "As a child I was punished for doing things less than perfect" and "My parents never tried to understand my mistakes". It may be that some students found these questions to be too personal or too critical of their parents, despite the anonymity of the questionnaires.

Whatever the reasons that caused students not to respond to these items, it is clear that there was a systematic pattern of omission present. Exclusion of cases with missing data on these items would have resulted in considerable loss
of all data for the cases. In order to address this issue, two exploratory factor analyses of the Active Perfectionism subscales were undertaken to assess the affect of substituting columnwise means for the missing data. A factor analysis was performed using substituted columnwise means for the missing data. A second factor analysis was performed omitting the records with the missing data. The results of these two analyses were highly comparable.

In each solution, two factors were extracted which explained 62% and 60% of the variance respectively. There were no notable differences in factor loadings between the two solutions (see Tables 18 and 19) and notably, the interpretation of the factors did not differ between the two solutions. The reliabilities of the factors were also highly comparable for both solutions. On the basis of this factor analytic and reliability evidence, columnwise means were substituted for the missing values in order to maintain the sample size.
Table 18

**Factor Structure and Subscale Reliabilities of the Active Perfectionism**

Dimensions of the MPS with Columnwise Means Substituted for Missing Data

<table>
<thead>
<tr>
<th>Item</th>
<th>Personal standards</th>
<th>Parental expectations</th>
<th>Parental criticism</th>
</tr>
</thead>
<tbody>
<tr>
<td>I have extremely high goals</td>
<td>.82</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I expect higher performance in my tasks than most people</td>
<td>.81</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I set higher goals than most people</td>
<td>.78</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I am very good at focusing my efforts on attaining a goal</td>
<td>.66</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other people accept lower standards from themselves than I do</td>
<td>.55</td>
<td></td>
<td></td>
</tr>
<tr>
<td>My parents want me to be the best at everything</td>
<td></td>
<td>.92</td>
<td></td>
</tr>
<tr>
<td>My parents have higher expectations for my future than I do</td>
<td></td>
<td>.78</td>
<td></td>
</tr>
<tr>
<td>My parents expect excellence from me</td>
<td></td>
<td>.63</td>
<td></td>
</tr>
<tr>
<td>My parents set very high standards for me</td>
<td></td>
<td>.59</td>
<td></td>
</tr>
<tr>
<td>I never felt like I could meet my parents' standards</td>
<td></td>
<td>.84</td>
<td></td>
</tr>
<tr>
<td>I never felt like I could meet my parents' expectations</td>
<td></td>
<td>.83</td>
<td></td>
</tr>
<tr>
<td>My parents never tried to understand my mistakes</td>
<td></td>
<td>.71</td>
<td></td>
</tr>
<tr>
<td>Only outstanding performance is good enough in my family</td>
<td></td>
<td>.68</td>
<td></td>
</tr>
<tr>
<td>As a child I was punished for doing things less than perfect α</td>
<td>.78</td>
<td>.82</td>
<td>.81</td>
</tr>
</tbody>
</table>
Table 19

**Factor Structure and Subscale Reliabilities of the Active Perfectionism**

**Dimensions of the MPS with Missing Data Records Omitted**

<table>
<thead>
<tr>
<th>Description</th>
<th>Personal Standards</th>
<th>Parental Expectations</th>
<th>Parental Criticism</th>
</tr>
</thead>
<tbody>
<tr>
<td>I have extremely high goals</td>
<td>.82</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I expect higher performance in my tasks than most people</td>
<td>.81</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I set higher goals than most people</td>
<td>.75</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I am very good at focusing my efforts on attaining a goal</td>
<td>.66</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other people accept lower standards from themselves than I do</td>
<td>.54</td>
<td></td>
<td></td>
</tr>
<tr>
<td>My parents want me to be the best at everything</td>
<td></td>
<td>.92</td>
<td></td>
</tr>
<tr>
<td>My parents have higher expectations for my future than I do</td>
<td></td>
<td>.78</td>
<td></td>
</tr>
<tr>
<td>My parents expect excellence from me</td>
<td></td>
<td>.62</td>
<td></td>
</tr>
<tr>
<td>My parents set very high standards for me</td>
<td></td>
<td>.57</td>
<td></td>
</tr>
<tr>
<td>I never felt like I could meet my parents' standards</td>
<td></td>
<td></td>
<td>.82</td>
</tr>
<tr>
<td>I never felt like I could meet my parents' expectations</td>
<td></td>
<td></td>
<td>.81</td>
</tr>
<tr>
<td>Only outstanding performance is good enough in my family</td>
<td></td>
<td></td>
<td>.68</td>
</tr>
<tr>
<td>My parents never tried to understand my mistakes</td>
<td></td>
<td></td>
<td>.65</td>
</tr>
<tr>
<td>As a child I was punished for doing things less than perfect</td>
<td></td>
<td></td>
<td>.57</td>
</tr>
<tr>
<td>$\alpha$</td>
<td>.79</td>
<td>.82</td>
<td>.80</td>
</tr>
</tbody>
</table>
All data from the scales administered at Time 1, including the MPS data with columnwise means substituted, were assessed for outliers. No univariate or multivariate outliers were present in the data on any of the scales. Normality of residuals for the independent variables was assessed by examination of residuals plots for each variable. All residuals were normally distributed. The linearity of the independent variables was assessed by the examination of scatterplots for item pairs. All the data demonstrated acceptable linearity.

12.3 Confirmatory factor analyses of scales developed in the pilot study and descriptive statistics for all scales

PRELIS (Version 1.2) was used to extract separate covariance matrices for 307 cases for each of the scales as this procedure yields an approximate r with mixed data types. These covariance matrices were then submitted to confirmatory factor analyses using AMOS (Version 3.6).

12.3.1 Mathematics Self-efficacy Scale (MSES) for class and test data

Separate confirmatory factor analyses were conducted for these scales in the different contexts. The independence models for the MSES (class) ($\chi^2_{36} = 1,398.85$, $p < .001$) and MSES (test) ($\chi^2_{36} = 1,618.07$, $p < .001$) each confirmed the presence of intercorrelations among the data, indicating the factorability of both scales.

The unifactorial structure of the MSES (class) was confirmed in the current data ($\chi^2_{22} = 51.48$, $p < .05$; $\chi^2/df = 2.34$; GFI=.98; AGFI=.95; NFI=.98; IFI=.99; TLI=.99; CFI=.99; RMSEA=.04). Factor loadings ranged from .62 to
.79 (see Table 20). The nine items were internally consistent (Cronbach $\alpha = .90$; item-total $r = .57$ to .72).

Table 20

<table>
<thead>
<tr>
<th>Item Content</th>
<th>Factor Loading</th>
</tr>
</thead>
<tbody>
<tr>
<td>A simultaneous equation</td>
<td>.79</td>
</tr>
<tr>
<td>Work with decimals</td>
<td>.76</td>
</tr>
<tr>
<td>An algebra problem</td>
<td>.75</td>
</tr>
<tr>
<td>Work with fractions</td>
<td>.74</td>
</tr>
<tr>
<td>Determine the degrees of a missing angle</td>
<td>.72</td>
</tr>
<tr>
<td>Determine the degrees of a missing side length</td>
<td>.72</td>
</tr>
<tr>
<td>Calculate values of area and volume</td>
<td>.67</td>
</tr>
<tr>
<td>A problem in trigonometry</td>
<td>.64</td>
</tr>
<tr>
<td>Sketch a curve</td>
<td>.62</td>
</tr>
<tr>
<td>$M$</td>
<td>34.66</td>
</tr>
<tr>
<td>$SD$</td>
<td>5.36</td>
</tr>
<tr>
<td>$\alpha$</td>
<td>.90</td>
</tr>
</tbody>
</table>

$^a$ Students were asked to rate how confidently they could complete each task in a mathematics class on a scale of 1 (not at all confident) to 5 (very confident).

The unifactorial structure of the MSES (test) scale was also confirmed in the current data ($\chi^2_{22} = 55.81$, $p < .05$; $\chi^2/df = 2.54$; GFI = .98; AGFI = .93; NFI = .98; IFI = .99; TLI = .99; CFI = .99; RMSEA = .04). Factor loadings ranged from .64 to .80 (see Table 21). The nine items had good internal consistency (Cronbach $\alpha = .90$; item-total $r = .53$ to .73).
Table 21

**Item loadings on the unifactorial Mathematics Self-efficacy Scale (test)**

<table>
<thead>
<tr>
<th>Item Content</th>
<th>Factor loading</th>
</tr>
</thead>
<tbody>
<tr>
<td>A simultaneous equation</td>
<td>.80</td>
</tr>
<tr>
<td>Work with decimals</td>
<td>.79</td>
</tr>
<tr>
<td>An algebra problem</td>
<td>.76</td>
</tr>
<tr>
<td>Work with fractions</td>
<td>.74</td>
</tr>
<tr>
<td>Determine the degrees of a missing angle</td>
<td>.74</td>
</tr>
<tr>
<td>Determine the degrees of a missing side length</td>
<td>.72</td>
</tr>
<tr>
<td>Calculate values of area and volume</td>
<td>.67</td>
</tr>
<tr>
<td>A problem in trigonometry</td>
<td>.64</td>
</tr>
<tr>
<td>Sketch a curve</td>
<td>.64</td>
</tr>
</tbody>
</table>

| M        | 31.72 |
| SD       | 6.01  |
| α        | .90   |

*Students were asked to rate how confidently they could complete each task in a mathematics test on a scale of 1 (not at all confident) to 5 (very confident).*

### 12.3.2 The Mathematics Strategies Scale

The independence model ($\chi^2_{28} = 521.85, \ p < .001$) confirmed the presence of intercorrelations among the data, indicating its factorability.

The proposed two-factor structure of the Mathematics Strategies Scale was confirmed in the current data ($\chi^2_{21} = 98.11, \ p < .05; \ \chi^2/df = 4.67; \ GFI=.93; \ AGFI=.89; \ NFI=.89; \ IFI=.90; \ TLI=.91; \ CFI=.91; \ RMSEA=.06$). Loadings on the Mathematics Concepts Factor ranged from .78 to .43. Loadings on the Mathematics Procedures Factor ranged from .78 to .36 (see Table 22). Scores on the two factors were internally reliable (Mathematics Concepts: Cronbach $\alpha = .89$; item-total $r = .47$ to .72; Mathematics Procedures: Cronbach $\alpha = .88$; item-total $r = .39$ to .78). The independence of these two factors in the current data was also confirmed ($r = .28$).
Table 22

**Item Loadings on the Mathematics Strategies Scale**

<table>
<thead>
<tr>
<th>Item Content</th>
<th>Mathematics concepts</th>
<th>Mathematics procedures</th>
</tr>
</thead>
<tbody>
<tr>
<td>In maths tests I try to understand an example so I can apply it to other problems</td>
<td>.78</td>
<td></td>
</tr>
<tr>
<td>Decimal values are much like fractions</td>
<td>.50</td>
<td></td>
</tr>
<tr>
<td>Maths is easiest when I can use one problem to help me work out another</td>
<td>.50</td>
<td></td>
</tr>
<tr>
<td>If I forget how to solve a maths problem I can usually think my way through it</td>
<td>.43</td>
<td></td>
</tr>
<tr>
<td>In maths I try to memorise what to do rather than understand what it all means</td>
<td></td>
<td>.78</td>
</tr>
<tr>
<td>In maths test I usually try to memorise the steps required to solve different sorts of problems</td>
<td></td>
<td>.76</td>
</tr>
<tr>
<td>Maths is about remembering, not understanding</td>
<td></td>
<td>.65</td>
</tr>
<tr>
<td>Remembering how to work out maths problems is just like remembering a recipe</td>
<td></td>
<td>.36</td>
</tr>
</tbody>
</table>

Correlation matrix

<table>
<thead>
<tr>
<th></th>
<th>Mathematics concepts</th>
<th>Mathematics procedures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mathematics concepts</td>
<td>1.00</td>
<td>0.29</td>
</tr>
<tr>
<td>Mathematics procedures</td>
<td>0.29</td>
<td>1.00</td>
</tr>
<tr>
<td>M</td>
<td>14.05</td>
<td>11.20</td>
</tr>
<tr>
<td>SD</td>
<td>2.84</td>
<td>3.49</td>
</tr>
<tr>
<td>α</td>
<td>.89</td>
<td>.88</td>
</tr>
</tbody>
</table>

*Students were asked to rate how often they employ each strategy when working mathematics problems on a scale of 1 (not at all) to 5 (very much).*

12.3.3 The Writing Strategies Scale

The independence model ($\chi^2 = 641.14$, $p < .001$) confirmed the presence of intercorrelations among the data, indicating its factorability.

The proposed two-factor structure of the Writing Strategies Scale was confirmed in the current sample ($\chi^2 = 95.78$, $p < .05$; $\chi^2/df = 5.04$; GFI=.95;
AGFI=.88; NFI=.95; IFI=.92; TLI=.91; CFI=.90; RMSEA=.05). Loadings on
the Writing Concepts factor ranged from .44 to .79 (see Table 23). Loadings on
the Writing Procedures factor ranged from .51 to .76. Scores on the two factors
were internally reliable (Writing Concepts: Cronbach $\alpha = .82$; item-total $r = .43$
to .68; Writing Procedures: Cronbach $\alpha = .83$; item-total $r = .46$ to .71). The
independence of these two factors in the current sample was also confirmed ($r$
= .30).
Table 23

Item Loadings on the Writing Strategies Scale

<table>
<thead>
<tr>
<th>Item Content</th>
<th>Writing concepts</th>
<th>Writing procedures</th>
</tr>
</thead>
<tbody>
<tr>
<td>I write best when I carefully consider the arguments I am trying to make</td>
<td>.79</td>
<td></td>
</tr>
<tr>
<td>I write best when I give myself room to explore many issues</td>
<td>.77</td>
<td></td>
</tr>
<tr>
<td>It's easier to write an essay when I try to relate all the ideas to each other</td>
<td>.54</td>
<td></td>
</tr>
<tr>
<td>I think more about the subject matter of my essays than whether all the commas are in the right spot</td>
<td>.44</td>
<td></td>
</tr>
<tr>
<td>I write best when I carefully consider all the grammar and punctuation rules</td>
<td></td>
<td>.76</td>
</tr>
<tr>
<td>When I write an essay I think mostly about whether I have followed all the rules of English, like punctuation</td>
<td></td>
<td>.64</td>
</tr>
<tr>
<td>I write best when I stick to a proven formula</td>
<td></td>
<td>.62</td>
</tr>
<tr>
<td>The way I write is to use my past essays as examples, or guides, for my work</td>
<td></td>
<td>.51</td>
</tr>
</tbody>
</table>

Correlation matrix

<table>
<thead>
<tr>
<th>Writing concepts</th>
<th>Writing procedures</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>.30</td>
<td>1.00</td>
</tr>
<tr>
<td>14.82</td>
<td>11.88</td>
</tr>
<tr>
<td>3.07</td>
<td>3.39</td>
</tr>
<tr>
<td>.82</td>
<td>.83</td>
</tr>
</tbody>
</table>

* Students were asked to rate how often they employ each strategy when writing stories or essays in English on a scale of 1 (not at all) to 5 (very much).

12.3.4 The Sources of Writing Self-efficacy Scale

The independence model ($\chi^2_{28} = 1,841.23$, $p < .001$) confirmed the presence of intercorrelations among the data, indicating its factorability. The proposed four-factor structure was confirmed in the current data ($\chi^2_{28} = 104.23$, $p < .05$; $\chi^2/df = 3.72$; GFI=.96; AGFI=.90; NFI=.96; IFI=.94; TLI=.93;
CFI=.93; RMSEA=.05). Loadings on the four factors ranged from .52 to .84 (see Table 24). Scores on the four factors were internally reliable (Enactive Mastery (EM): $\alpha = .88$; item-total $r = .54$ to .89; Vicarious Learning (VL): $\alpha = .74$; item-total $r = .34$ to .67; Social Persuasion (SP): $\alpha = .76$; item-total $r = .41$ to .61; Physiological State (PS): $\alpha = .92$; item-total $r = .59$ to .89). The four factors were also independent, where no intercorrelation was greater than $r=.27$. 
Table 24

Item Loadings on the Sources of Writing Self-efficacy Scale

<table>
<thead>
<tr>
<th>Item content</th>
<th>EM</th>
<th>VL</th>
<th>SP</th>
<th>PS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Getting good essay marks boosts my writing confidence</td>
<td>.80</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>If I'm pleased with an essay I submit, I feel ready to tackle another</td>
<td>.72</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The essays I write are much the same standard from year to year</td>
<td>.67</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>If my classmates struggle with an essay, I will struggle too</td>
<td>.61</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I can predict what I will score on an essay by what other people score</td>
<td>.57</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I expect to score about the same on my essays as my classmates</td>
<td>.52</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I can always write better when others believe in me</td>
<td>.62</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>My writing gets worse if I'm criticised too much about it</td>
<td>.60</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>If I can't make a start on an essay, nobody can boost my confidence</td>
<td>.54</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>If I get nervous about my writing, it makes things even worse</td>
<td>.84</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I can always write better when I'm feeling good about my work</td>
<td>.79</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>My writing seems to improve, the more relaxed I am</td>
<td>.72</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Correlation matrix

<table>
<thead>
<tr>
<th></th>
<th>EM</th>
<th>VL</th>
<th>SP</th>
<th>PS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enactive mastery</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vicarious learning</td>
<td>.07</td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Social persuasion</td>
<td>.04</td>
<td>.18</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>Physiological state</td>
<td>-.27</td>
<td>.19</td>
<td>.07</td>
<td>1.00</td>
</tr>
<tr>
<td>M</td>
<td>11.72</td>
<td>8.23</td>
<td>8.79</td>
<td>13.37</td>
</tr>
<tr>
<td>SD</td>
<td>2.35</td>
<td>2.14</td>
<td>2.32</td>
<td>2.09</td>
</tr>
<tr>
<td>α</td>
<td>.88</td>
<td>.74</td>
<td>.76</td>
<td>.92</td>
</tr>
</tbody>
</table>

* Students were asked to consider how much each statement applied to them on a scale of 1 (not at all) to 5 (very much).
12.3.5 Descriptive statistics and internal reliabilities of all scales from Time 1.

Means, standard deviations, actual ranges and internal reliabilities for all scales from Time 1 are presented in Table 25. A correlation matrix of all variables from pre Time 1, Time 1 and post Time 1 / pre Time 2 is presented in Table 26. The main outcome variables, year 10 English grade and year 10 mathematics grade were most strongly related to past (year 9) grades in English ($r=.55$) and mathematics ($r=.59$) respectively.
Table 25
Means, Standard Deviations, Scale Ranges and Reliability Statistics for all Scales from Study 2

<table>
<thead>
<tr>
<th>Scale</th>
<th>M</th>
<th>SD</th>
<th>Min</th>
<th>Max</th>
<th>α</th>
<th>Item-total r range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mathematics Anxiety Scale</td>
<td>27.28</td>
<td>9.66</td>
<td>10</td>
<td>50</td>
<td>.93</td>
<td>.60 - .78</td>
</tr>
<tr>
<td>Writing Apprehension Test – revised</td>
<td>26.83</td>
<td>8.35</td>
<td>10</td>
<td>50</td>
<td>.89</td>
<td>.58 - .72</td>
</tr>
<tr>
<td>Maths Self-efficacy Scale (class)</td>
<td>34.66</td>
<td>5.36</td>
<td>11</td>
<td>60</td>
<td>.90</td>
<td>.57 - .72</td>
</tr>
<tr>
<td>Maths Self-efficacy Scale (test)</td>
<td>31.72</td>
<td>6.01</td>
<td>9</td>
<td>45</td>
<td>.90</td>
<td>.53 - .73</td>
</tr>
<tr>
<td>Writing Skills Self-efficacy Scale (class)</td>
<td>33.30</td>
<td>7.67</td>
<td>9</td>
<td>45</td>
<td>.93</td>
<td>.61 - .77</td>
</tr>
<tr>
<td>Writing Skills Self-efficacy Scale (test)</td>
<td>31.27</td>
<td>7.97</td>
<td>9</td>
<td>45</td>
<td>.92</td>
<td>.62 - .76</td>
</tr>
<tr>
<td>Mathematics Strategies Scale</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- mathematics concepts</td>
<td>14.05</td>
<td>2.84</td>
<td>4</td>
<td>20</td>
<td>.89</td>
<td>.47 - .72</td>
</tr>
<tr>
<td>- mathematics procedures</td>
<td>11.20</td>
<td>3.49</td>
<td>4</td>
<td>20</td>
<td>.88</td>
<td>.39 - .78</td>
</tr>
<tr>
<td>Writing Strategies Scale</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- writing concepts</td>
<td>14.82</td>
<td>3.07</td>
<td>4</td>
<td>20</td>
<td>.82</td>
<td>.44 - .79</td>
</tr>
<tr>
<td>- writing procedures</td>
<td>11.88</td>
<td>3.39</td>
<td>4</td>
<td>16</td>
<td>.83</td>
<td>.51 - .76</td>
</tr>
<tr>
<td>Self-regulated Learning</td>
<td>46.77</td>
<td>9.15</td>
<td>14</td>
<td>70</td>
<td>.83</td>
<td>.32 - .67</td>
</tr>
<tr>
<td>Self-efficacy for Self-regulation</td>
<td>31.22</td>
<td>8.52</td>
<td>11</td>
<td>55</td>
<td>.89</td>
<td>.36 - .76</td>
</tr>
<tr>
<td>Deakin Coping Scale</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- appraisal</td>
<td>23.21</td>
<td>4.28</td>
<td>9</td>
<td>35</td>
<td>.82</td>
<td>.47 - .70</td>
</tr>
<tr>
<td>- challenge</td>
<td>12.89</td>
<td>2.30</td>
<td>4</td>
<td>20</td>
<td>.79</td>
<td>.47 - .70</td>
</tr>
<tr>
<td>- avoidance</td>
<td>12.01</td>
<td>2.99</td>
<td>4</td>
<td>20</td>
<td>.70</td>
<td>.32 - .59</td>
</tr>
<tr>
<td>- resources</td>
<td>13.72</td>
<td>3.13</td>
<td>4</td>
<td>20</td>
<td>.81</td>
<td>.59 - .71</td>
</tr>
<tr>
<td>Academic Purpose Goals</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- learning goals</td>
<td>16.10</td>
<td>4.30</td>
<td>5</td>
<td>25</td>
<td>.82</td>
<td>.55 - .69</td>
</tr>
<tr>
<td>- performance-avoid goals</td>
<td>14.32</td>
<td>5.10</td>
<td>6</td>
<td>30</td>
<td>.82</td>
<td>.56 - .63</td>
</tr>
<tr>
<td>- performance-approach goals</td>
<td>13.34</td>
<td>3.92</td>
<td>4</td>
<td>32</td>
<td>.70</td>
<td>.30 - .59</td>
</tr>
<tr>
<td>Multidimensional Perfectionism Scale</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- personal standards</td>
<td>16.09</td>
<td>3.67</td>
<td>5</td>
<td>25</td>
<td>.78</td>
<td>.32 - .64</td>
</tr>
<tr>
<td>- parental expectations</td>
<td>11.35</td>
<td>3.72</td>
<td>4</td>
<td>20</td>
<td>.82</td>
<td>.58 - .69</td>
</tr>
<tr>
<td>- parental criticism</td>
<td>12.15</td>
<td>4.14</td>
<td>5</td>
<td>25</td>
<td>.81</td>
<td>.43 - .69</td>
</tr>
<tr>
<td>- active perfectionism (total)</td>
<td>39.58</td>
<td>6.44</td>
<td>14</td>
<td>66</td>
<td>.80</td>
<td>.51 - .67</td>
</tr>
<tr>
<td>Life Orientation Test (R) (optimism)</td>
<td>9.86</td>
<td>2.40</td>
<td>3</td>
<td>15</td>
<td>.90</td>
<td>.64 - .87</td>
</tr>
</tbody>
</table>

12.4 Results from the analyses of the competing models

The following analyses relate to the testing of each of the competing models of mathematics and English performance proposed in Chapters 3 to 6 (i.e., competing models 1A, 1B, 2A, 2B, 3, 4A and 4B) which are represented in Chapter 7 as Figures 8 to 14.

The data from pre Time 1 are self-reported final grades for year 9 English and mathematics. The data from Time 1 comprise English and mathematics grade goals for the end of year 10 and the dispositional and situational variables measured at mid-year year 10. The data from post Time 1 / pre Time 2 are self-reported final grades for year 10 English and mathematics.

As several competing models will be presented in the following sections, a summary table of the percentages of variance in English and mathematics performance explained by each model is presented as Table 27.

Table 27

Summary of the Percentages of Variance Explained in English and Mathematics Performance by each Competing Model

<table>
<thead>
<tr>
<th>Model</th>
<th>Percentage variance explained in Year 10 English performance</th>
<th>Percentage variance explained in Year 10 mathematics performance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self-efficacy model</td>
<td>77</td>
<td>75</td>
</tr>
<tr>
<td>(approach-oriented copers)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Self-efficacy model</td>
<td>45</td>
<td>62</td>
</tr>
<tr>
<td>(avoidance-oriented copers)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Self-efficacy model</td>
<td>80</td>
<td>62</td>
</tr>
<tr>
<td>(combined copers)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Target goal model</td>
<td>36</td>
<td>45</td>
</tr>
<tr>
<td>Purpose goal model</td>
<td>40</td>
<td>31</td>
</tr>
<tr>
<td>Positive psychology model</td>
<td>59</td>
<td>55</td>
</tr>
<tr>
<td>Cognitive skill model</td>
<td>10</td>
<td>15</td>
</tr>
<tr>
<td>Self-regulatory skill model</td>
<td>63</td>
<td>60</td>
</tr>
</tbody>
</table>
12.4.1 Competing models 1A and 1B: Self-efficacy based models of performance in English and mathematics

To test the proposal (Chapter 3) that self-efficacy based models of performance would differ as a function of coping orientation, a cluster analysis was performed to categorise students on the basis of their coping orientation. While it was hypothesised that students would be either approach oriented or avoidance oriented in terms of coping disposition, it was clear from the initial cluster and, indeed, from the literature (e.g., Folkman & Lazarus, 1984) that many students would use both types of coping strategies. Therefore, three clusters were extracted from the data: students high on approach coping and low on avoidance coping ("approach copers", N=175), and vice versa ("avoidance copers", N=78), and a third cluster, the members of which were approximately equal on both coping orientations ("combined copers", N=54). Means and standard deviations for the criterion and clustering variable are presented in Table 28. There was a significant difference between the clusters for approach coping (F(2,304) = 174.92, p<.05) and avoidance coping (F(2,304) = 368.05, p<.05).

Table 28

<table>
<thead>
<tr>
<th>Cluster</th>
<th>Approach copers (n=175)</th>
<th>Avoidance copers (n=78)</th>
<th>Combined copers (n=54)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
<td>M</td>
</tr>
<tr>
<td>Approach Coping</td>
<td>11.57</td>
<td>2.13</td>
<td>8.84</td>
</tr>
<tr>
<td>Avoidance coping</td>
<td>8.31</td>
<td>2.16</td>
<td>12.91</td>
</tr>
</tbody>
</table>
The following sections detail results of the path analyses of the competing self-efficacy based models of English and mathematics performance for each coping cluster from Table 28. Results are presented by coping cluster. Models for English and mathematics performance for approach copers (competing model 1A) are presented in Figures 15 and 16. Models for English and mathematics performance for avoidance copers (competing model 1B) are presented in Figures 17 and 18. Models for English and mathematics performance for combined copers (named competing model 1C) are presented in Figures 19 and 20.

12.4.1.1 Competing model 1A (English): The self-efficacy based model of English performance for approach copers in year 10

The independence model indicated the suitability of the data for modeling ($\chi^2_{28} = 2,793.26, p < .001$). The data provided a reasonable fit to the proposed model ($\chi^2_{13} = 86.52, p < .05; \chi^2/df = 6.65; NFI=.94; IFI=.94; CFI=.95$). Model respecifications were examined following the recommendation that the criteria for change be made on substantive grounds rather than for statistical advantage (Schumaker & Lomax, 1996), and according to MacCallum (1996), paths were added before deleting parameters. This procedure will be followed in this and all subsequent models to be tested.

These modifications allowed final year 9 English grade to load directly onto final year 10 English grade. In addition, two non-significant paths were progressively removed. Non-significant paths were those from social persuasion to writing self-efficacy in the class context and from social persuasion to writing self-efficacy in the test context. The data provided a good
fit to the revised model ($\chi^2_{11} = 36.25, p > .05; \chi^2/df = 3.30; NFI = .97; IFI = .99; CFI = .99$). Seventy-seven percent of the variance in the year 10 English performance of approach-oriented copers was explained by variables in the model (see Figure 15).

Figure 15. Final paths with beta-weights and squared multiple correlations for competing model 1A (English): Approach-oriented copers in a self-efficacy based model of year 10 English performance

Strong direct contributions to year 10 English grades were made by year 9 English grades ($\beta = .59$) and writing class self-efficacy ($\beta = .55$). The total effects of writing anxiety ($\beta = .51$) on year 10 English grades were also strong.
Table 29 provides an overview of direct effects, indirect effects and total effects from the model.

Table 29

Direct Effects, Indirect Effects and Total Effects from the Model of Year 10

<table>
<thead>
<tr>
<th>Effect</th>
<th>Direct effect</th>
<th>Indirect effect</th>
<th>Total effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>On year 10 English grade</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Of year 9 English grade</td>
<td>.59</td>
<td>.07</td>
<td>.66</td>
</tr>
<tr>
<td>Of enactive mastery</td>
<td>.00</td>
<td>.23</td>
<td>.23</td>
</tr>
<tr>
<td>Of modeling</td>
<td>.00</td>
<td>-.15</td>
<td>-.15</td>
</tr>
<tr>
<td>Of writing anxiety</td>
<td>-.17</td>
<td>-.34</td>
<td>-.51</td>
</tr>
<tr>
<td>Of writing class self-efficacy</td>
<td>.55</td>
<td>.00</td>
<td>.55</td>
</tr>
<tr>
<td>Of writing test self-efficacy</td>
<td>.27</td>
<td>.00</td>
<td>.27</td>
</tr>
<tr>
<td>On writing class self-efficacy</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Of year 10 English grade</td>
<td>.00</td>
<td>.08</td>
<td>.08</td>
</tr>
<tr>
<td>Of enactive mastery</td>
<td>.31</td>
<td>.00</td>
<td>.31</td>
</tr>
<tr>
<td>Of modeling</td>
<td>-.21</td>
<td>.00</td>
<td>-.21</td>
</tr>
<tr>
<td>Of writing anxiety</td>
<td>-.40</td>
<td>.00</td>
<td>-.40</td>
</tr>
<tr>
<td>On writing test self-efficacy</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Of year 10 English grade</td>
<td>.00</td>
<td>.06</td>
<td>.06</td>
</tr>
<tr>
<td>Of enactive mastery</td>
<td>.22</td>
<td>.00</td>
<td>.22</td>
</tr>
<tr>
<td>Of modeling</td>
<td>-.13</td>
<td>.00</td>
<td>-.13</td>
</tr>
<tr>
<td>Of writing anxiety</td>
<td>-.46</td>
<td>.00</td>
<td>-.46</td>
</tr>
<tr>
<td>On enactive mastery</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Of year 10 English grade</td>
<td>.27</td>
<td>.00</td>
<td>.27</td>
</tr>
</tbody>
</table>

12.4.1.2 Competing model 1A (mathematics): The self-efficacy based model of mathematics performance for approach copers in year 10

The independence model indicated the suitability of the data for modeling ($\chi^2_{28} = 2,642.57, p < .001$), however the data did not provide a good fit to the proposed model ($\chi^2_{13} = 153.69, p < .05; \chi^2/df = 11.82; NFI=.86; IFI=.86; CFI=.88$). Model respecifications allowed final year 9 mathematics grade to load directly onto final year 10 mathematics grade. In addition, seven non-significant paths were progressively removed. These non-significant paths were from each of the four sources of self-efficacy to mathematics self-efficacy.
in the class context, from modeling and social persuasion to mathematics self-efficacy in the test context, and from mathematics self-efficacy in the class context to final year 10 mathematics grade. After the removal of these non-significant paths, the data provided a good fit to the revised model ($\chi^2 / df = 22.32, p > .05; \chi^2 / df = 3.72; NFI = .97; IFI = .97; CFI = .98$). Seventy-five percent of the variance in year 10 mathematics performance was explained by variables in the model (see Figure 16).

Figure 16. Final paths with beta-weights and squared multiple correlations for competing model 1A (mathematics): Approach-oriented copers in a self-efficacy based model of year 10 mathematics performance
There were strong direct effects on year 10 mathematics grades by year 9 mathematics grades ($\beta=.61$) and mathematics test self-efficacy ($\beta=.56$). The total effects of mathematics anxiety on year 11 mathematics grades were also strong ($\beta=-.49$). Table 30 provides an overview of direct effects, indirect effects and total effects from the model.

Table 30

**Mathematics Performance for Approach Copers**

<table>
<thead>
<tr>
<th>Effect</th>
<th>Direct effect</th>
<th>Indirect effect</th>
<th>Total effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>On year 10 Mathematics grade</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Of year 9 Mathematics grade</td>
<td>.61</td>
<td>.13</td>
<td>.74</td>
</tr>
<tr>
<td>Of enactive mastery</td>
<td>.00</td>
<td>.22</td>
<td>.22</td>
</tr>
<tr>
<td>Of mathematics anxiety</td>
<td>-.23</td>
<td>-.26</td>
<td>-.49</td>
</tr>
<tr>
<td>Of mathematics test self-efficacy</td>
<td>.56</td>
<td>.00</td>
<td>.56</td>
</tr>
<tr>
<td>On mathematics test self-efficacy</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Of year 9 Mathematics grade</td>
<td>.00</td>
<td>.22</td>
<td>.22</td>
</tr>
<tr>
<td>Of enactive mastery</td>
<td>.40</td>
<td>.00</td>
<td>.40</td>
</tr>
<tr>
<td>Of mathematics anxiety</td>
<td>-.47</td>
<td>.00</td>
<td>-.47</td>
</tr>
<tr>
<td>On enactive mastery</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Of year 9 Mathematics grade</td>
<td>.56</td>
<td>.00</td>
<td>.56</td>
</tr>
</tbody>
</table>

12.4.1.3 Competing model 1B (English): The self-efficacy based model of English performance for avoidance copers in year 10

The independence model indicated the suitability of the data for modeling ($\chi^2_{28} = 1,801.82$, $p < .001$). The data did not provide a good fit to the proposed model ($\chi^2_{11} = 229.17$, $p < .05$; $\chi^2/df = 20.83$; NFI=.88; IFI=.88; CFI=.90). Model respecifications allowed final year 9 English grade to load directly onto final year 10 English grade. In addition, six non-significant paths were progressively removed. Non-significant paths were those from social persuasion to writing self-efficacy in the class context and from social persuasion to writing self-efficacy in the class and test contexts, from enactive...
mastery, modeling and writing anxiety to writing self-efficacy in the class context, and from writing self-efficacy in the class context to final year 10 English grade. After the removal of non-significant paths, the data provided a good fit to the revised model ($\chi^2 = 41.17, p > .05; \chi^2/df = 4.57; \text{NFI} = .96; \text{IFI} = .97; \text{CFI} = .98$). Forty-five percent of the variance in year 10 English performance was explained by the variables in the model. (see Figure 17).

Figure 17. Final paths with beta-weights and squared multiple correlations for competing model 1B (English): Avoidance-oriented copers in a self-efficacy based model of year 10 English performance

There was a strong direct effect of year 9 English grades ($\beta = .54$) and a moderate total effect of writing anxiety on year
10 English grades ($\beta = .42$). Table 31 provides an overview of direct effects, indirect effects and total effects from the model.

Table 31

**Direct Effects, Indirect Effects and Total Effects from the Model of Year 10**

<table>
<thead>
<tr>
<th>Effect</th>
<th>Direct effect</th>
<th>Indirect effect</th>
<th>Total effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>On year 10 English grade</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Of year 9 English grade</td>
<td>.54</td>
<td>.03</td>
<td>.57</td>
</tr>
<tr>
<td>Of enactive mastery</td>
<td>.00</td>
<td>.06</td>
<td>.06</td>
</tr>
<tr>
<td>Of modeling</td>
<td>.00</td>
<td>.03</td>
<td>.03</td>
</tr>
<tr>
<td>Of writing anxiety</td>
<td>-.28</td>
<td>-.14</td>
<td>-.42</td>
</tr>
<tr>
<td>Of writing test self-efficacy</td>
<td>.25</td>
<td>.00</td>
<td>.25</td>
</tr>
<tr>
<td>On writing test self-efficacy</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Of year 9 English grade</td>
<td>.00</td>
<td>.10</td>
<td>.10</td>
</tr>
<tr>
<td>Of enactive mastery</td>
<td>.24</td>
<td>.00</td>
<td>.24</td>
</tr>
<tr>
<td>Of modeling</td>
<td>-.11</td>
<td>.00</td>
<td>-.11</td>
</tr>
<tr>
<td>Of writing anxiety</td>
<td>-.55</td>
<td>.00</td>
<td>-.55</td>
</tr>
<tr>
<td>On enactive mastery</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Of year 9 English grade</td>
<td>.42</td>
<td>.00</td>
<td>.42</td>
</tr>
</tbody>
</table>

12.4.1.4 Competing model 1B (mathematics): The self-efficacy based model of mathematics performance for avoidance copers in year 10

The independence model indicated the suitability of the data for modeling ($\chi^2_{36} = 2.666.00, p < .001$). The data did not provide a good fit to the proposed model ($\chi^2_{13} = 122.36, p < .05; \chi^2/df = 9.41; NFI = .84; IFI = .82; CFI = .85$). Model respecifications again allowed final year 9 mathematics grade to load directly onto final year 10 mathematics grade. In addition, three non-significant paths were progressively removed. These non-significant paths were from social persuasion to mathematics self-efficacy in both the class and test contexts, and from modeling to mathematics self-efficacy in the class context. After the removal of non-significant paths, the data provided a good fit to the revised model ($\chi^2_{10} = 32.56, p < .05; \chi^2/df = 3.26; NFI = .98; IFI = .98$;
CFI=.99). Sixty-two percent of the variance in year 10 mathematics performance was explained by variables in the model (see Figure 18).

![Diagram](image)

Figure 18. Final paths with beta-weights and squared multiple correlations for competing model 1B (mathematics): Avoidance oriented copers in a self-efficacy based model of year 10 mathematics performance

There was a strong direct effect of year 9 mathematics grades on year 10 mathematics grades ($\beta=.57$) and a strong total effect of mathematics anxiety on year 10 mathematics grades ($\beta=.53$). Moderate direct effects of mathematics class self-efficacy ($\beta=.34$), mathematics test self-efficacy ($\beta=.33$) and enactive mastery ($\beta=.33$) on year 10 mathematics grades were also
observed. Table 32 provides an overview of direct effects, indirect effects and total effects from the model.

Table 32

**Direct Effects, Indirect Effects and Total Effects from the Model of Year 10**

**Mathematics Performance for Avoidance Copers**

<table>
<thead>
<tr>
<th>Effect</th>
<th>Direct effect</th>
<th>Indirect effect</th>
<th>Total effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>On year 10 mathematics grade</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Of year 9 mathematics grade</td>
<td>.57</td>
<td>.17</td>
<td>.74</td>
</tr>
<tr>
<td>Of enactive mastery</td>
<td>.00</td>
<td>.33</td>
<td>.33</td>
</tr>
<tr>
<td>Of modeling</td>
<td>.00</td>
<td>-.04</td>
<td>-.04</td>
</tr>
<tr>
<td>Of mathematics anxiety</td>
<td>-.25</td>
<td>-.28</td>
<td>-.53</td>
</tr>
<tr>
<td>Of mathematics class self-efficacy</td>
<td>.34</td>
<td>.00</td>
<td>.34</td>
</tr>
<tr>
<td>Of mathematics test self-efficacy</td>
<td>.33</td>
<td>.00</td>
<td>.33</td>
</tr>
<tr>
<td>On mathematics class self-efficacy</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Of year 9 mathematics grade</td>
<td>.00</td>
<td>.21</td>
<td>.21</td>
</tr>
<tr>
<td>Of enactive mastery</td>
<td>.42</td>
<td>.00</td>
<td>.42</td>
</tr>
<tr>
<td>Of mathematics anxiety</td>
<td>-.38</td>
<td>.00</td>
<td>-.38</td>
</tr>
<tr>
<td>On mathematics test self-efficacy</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Of year 9 mathematics grade</td>
<td>.00</td>
<td>.30</td>
<td>.30</td>
</tr>
<tr>
<td>Of enactive mastery</td>
<td>.58</td>
<td>.00</td>
<td>.58</td>
</tr>
<tr>
<td>Of modeling</td>
<td>-.13</td>
<td>.00</td>
<td>-.13</td>
</tr>
<tr>
<td>Of mathematics anxiety</td>
<td>-.46</td>
<td>.00</td>
<td>-.46</td>
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<tr>
<td>On enactive mastery</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Of year 9 mathematics grade</td>
<td>.51</td>
<td>.00</td>
<td>.51</td>
</tr>
</tbody>
</table>

12.4.1.5 Competing model 1C (English): The self-efficacy based model of English performance for combined copers in year 10

The independence model indicated the suitability of the data for modeling ($\chi^2_{36} = 1,980.22, p < .001$). The data provided a reasonable fit to the proposed model ($\chi^2_{16} = 105.23, p < .05; \chi^2/df = 6.58; NFI=.91; IFI=.91; CFI=.93$). Model respecifications again allowed final year 9 English grade to load directly onto final year 10 English grade. In addition, two non-significant paths from enactive mastery to each of writing self-efficacy in the class and test contexts were progressively removed. The data provided a good fit to the revised model ($\chi^2_{6} = 21.22, p > .05; \chi^2/df = 3.54; NFI=.97; IFI=.98; CFI=.99$).
Eighty percent of the variance in year 10 English performance was explained by variables in the model (see Figure 19).

Figure 19. Final paths with beta-weights and squared multiple correlations for competing model 1C (English): Combined copers in a self-efficacy based model of year 10 English performance

Strong direct effects of writing class self-efficacy (β=.60) and of year 9 English grade (β=.55) along with a moderate direct effect of writing test self-efficacy (β=.31) on year 10 English grades were observed. There was also a strong total effect of writing anxiety (β=-.51) and a moderate total effect of modeling (β=-.31) on year 10 English grades. Table 33 provides an overview of direct effects, indirect effects and total effects from the model.
Table 33

Direct Effects, Indirect Effects and Total Effects from the Model of Year 10

English Performance for Combined Copers

<table>
<thead>
<tr>
<th>Effect</th>
<th>Direct effect</th>
<th>Indirect effect</th>
<th>Total effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>On year 10 English grade</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Of year 9 English grade</td>
<td>.55</td>
<td>.00</td>
<td>.55</td>
</tr>
<tr>
<td>Of modeling</td>
<td>.00</td>
<td>-.31</td>
<td>-.31</td>
</tr>
<tr>
<td>Of writing anxiety</td>
<td>-.14</td>
<td>-.37</td>
<td>-.51</td>
</tr>
<tr>
<td>Of writing class self-efficacy</td>
<td>.60</td>
<td>.00</td>
<td>.60</td>
</tr>
<tr>
<td>Of writing test self-efficacy</td>
<td>.31</td>
<td>.00</td>
<td>.31</td>
</tr>
<tr>
<td>On writing class self-efficacy</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Of modeling</td>
<td>.34</td>
<td>.00</td>
<td>.34</td>
</tr>
<tr>
<td>Of social persuasion</td>
<td>.19</td>
<td>.00</td>
<td>.19</td>
</tr>
<tr>
<td>Of writing anxiety</td>
<td>-.39</td>
<td>.00</td>
<td>-.39</td>
</tr>
<tr>
<td>On writing test self-efficacy</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Of modeling</td>
<td>-.33</td>
<td>.00</td>
<td>-.33</td>
</tr>
<tr>
<td>Of social persuasion</td>
<td>.18</td>
<td>.00</td>
<td>.18</td>
</tr>
<tr>
<td>Of writing anxiety</td>
<td>-.43</td>
<td>.00</td>
<td>-.43</td>
</tr>
<tr>
<td>On enactive mastery</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Of year 9 English grade</td>
<td>.31</td>
<td>.00</td>
<td>.31</td>
</tr>
</tbody>
</table>

12.4.1.6 Competing model 1C (mathematics): The self-efficacy based model of mathematics performance for combined copers in year 10

The independence model indicated the suitability of the data for modeling ($\chi^2_{21} = 1,545.40, p < .001$). The data did not provide a good fit to the proposed model ($\chi^2_{16} = 146.11, p < .05; \chi^2/df = 9.13; NFI=.79; IFI=.80; CFI=.82$). Model respecifications again allowed final year 9 mathematics grade to load directly onto final year 10 mathematics grade. In addition, four non-significant paths were progressively removed. These non-significant paths were from modeling and social persuasion to mathematics self-efficacy in the class context and mathematics self-efficacy in the test context. After the removal of non-significant paths, the data provided a good fit to the revised model ($\chi^2_{12} = 44.32, p > .05; \chi^2/df = 3.69; NFI=.98; IFI=.98; CFI=.99$). Sixty-
two percent of the variance in year 10 mathematics performance was explained by variables in the model (see Figure 20).

Figure 20. Final paths with beta-weights and squared multiple correlations for competing model 1C (mathematics): Combined copers in a self-efficacy based model of year 10 mathematics performance

There were strong direct effects on year 10 mathematics grades by year 9 mathematics grades ($\beta=-.58$) and by mathematics class self-efficacy ($\beta=-.57$), along with a moderate direct effect on year 11 mathematics grade by mathematics test self-efficacy ($\beta=-.33$). There was also a strong indirect effect on year 10 mathematics grades by mathematics anxiety ($\beta=-.64$). Table 34
provides an overview of direct effects, indirect effects and total effects from the model.

### Table 34

**Direct Effects, Indirect Effects and Total Effects from the Model of Year 10**

**Mathematics Performance for Combined Copers**

<table>
<thead>
<tr>
<th>Effect</th>
<th>Direct effect</th>
<th>Indirect effect</th>
<th>Total effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>On year 10 mathematics grade</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Of year 9 mathematics grade</td>
<td>.58</td>
<td>.17</td>
<td>.75</td>
</tr>
<tr>
<td>Of enactive mastery</td>
<td>.00</td>
<td>.18</td>
<td>.18</td>
</tr>
<tr>
<td>Of mathematics anxiety</td>
<td>-.23</td>
<td>-.41</td>
<td>-.64</td>
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<tr>
<td>Of mathematics class self-efficacy</td>
<td>.57</td>
<td>.00</td>
<td>.57</td>
</tr>
<tr>
<td>Of mathematics test self-efficacy</td>
<td>.33</td>
<td>.00</td>
<td>.33</td>
</tr>
<tr>
<td>On mathematics class self-efficacy</td>
<td></td>
<td></td>
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<tr>
<td>Of year 9 mathematics grade</td>
<td>.00</td>
<td>.05</td>
<td>.05</td>
</tr>
<tr>
<td>Of enactive mastery</td>
<td>.17</td>
<td>.00</td>
<td>.17</td>
</tr>
<tr>
<td>Of mathematics anxiety</td>
<td>-.52</td>
<td>.00</td>
<td>-.52</td>
</tr>
<tr>
<td>On mathematics test self-efficacy</td>
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<td></td>
</tr>
<tr>
<td>Of year 9 mathematics grade</td>
<td>.00</td>
<td>.07</td>
<td>.07</td>
</tr>
<tr>
<td>Of enactive mastery</td>
<td>.25</td>
<td>.00</td>
<td>.25</td>
</tr>
<tr>
<td>Of mathematics anxiety</td>
<td>-.62</td>
<td>.00</td>
<td>-.62</td>
</tr>
<tr>
<td>On enactive mastery</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Of year 9 mathematics grade</td>
<td>.27</td>
<td>.00</td>
<td>.27</td>
</tr>
</tbody>
</table>

Presented in Table 35 is a summary of the percentages of variance in year 10 English and mathematics performance explained by the competing self-efficacy based models for each coping cluster.
Table 35

Percentages of Variance in Year 10 English and Mathematics Performance Explained by the Competing Self-efficacy Based Models for Each Coping Cluster

<table>
<thead>
<tr>
<th></th>
<th>% variance explained in performance by self-efficacy based model</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Approach Coping Cluster</td>
</tr>
<tr>
<td>Year 10 English</td>
<td>77%</td>
</tr>
<tr>
<td>Performance</td>
<td></td>
</tr>
<tr>
<td>Year 10 Mathematics</td>
<td>75%</td>
</tr>
<tr>
<td>Performance</td>
<td></td>
</tr>
</tbody>
</table>

12.4.2 Competing models 2A and 2B: Goal based models of performance in English and mathematics

The second type of competing models that were proposed in Chapter 7 were those based on target goals (competing model 2A) and purpose goals (competing model 2B). These goal based models of performance, based upon Figures 10 and 11, were analysed for both English and mathematics.

12.4.2.1 Competing model 2A (English): The target goal model of English performance in year 10

Structural equation modeling was used to predict final year 10 English grades using the target goal model developed in Chapter 4. Writing self-efficacy in the class context, writing self-efficacy in the test context, use of conceptual writing strategies, use of procedural writing strategies and optimism
were hypothesised to predict final year 10 English grade goal (the target goal), which in turn was hypothesised to predict final year 10 English grade.

The independence model indicated the suitability of the data for modeling \( \chi^2_{15} = 3,285.93, p < .001 \). No additional paths were suggested by modification indices, however paths from optimism to year 10 grade goal and from procedural strategies to year 10 grade goal was not significant and were deleted from the final model. After deletion of the non-significant paths, the data provided a good fit to the revised model \( \chi^2 = 30.32, p > .05; \chi^2/df = 4.33; NFI = .98; IFI = .98; CFI = .98 \). Thirty-six percent of the variance in year 10 English grades was explained by the variables in the model, and 22% of the variance in grade goals was explained by writing self-efficacy in the class context, writing self-efficacy in the test context and the use of conceptual writing strategies (see Figure 21).

Direct effects: Writing self-efficacy in the class context \( (\beta = .26) \), writing self-efficacy in the test context \( (\beta = .35) \) and the use of conceptual writing strategies \( (\beta = .19) \) each directly predicted final year 10 English grade goals and together explained 22% of the variance. The use of procedural writing strategies and a sense of optimism did not contribute to final year 10 grade goals. Final year 10 English grade goals directly predicted final year 10 English grades \( (\beta = .40) \).
Indirect effects: Writing self-efficacy in the class context, writing self-efficacy in the test context and the use of conceptual writing strategies each indirectly contributed to final year 10 English grades through their effects on year 10 English grade goals ($\beta=.10$, $\beta=.14$ and $\beta=.08$) respectively.

12.4.2.2 Competing model 2A (mathematics): The target goal model of mathematics performance in year 10

Structural equation modeling was used to predict final year 10 mathematics grades using the target goal model developed in Chapter 4. Mathematics self-efficacy in the class context, mathematics self-efficacy in the test context, use of conceptual mathematics strategies, use of procedural mathematics strategies and optimism were hypothesized to predict final year 10
mathematics grade goal (the target goal), which in was hypothesised to predict final year 10 mathematics grade.

The independence model indicated the suitability of the data for modeling ($\chi^2_{28} = 3.563.26, p < .001$). No additional paths were suggested by modification indices and all paths reached significance. The data provided a good fit to the proposed model ($\chi^2_{15} = 52.68, p > .05; \chi^2/df = 3.50; \text{NFI}=.99; \text{IFI}=.99; \text{CFI}=.99$). Forty-five percent of the variance in year 10 mathematics grades was explained by the variables in the model, and 24% of the variance in mathematics grade goal was explained by a combination of the other independent variables (see Figure 22).

Figure 22. Final paths with beta-weights and squared multiple correlations for competing model 2A (mathematics): The target goal model of year 10 mathematics performance
Direct effects: mathematics self-efficacy in the class context ($\beta = .13$), mathematics self-efficacy in the test context ($\beta = .40$), the use of conceptual mathematics strategies ($\beta = .12$), the use of procedural mathematics strategies ($\beta = .14$) and a sense of optimism ($\beta = .19$) each directly predicted final year 10 mathematics grade goals and together explained 24% of the variance in year 10 mathematics grade goal. Final year 10 mathematics grade goals directly predicted final year 10 mathematics grades ($\beta = .39$).

Indirect effects: Mathematics self-efficacy in the class context, mathematics self-efficacy in the test context, the use of conceptual mathematics strategies, the use of procedural mathematics strategies and optimism each indirectly contributed to final year 10 mathematics grades through their effects on year 10 mathematics grade goals ($\beta = .05$, $\beta = .16$, $\beta = .05$, $\beta = .05$ and $\beta = .07$).

12.3.2.3 Competing model 2B (English): The purpose goal model of English performance in year 10

Structural equation modeling was used to predict final year 10 English grade using the purpose goal model developed in Chapter 4. Gender and year 9 English grade were hypothesised to predict the three purpose goals (mastery goals, performance-approach goals and performance-avoid goals), which in turn were hypothesised to predict final year 10 English grade.

The independence model indicated the suitability of the data for modeling ($\chi^2 = 4,329.44$, $p < .001$). No additional paths were suggested by modification indices, however paths from gender to mastery goals, gender to performance-avoid goals, past performance to performance-approach goals and
performance-avoid goals to final year 10 English grade were not significant and were removed from the model. The data provided a good fit to the revised model ($\chi^2_8 = 30.58, p > .05; \chi^2/df = 3.82; NFI=.99; IFI=.99; CFI=.99$). Forty percent of the variance in year 10 English grade was explained by the variables in the model (see Figure 23).

Direct effects: Gender was directly and negatively related to performance-approach goals ($\beta=-.36$), indicating that girls espouse these goals more than do boys. Gender did not contribute to mastery goals, nor to performance-avoid goals. Year 9 English grade directly contributed to mastery goals ($\beta=.40$) and to performance-avoid goals ($\beta=-.32$), but not to performance-approach goals. While mastery goals ($\beta=.45$) and performance-avoid goals ($\beta=-.44$) each directly contribute to year 10 English grade, there was no significant contribution of performance-approach goals.

Figure 23. Final paths with beta-weights and squared multiple correlations for competing model 2B (English): The purpose goal model of year 10 English performance
Indirect effects: Final year 9 English grade contributed indirectly to final year 10 English grade through its effects on mastery goals (β=.18) and performance-avoid goals (β=.14) for a total contribution of β=.32.

12.4.2.4 Competing model 2B (mathematics): The purpose goal model of mathematics performance in year 10

Structural equation modeling was used to predict final year 10 mathematics grade using the purpose goal model developed in Chapter 4. Gender and year 9 mathematics grade were hypothesised to predict the three purpose goals (mastery goals, performance-approach goals and performance-avoid goals), which in turn were hypothesised to predict final year 10 mathematics grade.

The independence model indicated the suitability of the data for modeling ($\chi^2_{20} = 4,207.42, p < .001$). No additional paths were suggested by modification indices, however paths from gender to mastery goals, gender to performance-avoid goals and past performance to performance-avoid goals were not significant and were removed from the model. The data provided a good fit to the revised model ($\chi^2_8 = 32.12, p > .05; \chi^2/df = 4.02; NFI=.99; IFI=.99; CFI=.98$). Thirty-one percent of the variance in year 10 mathematics grade was explained by the variables in the model (see Figure 24).
Figure 24. Final paths with beta-weights and squared multiple correlations for competing model 2B (mathematics): The purpose goal model of year 10 mathematics performance

Direct effects: Gender was directly and negatively related to performance-approach goals (β = -.25), indicating that girls espouse these goals more than do boys. Gender did not contribute to mastery goals, nor to performance-avoid goals. Year 9 mathematics grade directly contributed to mastery goals (β = .37) and to performance-approach goals (β = .31), but not to performance-avoid goals. Mastery goals (β = .41), performance-approach goals (β = .23) and performance-avoid goals (β = -.29) each directly contributed to year 10 mathematics grade.

Indirect effects: Gender contributed indirectly to final year 10 mathematics grade through its effects on performance-approach goals (β = -.06). Final year 9 mathematics grade contributed indirectly to final year 10
mathematics grade through its effects on mastery goals ($\beta=.15$) and performance-approach goals ($\beta=.07$), for a total contribution of $\beta=.22$.

A summary table of the percentages of variance explained in year 10 English and mathematics performance by the competing target and purpose goal models is presented below (see Table 36).

Table 36

<table>
<thead>
<tr>
<th></th>
<th>% variance explained in performance by competing goal-based model</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Target goal model</td>
</tr>
<tr>
<td>Year 10 English Performance</td>
<td>36%</td>
</tr>
<tr>
<td>Year 10 Mathematics Performance</td>
<td>45%</td>
</tr>
</tbody>
</table>

12.4.3 Models of performance in English and mathematics based on positive psychology variables

The third type of competing model that was proposed in Chapter 7 was a model based on positive psychology variables (see Figure 12). This model was analysed in terms of both English and mathematics performance.

12.4.3.1 Competing model 3 (English): The positive psychology model of English performance in year 10

Structural equation modelling was used to predict final year 10 English grade from the model of positive psychology. Optimism and active perfectionism were hypothesised to contribute to mastery goals, self-regulatory
skills and year 10 English grade goals, which it turn were hypothesised to contribute to final year 10 English grade.

The independence model indicated the suitability of the data for modeling ($\chi^2_{21} = 5,173.26, p < .001$). No additional paths were suggested by modification indices, however paths from active perfectionism to mastery goals and from active perfectionism to year 10 English grade goals were not significant and were removed from the model. The data provided a good fit to the revised model ($\chi^2_6 = 21.02, p > .05; \chi^2/df = 3.50; \text{NFI} = .99; \text{IFI} = .99; .99$). Fifty-nine percent of the variance in year 10 English grade was explained by the variables in the model (see Figure 25).

Direct effects: Optimism was directly and positively related to mastery goals ($\beta = .38$), use of self-regulatory skills ($\beta = .32$) and year 10 English grade goals ($\beta = .41$). Active perfectionism was directly and positively related to the use of self-regulatory skills ($\beta = .29$), but not to mastery goals nor year 10 English grade goals. Mastery goals ($\beta = .30$), self-regulatory skills ($\beta = .41$) and year 10 English grade goal ($\beta = .52$) were directly and positively related to final year 10 English grade.
Figure 25. Final paths with beta-weights and squared multiple correlations for competing model 3 (English): The positive psychology model of year 10 English performance

Indirect effects: Active perfectionism made an indirect contribution to year 10 English grade through its effects on the use of self-regulatory skills ($\beta=.12$). Optimism made indirect contributions to year 10 English grade through its effects on mastery goals ($\beta=.11$), the use of self-regulatory skills ($\beta=.13$) and year 10 English grade goals ($\beta=.21$) for a total contribution of $\beta=.45$ on final year 10 English grade.

12.4.3.2 Competing model 3 (mathematics): The positive psychology model of mathematics performance in year 10

Structural equation modelling was used to predict final year 10 mathematics grade from the model of positive psychology. Optimism and active perfectionism were hypothesised to contribute to mastery goals, self-regulatory skills and year 10 mathematics grade goals, which in turn were hypothesised to contribute to final year 10 mathematics grade.
The independence model indicated the suitability of the data for
modeling ($\chi^2_{241} = 6,320.52, p < .001$). No additional paths were suggested by
modification indices, however paths from active perfectionism to mastery goals
and from active perfectionism to year 10 mathematics grade goals were not
significant and were removed from the model. The data provided a good fit to
the revised model ($\chi^2_{6} = 24.58, p > .05; \chi^2/df = 4.10; NFI=.98; IFI=.98; .98$).
Fifty-five percent of the variance in year 10 mathematics grade was explained
by the variables in the model (see Figure 26).

![Diagram](image)

Figure 26. Final paths with beta-weights and squared multiple correlations for
competing model 3 (mathematics): The positive psychology model of year 10
mathematics performance

Direct effects: Optimism was directly and positively related to mastery
goals ($\beta=.36$), use of self-regulatory skills ($\beta=.32$) and year 10 mathematics
grade goals ($\beta=.41$). Active perfectionism was directly and positively related to
the use of self-regulatory skills ($\beta=.29$), but not to mastery goals nor year 10 mathematics grade goals. Mastery goals ($\beta=.30$), self-regulatory skills ($\beta=.36$) and year 10 mathematics grade goal ($\beta=.53$) were directly and positively related to final year 10 mathematics grade.

**Indirect effects:** Active perfectionism made an indirect contribution to year 10 mathematics grade through its effects on the use of self-regulatory skills ($\beta=.10$). Optimism made indirect contributions to year 10 mathematics grade through its effects on mastery goals ($\beta=.11$), the use of self-regulatory skills ($\beta=.12$) and year 10 mathematics grade goals ($\beta=.22$) for a total contribution of $\beta=.45$ to year 10 mathematics grade.

12.4.4 Competing models 4A and 4B: Skill-based models of performance in English and mathematics

The final type of models that were proposed in Chapter 7 were those based on the use of self-regulatory skills (competing model 4A) and cognitive strategies (competing model 4B). Skill-based models of performance, based upon Figures 13 and 14, were analysed for both English and mathematics.

12.4.4.1 Competing model 4A (English): The self-regulatory model of English performance in year 10

Structural equation modelling was used to analyse the self-regulatory model of year 10 English performance. The independence model indicated the suitability of the data for modeling ($\chi^2_{22} = 6,492.54$, $p < .001$). The data provided a reasonable fit to the proposed model ($\chi^2_{12} = 145.26$, $p > .05$; $\chi^2/df = 8.54$; NFI = .93; IFI = .95; CFI = .97), although the ratio of chi-square to the degrees of freedom was high. Model re-specifications were examined, again
following the recommendation that the criteria for change be made on substantive grounds rather than for statistical advantage (Schumaker & Lomax, 1996). These modifications allowed year 9 English grade to load directly onto year 10 English grade prescribed the progressive removal of three non-significant paths from performance-avoid goals to self-regulation and self-efficacy for self-regulation and from performance-approach goals to self-efficacy for self-regulation. After removal of these non-significant paths, the data provided a better fit to the revised model, although the ratio of chi-square to the degrees of freedom was still higher than optimally desired ($\chi^2/df = 56.32$, $p > .05$; $\chi^2/df = 6.26$; NFI = .98; IFI = .99; CFI = .99). Sixty-three percent of the variance in final year 10 English grades was explained by the variables in the self-regulatory skill-based model (see Figure 27).

![Diagram](https://via.placeholder.com/150)

Figure 27. Final paths with beta-weights and squared multiple correlations for competing model 4A (English): The self-regulatory skill-based model of year 10 English performance
There were strong direct effects on year 10 English grades of self-regulatory skills ($\beta=.54$) and year 9 English grades ($\beta=.53$) and self-efficacy for self-regulation ($\beta=.67$). In addition, there was a strong total effect on year 10 English grades of self-efficacy for self-regulation ($\beta=.60$). Table 37 provides an overview of direct effects, indirect effects and total effects from the model.

Table 37

<table>
<thead>
<tr>
<th>Effect</th>
<th>Direct effect</th>
<th>Indirect effect</th>
<th>Total effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>On year 10 English grade</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Of self-regulatory skills</td>
<td>.54</td>
<td>.00</td>
<td>.54</td>
</tr>
<tr>
<td>Of self-efficacy for self-regulation</td>
<td>.31</td>
<td>.29</td>
<td>.60</td>
</tr>
<tr>
<td>Of year 9 English grade</td>
<td>.53</td>
<td>.16</td>
<td>.69</td>
</tr>
<tr>
<td>On self-regulatory skills</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Of self-efficacy for self-regulation</td>
<td>.54</td>
<td>.00</td>
<td>.54</td>
</tr>
<tr>
<td>Of performance-approach goals</td>
<td>.28</td>
<td>.00</td>
<td>.28</td>
</tr>
<tr>
<td>Of mastery goals</td>
<td>.35</td>
<td>.00</td>
<td>.35</td>
</tr>
<tr>
<td>Of year 9 English grade</td>
<td>.17</td>
<td>.11</td>
<td>.28</td>
</tr>
<tr>
<td>On self-efficacy for self-regulation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Of mastery goals</td>
<td>.20</td>
<td>.00</td>
<td>.20</td>
</tr>
<tr>
<td>Of year 9 English grade</td>
<td>.21</td>
<td>.00</td>
<td>.21</td>
</tr>
</tbody>
</table>

12.4.4.2 Competing model 4A (mathematics): The self-regulatory model of mathematics performance in year 10

Structural equation modeling was used to analyse the self-regulatory model of year 10 mathematics performance. The independence model indicated the suitability of the data for modeling ($\chi^2_{22} = 6,514.83, p <.001$). The data provided a reasonable fit to the proposed model ($\chi^2_{17} = 132.89, p >.05; \chi^2/df = 7.82; NFI=.94; IFI=.95; CFI=.97$), although again the ratio of chi-square to the degrees of freedom was high. Model respecifications were examined, and as
per the previous model a direct path was added from year 9 mathematics grade to year 10 mathematics grade and paths from performance-avoid goals to self-regulation and self-efficacy for self-regulation and from performance-approach goals to self-efficacy for self-regulation were progressively removed. After removal of these non-significant paths, the data provided a better fit to the revised model, although like the previous model the ratio of chi-square to the degrees of freedom was still higher than optimal (χ²/df = 5.85; NFI=.98; IFI=.99; CFI=.99). Sixty percent of the variance in final year 10 mathematics grades was explained by the variables in the self-regulatory skill-based model (see Figure 28).

![Diagram](image)

Figure 28. Final paths with beta-weights and squared multiple correlations for competing model 4A (mathematics): The self-regulatory skill-based model of year 10 mathematics performance.

There were strong direct effects on year 10 mathematics grades of self-regulatory skills (β=.58) and year 9 mathematics grades (β=.51). In addition
there was a strong total effect of self-efficacy for self-regulation ($\beta=.72$) on year 10 mathematics grades. Table 38 provides an overview of direct effects, indirect effects and total effects from the model.

Table 38

**Direct Effects, Indirect Effects and Total Effects from the Self-Regulatory Skill Based Model of Year 10 Mathematics Performance**

<table>
<thead>
<tr>
<th>Effect</th>
<th>Direct effect</th>
<th>Indirect effect</th>
<th>Total effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>On year 10 mathematics grade</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Of self-regulatory skills</td>
<td>.58</td>
<td>.00</td>
<td>.58</td>
</tr>
<tr>
<td>Of self-efficacy for self-regulation</td>
<td>.41</td>
<td>.31</td>
<td>.72</td>
</tr>
<tr>
<td>Of year 9 mathematics grade</td>
<td>.51</td>
<td>.25</td>
<td>.76</td>
</tr>
<tr>
<td>On self-regulatory skills</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Of self-efficacy for self-regulation</td>
<td>.54</td>
<td>.00</td>
<td>.54</td>
</tr>
<tr>
<td>Of performance-approach goals</td>
<td>.28</td>
<td>.00</td>
<td>.28</td>
</tr>
<tr>
<td>Of mastery goals</td>
<td>.35</td>
<td>.00</td>
<td>.35</td>
</tr>
<tr>
<td>Of year 9 mathematics grade</td>
<td>.23</td>
<td>.16</td>
<td>.39</td>
</tr>
<tr>
<td>On self-efficacy for self-regulation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Of mastery goals</td>
<td>.20</td>
<td>.00</td>
<td>.20</td>
</tr>
<tr>
<td>Of year 9 mathematics grade</td>
<td>.29</td>
<td>.00</td>
<td>.29</td>
</tr>
</tbody>
</table>

12.4.4.3 Competing model 4B (English): The cognitive skill-based model of English performance in year 10

A multiple regression analysis was performed to predict final year 10 English grade from students' use of conceptual writing strategies and procedural writing strategies. Thirteen percent of the variance in final year 10 English grade was explained ($F^2_{284}=20.90$, $p<.05$), although only the contribution of conceptual writing strategies to year 10 English grade was significant ($\beta=.35$) (see Figure 29).
12.4.4.4 Competing model 4B (mathematics): The cognitive skills-based model of mathematics performance in year 10

A multiple regression analysis was performed to predict final year 10 mathematics grade from students' use of conceptual mathematics strategies and procedural mathematics strategies. Fifteen percent of the variance in final year 10 mathematics grade was explained ($R^2_{284}=18.53$, $p<.05$). Both conceptual mathematics strategies ($\beta=.24$) and procedural mathematics strategies ($\beta=.37$) contributed significantly to year 10 mathematics grade (see Figure 30).
Figure 30. Final paths with beta-weights and squared multiple correlations for competing model 4B (mathematics): The cognitive skill-based model of year 10 mathematics performance

The percentages of variance explained in both English and mathematics performance by these competing skill based models are summarised in Table 39.

Table 39

Percentages of Variance in Year 10 English and Mathematics Performance Explained by the Competing Skill Based Models

<table>
<thead>
<tr>
<th></th>
<th>% variance explained in performance by competing skill-based model</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Cognitive skill-based model</td>
</tr>
<tr>
<td>Year 10 English Performance</td>
<td>10%</td>
</tr>
<tr>
<td>Year 10 Mathematics Performance</td>
<td>15%</td>
</tr>
</tbody>
</table>

12.5 Chapter summary

The aim of Study 2 was to confirm the component structures of the new scales developed in Study 1 and to test the competing performance models, for English and mathematics, in a pre VCE year 10 student sample. Component structures of the four new scales were confirmed, indicating their use in Study
2. Analyses of the competing performance models revealed that these models explained between 10% and 80% of the variance in year 10 English performance and between 15% and 75% of the variance in year 10 mathematics performance.
CHAPTER THIRTEEN

STUDY TWO – DISCUSSION

In this study, competing models of year 10 English and mathematics performance based on 1) self-efficacy, 2) target and purpose goals, 3) positive psychology, and 4) cognitive and self-regulatory strategies were tested. The discussion of results from this study are divided into sections that reflect the order of presentation of the results section. The first section contains a brief discussion of the pre Time 1 data (i.e., students’ final year 9 English and mathematics grades). In the second section a discussion of the preliminary data screening undertaken on all variables collected at Time 1 (mid-year year 10) is presented, along with a discussion of the confirmatory factor analyses of scales that were developed in Study 1 (see Chapters 8, 9 and 10) when administered in the current year 10 sample at Time 1, and a discussion of the descriptive statistics pertaining to each of the scales administered at Time 1. In the final section a discussion of results from analyses of each of the competing models of year 10 English and mathematics performance is presented.

13.1 Pre Time 1 data

13.1.1 Self-reported year 9 grades for English and mathematics

Students’ self-reported year 9 grades of B for English and B for mathematics were, on average, above the mean of C- to D+ that would be expected from a normal distribution of grades with a possible range of A+ to F-. These mean grades indicate that this sample of students, on average, performed well in their first year of middle school, scoring between 70 and
79% on their assessment items over the course of the year. While these grades are self-reported, rather than actual grades, and therefore it might be argued that they are affected by retrospective recall, Gibbons et al. (2000) reported a correlation of $r = .96$ between self-reported past grades and subsequently cross-checked actual grades provided by a sample of secondary school students. Based upon their findings, it is suggested that the grades provided by students in the current sample are also highly accurate.

Despite the high average, the results for past grades show that at least some students (3%) did not achieve a pass in year 9 mathematics, although none of the students reported failing year 9 English. The observation that no students reported failing year 9 English is most likely due to the fact that any student who does fail year 9 English in Victoria is required to repeat year 9. Generally, the only exception to a student repeating year 9 would be for them to undertake, and pass, a bridging course in the summer months prior to the commencement of the new school year and hence pass year 9 English in the summer, rather than at the end of fourth term. Each of the students in the current year 10 sample thus will have achieved a passing grade for year 9 English at some point. Of course some of these students might also have failed year 9 English at some point, but to be advanced to year 10, they must eventually have passed the year 9 English course.

This same pass requirement does not automatically apply if a student fails year 9 mathematics. Hence it may be that some students undertaking year 10 mathematics did not pass year 9 mathematics and it may be that these
students do not have the sufficient understanding to cope with the more advanced year 10 mathematics course.

In terms of their future prospects, failure in mathematics in year 9, and the negative implications of this for a passing grade in year 10 is concerning because many students may then enter into VCE mathematics ill-prepared and with inadequate understanding of the basic material on which VCE mathematics ultimately builds. While it may be that many students who do fail year 9 or year 10 mathematics will be dissuaded by teachers, parents or school counsellors from enrolling in VCE mathematics, the fact is that VCE mathematics is now a prerequisite unit for many tertiary courses in Australia, as well as for entry into many vocational training courses, and this might mean that some students will opt to take VCE mathematics despite poor mathematics grades in middle school, and despite any advice to the contrary.

Because enrolment in mathematics in the VCE is high, and it seems likely always to be high, it is clearly important that students enter VCE mathematics with the strongest mathematics backgrounds they can each have. It follows that it is important to stem what might foreseeably be a snowballing effect of middle-school (year 9 and 10) mathematics failures on poor performance in VCE mathematics for some students. It is thus suggested that the compulsory undertaking of bridging courses, similar to those used for students failing English, also seems warranted for students who fail year 9 and year 10 mathematics. Perhaps if students who fail mathematics in middle school were required to undertake such bridging courses, these students could
then approach their study of higher level VCE mathematics with greater confidence and with greater chances of success.

13.1.2 Gender differences in self-reported year 9 English and mathematics grades

The gender difference observed in students' self-reported year 9 English grades, where girls scored higher than boys, is consistent with the recent PISA 2000 data (OECD, 2000) for Australian students in the domain of English. However, while the current results are also consistent with recent results from some studies in North America (e.g., Pajares & Valiante, 1999) they contradict others (e.g., Pajares & Valiante, 2001), in which the observed gender difference favouring girls in writing domains has been attributed to gender-stereotypic beliefs, rather than gender per se. The current study did not assess students' gender-stereotypic beliefs, thus it is not known whether the effect of gender would have disappeared in the current sample as a function of such belief orientations. Clearly it is important that future research does replicate Pajares & Valiante's (2001) findings in the Australian context. However, it may be that gender differences in writing performance are culture-bound, and that Australian girls really are more competent in this domain than Australian boys. Certainly the current study, and the recent PISA figures, support this latter claim.

However, the current results suggesting that girls also outperform boys in the domain of mathematics contradict those from PISA 2000, as well as those from several authors, reviewed by Seegers and Boekaerts (1996), who reported that boys, in fact, tend to outperform girls in mathematics. The gender
differences in self-reported mathematics grades favouring girls in the current study might be explained by the fact that many of the girls in this study were recruited from single-sex schools. In Victoria, the academic performance of girls from single-sex schools has been found to be superior, across the board, to boys' performance (whether from co-educational or boys' schools) and to girls' performance from co-educational schools (Lipsig-Mummé, Brown & Zajdow, 2003), and a post-hoc comparison revealed this to be true in the current data. At least in Victoria, Australia, girls seem to benefit academically in a single-sex school environment. It may be that girls feel more comfortable in a single-sex environment, or they may be less intimidated or distracted in a co-educational environment.

Another explanation for the observed gender difference in mathematics favouring girls in the current sample can be inferred from Pajares (1996b) observation that gifted girls outperformed gifted boys in mathematics performance. While students in the current sample were not drawn from a gifted population, it may be that due to the large number of girls recruited from single-sex schools, where girls typically thrive academically in Australia, these girls were proportionately more mathematically talented than the boys in the sample, thus contributing to the observed gender difference.

13.2 Scales administered at time 1

13.2.1 Factor structure and reliability of the Mathematics Self-efficacy Scale (MSES) for class and test data

The MSES developed in Study 1 was confirmed in the class and test context in the current study. While the MSES was designed around the
curriculum set for Australian middle school students, and therefore its applicability might appear limited in other situations, it can be argued that the scale would also be appropriate for students of the same mathematics level in other countries, as there would be a high degree of overlap in the mathematics courses for students of similar ages. In the current study, the specificity of items can be said to strengthen the construct validity of the MSES because the MSES measures perceived competencies that bear criterial similarity to performance measures, as recommended by Bandura (1997).

Not only is the MSES theoretically consistent with Bandura’s (1997) conceptualisation of self-efficacy as a content specific self-evaluation, it has also been demonstrated to be robust across, yet sensitive to, different contexts. These dual properties support Bandura’s conceptualisation of self-efficacy as content and context specific and indicate that self-efficacy scales that purport to measure ‘generalised’ self-efficacy (e.g., Bong, 1997) should be used with caution, because self-efficacy is not a measure of perceived ‘general’ competence, but rather one of (many) perceived specific competencies.

Despite these encouraging results, it needs to be acknowledged that the order of presentation for the MSES was not counterbalanced across the two forms during administration to the year 10 students. That is, all participants answered the class version prior to the test version. While it is unlikely that order effects have contributed greatly to these results, in order to replicate these findings in a meaningful manner, future studies should ensure that the administration of the class and test versions is counterbalanced.
Future research might also extend the administration of the MSES to contexts other than the classroom and test environments. For example, other relevant contexts might include “when completing homework” or “when presenting to the class”. These contexts could assess self-efficacy when working alone, without the aid of resources, and also in a context where social or performance anxiety might attenuate students’ self-efficacy.

In conclusion, the high degree of internal consistency demonstrated by the MSES in each context, together with the brevity of the nine-item instrument, makes it an appealing measure for the assessment of class-related and test-related mathematics self-efficacy of middle school students. It is also likely that with appropriate criterial domain adaptations, the MSES would have applications for the valid and reliable measurement of mathematics self-efficacy among junior and senior students, as well as among students outside Australia.

13.2.2 Factor structure and reliability of the Mathematics and Writing Strategies Scales

Results from this study demonstrated that the Mathematics Strategies Scale and the Writing Strategies Scale are each reliable, two-factor instruments. Levels of internal consistency across all factors were high in the current sample.

Correlations between the two factors for each scale were low, suggesting that the factors are independent, which would be expected due to the different natures of conceptual and procedural knowledge on which the scale items were based. This independence, coupled with high levels of internal
consistency and the brevity of the two scales makes them particularly attractive for use in research. A further contribution of these scales is that they can be used among students at any school level to measure their approach to the study of mathematics and writing.

13.2.3 Factor structure and reliability of the Sources of Writing Self-efficacy Scale (SoWSES)

Results from this study confirmed the four factor structure of the SoWSES and supported Bandura’s (1997) proposal that self-efficacy is sourced by enactive mastery, vicarious learning (modeling), social persuasion and physiological state experiences. The levels of internal consistency of these scales is substantial. Coupled with low correlations between the factors, these data suggest that Bandura’s theoretical sources of self-efficacy, at least in respect to writing, are both theoretically unambiguous and statistically distinct.

The development of a scale to measure the sources of writing self-efficacy is an important step forward in self-efficacy research because despite Bandura’s (1997) clear theoretical direction with respect to efficacy sources, no scales to measure these sources in the context of writing have appeared previously in the literature. The utility of these scales to actually predict self-efficacy was tested in models 1A to 1C and while enactive mastery and physiological state experiences consistently predicted writing self-efficacy, results for modeling and social persuasion were mixed. These will be discussed further in relation to the self-efficacy models.
13.2.4 Descriptive statistics and internal reliability indices of all established scales administered at time 1

When the data for the Multidimensional Perfectionism Scale (MPS) (Frost et al., 1990) was screened, it was apparent that over 7% of the data were missing. This loss of data was systematically confined to two items from the Parental Criticism subscale: “As a child I was punished for doing things less than perfect” and “My parents never tried to understand my mistakes”. While there are no other reports in the literature of students objecting to these items, it might be that some students in the current sample did not like the suggestion that their parents may be overly critical, or did not choose to disclose this fact.

Separate factor analyses were conducted to compare the facture structure of the MPS using 1) columnwise means substitution and 2) omitting the missing data records. These solutions were robust and yielded three reliable factors, so columnwise means were substituted in order to retain the sample size for further analysis.

Means, standard deviations and actual ranges for all scales administered at Time 1 were within the ranges reported in the literature. Internal reliability of all scales using Cronbach’s Alpha was also satisfactory with all $\alpha$s greater than .70.

13.3 Tests of the proposed competing performance models in English and mathematics

While it seems clear from the results and the summary table (Table 27, p.193) that students final year 10 grades in both English and mathematics are best explained by the self-efficacy models for approach copers and combined
copers, followed by the positive psychology model, a discussion of each of the models is presented below.

### 13.3.1 Self-efficacy based models of performance

Competing models of performance in year 10 English and mathematics based on self-efficacy theory were analysed by the type of coping orientations students have in relation to school demands. While the literature has typically referred to a dichotomy of problem or solution-oriented coping versus affective or emotion-focused coping (Lazarus & Folkman, 1984), many people will utilise both types of coping strategies simultaneously to the same degree (Folkman & Lazarus, 1985). Accordingly, three clusters were extracted from the current data: approach-oriented copers (high on approach coping and low on avoidance coping), avoidance-oriented copers (high on avoidance coping and low on approach coping) and combined copers (high on both approach and avoidance coping). From the current data, it is not possible to determine why students use particular levels of coping strategies, however, a discussion of the self-efficacy based performance models reveals that they are important in predicting students' academic performance.

#### 13.3.1.1 Approach-oriented copers

The greatest contributions to year 10 performance in both English and mathematics among approach copers were made by past (year 9) performance. The observation that past performance was the greatest contributor to future performance in the current data is not inherently enlightening, in that it does not directly inform strategies to improve performance, beyond the rather circular suggestion of 'improving performance to improve performance'.
However, what this finding does suggest is that future research needs to focus on factors that contribute to performance early on in students' academic lives—perhaps even in their primary school experience. By focusing research investigations at an early primary school level, it might be possible to determine which dispositional and situational factors contribute to early performance before well-established past performance/future performance patterns are established. A greater understanding of the situational and dispositional factors that contribute to early performance levels will then inform strategies to improve performance in the later years, and may help to break cycles of poor performance/poor future performance.

Large contributions to performance in English and mathematics were also made by anxiety and self-efficacy among approach copers. In terms of self-efficacy, the greatest contribution to English grades was by class self-efficacy, while the greatest contribution to mathematics grades was by test self-efficacy. These results can be interpreted as providing validity for the measurement of self-efficacy by context. The contribution of self-efficacy to year 10 grades for approach copers was significant from both class self-efficacy and test self-efficacy for year 10 grades in English, but only test self-efficacy contributed to year 10 mathematics grades. It seems that for these students who take a proactive approach to coping with school demands (e.g., 'take control of the situation', 'see it as a challenge' 'try to get rid of the problem'), it is a sense of generalised competence (in terms of context) that contributes to English grades, but a more specific perception of competence in mathematics tests that contributes to high mathematics grades.
It might be that proactive copers view mathematics tests as the main obstacle they have to overcome in the pursuit of high performance, rather than a combination of their tests and their classwork, and that these students see mathematics tests in particular 'as a challenge'. It might also be that these students feel they are best able to be proactive, or 'take control', in mathematics tests, rather than in mathematics class. Perhaps approach copers feel that the mathematics test is the appropriate forum in which they can solve problems and demonstrate what they are able to accomplish.

In English, however, approach copers' year 10 English grades were informed by both writing test self-efficacy and, to a larger extent, writing class self-efficacy. This result, taken in conjunction with that for mathematics grades, might suggest that approach copers see the roads to success as somewhat subject specific arterials. While approach copers might see the mathematics test as the best forum in which they can demonstrate competence, these data might indicate that these same students view English classes, as well as English tests as important in their proactive pursuit of high grades. It might be that approach copers consider the value of classwork in English and in mathematics quite differently. If this is the case, these data might be taken to indicate that approach copers consider competence in English classes to be important, but competence in mathematics classes not so important.

These possible differences in the value of classwork might be explained by the different natures of English and mathematics curricula. It might be that approach copers, who aim to 'take control' of their school problems, or 'see them as a challenge', consider the in-depth discussion of
writing that takes place in the classroom as beneficial for their ability to take control and contribute positively to final English grades. While not directly implied by the current data, it also seems possible that some students might under-value the conceptual discussions of mathematics that occur in the classroom, and instead focus on their own rote learning in order to perform in a test situation.

Taken together, results demonstrating the contributions of anxiety and self-efficacy to performance indicate that for students with an approach coping orientation, low levels of anxiety and a favourable perception of one's competence predict good grades. While the negative path in both the English and mathematics model from anxiety to performance was contrary to expectations among approach copers, past research has typically reported a negative relationship between these constructs (e.g., Pajares & Graham, 1999; Pajares & Kranzler, 1995; Pajares & Miller, 1994; Pajares & Valiante, 2001; Pajares et al., 2000). However, it was argued in this thesis that anxiety would not be negatively related to performance for approach-oriented copers. Contrary to expectations, approach-oriented coping did not transform debilitating anxiety into a motivating vehicle for enhanced performance or enhanced self-efficacy. Approach-oriented coping, then, does not appear from these data to inoculate students from the effects of mathematics anxiety, nor writing anxiety.

In terms of other components in these models for approach copers, as well as contributing to year 10 grades, final year nine grades positively contributed to enactive mastery in both the writing context and the
mathematics context. In each context the beta weights were highly similar - except for past (year 9) grade on enactive mastery, which was lower in English than in the mathematics model. While these results support Bandura’s (1997) proposal that past performance data informs enactive mastery, clearly there are other factors not identified in this study that also contributed to this source of self-efficacy. One such factor may be the subjective ways in which students interpret their past grades.

For instance, the differential subject effects of past performance on mastery might have occurred because, as Bandura argued, enactive mastery is more than just raw past performance data. Bandura argued that the ways in which past performance data are cognitively processed also impact upon their integration into the mastery store. For instance, some students might account for difficulty or effort expenditure when assessing past performance, while others might discount mediating influences. The current data can be interpreted to suggest that enactive mastery in the mathematics domain is particularly influenced by raw past performance data, since actual past grades contributed strongly to perceptions of mastery. In the writing domain however, it might not be raw past performance data, but rather the interpretations of past performance data, that is important in the development of enactive mastery, since actual past grades in English made only a moderate contribution to writing mastery. It might be that the ways in which different students interpret the same grade is more influential in the development of writing mastery. For instance, while some students might interpret a B grade favourably, other students might view
a B grade as akin to failure. Future research should test this assertion by asking students to rate how favourably they consider particular grades.

Of Bandura’s (1997) four proposed sources of self-efficacy, three sources – high levels of enactive mastery, low levels of modeling and low levels of physiological state experiences (operationalised here as anxiety, see Chapter 3) - contributed to both class self-efficacy and test self-efficacy in English for approach copers. In the mathematics model, no source of self-efficacy predicted class self-efficacy for approach copers, and only enactive mastery and low levels of anxiety contributed to mathematics test self-efficacy. Contrary to Bandura’s (1997) proposal, social persuasion made no significant contribution to self-efficacy in either the mathematics or in the writing domain for approach copers.

Evidently for those students who tend to take a proactive approach to school problems, encouragement from others does not impact significantly on self-perceptions of competence in mathematics or in writing. It might be that these students rely primarily on themselves not only to solve their own problems, but also to source their own self-perceptions. This suggestion is supported by the observation that for approach-oriented copers it is the internal sources of self-efficacy (i.e., high levels of enactive mastery and low levels of anxiety) that most strongly influence self-efficacy. In the English model, where modeling did contribute negatively to self-efficacy, its effects, while significant, were weak and of little practical importance.

Despite the contributions of mastery, anxiety and modeling to self-efficacy, most of the variance in mathematics and writing self-efficacy in both
the class and the test contexts remained unaccounted for. This result is surprising, since the models that were tested were drawn directly from Bandura’s (1997) theory regarding the sourcing of self-efficacy. The validity of social persuasion as a source of self-efficacy is of particular concern because not only did it fail to predict self-efficacy among approach copers in the current study, it also failed to predict writing self-efficacy in either the class or the test context in the Pilot study (see Chapter 9).

While the theoretical arguments for social persuasion as a source of self-efficacy are internally consistent, these contentions have not been supported empirically in the current data. It might be that these items are not indicative of the sources of self-efficacy or, indeed, other factors may be more influential. Future research should investigate the items that form the social persuasion components of the two self-efficacy source scales used in this study in order to determine whether the failure of these items to predict self-efficacy is due to semantic problems, psychometric issues, or whether it is a reflection of the theoretical rationale concerning the sources of self-efficacy. One investigative method that might shed light on the latter possibility may be to conduct qualitative studies whereby students are asked to respond to open-ended interview questions such as “if you were to assess how good you are at mathematics/English, what sorts of things would you base this judgment on?” Results of such qualitative studies could then inform larger-scale quantitative studies based on interpretations of students interview data.
13.3.1.2 Avoidance-oriented copers

For avoidance copers, a lower percentage of the variance in year 10 performance was explained by the variables in the model for English (45%) than for mathematics (60%). This gap in variance explained was far greater than was observed between the models for English and mathematics among approach copers, and in addition, there was more variance explained in the models for approach copers than for avoidance copers. These data can be interpreted to suggest that the predictive utility of social cognitive variables for year 10 English and mathematics performance differ as a function of coping style, lending some validity to the methodology adopted in this study of comparing models by coping style.

Like their approach-coping counterparts, the greatest contribution to year 10 grades for avoidance copers was year 9 grades. Taken together, these results can be interpreted to suggest that irrespective of coping orientation, it is important to understand what leads to the development of the past performance / future performance cycle in the early school years, in order to inform practices aimed at breaking poor performance / poor performance cycles, and in so doing, encouraging high performance / high performance cycles.

Also like the approach copers, anxiety was a substantial contributor to year 10 grades for avoidance copers, but self-efficacy was less influential. These data support the negative relationship proposed between anxiety and performance for avoidance copers, which, discussed in relation to approach copers, is the typical relationship reported in the literature. In terms of the lesser influence of self-efficacy on performance among avoidance copers, these
data might be taken to suggest that students who 'hope and pray' for their problems at school to disappear do not believe that competence necessarily yields good grades. This interpretation is certainly consistent with the coping style of students who appear to believe that external and existential phenomena might solve their problems, above internal conditions such as competence.

In terms of the other variables in the models, final year nine grades also positively contributed to enactive mastery in the writing context and in the mathematics context for avoidance copers. As with the models for approach copers, these results also support Bandura's (1997) proposal that past performance data partially informs enactive mastery. However, substantial proportions of the variance in enactive mastery in both the mathematics context (74%) and the writing context (82%) remained unexplained. While past grades are clearly influential in the development of enactive mastery, it is clear that further factors are also involved. As discussed in the previous section, one of these factors may be the way in which past grades are interpreted. Also as suggested earlier, it is important that future research concurrently assess the students’ attitudes towards their particular grades as students’ attitudes about the same grades may substantially differ. Nevertheless, taken in conjunction with results for approach copers, these results suggest that past performance data contributes to a sense of mastery irrespective of students’ coping orientations.

As predicted, enactive mastery made a positive contribution to mathematics self-efficacy both in the class and test context but only to writing self-efficacy in the test context among avoidance copers. There was no
contribution of enactive mastery to writing class self-efficacy among these students. Neither was there a significant contribution of writing anxiety to writing self-efficacy in the class context, but a relationship between anxiety and mathematics self-efficacy was present in the mathematics class context.

Evidently for avoidance copers, the ways in which self-efficacy is sourced is somewhat subject specific. While a sense of mastery contributed to mathematics self-efficacy cross-situationally, students who simply ‘hope for a solution to appear’ for their school problems did not appear to utilise mastery information when making judgments of their writing competence within the classroom. Writing self-efficacy in the classroom did not contribute to English grades, unlike its test-specific counterpart, so it may be that for avoidance copers, self-perceptions of competence in the English classroom are just not particularly salient. These data can be interpreted to suggest that coping style is an important arbiter of the effects that self-efficacy can have on performance outcomes, in terms of isolating the context in which self-efficacy judgments are likely to be informative. If writing class-self-efficacy is not important enough to inform final English grades, then this might be why writing self-efficacy in the classroom itself is not well sourced by traditional social cognitive informants.

While modeling negatively predicted test self-efficacy for both mathematics and writing, its effects were weak and of little practical utility. Nevertheless, the results indicate that the students in this sample who did take notice of similar models actually reported lower self-efficacy in both English and mathematics tests. One explanation for these results might be that
avoidance copers feel academically inferior to the peers whom they model, as a result of their ineffectual avoidance coping strategies. It might be that these students do appreciate and acknowledge that ‘keeping their fingers crossed’ is not an effective way to manage demands, but remain oriented towards such strategies in the absence of any approach coping strategies.

Like their approach-oriented coping counterparts, social persuasion failed to make a contribution to self-efficacy among avoidance copers. The failure of these external sources of self-efficacy to make substantial, or any, impact on self-efficacy in these models is not surprising when the typical tendencies of avoidance copers are considered: ‘feel miserable’, ‘keep my fingers crossed that it will go away’, ‘hope or pray for it to go away’. Clearly these types of strategies are not focused on outward solutions, which are characteristic of modeling (e.g., ‘people I look up to are good at maths’) and social persuasion (e.g., ‘my teacher has picked me out as having good maths skills’). Thus it is recommended that teachers and counselors should be aware of students with these avoidance coping tendencies, particularly if these students have received poor grades in the past, because it is possible that their inward focus, and lack of proactive strategy might foster self-fulfilling cycles of poor performance. Future research should assess the direct effects on performance of the three coping orientations identified in this study so that the potential for such self-fulfilling cycles of poor performance might be averted early in the student’s school life.
13.3.1.3 Combined copers

Models of English and mathematics performance for combined copers were explored because approximately one-third of participants employed equal proportions of approach- and avoidance-oriented coping strategies. For both models, the greatest contributors to year 10 grades were year 9 grades, class self-efficacy and anxiety.

In the English model, the greatest contributor to year 10 grades was class self-efficacy. While final grades in English and in mathematics were significantly predicted by both class and test self-efficacy, major differences in the sourcing of self-efficacy emerged between combined copers and their approach- and avoidance-oriented counterparts.

For the mathematics models, no significant contribution to self-efficacy in either the class or test context was observed for enactive mastery among combined copers. While paths from enactive mastery to both mathematics class and test self-efficacy were significant, they were not of the large magnitude ($\beta=.17$ and $\beta=.25$) that would be expected from Bandura's (1997) theory. Furthermore, enactive mastery in the mathematics model had a far smaller effect on self-efficacy in the class and test contexts than did mathematics anxiety ($\beta=-.52$ and $\beta=-.62$). These results are counter to Bandura’s (1997) proposition that mastery is the single greatest informant of self-efficacy perceptions.

Why enactive mastery would fail to contribute largely to mathematics self-efficacy or at all to writing self-efficacy for combined copers is unclear. One possibility is that combined copers are uncertain about the authenticity of
their past performances. Combined copers at least appear uncertain about the best ways to approach their current problems at school, evidenced by them employing both approach and avoidance coping strategies – on the one hand ‘keeping fingers crossed that it will go away’ and on the other ‘taking a positive approach to the problem’. It may be that these students neither trust the efficacy of their current judgments, nor the authenticity of their judgments of past performances. If this is the case, it might well follow that combined copers may neither integrate past performance data into a mastery store, nor utilise mastery in the assessment of self-efficacy. Future research should assess perceived authenticity among people with these undifferentiated coping tendencies. While Pajares (2001) reported a higher level of perceived authenticity among boys than among girls, it is now important to assess whether coping style is also a factor in whether one believes one’s attainments are deserved.

The idea that combined copers do not rely on the authenticity of their own judgments is supported by the observation that social persuasion significantly predicted both class and test self-efficacy in both the English and mathematics models for combined copers, whereas it failed to contribute to either model for the approach- or avoidance-copers. Also, modeling, which contributed only weakly in the approach- and avoidance-oriented coping models contributed substantially to self-efficacy in both class and in tests in the English and mathematics models for combined copers. Clearly students who utilise both approach and avoidance coping strategies concurrently appear to rely more heavily on external sources of efficacy information than do their
counterparts with clearly demarcated approach or avoidance coping tendencies. It is important therefore that school teachers and school counselors become more aware of their students’ coping tendencies because these data can be interpreted to indicate that differences in coping style can influence the ways in which self-perceptions of competence both in English and in mathematics inform final grade outcomes.

13.3.1.4 Summary of the self-efficacy models

Of the self-efficacy models tested across two domains (English and mathematics) and three coping orientations, it appears that a combination of past grades, self-efficacy and anxiety predict final year 10 grades. While the observation that past grades are predictive of future grades in these models is not inherently enlightening, this finding does highlight the importance of determining other situational and dispositional variables that contribute to early performance patterns, because the manipulation of these latter variables might improve early performance outcomes, and thus contribute to improved performance outcomes in later years.

The impact of anxiety on performance was uniformly negative across the three coping orientations, despite the prediction that anxiety would not contribute negatively to performance among approach copers. This latter result is at odds with Bandura’s (1986) suggestion that efficacious coping styles might transform the debilitating effects of anxiety. At least according to the current data, anxiety in both English and in mathematics contributes negatively to performance, irrespective of students’ coping orientations. Clearly it is important that students are taught methods of bringing such debilitating anxiety
under control. Such methods might include current cognitive behavioural therapy techniques used in relation to childhood and adolescent anxiety disorders (c.g., Barret, Duffy, Dadds & Rapee, 2001; Ginsburg & Drake, 2002; Lowry, Hayley, Barret & Dadds, 2001; Manassis, Mendlowitz, Scapillato, Avery, Fiskenaum, Freire, Monga & Owens, 2002).

Differential effects on performance of class and test self-efficacy were observed as a function of subject (English vs mathematics) and as a function of coping orientation. These results can be interpreted as providing validity for the context and context specificity of self-efficacy, the predictive utility of employing content and context specific self-efficacy measures, and the validity of investigating the effects of self-efficacy on performance as a function of coping style.

13.3.2 Goal based models of performance

Two goal-based models of performance were tested in English and in mathematics: a target goal model and a purpose goal model. These will each be discussed separately below.

13.3.2.1 Target goal models of performance

The variables in the target models of performance did not explain substantial percentages of the variance either in final year 10 English grades (36%) or in final year 10 mathematics grades (45%). These results can be taken to suggest that while students' desired grade outcomes have some influence on actual outcomes prior to the VCE, there are further variables of influence that were not accounted for in these target goal models.
Nevertheless, higher mathematics and English grades were predicted by the setting of higher year 10 grade goals in mathematics and in English respectively, supporting earlier research by Hollenbeck and Brief (1987), Locke and Latham (1990), Phillips and Gully (1997), Zimmerman et al. (1992) and Zimmerman and Bandura (1994) who each observed that grade goals contributed significantly to grade outcomes. The current results can be taken to indicate that outcome intentions are, in part, reliable predictors of actual outcomes in education, highlighting the need for educators to understand more about the factors that underlie outcome goal setting — in this instance, the setting of grade goals.

While earlier educational studies have focused on the contribution of self-efficacy to grade goal setting (e.g., Zimmerman et al., 1992), the current study was distinctive because it concurrently assessed the contributions to grade goals of context specific self-efficacies, that is, class self-efficacy and test self-efficacy. In the current study, the greatest contributor to year 10 grade goals in both mathematics and writing was test self-efficacy (in mathematics and writing respectively), suggesting that students who consider themselves to be competent in test situations set high grade goals. This may be because students assume that it is only, or mostly, test results that contribute to grades on their report cards.

While mathematics and writing class self-efficacy were also important predictors, respectively, of mathematics and English grade goals, their respective effects were less than those of their test-specific counterparts. These results highlight further the importance of specifying context when using self-
efficacy as a predictor variable and provide direct empirical evidence of the different predictive ability of self-efficacy when considered in multiple contexts.

A sense of optimism contributed to final mathematics grade goals, with more optimistic students setting higher grade goals, but there was no significant contribution of optimism to English grade goals. While the relationship between optimism and grade goals in mathematics was not strong, these data nonetheless provide some support for the contention that the optimistic grade expectancies observed by Jones et al. (1995) might be attributed in part to dispositional optimism. Considered in conjunction with the fact that the current data also revealed a strong relationship between higher grade goal setting and higher grades in mathematics, it might be of some benefit to students if both teachers and parents foster optimistic thinking among students of mathematics.

Why optimism would contribute to grade goals in mathematics but not in English is not entirely clear. It may be that the students in this study were more certain of their abilities (whether these be good or bad) in English than they were in mathematics, and therefore relied more on their perceptions of actual competence (self-efficacy) in English, than on more existential expectancies of optimism. Future studies need to assess how confident students are about their self-efficacy judgments. Such 'self-efficacy for self-efficacy judgments' might simply ask students how certain they are that their judgments of their mathematics/writing abilities are accurate.
Despite being weak, the significant relationship between optimism and mathematics grade goals observed in these data is important as it provides the first empirical evidence that optimism does have an effect on future thinking in the context of education. While Pajares (2001) has recently reported relationships between optimism and different types of purpose goals, the current data are the first to have assessed how optimism relates specifically to the actual outcome goals that students set for themselves. The fact that optimism was demonstrated to be positively related to grade goal setting in this study, at least for mathematics, also supports Scheier and Carver’s (1985) proposals about the facilitative behavioural effects of optimism.

Finally, these models indicate that students who used a high degree of conceptual strategies when working mathematics problems or when writing essays set high mathematics and English grade goals. These results are in the predicted direction and, taken in conjunction with the positive relationships between grade goals and grades in both English and mathematics, they support Hecht’s (1998) argument that the use of conceptual knowledge facilitates performance. It must be acknowledged, however, that the strength of the relationship between conceptual strategies and grade goals was not strong, indicating that while of some utility to the setting of grade goals, the use of conceptual strategies is not paramount to this latter process.

A negative relationship between the use of procedural knowledge and grade goals was hypothesized following Jones et al’s (1995) observation that students who set lower grade goals tend to focus on procedural rote learning strategies. This negative relationship was not observed in the current data either
for English or for mathematics. In fact, a positive relationship emerged between the use of mathematics procedural strategies and mathematics grade goals, while there was no relationship between the use of English procedural strategies and English grade goals. One explanation for these results may be that these students may have believed in the utility of both these types of strategies for performance in mathematics, while they saw no benefits of procedural strategies for English performance.

In mathematics, perhaps these students saw benefits in the rote learning of mathematical procedures, particularly if their conceptual knowledge of mathematics was not well consolidated. Also, it is possible that a strong knowledge of mathematics procedures, rather than a reliance on conceptual understandings, may be beneficial in mathematics testing situations where time is constrained and students need to work quickly through their exam papers.

Certainly it is not unusual to see mathematics students trying to memorise formulae in the last moments before an examination and a reliable knowledge of procedures, rather than attempting to work out mathematics solutions from theorems, may benefit students when time is against them. So while it can be argued that students need a conceptual understanding of their subjects, it is also true that knowing and using procedures, at least in the case of mathematics, may also be beneficial for performance. Therefore, while the positive relationship between the use of mathematics procedures and mathematics grade goals was not initially expected, it does support Hiebert and
Lefevre’s (1986) argument that procedural knowledge does not always hinder performance.

In terms of the non-significant relationship between writing procedures and English grade goals observed in the current data, one explanation for this finding might be that writing procedures are not emphasised in English assessment at middle and senior high school levels. For instance, the task of writing an English essay, whether in class or in an examination, is unlikely to be particularly facilitated by a student’s focus on the rules of English grammar as these would, or should, have been assimilated in lower grades. English performance at the middle and senior high-school levels is expected to encompass good knowledge of grammatical rules and form, but these are assessed indirectly through creative or polemic essay writing, rather than directly through punctuation exercises.

In conclusion, these target goal models revealed that students’ self-beliefs and knowledge strategies predict grade goals for both English and mathematics, and that grade goals themselves partially predict final grades for these two subject areas. Importantly, differences between the final models for English and mathematics performance highlight the need to assess the informants of grade goals on a subject by subject basis, as it may be that the use of procedural strategies and also dispositional optimism are more important factors with regards to goal-setting in some subjects but not others.

13.3.2.2 Purpose goal models

The purpose goal models of year 10 English and mathematics performance explained 40% and 31% of the variance respectively in final year
10 English and mathematics grades, suggesting that in the current sample, performance can be explained as reliably by students' desired grade outcomes (grade goals) as by the purposes students have for learning. Clearly, like the target goal models, there are factors beyond purpose goals that are influential in performance outcomes. Nevertheless, the current results indicate that since purpose goals are influential over performance, it is important to understand how students' purpose goals develop in order to enhance performance outcomes.

One factor that was investigated in terms of its contribution to purpose goals was gender. While there was no significant contribution of gender to either mastery goals or performance-avoid goals, gender did contribute negatively to performance-approach goals, favouring girls. This result, and its reasonable effect size (β=.36) can be taken to suggest that being female is an important contributor to the performance-oriented goal focussed on normative performance. In the English model, gender was in fact the only significant contributor to this particular purpose goal, but in mathematics, being female combined with past grades in mathematics to explain a modest 15% of the variance in performance-approach goals. Given the respective beta weights of the paths from gender (β=.36) and past mathematics grade (β=.31) to performance-approach goals, the variance explained by these two factors largely overlapped.

Educators committed to equal opportunity principles in the classroom may find heartening the observation that gender was not an important factor in explaining why some students are motivated by the need to avoid appearing
incompetent, particularly in relation to mathematics. Guzetti and Williams (1996) observed that male sex-typing of science-based subjects is stubbornly persisting and thus it would not be unreasonable to expect that such a phenomenon might result in some girls focusing on performance-avoid goals. There is no way of knowing from the current data whether the students in this sample held sex-based stereotypes in relation to their school subjects, however, many of the schools from which the students in this sample were drawn were single-sex schools, which may foster an environment where subject-based sex-typing is not a salient issue.

While gender did not contribute to mastery goals or to performance-avoid goals among the current year 10 sample, past grades in year 9 English and in year 9 mathematics contributed positively to mastery goals and past year 9 English grades contributed negatively to performance-avoid goals. While effect sizes indicate that factors other than past grades contribute to the development of a mastery goal orientation, it seems from those data that higher past grades are reasonably strong motivators in both English and mathematics domains. These data can be interpreted as suggesting that as students strived to learn and to master their English and mathematics material, performance levels benefited from this purpose goal. Thus, the benefits of mastery goals for learning and performance that were espoused by Boekaerts (1993) were evident in the current data for Australian students.

In terms of the contribution of purpose goals to future (year 10) performance, exploration of the contribution of performance-approach goals to year 10 English and mathematics performance revealed a positive relationship
between the motivation to outperform others and final grades in mathematics, but this relationship was not observed in the English domain. One reason why competitiveness appears to facilitate performance in mathematics, but not in English, might involve subject-related differences in the value that students place on normative performance. That fact that performance-approach goals were important to performance in mathematics, but not in English, for these students, perhaps indicates that students believe it is important to surpass others in mathematics, but that it is not particularly important to do so in English.

There are many reasons why students might place different value on normative performance in different subject areas. Students may rate certain subjects as more important for future study or career alternatives, and thus outperforming others in such subjects may be important in terms of the competition for study places or employment. Alternatively, the different values on normative performance across different subject areas might reflect broader societal views about the importance or prestige of normative success in certain subjects. As our world becomes increasingly more technologically oriented, this might well explain differences in the importance or prestige of normative success in mathematics. Notwithstanding this, replication of these findings in future samples is clearly necessary due to the exploratory nature of the path from performance-approach goals to performance in these models.

Exploration of the contribution of performance-avoid goals to year 10 English and mathematics grades revealed negative contributions in both subject domains. As motivation to avoid the demonstration of incompetence increased, grades decreased. These results might suggest that through focusing on
performance-avoid goals, these students detracted their attention away from facilitative goals associated with better academic outcomes, such as mastery goals.

It also seems likely that for students whose goal is to avoid looking incompetent, other variables that commonly debilitate performance, such as anxiety and low self-efficacy might also be present. Presumably students who espouse performance-avoid goals, espouse them because they believe in the possibility, indeed the likelihood, of appearing incompetent. It seems consistent to propose that students who do believe there is a likelihood they may appear incompetent possibly also harbour impoverished self-efficacy and high levels of anxiety.

As self-efficacy perceptions were also contributors to the target goals discussed in the previous models, those results, taken in conjunction with results of the initial self-efficacy models and the current purpose goal models, might be interpreted to suggest that an integration of these models might enhance both statistical outcomes and theoretical interpretation with regards to school performance. Such “intertheoretical crosstalk” (Pajares, 1996, p. 569) is consistent with Pajares’ argument that the mergence of constructs from theoretically consistent paradigms may increase understanding of the complex relationships that may exist “between self-efficacy and its motivational cousins” (p.570). Thus is the year 11 study to follow, as well as re-testing the current performance models to assess their robustness in the current sample during their VCE, performance models in English and mathematics based on an integration of those current models will also be proposed and tested.
13.3.3 Models of performance based on positive psychology

Models of performance in English and mathematics based on positive psychology were proposed that predicted indirect effects of optimism and active perfectionism on performance through mastery goals, self-regulatory skills and target (grade) goals. The variables in these models explained 59% of the variance in year 10 English performance and 55% of the variance in year 10 mathematics performance.

The two positive psychology variables, optimism and active perfectionism explained 18% and 16% of the variance respectively in self-regulatory skills in English and mathematics, suggesting that students with a greater sense of well-being engaged in more productive and effortful behaviour geared towards academic success. These facilitative behavioural effects of optimism and of active perfectionism are to be expected – the former being in line with Scheier and Carver’s (1985) description of optimists as those whose behaviours are geared towards the attainment of goals, and the latter being in line with Lynd-Stevenson and Hearne’s (1999) argument that the active component of perfectionism can have adaptive qualities. It must, however, also be recognised that a substantial proportion of the variance in students’ use of self-regulatory strategies remained unaccounted for in these models. Nevertheless, further contributors to self-regulation will be discussed in the self-regulatory model to follow.

It was expected that active perfectionism, with its adaptive nature, would also be related to the target and purpose goals that spur high academic performance. However, active perfectionism was related neither to mastery
goals nor to final year 10 English or mathematics grade goals in the current sample. Evidently, the effects of active perfectionism are behavioural, not motivational. This might be because the setting of high standards, which is characteristic of high active perfectionism, relates to the articulation of actual outcomes, rather than to why one might desire a particular outcome.

Optimism, on the other hand, was positively related to both mastery goals ($\beta=0.38$ [English] and $\beta=0.36$ [mathematics]) as well as to final year 10 English grade goals ($\beta=0.41$) and final year 10 mathematics grade goals ($\beta=0.41$), indicating that students' actual goal setting as well as the reasons they have for setting particular goals in part derive from a conviction that these goals can be achieved.

While Pajares (2001) conceptualised the relationship between optimism and mastery goals in the opposite direction to that proposed, and demonstrated, in the current study, the current results support Scheier and Carver's (1985) theory that optimism is a positively motivating construct, at least within the realm of school performance. Rather than mastery goals contributing to optimism, as Pajares proposed, it might be that the high grades associated with mastery goals in part confirm the validity of students' extant optimism thinking.

Whatever the case, it seems clear from the current results that these two positive personality factors, optimism and active perfectionism should be nurtured in the classroom as their behavioural effects are quite facilitative for performance in English and in mathematics. Optimism, particularly, made a substantial indirect contribution to performance both in English and
mathematics of $\beta=.45$. When considered in conjunction with its indirect effect on performance through grade goals, dispositional optimism appears to one factor that has quite broad-reaching positive implications for performance.

While the indirect effects of active perfectionism on performance were not strong, they were significant and positive. The fact that active perfectionism contributed positively to performance helps to confirm the validity of considering this aspect of perfectionistic thinking as a positive, rather than negative, personality trait. In this sense, this study has made a valuable contribution to the field of positive psychology and has provided future researchers with another avenue of inquiry in relation to the study of human accomplishment.

13.3.4 Skill based models of performance

The final performance models tested in the current year 10 sample were those based on self-regulatory skills and cognitive strategies. While the variables in the self-regulatory models explained moderate percentages of the variance in English performance (36%) and mathematics performance (56%), the cognitive strategies variables explained on very modest amounts of variance (10% for English and 15% for mathematics).

13.3.4.1 Self-regulatory skill based models

As it has been previously reported (see Ablard & Lipschultz, 1998) that students' usage of self-regulatory strategies has positive implications for school performance, it is important to understand the factors that dispose some students to use these range of academic strategies. While Schunk and Zimmerman (1994), Zimmerman et al. (1992) and Zimmerman and Martinez-
Pons (1990) each demonstrated that students’ self-efficacy for self-regulation made direct positive contributions to final grades, it was proposed in this thesis that students’ purpose goals and their past grades would also contribute to students’ self-regulation.

In terms of the contribution of purpose goals to self-regulation, students mastery goals and their performance-approach goals each contributed positively to self-regulation, but there was no contribution to self-regulation of performance-avoid goals. The current results replicate several others (e.g., Ablard & Lipschultz, 1998; Meece et al., 1999; Pajares, 2001; Pajares et al., 2000; Pintrich, 1996; Wolters, 1996) with respect to the relationship between mastery goals and self-regulatory skills. If, as Turner et al. (1998) argued, students with mastery goals self-regulate their learning in order to address previous errors, the positive relationship between self-regulatory skills and performance observed in the current data indeed indicate that the self-regulatory efforts of students in the current sample have been successful. Clearly then, according to the current results, it would be beneficial for students’ learning and their performance for teachers and school counsellors to encourage the mastery goals that spur facilitative self-regulatory practices.

The current data add to a limited body of findings on the relationship between self-regulation and performance goals, however some differences have emerged between these current results and those reported by Pajares (2001) and Pajares et al. (2000). In the current study, there was no significant contribution to self-regulation by performance-avoid goals. Evidently among the current sample of students, the motivation to avoid looking incompetent
does not propel self-regulatory academic behaviour. The lack of any significant relationship observed in the current study might be explained by the fact that performance-avoid goals have a somewhat negative, or avoidant, focus, while self-regulation encompasses a certain positivity, or approach-oriented outlook. Due to their different foci, perhaps we should not expect these two constructs to be related. While this result is consistent with Pajares’ (2001) findings, and the findings from Pajares et al.’s (2000) first study, it contradicts Pajares’ et al.’s second study in which a small but significant negative correlation was observed between performance-avoid goals and self-regulation. It is unclear why a significant relationship was found between these variables in Pajares et al.’s second study. Certainly this significance does not appear to be a function of the sample size, which was not excessively large (N=281). As research into the relationship between self-regulation and Middleton and Midgley’s (1997) tri-partite model of purpose goals is in its infancy, it is clear that further studies are required in order to clarify the reliability of the relationship between performance-avoid goals and self-regulation.

In the current study, performance-approach goals made a positive contribution to self-regulation. While Pajares (2001) and Pajares et al. (2001) also reported positive correlations between these constructs, the effect size in the current study well exceeded those reported by Pajares and Pajares et al. As discussed in relation to performance-avoid goals and self regulation, it is apparent that further research is required to help clarify these limited findings. Nevertheless, the current results can be taken to suggest that self-regulation is in part driven by students’ desires to outperform their peers. This relationship
may have occurred because students in this sample who espoused these performance-approach goals saw the road to normative success as partly derived through their own application. Taken in conjunction with the results for mastery goals, the current results can be interpreted to suggest that approach-oriented purpose goals (i.e., mastery goals that are oriented towards approaching self-referenced success and performance-approach goals that are oriented toward approaching other-referenced, or normative, success) combine to effect facilitative self-regulation at school. Since mastery goals have also been demonstrated to be directly related to English performance, and performance-approach goals have been demonstrated to be directly related to English and mathematics performance, clearly these are two purpose goals that students should be encouraged to adopt.

As well as the contributions of these purpose goals to self-regulation, final year 9 grades in English and in mathematics, as predicted, also contributed positively to self-regulation. These data can be interpreted to suggest that good grade outcomes are indeed somewhat motivating in themselves, as they appear in the current sample to have partly driven students future efforts towards the pursuit of further good grades. It is important to establish the processes through which past grades contribute to future grades because, as discussed in relation to the self-efficacy models, the observation that past grades predict future grades is, in itself, not particularly useful in terms of informing strategies to increase students' academic performance outcomes. Clearly though, past grades operate through variables other than self-regulation. They also operate through self-efficacy (via enactive mastery)
and, as demonstrated in the current self-regulatory model, they operate through self-regulatory efficacy.

Students' self-regulatory efficacy, or self-efficacy for self-regulation, contributed both indirectly to English and mathematics grades through its effect on self-regulatory skill use, as well as having direct effects on performance. The observation that students' self-regulatory efficacy positively, and strongly ($\beta=.57$) contributed to their use of self-regulatory skills, is consistent with previous findings (e.g., Schunk & Zimmerman, 1994; Zimmerman et al., 1992; Zimmerman & Martinez-Pons, 1990) and can be taken to indicate that the students in this sample tended to use self-regulatory skills in accordance with how well they perceived they could use them.

While this latter relationship might seem obvious, it is important that it is demonstrated empirically as it confirms that these students used their self-regulatory skills in a deliberate and reasoned way, which Bandura (1986) argued in fact characterises skills as self-regulated. The total effect of self-regulatory efficacy on final year 10 English and mathematics grades was $\beta=.62$ and $\beta=.74$ respectively, which were in fact larger even than the direct effects of self-regulation on English and mathematics grades ($\beta=.54$ and $\beta=.58$). Clearly in this sample, self-regulatory efficacy had strong and beneficial effects for school performance, thus it is recommended that teachers focus not only on enhancing students' perceptions of competence with regards to outcomes (i.e., their self-efficacy), but also on enhancing their perceptions with regards to the processes that facilitate good outcomes, namely, their self-regulatory efficacy.
13.3.4.2 Cognitive skill based models

The degrees to which students used strategies based on either conceptual or procedural skills in English and mathematics were loaded onto final grades in English and mathematics respectively to determine their contributions to predicting performance. The use of conceptual strategies contributed to higher year 10 English grades ($\beta=.35$) and higher year 10 mathematics grades ($\beta=.24$). These results support the facilitative role of conceptual knowledge proposed by Byrnes and Wasik (1991), although it should be acknowledged that effect sizes were not large, indicating that the practical relevance of these results is also limited.

Students who utilise conceptual knowledge tend to rely on their understanding of a subject area, rather than on pure rote learning. Educators who spend their time in an effort to impart detailed and integrated knowledge to their students should thus be heartened to see that these results indeed indicate the importance of this teaching style on students’ English and mathematics performance. The fact that conceptual strategies contributed to performance in subject areas as diverse as English and mathematics suggests that the benefits of conceptual knowledge may be relevant across a range of curriculum areas. Future research should thus aim to replicate these findings in other subjects.

In terms of the role of procedural strategies in English and mathematics performance, not only were these results contrary to predictions, but they also differed across the two subject contexts. Firstly, use of procedural strategies in English did not contribute to final year 10 English grades. This
lack of contribution to grades of English procedural knowledge might have arisen because students at this level no longer need to consciously focus on such writing minutiae. While the apparent lack of importance of English procedural knowledge for English performance might be taken to indicate that the teaching of English procedures are redundant at this higher secondary level, it seems unlikely that this would be the case in the primary and lower secondary levels, where the foundations of essay construction skills are laid. Therefore, these results should not be used to indicate the redundancy of instruction in these fundamental skills earlier on in the school experience.

While it was expected that the use of mathematics procedural knowledge would contribute positively to year 10 mathematics performance, the observed relationship was, in fact, negative ($\beta=-.40$). Evidently, the use of memorisation in mathematics hinders mathematics performance, at least at this higher secondary level. This finding can be explained by Byrnes and Wasik's (1991) conceptualisation of the 'procedural bug'. Byrnes and Wasik argued that when students learn through memorisation, errors can occur that are not recognised as incorrect because memorisation is often done at the expense of understanding. It might be that the students in this sample who did use a high degree of procedural knowledge actually memorised incorrect procedures. Alternatively, it might be that these students did memorise their procedures correctly, but applied them to incorrect problem types. The incorrect application of procedures might also be thought of as a procedural bug, since it occurs due to the lack of understanding of the procedure. Finally, it might be that the procedures necessary to execute mathematics tasks at the higher
secondary level are too complex to be reliably memorised. If this is the case, reference to the conceptual underpinnings of these complex procedures should, in theory, improve performance.

At least with regard to mathematics, these results can be interpreted to suggest that students should be discouraged from rote learning formulae in the attempt to perform at a high level. It also seems possible that a reliance on procedural knowledge relating to science-based subjects that rely on mathematical formulae, such as physics and chemistry, might also hinder performance. Future research should investigate these relationships across the broader secondary curricula.

13.4 Conclusions

While several models of year 10 English and mathematics performance have been tested in this study, the greatest explanatory power was seen among the initial self-efficacy based models. With the exception of avoidance copers in English, the self-efficacy models explained large proportions of the variance in year 10 English and mathematics performance (62% to 80%). Clearly the social cognitive variables contained in these models, including past performance, anxiety and self-efficacy are powerful executives, bearing upon future grades, which themselves form part of the enactive mastery that may in turn source future perceptions of efficacy.

One question that remains unanswered in this, and in other, efficacy studies is the conundrum that Pajares (1996) referred to as the "chicken-or-egg" (p.566) question. The reciprocal nature of the self-efficacy / performance relationship proposed by Bandura (1997) makes identification of the genesis of
self-efficacy perceptions a potentially confusing task. While other sources of
self-efficacy have been proposed (i.e., enactive mastery, modeling, social
persuasion and physiological state, or anxiety), their effects on self-efficacy in
this study were mixed. It will be important for future studies to identify
additional sources of students’ early efficacy perceptions, because at least in
the current sample, self-efficacy models do appear to be the best predictors of
English and mathematics performance among each of the competing models
tested.

The goal-based models of year 10 English and mathematics
performance tested in this study explained moderate amounts of the variance in
year 10 English and mathematics performance, and target goals and purpose
goals explained this variance equally well. Nevertheless, motivation in the
form of target goals and purpose goals does not appear from the current results
to be as influential to performance at this mid secondary level as is students’
self-efficacy. It may be that students at this level are yet to see the long term
implications of their academic outcomes, thus focusing more on the ‘here-and-
now’ of what they think they can achieve, rather than on desirable outcomes
and their reasons for wanting these outcomes. It will be interesting to compare
these current goal-based models with those to be re-tested in the VCE in the
study to follow.

The models of year 10 English and mathematics performance based
on positive psychology demonstrated that students’ well-being, in terms of
their optimism and active perfectionism, influenced the goals and self-
regulatory skills that in turn enhanced performance. The current results can be
taken to suggest that students who do have an optimistic outlook and who do set high standards reap the rewards of this positivity in the form of good grades. Indeed, it seems to follow that if students are to reap the rewards of positive thinking, their teachers and their parents should be encouraged to nurture these characteristics in their students and children. This latter recommendation is a significant departure from the tone of earlier studies of perfectionism (e.g., Burns, 1980), in which perfectionism was typically seen as a destructive trait, and thus discouraged. While active perfectionism did not have as strong an influence on performance as did optimism, these results nonetheless add to the emerging field of positive psychology and provide researchers in the area with a further construct of interest for their investigations.

The self-regulatory skill based models explained moderate proportions of the variance both in mathematics and English performance, and, like the self-efficacy models, highlight the power that self-perceptions can have over academic outcomes. In the following study, an integrated model that incorporates the use of self-regulatory skills and self-regulatory efficacy into basic self-efficacy models, such as those presented initially, will be able to assess the concurrent effects that self-perceptions of competence have both on actual outcomes and on the processes that facilitate outcomes.

The cognitive skill based models of performance were not particularly enlightening with respect to year 10 English or mathematics performance. While the use of conceptual knowledge in English and conceptual and procedural knowledge in mathematics did explain small percentages of the
variance in year 10 performance, these were well below the explanatory power of all other models. Nevertheless, use of these constructs within other models, such as self-efficacy models and goal models, may add to statistical and theoretical solutions in fairly simple, yet meaningful ways. This type of "intertheoretical crosstalk", espoused by Pajares (1996, p.688), may help to demonstrate the commensurability and explanatory efficacy of integrating constructs from different paradigms, therefore, as discussed earlier in this chapter, along with re-testing the current models in the study to follow, an integrated model will also be presented and tested, which will include these cognitive skills.

13.5 Chapter Summary

Results from the first three data collection points of the year 9 and 10 study were discussed in this chapter. The self-reported mean grades for year 9 English and mathematics were above those that would have been expected from a normal distribution of scores. Gender differences in year 9 English grades favouring girls supported other literature in the area, but gender differences favouring girls in mathematics were contrary to recent trends. This latter result might reflect the large proportion of girls from girls-only schools in the sample. All scales in the study demonstrated adequate validity and reliability. While over 7% of the data were missing on the Multidimensional Perfectionism Scale, factor analyses revealed that means substitution did not alter the scale structure, while retaining the sample size. Analyses of the models proposed in Chapter 7 were summarised in Table 27 (p.193). Conclusions drawn from these analyses were that self-efficacy models were the
best predictors of performance, both in English and in mathematics. Goal based models, models based on positive psychology and self-regulatory skill based models were moderately predictive of performance. Models of performance based on cognitive skills were not very influential. Taken together, results from these models indicated that a performance model that is an integration of the competing models tested in this study might provide a statistically enhanced and more theoretically complete explanation of English and mathematics performance. Thus is the study to follow, the situational and dispositional indicators of performance that comprised the competing models in the current study will be integrated and tested in twelve months time.
CHAPTER FOURTEEN

STUDY THREE - RESULTS

Twelve months after the mid-year 10 data collection (Study 2), the same students were again administered each of the scales at mid-year year 11, in order to ascertain the robustness of the competing English and mathematics performance models when these students were undertaking their VCE. The results presented in this chapter relate to data from this second administration and thus pertain to end year 10 (Post Time 1 / pre Time 1), mid-year year 11 (Time 2) and end year 11 (post Time 2). The results are divided into three parts:

Part 1:
- the results of the screening of all scales administered at Time 2 (mid-year year 11) along with descriptive statistics and internal reliability indices of all scales administered at Time 2

Part 2:
- results from the re-testing of each of the competing models of English and mathematics performance

Part 3:
- results of the analysis of an integrated model, operationalised in both English and mathematics contexts, which combines variables from the competing models following Pajares’ (1996) suggestion that such integration may provide theoretically enhanced interpretations and statistically enhanced solutions
14.1.1 Data screening of all scales from Time 2

All scales administered at Time 2 were examined for missing values, univariate and multivariate outliers, normality and linearity. There were less than 5% missing data. The phenomenon of missing data that occurred on the Multidimensional Perfectionism Scale (Frost et al., 1990) at the Time 1 data collection (mid-year year 10) did not occur at the current Time 2 data collection (mid-year year 11). As there was no evidence of systematic omission amongst this missing data, all missing values were substituted with columnwise mean values, which is the preferred method according to Tabachnick and Fidell (1996). While this method allows for retention of the entire sample, it does reduce the variance and might possibly attenuate results.

No univariate or multivariate outliers were present in the data on any of the scales. Univariate normality of the dependent variables (end year 11 English and mathematics grades) was confirmed through skewness indices, Kolmogorov-Smirnov tests and histograms. Normality of residuals for the independent variables was assessed by examination of residuals plots for each variable. All residuals were normally distributed. The linearity of the independent variables was assessed by the examination of scatterplots for item pairs. All the data demonstrated acceptable linearity.

14.1.2 Descriptive statistics and internal reliabilities of the scales

Means, standard deviations, actual ranges and internal reliabilities for all scales from Time 2 are presented in Table 40. A correlation matrix is presented in Table 41.
Table 40
Means, Standard Deviations, Scale Ranges and Reliability Statistics for all Scales from Study 3

<table>
<thead>
<tr>
<th>Scale</th>
<th>M</th>
<th>SD</th>
<th>Min</th>
<th>Max</th>
<th>α</th>
<th>Item-total r range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mathematics Anxiety Scale</td>
<td>27.15</td>
<td>9.31</td>
<td>10</td>
<td>50</td>
<td>.94</td>
<td>.61 - .80</td>
</tr>
<tr>
<td>Writing Apprehension Test – revised</td>
<td>25.99</td>
<td>8.41</td>
<td>10</td>
<td>50</td>
<td>.88</td>
<td>.56 - .74</td>
</tr>
<tr>
<td>Maths Self-efficacy Scale (class)</td>
<td>35.12</td>
<td>5.64</td>
<td>10</td>
<td>60</td>
<td>.91</td>
<td>.61 - .72</td>
</tr>
<tr>
<td>Maths Self-efficacy Scale (test)</td>
<td>31.72</td>
<td>6.01</td>
<td>10</td>
<td>60</td>
<td>.92</td>
<td>.60 - .72</td>
</tr>
<tr>
<td>Writing Skills Self-efficacy Scale (class)</td>
<td>32.35</td>
<td>7.56</td>
<td>9</td>
<td>45</td>
<td>.93</td>
<td>.60 - .81</td>
</tr>
<tr>
<td>Writing Skills Self-efficacy Scale (test)</td>
<td>30.36</td>
<td>7.77</td>
<td>9</td>
<td>45</td>
<td>.93</td>
<td>.63 - .77</td>
</tr>
<tr>
<td>Mathematics Strategies Scale</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- mathematics concepts</td>
<td>14.13</td>
<td>2.64</td>
<td>4</td>
<td>20</td>
<td>.88</td>
<td>.51 - .71</td>
</tr>
<tr>
<td>- mathematics procedures</td>
<td>11.32</td>
<td>3.53</td>
<td>4</td>
<td>20</td>
<td>.88</td>
<td>.47 - .78</td>
</tr>
<tr>
<td>Writing Strategies Scale</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>- writing concepts</td>
<td>14.72</td>
<td>3.67</td>
<td>4</td>
<td>20</td>
<td>.81</td>
<td>.49 - .76</td>
</tr>
<tr>
<td>- writing procedures</td>
<td>11.87</td>
<td>3.32</td>
<td>4</td>
<td>16</td>
<td>.83</td>
<td>.53 - .75</td>
</tr>
<tr>
<td>Self-regulated Learning</td>
<td>48.13</td>
<td>9.22</td>
<td>14</td>
<td>70</td>
<td>.82</td>
<td>.36 - .66</td>
</tr>
<tr>
<td>Self-efficacy for Self-regulation</td>
<td>32.42</td>
<td>8.51</td>
<td>11</td>
<td>55</td>
<td>.89</td>
<td>.41 - .75</td>
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<tr>
<td>Deakin Coping Scale</td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>- appraisal</td>
<td>22.51</td>
<td>4.38</td>
<td>9</td>
<td>35</td>
<td>.81</td>
<td>.49 - .72</td>
</tr>
<tr>
<td>- challenge</td>
<td>12.69</td>
<td>3.00</td>
<td>4</td>
<td>20</td>
<td>.77</td>
<td>.53 - .70</td>
</tr>
<tr>
<td>- avoidance</td>
<td>12.71</td>
<td>2.65</td>
<td>4</td>
<td>20</td>
<td>.75</td>
<td>.41 - .58</td>
</tr>
<tr>
<td>- resources</td>
<td>13.74</td>
<td>2.89</td>
<td>4</td>
<td>20</td>
<td>.81</td>
<td>.59 - .72</td>
</tr>
<tr>
<td>Academic Purpose Goals</td>
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<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>- learning goals</td>
<td>16.13</td>
<td>4.37</td>
<td>5</td>
<td>25</td>
<td>.81</td>
<td>.56 - .71</td>
</tr>
<tr>
<td>- performance-avoid goals</td>
<td>14.28</td>
<td>4.97</td>
<td>6</td>
<td>30</td>
<td>.82</td>
<td>.56 - .68</td>
</tr>
<tr>
<td>- performance-approach goals</td>
<td>13.56</td>
<td>3.94</td>
<td>4</td>
<td>32</td>
<td>.76</td>
<td>.51 - .63</td>
</tr>
<tr>
<td>Multidimensional Perfectionism Scale</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- personal standards</td>
<td>16.65</td>
<td>3.64</td>
<td>5</td>
<td>25</td>
<td>.79</td>
<td>.52 - .64</td>
</tr>
<tr>
<td>- parental expectations</td>
<td>11.36</td>
<td>3.54</td>
<td>4</td>
<td>20</td>
<td>.82</td>
<td>.58 - .68</td>
</tr>
<tr>
<td>- parental criticism</td>
<td>13.01</td>
<td>4.06</td>
<td>5</td>
<td>25</td>
<td>.81</td>
<td>.51 - .69</td>
</tr>
<tr>
<td>- active perfectionism (total)</td>
<td>38.61</td>
<td>5.78</td>
<td>14</td>
<td>66</td>
<td>.81</td>
<td>.51 - .67</td>
</tr>
<tr>
<td>Life Orientation Test (R) (optimism)</td>
<td>9.88</td>
<td>2.41</td>
<td>3</td>
<td>15</td>
<td>.92</td>
<td>.74 - .88</td>
</tr>
<tr>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
<td>E</td>
<td>F</td>
<td>G</td>
</tr>
<tr>
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</tr>
</tbody>
</table>

Table 41: Correlation Matrix of All Variables from Study 3
14.2 Results from the re-analyses of the competing models of English and mathematics performance

The following analyses relate to the re-testing of each of the competing models of mathematics and English performance proposed in Chapter 7. The data from post Time 1 / pre Time 2 are self-reported final grades for year 10 English and mathematics. The data from Time 2 are each of the dispositional and situational variables measured at mind-year year 11. The data from post Time 2 are self-reported final grades for year 11 English and mathematics.

The same competing models that were presented in Study 2 (Chapter 12) will also be presented in the following sections. A summary table of the percentages of variance in English and mathematics performance explained by each model is presented in Table 42.

Table 42

Summary of the Percentages of Variance Explained in English and Mathematics Performance by each Competing Model

<table>
<thead>
<tr>
<th>Model</th>
<th>Percentage variance explained in Year 11 English performance</th>
<th>Percentage variance explained in Year 11 mathematics performance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self-efficacy model (approach-oriented copers)</td>
<td>72</td>
<td>62</td>
</tr>
<tr>
<td>Self-efficacy model (avoidance-oriented copers)</td>
<td>46</td>
<td>67</td>
</tr>
<tr>
<td>Self-efficacy model (combined copers)</td>
<td>81</td>
<td>76</td>
</tr>
<tr>
<td>Target goal model</td>
<td>42</td>
<td>49</td>
</tr>
<tr>
<td>Purpose goal model</td>
<td>71</td>
<td>72</td>
</tr>
<tr>
<td>Positive psychology model</td>
<td>62</td>
<td>63</td>
</tr>
<tr>
<td>Cognitive skill model</td>
<td>15</td>
<td>16</td>
</tr>
<tr>
<td>Self-regulatory skill model</td>
<td>67</td>
<td>65</td>
</tr>
</tbody>
</table>
14.2.1 Self-efficacy based models of performance in English and mathematics

A repeated measures ANOVA revealed no significant differences in students' coping cluster scores (see Chapter 12.4.1) from year 10 to year 11, therefore the self-efficacy based models of performance were re-tested in this year 11 study among the same clusters as those used in the year 10 study (Study 2). However, do the loss of a small percentage of the sample from year 10 to year 11, cluster memberships declined slightly in each cluster in Study 3 (approach copers N=145, avoidance copers N=74, combined copers N=61).

The following sections detail results of the path analyses of the proposed self-efficacy based models of English and mathematics performance for each coping when re-tested in year 11. Results are presented by coping cluster. Models for English and mathematics performance for approach copers (competing model 1A) are presented in Figures 29 and 30. Models for English and mathematics performance for avoidance copers (competing model 1B) are presented in Figures 31 and 32. Models for English and mathematics performance for combined copers (competing model 1C) are presented in Figures 33 and 34.

14.2.1.1 Competing model 1A (English): The self-efficacy based model of English performance for approach copers in year 11

The independence model indicated the suitability of the data for modeling ($\chi^2_{28} = 2,562.14, p < .001$). The data provided a reasonable fit to the proposed model ($\chi^2_{13} = 88.01, p < .05; \chi^2/df = 6.77; NFI=.94; IFI=.94; CFI=.94$). Model respecifications were examined following the
recommendation that the criteria for change be made on substantive grounds rather than for statistical advantage (Schumaker & Lomax, 1996), and according to MacCallum (1996), paths were added before deleting parameters. Modifications allowed year 10 English grade to load directly onto year 11 English grade. In addition, two non-significant paths, from social persuasion to writing self-efficacy in the class and test contexts, were progressively removed. The data provided a good fit to the revised model ($\chi^2 = 22.52, p > .05; \chi^2/df = 2.50; NFI = .99; IFI = .99; CFI = .99$). Seventy-two percent of the variance in the year 11 English performance of approach-oriented copers was explained by variables in the model (see Figure 31).

Figure 31. Final paths with beta-weights and squared multiple correlations for approach-oriented copers in a self-efficacy based model of year 11 English performance
There were strong direct effects on year 11 English grades by year 10 English grades ($\beta=.62$) and writing class self-efficacy ($\beta=.54$). The total effects of writing anxiety on year 11 English grades were also strong ($\beta=.52$). Table 43 provides an overview of direct effects, indirect effects and total effects from the model.

Table 43

**Direct Effects, Indirect Effects and Total Effects from the Model of Year 11 English Performance for Approach Copers**

<table>
<thead>
<tr>
<th>Effect</th>
<th>Direct effect</th>
<th>Indirect effect</th>
<th>Total effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>On year 11 English grade</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Of year 10 English grade</td>
<td>.55</td>
<td>.07</td>
<td>.62</td>
</tr>
<tr>
<td>Of enactive mastery</td>
<td>.00</td>
<td>.23</td>
<td>.23</td>
</tr>
<tr>
<td>Of modeling</td>
<td>.00</td>
<td>-.15</td>
<td>-.15</td>
</tr>
<tr>
<td>Of writing anxiety</td>
<td>-.18</td>
<td>-.34</td>
<td>-.52</td>
</tr>
<tr>
<td>Of writing class self-efficacy</td>
<td>.54</td>
<td>.00</td>
<td>.54</td>
</tr>
<tr>
<td>Of writing test self-efficacy</td>
<td>.30</td>
<td>.00</td>
<td>.30</td>
</tr>
<tr>
<td>On writing class self-efficacy</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Of year 10 English grade</td>
<td>.00</td>
<td>.09</td>
<td>.09</td>
</tr>
<tr>
<td>Of enactive mastery</td>
<td>.31</td>
<td>.00</td>
<td>.31</td>
</tr>
<tr>
<td>Of modeling</td>
<td>-.21</td>
<td>.00</td>
<td>-.21</td>
</tr>
<tr>
<td>Of writing anxiety</td>
<td>-.38</td>
<td>.00</td>
<td>-.38</td>
</tr>
<tr>
<td>On writing test self-efficacy</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Of year 10 English grade</td>
<td>.00</td>
<td>.06</td>
<td>.06</td>
</tr>
<tr>
<td>Of enactive mastery</td>
<td>.21</td>
<td>.00</td>
<td>.21</td>
</tr>
<tr>
<td>Of modeling</td>
<td>-.14</td>
<td>.00</td>
<td>-.14</td>
</tr>
<tr>
<td>Of writing anxiety</td>
<td>-.44</td>
<td>.00</td>
<td>-.44</td>
</tr>
<tr>
<td>On enactive mastery</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Of year 10 English grade</td>
<td>.29</td>
<td>.00</td>
<td>.29</td>
</tr>
</tbody>
</table>

14.2.1.2 Competing model 1A (mathematics): The self-efficacy based model of mathematics performance for approach copers in year 11

The independence model indicated the suitability of the data for modeling ($\chi^2_{28} = 2,504.27, p < .001$), however the data did not provide a good fit to the proposed model ($\chi^2_{13} = 125.26, p < .05; \chi^2/df = 9.64; NFI = .90; IFI = .91; CFI = .92$). Model respecifications allowed final year 10 mathematics
grade to load directly onto final year 11 mathematics grade. In addition, seven non-significant paths were progressively removed. These non-significant paths were from each of the four sources of self-efficacy to mathematics self-efficacy in the class context, from modeling and social persuasion to mathematics self-efficacy in the test context, and from mathematics self-efficacy in the class context to final year 11 mathematics grade. After the removal of these non-significant paths, the data provided a better fit to the revised model, although the ratio of chi-square to the degrees of freedom was marginally higher than desired ($\chi^2_{6} = 29.57, p > .05; \chi^2/df = 4.92; \text{NFI}=.97; \text{IFI}=.96; \text{CFI}=.96$). Sixty-two percent of the variance in year 11 mathematics performance was explained by variables in the model (see Figure 32).
Figure 32. Final paths with beta-weights and squared multiple correlations for approach oriented copers in a self-efficacy based model of year 11 mathematics performance.

There were strong direct effects on year 11 mathematics grades by year 10 mathematics grades (β=.51) and mathematics test self-efficacy (β=.56). The total effects of mathematics anxiety on year 11 mathematics grades were also strong (β=.47). Table 44 provides an overview of direct effects, indirect effects and total effects from the model.
Table 44

Direct Effects, Indirect Effects and Total Effects from the Model of Year 11 Mathematics Performance for Approach Copers

<table>
<thead>
<tr>
<th>Effect</th>
<th>Direct effect</th>
<th>Indirect effect</th>
<th>Total effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>On year 11 Mathematics grade</td>
<td>.51</td>
<td>.10</td>
<td>.61</td>
</tr>
<tr>
<td>Of year 10 Mathematics grade</td>
<td>.00</td>
<td>.20</td>
<td>.20</td>
</tr>
<tr>
<td>Of enactive mastery</td>
<td>-2.2</td>
<td>-2.5</td>
<td>-4.7</td>
</tr>
<tr>
<td>Of mathematics anxiety</td>
<td>.56</td>
<td>.00</td>
<td>.56</td>
</tr>
<tr>
<td>On mathematics test self-efficacy</td>
<td>.00</td>
<td>.18</td>
<td>.18</td>
</tr>
<tr>
<td>Of year 10 Mathematics grade</td>
<td>.36</td>
<td>.00</td>
<td>.36</td>
</tr>
<tr>
<td>Of enactive mastery</td>
<td>-4.5</td>
<td>.00</td>
<td>-4.5</td>
</tr>
<tr>
<td>On enactive mastery</td>
<td>.49</td>
<td>.00</td>
<td>.49</td>
</tr>
</tbody>
</table>

14.2.1.3 Competing model 1B (English): The self-efficacy based model of English performance for avoidance copers in year 11

The independence model indicated the suitability of the data for modeling ($\chi^2_{28} = 1,976.88, p < .001$), although the data did not provide a good fit to the proposed model ($\chi^2_{11} = 202.31, p < .05; \chi^2/df = 18.39; \text{NFI} = .92; \text{IFI} = .92; \text{CFI} = .91$). Model respecifications were examined, again following the recommendation that the criteria for change be made on substantive grounds rather than for statistical advantage (Schumaker & Lomax, 1996), and according to MacCallum (1996), paths were added before deleting parameters. These modifications again allowed final year 10 English grade to load directly onto final year 11 English grade. In addition, six non-significant paths were progressively removed. Non-significant paths were those from social persuasion to writing self-efficacy in the class and test contexts, from enactive mastery, modeling and writing anxiety to writing self-efficacy in the class context, and from writing self-efficacy in the class context to final year 11
English grade. After the removal of non-significant paths, the data provided a better fit to the revised model ($\chi^2 = 40.89$, $p > .05$; $\chi^2/df = 4.54$; NFI=.98; IFI=.98; CFI=.98). Forty-six percent of the variance in year 11 English performance was explained by the variables in the model (see Figure 33).

Figure 33. Final paths with beta-weights and squared multiple correlations for avoidance-oriented copers in a self-efficacy based model of year 11 English performance

There was a strong direct effect of year 10 English grades on year 11 English grades ($\beta=.59$) and a moderate total effect of writing anxiety on year 11 English grades ($\beta=-.39$). Table 45 provides an overview of direct effects, indirect effects and total effects from the model.
Table 45

Direct Effects, Indirect Effects and Total Effects from the Model of Year 11

<table>
<thead>
<tr>
<th>Effect</th>
<th>Direct effect</th>
<th>Indirect effect</th>
<th>Total effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>On year 11 English grade</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Of year 10 English grade</td>
<td>.56</td>
<td>.03</td>
<td>.59</td>
</tr>
<tr>
<td>Of enactive mastery</td>
<td>.00</td>
<td>.06</td>
<td>.06</td>
</tr>
<tr>
<td>Of modeling</td>
<td>.00</td>
<td>-.04</td>
<td>-.04</td>
</tr>
<tr>
<td>Of writing anxiety</td>
<td>-.25</td>
<td>-.14</td>
<td>-.39</td>
</tr>
<tr>
<td>Of writing test self-efficacy</td>
<td>.29</td>
<td>.00</td>
<td>.29</td>
</tr>
<tr>
<td>On writing test self-efficacy</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Of year 10 English grade</td>
<td>.00</td>
<td>.10</td>
<td>.10</td>
</tr>
<tr>
<td>Of enactive mastery</td>
<td>.22</td>
<td>.00</td>
<td>.22</td>
</tr>
<tr>
<td>Of modeling</td>
<td>-.14</td>
<td>.00</td>
<td>-.14</td>
</tr>
<tr>
<td>Of writing anxiety</td>
<td>-.48</td>
<td>.00</td>
<td>-.48</td>
</tr>
<tr>
<td>On enactive mastery</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Of year 10 English grade</td>
<td>.47</td>
<td>.00</td>
<td>.47</td>
</tr>
</tbody>
</table>

14.2.1.4 Competing model 1B (mathematics): The self-efficacy based model of mathematics performance for avoidance copers in year 11

The independence model indicated the suitability of the data for modeling ($\chi^2_{36} = 2.683.00, p <.001$). The data did not provide a good fit to the proposed model ($\chi^2_{13} = 103.26, p <.05; \chi^2/df = 7.94; NFI=.92; IFI=.92; CFI=.92$) and model respecifications again allowed final year 10 mathematics grade to load directly onto final year 11 mathematics grade. In addition, three non-significant paths were progressively removed from social persuasion to mathematics self-efficacy in both the class and test contexts, and from modeling to mathematics self-efficacy in the class context. After the removal of these non-significant paths, the data provided a good fit to the revised model ($\chi^2_{10} = 36.03, p <.05; \chi^2/df = 3.60; NFI=.98; IFI=.98; CFI=.99$). Sixty-seven percent of the variance in year 11 mathematics performance was explained by variables in the model (see Figure 34).
There was a strong direct effect of year 10 mathematics grades on year 11 mathematics grades ($\beta=.57$) and a strong total effect of mathematics anxiety on year 11 mathematics grades ($\beta=-.52$). Moderate direct effects of mathematics class self-efficacy ($\beta=.36$) and mathematics test self-efficacy ($\beta=.39$) on year 11 mathematics grades were also observed. Table 46 provides an overview of direct effects, indirect effects and total effects from the model.
Table 46

Direct Effects, Indirect Effects and Total Effects from the Model of Year 11

Mathematics Performance for Avoidance Copers

<table>
<thead>
<tr>
<th>Effect</th>
<th>Direct effect</th>
<th>Indirect effect</th>
<th>Total effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>On year 11 mathematics grade</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Of year 10 mathematics grade</td>
<td>.57</td>
<td>.17</td>
<td>.74</td>
</tr>
<tr>
<td>Of enactive mastery</td>
<td>.00</td>
<td>.34</td>
<td>.34</td>
</tr>
<tr>
<td>Of modeling</td>
<td>.00</td>
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<td>-.05</td>
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<td>Of mathematics anxiety</td>
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<td>-.27</td>
<td>-.52</td>
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<tr>
<td>Of mathematics class self-efficacy</td>
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<td>.00</td>
<td>.36</td>
</tr>
<tr>
<td>Of mathematics test self-efficacy</td>
<td>.39</td>
<td>.00</td>
<td>.39</td>
</tr>
<tr>
<td>On mathematics class self-efficacy</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Of year 10 mathematics grade</td>
<td>.00</td>
<td>.23</td>
<td>.23</td>
</tr>
<tr>
<td>Of enactive mastery</td>
<td>.45</td>
<td>.00</td>
<td>.45</td>
</tr>
<tr>
<td>Of mathematics anxiety</td>
<td>-.31</td>
<td>.00</td>
<td>-.31</td>
</tr>
<tr>
<td>On mathematics test self-efficacy</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Of year 10 mathematics grade</td>
<td>.00</td>
<td>.23</td>
<td>.23</td>
</tr>
<tr>
<td>Of enactive mastery</td>
<td>.46</td>
<td>.00</td>
<td>.46</td>
</tr>
<tr>
<td>Of modeling</td>
<td>-.13</td>
<td>.00</td>
<td>-.13</td>
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<tr>
<td>Of mathematics anxiety</td>
<td>-.42</td>
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<td>On enactive mastery</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Of year 10 mathematics grade</td>
<td>.50</td>
<td>.00</td>
<td>.50</td>
</tr>
</tbody>
</table>

14.2.1.5 Competing model 1C (English): The self-efficacy based model of English performance for combined copers in year 11

The independence model indicated the suitability of the data for modeling ($\chi^2_{36} = 2,349.23$, $p < .001$). The data provided a reasonable fit to the proposed model ($\chi^2_{16} = 98.51$, $p < .05$; $\chi^2/df = 6.16$; NFI=.93; IFI=.93; CFI=.93), but model respecifications again allowed final year 10 English grade to load directly onto final year 11 English grade. In addition, two non-significant paths from enactive mastery to each of writing self-efficacy in the class and test contexts were progressively removed. The data provided a good fit to the revised model ($\chi^2_{6} = 23.82$, $p > .05$; $\chi^2/df = 3.97$; NFI=.98; IFI=.98; CFI=.98). Eighty-one percent of the variance in year 11 English performance was explained by variables in the model (see Figure 35).
Figure 35. Final paths with beta-weights and squared multiple correlations for combined copers in a self-efficacy based model of year 11 English performance.

Strong direct effects of year 10 English grade ($\beta = .52$) and of writing class self-efficacy ($\beta = .54$), along with a moderate direct effect of writing test self-efficacy ($\beta = .39$) on year 11 English grades were observed. There was also a strong total effect of writing anxiety ($\beta = .54$) on year 11 English grades. Table 47 provides an overview of direct effects, indirect effects and total effects from the model.
Table 47

Direct Effects, Indirect Effects and Total Effects from the Model of Year 11

English Performance for Combined Copers

<table>
<thead>
<tr>
<th>Effect</th>
<th>Direct effect</th>
<th>Indirect effect</th>
<th>Total effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>On year 11 English grade</td>
<td>.52</td>
<td>.00</td>
<td>.52</td>
</tr>
<tr>
<td>Of year 10 English grade</td>
<td>.00</td>
<td>-.31</td>
<td>-.31</td>
</tr>
<tr>
<td>Of modeling</td>
<td>-.19</td>
<td>-.35</td>
<td>-.54</td>
</tr>
<tr>
<td>Of writing anxiety</td>
<td>.54</td>
<td>.00</td>
<td>.54</td>
</tr>
<tr>
<td>Of writing class self-efficacy</td>
<td>.39</td>
<td>.00</td>
<td>.39</td>
</tr>
<tr>
<td>On writing class self-efficacy</td>
<td>-.36</td>
<td>.00</td>
<td>-.36</td>
</tr>
<tr>
<td>Of social persuasion</td>
<td>.14</td>
<td>.00</td>
<td>.14</td>
</tr>
<tr>
<td>Of writing anxiety</td>
<td>-.37</td>
<td>.00</td>
<td>-.37</td>
</tr>
<tr>
<td>On writing test self-efficacy</td>
<td>-.32</td>
<td>.00</td>
<td>-.32</td>
</tr>
<tr>
<td>Of modeling</td>
<td>.16</td>
<td>.00</td>
<td>.16</td>
</tr>
<tr>
<td>Of writing anxiety</td>
<td>-.39</td>
<td>.00</td>
<td>-.39</td>
</tr>
<tr>
<td>On enactive mastery</td>
<td>.34</td>
<td>.00</td>
<td>.34</td>
</tr>
</tbody>
</table>

14.2.1.6 Competing model 1C (mathematics): The self-efficacy based model of mathematics performance for combined copers in year 11

The independence model indicated the suitability of the data for modeling ($\chi^2_{21} = 1,682.49, p < .001$). The data provided a reasonable fit to the proposed model ($\chi^2_{16} = 103.76, p < .05; \chi^2/df = 6.49; NFI=.93; IFI=.94; CFI=.94$), but model respecifications again allowed final year 10 mathematics grade to load directly onto final year 11 mathematics grade. In addition, four non-significant paths were progressively removed. These non-significant paths were from modeling and social persuasion to mathematics self-efficacy in the class context and mathematics self-efficacy in the test context. After the removal of non-significant paths, the data provided a good fit to the revised model ($\chi^2_{12} = 41.51, p > .05; \chi^2/df = 3.46; NFI=.98; IFI=.98; CFI=.99$).
Seventy-six percent of the variance in year 11 mathematics performance was explained by variables in the model (see Figure 36).

There were strong direct effects on year 11 mathematics grades by year 10 mathematics grades ($\beta = .57$) and by mathematics class self-efficacy ($\beta = .50$), along with a moderate direct effect on year 11 mathematics grade by mathematics test self-efficacy ($\beta = .37$). There was also a strong indirect effect on year 11 mathematics grades by mathematics anxiety ($\beta = .65$). Table 48 provides an overview of direct effects, indirect effects and total effects from the model.
Table 48

Direct Effects, Indirect Effects and Total Effects from the Model of Year 11 Mathematics Performance for Combined Copers

<table>
<thead>
<tr>
<th>Effect</th>
<th>Direct effect</th>
<th>Indirect effect</th>
<th>Total effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>On year 11 mathematics grade</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Of year 10 mathematics grade</td>
<td>.51</td>
<td>.06</td>
<td>.57</td>
</tr>
<tr>
<td>Of enactive mastery</td>
<td>.00</td>
<td>.20</td>
<td>.20</td>
</tr>
<tr>
<td>Of mathematics anxiety</td>
<td>-.21</td>
<td>-.44</td>
<td>-.65</td>
</tr>
<tr>
<td>Of mathematics class self-efficacy</td>
<td>.50</td>
<td>.00</td>
<td>.50</td>
</tr>
<tr>
<td>Of mathematics test self-efficacy</td>
<td>.37</td>
<td>.00</td>
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</tr>
<tr>
<td>Of year 10 mathematics grade</td>
<td>.00</td>
<td>.06</td>
<td>.06</td>
</tr>
<tr>
<td>Of enactive mastery</td>
<td>.21</td>
<td>.00</td>
<td>.21</td>
</tr>
<tr>
<td>Of mathematics anxiety</td>
<td>-.48</td>
<td>.00</td>
<td>-.48</td>
</tr>
<tr>
<td>On mathematics test self-efficacy</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Of year 10 mathematics grade</td>
<td>.00</td>
<td>.07</td>
<td>.07</td>
</tr>
<tr>
<td>Of enactive mastery</td>
<td>.25</td>
<td>.00</td>
<td>.25</td>
</tr>
<tr>
<td>Of mathematics anxiety</td>
<td>-.43</td>
<td>.00</td>
<td>-.43</td>
</tr>
<tr>
<td>On enactive mastery</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Of year 10 mathematics grade</td>
<td>.29</td>
<td>.00</td>
<td>.29</td>
</tr>
</tbody>
</table>

Presented in Table 49 is a summary of the percentages of variance in year 11 English and mathematics performance explained by the competing self-efficacy based models for each coping cluster.

Table 49

Percentages of Variance in Year 11 English and Mathematics Performance Explained by the Self-efficacy Based Models for Each Coping Cluster

<table>
<thead>
<tr>
<th></th>
<th>% variance explained in performance by self-efficacy based model</th>
<th>Approach Coping Cluster</th>
<th>Avoidance Coping Cluster</th>
<th>Combined Coping Cluster</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year 11 English</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Performance</td>
<td>72%</td>
<td>46%</td>
<td>81%</td>
<td></td>
</tr>
<tr>
<td>Year 11 Mathematics</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Performance</td>
<td>62%</td>
<td>67%</td>
<td>76%</td>
<td></td>
</tr>
</tbody>
</table>
14.2.2 Goal based models of performance in English and mathematics

The second class of competing models that were re-tested in this study were those based on target goals and purpose goals. These models were each re-tested in year 11 English and mathematics.

14.2.2.1 Competing model 2A (English): The target goal model for year 11 English performance

Structural equation modeling was used to predict final year 11 English grades using the target goal model developed in Chapter 4. Writing self-efficacy in the class context, writing self-efficacy in the test context, use of conceptual writing strategies, use of procedural writing strategies and optimism were hypothesised to predict final year 11 English grade goal (the target goal), which in turn was hypothesised to predict final year 11 English grades.

The independence model indicated the suitability of the data for modeling ($\chi^2_{15} = 3,532.57, p < .001$). No additional paths were suggested by modification indices, however the paths from procedural strategies to year 11 English grade goal did not reach significance and was deleted from the final model. After deletion of the non-significant path, the data provided a good fit to the revised model ($\chi^2_{8} = 31.07, p > .05; \chi^2/df = 3.88; NFI=.98; IFI=.98; CFI=.99$). Forty-two percent of the variance in year 11 English grades was explained by the variables in the model (see Figure 37).
Figure 37. Final paths with beta-weights and squared multiple correlations for the target goal model of year 10 English performance

Direct effects: Writing self-efficacy in the class context ($\beta = .27$), writing self-efficacy in the test context ($\beta = .32$), the use of conceptual writing strategies ($\beta = .22$) and a sense of optimism ($\beta = .23$) each directly predicted final year 11 English grade goals and together explained 28% of the variance. The use of procedural writing strategies did not contribute to final year 11 grade goals. Final year 11 English grade goals directly predicted final year 11 English grades ($\beta = .65$).

Indirect effects: Writing self-efficacy in the class context, writing self-efficacy in the test context, the use of conceptual writing strategies and optimism each indirectly contributed to final year 11 English grades through their effects on year 11 English grade goals ($\beta = .18$, $\beta = .21$, $\beta = .14$ and $\beta = .15$).
14.2.2.2 Competing model 2A (mathematics): The target goal model for year 11 mathematics performance

Structural equation modeling was used to predict final year 11 mathematics grades using the target goal model developed in Chapter 4. Mathematics self-efficacy in the class context, mathematics self-efficacy in the test context, use of conceptual mathematics strategies, use of procedural mathematics strategies and optimism were hypothesized to predict final year 11 mathematics grade goal (the target goal), which in was hypothesized to predict final year 11 mathematics grade.

The independence model indicated the suitability of the data for modeling ($\chi^2_{28} = 3,205.21$, $p < .001$). No additional paths were suggested by modification indices and all paths reached significance. The data provided a good fit to the proposed model ($\chi^2_{15} = 50.22$, $p > .05$; $\chi^2/df = 3.35$; NFI = .99; IFI = .99; CFI = .99). Forty-nine percent of the variance in year 10 mathematics grades was explained by the variables in the model (see Figure 38).

Direct effects: mathematics self-efficacy in the class context ($\beta = .21$), mathematics self-efficacy in the test context ($\beta = .32$), the use of conceptual mathematics strategies ($\beta = .20$), the use of procedural mathematics strategies ($\beta = -.21$) and a sense of optimism ($\beta = .26$) each directly predicted final year 10 mathematics grade goals and together explained 30% of the variance. Final year 11 mathematics grade goals directly predicted final year 11 mathematics grades ($\beta = .70$).
Figure 38. Final paths with beta-weights and squared multiple correlations for the target goal model of year 11 mathematics performance

Indirect effects: Mathematics self-efficacy in the class context, mathematics self-efficacy in the test context, the use of conceptual mathematics strategies, the use of procedural mathematics strategies and optimism each indirectly contributed to final year 11 mathematics grades through their effects on year 11 mathematics grade goals ($\beta=.12$, $\beta=.22$, $\beta=.14$, $\beta=.15$ and $\beta=.18$).

14.2.2.3 Competing model 2B (English): The purpose goal model for year 11 English performance

Structural equation modeling was used to predict final year 11 English grade using the purpose goal model developed in Chapter 4. Gender and year 10 English grade were hypothesized to predict the three purpose goals (mastery
goals, performance-approach goals and performance-avoid goals), which in turn were hypothesised to predict final year 11 English grade.

The independence model indicated the suitability of the data for modeling ($\chi^2_{28} = 4,382.51, p < .001$). No additional paths were suggested by modification indices, however paths from gender to mastery goals and gender to performance-avoid were not significant and were removed from the model. The data provided a good fit to the revised model ($\chi^2_{8} = 31.61, p > .05; \chi^2/df = 3.95; NFI=.99; IFI=.99; CFI=.99$). Seventy-one percent of the variance in year 11 English grade was explained by the variables in the model (see Figure 39).

![Diagram](image)

**Figure 39.** Final paths with beta-weights and squared multiple correlations for the purpose goal model of year 11 English performance

Direct effects: Gender was directly and negatively related to performance-approach goals ($\beta=-.39$), indicating that girls espouse these goals more than boys. Gender did not contribute to mastery goals, nor to performance-avoid goals. Year 10 English grade directly contributed to mastery goals ($\beta=.43$) and to performance-avoid goals ($\beta=-.33$), but not to
performance-approach goals. Mastery goals ($\beta=.58$), performance-approach goals ($\beta=.55$) and performance-avoid goals ($\beta=-.27$) each directly contributed to year 11 English grade.

Indirect and total effects: Final year 10 English grade contributed indirectly to final year 11 English grade through its effects on mastery goals ($\beta=.25$) and performance-avoid goals ($\beta=.09$) for a total contribution of year 10 English grades to year 11 English grades of $\beta=.38$. Gender contributed indirectly to year 11 English grade through its effect on performance-approach goals ($\beta=-.21$).

14.2.2.4 Competing model 2B (mathematics): The purpose goal model for year 11 mathematics performance

Structural equation modeling was used to predict final year 11 mathematics grade using the purpose goal model developed in Chapter 4. Gender and year 10 mathematics grade were hypothesised to predict the three purpose goals (mastery goals, performance-approach goals and performance-avoid goals), which in turn were hypothesised to predict final year 11 mathematics grade.

The independence model indicated the suitability of the data for modeling ($\chi^2_{20} = 3,873.52, p <.001$). No additional paths were suggested by modification indices, however paths from gender to mastery goals and from gender to performance-avoid goals were not significant and were removed from the model. The data provided a good fit to the revised model ($\chi^2_{s} = 28.49, p >.05; \chi^2/df = 3.56; NFI=.99; IFI=.99; CFI=.98$). Seventy-two percent
of the variance in year 11 mathematics grade was explained by the variables in the model (see Figure 40).

![Path diagram]

Figure 40. Final paths with beta-weights and squared multiple correlations for the purpose goal model of year 11 mathematics performance

Direct effects: Gender was directly and negatively related to performance-approach goals (β=-.24), indicating that girls espouse these goals more than boys. Gender did not contribute to mastery goals, nor to performance-avoid goals. Year 10 mathematics grade directly contributed to mastery goals (β=.39) and to performance-approach goals (β=.34), but not to performance-avoid goals. Mastery goals (β=.48), performance-approach goals (β=.59) and performance-avoid goals (β=-.37) each directly contributed to year 11 mathematics grade.

Indirect and total effects: Gender contributed indirectly to final year 11 mathematics grade through its effects on performance-approach goals (β=-.14). Final year 11 mathematics grade contributed indirectly to final year 11
mathematics grade through its effects on mastery goals ($\beta=.19$) and performance-approach goals ($\beta=.20$), for a total contribution of year 10 mathematics grades to year 11 mathematics grades of $\beta=.39$.

The percentages of variance explained in English and mathematics performance by each of these competing models is summarised in a Table 50.

Table 50

Percentages of Variance in Year 11 English and Mathematics Performance Explained by the Competing Goal-Based Models

<table>
<thead>
<tr>
<th></th>
<th>% variance explained in performance by goal-based model</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Target goal model</td>
</tr>
<tr>
<td>Year 11 English Performance</td>
<td>42%</td>
</tr>
<tr>
<td>Year 11 Mathematics Performance</td>
<td>49%</td>
</tr>
</tbody>
</table>

14.2.3 Models of performance in English and mathematics based on positive psychology variables

The third competing model that was re-tested in this study were that based on positive psychology variables. Models of performance based upon positive psychology variables (see Figure 12, p.107) were analysed for both English and mathematics.

14.2.3.1 Competing model 3 (English): Positive psychology in year 11 English performance

Structural equation modelling was used to predict final year 11 English grade from the model of positive psychology. Optimism and active perfectionism were hypothesised to contribute to mastery goals, self-regulatory
skills and year 11 English grade goals, which it turn were hypothesised to contribute to final year 11 English grade.

The independence model indicated the suitability of the data for modeling ($\chi^2_{21} = 5,630.92$, $p < .001$). No additional paths were suggested by modification indices, and all proposed paths were significant. The data provided a good fit to the model ($\chi^2_g = 32.05$, $p > .05$; $\chi^2/df = 4.01$; NFI=.98; IFI=.98; CFI=.99). Sixty-two percent of the variance in year 11 English grade was explained by the variables in the model (see Figure 41).

![Diagram](image)

Figure 41. Final paths with beta-weights and squared multiple correlations for the model of year 11 English performance based on positive psychology variables

**Direct effects:** Optimism was directly and positively related to mastery goals ($\beta=.39$), use of self-regulatory skills ($\beta=.38$) and year 11 English grade goals ($\beta=.41$). Active perfectionism was also directly and positively related to mastery goals ($\beta=.28$), the use of self-regulatory skills ($\beta=.39$) and final year
11 English grade goals (β=.40). The two positive psychology variables, optimism and active perfectionism, combined to explain 23% of the variance in mastery goals, 30% of the variance in the use of self-regulatory skills and 33% of the variance in final year 11 English grade goals. Mastery goals (β=.31), self-regulatory skills (β=.41) and year 11 English grade goal (β=.60) were directly and positively related to final year 11 English grade.

Indirect effects: Optimism made indirect contributions to year 11 English grade through its effects on mastery goals (β=.12), the use of self-regulatory skills (β=.16) and year 11 English grade goals (β=.25) for a total contribution of β=.53. Active perfectionism also made indirect contributions to year 11 English grade through its effects on mastery goals (β=.09), the use of self-regulatory skills (β=.16) and year 11 English grade goals (β=.24) for a total contribution of β=.49.

14.2.3.2 Competing model 3 (mathematics): Positive psychology in year 11 mathematics performance

Structural equation modelling was used to predict final year 11 mathematics grade from the model of positive psychology. Optimism and active perfectionism were hypothesized to contribute to mastery goals, self-regulatory skills and year 11 mathematics grade goals, which in turn were hypothesized to contribute to final year 11 mathematics grade.

The independence model indicated the suitability of the data for modeling ($\chi^2_{21} = 5.857.43, p < .001$). No additional paths were suggested by modification indices and all proposed paths were significant. The data provided a good fit to the model ($\chi^2_8 = 22.96, p > .05; \chi^2/df = 2.87; NFI=.99; IFI=.99$;
Sixty-three percent of the variance in year 11 mathematics grade was explained by the variables in the model (see Figure 42).

Figure 42. Final paths with beta-weights and squared multiple correlations for the model of year 11 mathematics performance based on positive psychology variables.

Direct effects: Optimism was directly and positively related to mastery goals ($\beta = .39$), use of self-regulatory skills ($\beta = .38$) and year 11 mathematics grade goals ($\beta = .43$). Active perfectionism was also directly and positively related to mastery goals ($\beta = .28$), the use of self-regulatory skills ($\beta = .39$) and year 11 mathematics grade goals ($\beta = .45$). The two positive psychology variables, optimism and active perfectionism, combined to explain 23% of the variance in mastery goals, 30% of the variance in the use of self-regulatory skills and 39% of the variance in final year 11 mathematics grade goals. Mastery goals ($\beta = .32$), self-regulatory skills ($\beta = .38$) and year 11 mathematics
grade goal (β=.62) were directly and positively related to final year 11 mathematics grade.

Indirect effects: Optimism made indirect contributions to year 11 mathematics grade through its effects on mastery goals (β=.12), the use of self-regulatory skills (β=.14) and year 11 mathematics grade goals (β=.27) for a total contribution of β=.53. Active perfectionism also made indirect contributions to year 11 mathematics grade through its effects on mastery goals (β=.09), the use of self-regulatory skills (β=.15) and year 11 mathematics grade goals (β=.28) for a total contribution of β=.52.

14.2.4 Skill based models of performance in English and mathematics

The final class of competing models that were re-tested in this study were those based on the usage of self-regulatory skills and cognitive strategies. These skill based models of performance were analysed for both English and mathematics.

14.2.4.1 Competing model 4A (English): The self-regulatory skill-based model of year 11 English performance

Structural equation modeling was used to analyse the self-regulatory model of year 11 English performance. The independence model indicated the suitability of the data for modeling ($\chi^2_{22} = 6,704.94$, $p < .001$). The data provided a reasonable fit to the proposed model ($\chi^2_{17} = 121.02$, $p > .05$; $\chi^2/df = 7.11$; NFI=.93; IFI=.94; CFI=.96), although the ratio of chi-square to the degrees of freedom was higher than desired. Model respecifications prescribed the addition of a path from year 10 English grade to year 11 grade and the progressive removal of three non-significant paths. These non-significant paths
were from performance-avoid goals to self-regulation and self-efficacy for self-regulation and from performance-approach goals to self-efficacy for self-regulation. After removal of these non-significant paths, the data provided an adequate fit to the revised model, although the ratio of chi-square to the degrees of freedom was still inflated ($\chi^2 = 51.54, p > .05; \chi^2/df = 5.73$; NFI=.97; IFI=.97; CFI=.98). Sixty-seven percent of the variance in final year 11 English grades was explained by the self-regulatory skill-based model (see Figure 43).

![Figure 43. Final paths in a self-regulatory model of English performance](image)

There were strong total effects on year 11 English grades of year 10 English grades ($\beta=.75$) and self-efficacy for self-regulation ($\beta=.67$). In addition, there was a moderate total effect on year 11 English grades of the use of self-regulatory skills ($\beta=.46$). Table 51 provides an overview of direct effects, indirect effects and total effects from the model.
Table 51

Direct Effects, Indirect Effects and Total Effects from the Self-Regulatory Skill

Based Model of Year 11 English Performance

<table>
<thead>
<tr>
<th>Effect</th>
<th>Direct effect</th>
<th>Indirect effect</th>
<th>Total effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>On year 11 English grade</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Of self-regulatory skills</td>
<td>.46</td>
<td>.00</td>
<td>.46</td>
</tr>
<tr>
<td>Of self-efficacy for self-regulation</td>
<td>.43</td>
<td>.24</td>
<td>.67</td>
</tr>
<tr>
<td>Of year 10 English grade</td>
<td>.52</td>
<td>.23</td>
<td>.75</td>
</tr>
<tr>
<td>On self-regulatory skills</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Of self-efficacy for self-regulation</td>
<td>.55</td>
<td>.00</td>
<td>.55</td>
</tr>
<tr>
<td>Of performance-approach goals</td>
<td>.25</td>
<td>.00</td>
<td>.25</td>
</tr>
<tr>
<td>Of mastery goals</td>
<td>.36</td>
<td>.00</td>
<td>.36</td>
</tr>
<tr>
<td>Of year 10 English grade</td>
<td>.26</td>
<td>.14</td>
<td>.40</td>
</tr>
<tr>
<td>On self-efficacy for self-regulation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Of mastery goals</td>
<td>.25</td>
<td>.00</td>
<td>.25</td>
</tr>
<tr>
<td>Of year 10 English grade</td>
<td>.26</td>
<td>.00</td>
<td>.26</td>
</tr>
</tbody>
</table>

14.2.4.2 Competing model 4A (mathematics): The self-regulatory skill-based model of year 11 mathematics performance

Structural equation modeling was used to analyse the self-regulatory model of year 11 English performance. The independence model indicated the suitability of the data for modeling ($\chi^2_{22} = 5.863.62$, $p < .001$). The data provided a reasonable fit to the proposed model ($\chi^2_{17} = 108.57$, $p > .05$; $\chi^2/df = 6.39$; NFI= .95; IFI= .95; CFI= .96), although again the ratio of chi-square to the degrees of freedom was high. Model respecifications were examined, and as per the previous model prescribed the addition of a direct path from final year 10 mathematics grade to final year 11 mathematics grade, along with the progressive removal of non-significant paths from performance-avoid goals to self-regulation and self-efficacy for self-regulation and from performance-approach goals to self-efficacy for self-regulation. After these modifications, the data provided a better fit to the revised model ($\chi^2_{9} = 50.31$, $p > .05$; $\chi^2/df = $
5.59; NFI=.98; IFI=.98; CFI=.98). Sixty-five percent of the variance in final year 11 mathematics grades was explained by the self-regulatory skill-based model (see Figure 44).

![Diagram showing proposed paths in a self-regulatory model of mathematics performance]

Figure 44. Proposed paths in a self-regulatory model of mathematics performance

There were strong total effects on year 11 mathematics grades of year 10 mathematics grades (β=.76) and self-efficacy for self-regulation (β=.66). In addition, there was a moderate total effect on year 11 mathematics grades of the use of self-regulatory skills (β=.45). Table 52 provides an overview of direct effects, indirect effects and total effects from the model.
Table 52

Direct Effects, Indirect Effects and Total Effects from the Self-Regulatory Skill Based Model of Year 11 Mathematics Performance

<table>
<thead>
<tr>
<th>Effect</th>
<th>Direct effect</th>
<th>Indirect effect</th>
<th>Total effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>On year 11 mathematics grade</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Of self-regulatory skills</td>
<td>.45</td>
<td>.00</td>
<td>.45</td>
</tr>
<tr>
<td>Of self-efficacy for self-regulation</td>
<td>.42</td>
<td>.24</td>
<td>.66</td>
</tr>
<tr>
<td>Of year 10 mathematics grade</td>
<td>.52</td>
<td>.24</td>
<td>.76</td>
</tr>
<tr>
<td>On self-regulatory skills</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Of self-efficacy for self-regulation</td>
<td>.57</td>
<td>.00</td>
<td>.57</td>
</tr>
<tr>
<td>Of performance-approach goals</td>
<td>.28</td>
<td>.00</td>
<td>.28</td>
</tr>
<tr>
<td>Of mastery goals</td>
<td>.35</td>
<td>.14</td>
<td>.49</td>
</tr>
<tr>
<td>Of year 10 mathematics grade</td>
<td>.25</td>
<td>.17</td>
<td>.42</td>
</tr>
<tr>
<td>On self-efficacy for self-regulation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Of mastery goals</td>
<td>.20</td>
<td>.00</td>
<td>.20</td>
</tr>
<tr>
<td>Of year 10 mathematics grade</td>
<td>.30</td>
<td>.00</td>
<td>.30</td>
</tr>
</tbody>
</table>

14.2.4.3 Competing model 4B (English): The cognitive skill-based model of year 11 English performance

A multiple regression analysis was performed to predict final year 11 English grade from students' use of conceptual writing strategies and procedural writing strategies. Fifteen percent of the variance was explained in final year 11 English grade ($R^2 = .15, F_{284}^2 = 20.90, p < .05$). The use of conceptual writing strategies ($\beta = .38$) and procedural writing strategies ($\beta = .17$) both contributed positively to year 11 English grade (see Figure 45).
14.2.4.4 The cognitive skill-based model of year 11 mathematics performance

A multiple regression analysis was performed to predict final year 11 mathematics grade from students' use of conceptual mathematics strategies and procedural mathematics strategies. Sixteen percent of the variance was explained in final year 11 mathematics grade ($R^2=.16$, $F_{2,264}=18.53$, $p<.05$). Conceptual mathematics strategies contributed positively to year 11 mathematics grade ($\beta=.27$) and procedural mathematics strategies contributed negatively to year 11 mathematics grade ($\beta=-.32$) (see Figure 46).

Figure 45. Final paths with beta-weights and squared multiple correlations for the model of year 11 English performance based on cognitive skills

Figure 46. Final paths with beta-weights and squared multiple correlations for the model of year 11 mathematics performance based on cognitive skills
The percentages of variance explained in both English and mathematics performance by the competing skill-based models are summarised in Table 53.

Table 53

Percentages of Variance in Year 11 English and Mathematics Performance Explained by the Skill-Based Models

<table>
<thead>
<tr>
<th></th>
<th>% variance explained in performance by skill-based model</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Cognitive skill-based model</td>
</tr>
<tr>
<td>Year 11 English Performance</td>
<td>15%</td>
</tr>
<tr>
<td>Year 11 Mathematics Performance</td>
<td>16%</td>
</tr>
</tbody>
</table>

14.3 An integrated model of performance in year 11

In the discussion of Study 2 (Chapter 13) it was proposed, in accordance with Pajares (1996) earlier suggestion, that a model that combines constructs from competing models may provide a theoretically and statistically enhanced performance model. Hence, in the final section of this chapter, path analyses of the theoretical performance model presented in Figure 47 will be presented. This theoretical model is an integration of commensurate variables from the competing models that have been tested in Study 2 and re-tested in Study 3.
Figure 47. Theoretical model of the integrated situational and dispositional indicators of performance

14.3.1 Tests of the integrated models for year 11 English and mathematics performance

Structural equation modeling was used to analyse each of the integrated models of year 11 English and mathematics performance. Seventy-one percent of the variance in year 11 English performance and 70% of the variance in year
11 mathematics performance was explained by the variables in the two models. As the final models are rather complex, only tables of standardised total effects are presented for year 11 English (Table 54) and year 11 mathematics (Table 55).

The strongest total effects on year 11 English grades were by year 10 English grades ($\beta = .77$), mastery goals ($\beta = .74$), performance-approach goals ($\beta = .66$), optimism ($\beta = .59$) and self-regulatory efficacy ($\beta = .59$). Writing anxiety ($\beta = -.54$) and writing test self-efficacy ($\beta = .51$) also demonstrated rather strong effects on year 11 English grades.

There was only one non-significant contribution, by social persuasion, to year 11 English grades, although contributions by several other variables (modeling, gender, use of procedural writing strategies, enactive mastery) were small, and thus of little practical significance.

All standardised total effects on year 11 English performance are summarised in Table 54.
<table>
<thead>
<tr>
<th>Effect on year 11 English performance</th>
<th>Standardised Total effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Of Year 10 English grade</td>
<td>.77*</td>
</tr>
<tr>
<td>Of Writing anxiety</td>
<td>-.54*</td>
</tr>
<tr>
<td>Of Writing self-efficacy (class)</td>
<td>.40*</td>
</tr>
<tr>
<td>Of Writing self-efficacy (test)</td>
<td>.51*</td>
</tr>
<tr>
<td>Of Mastery goals</td>
<td>.74*</td>
</tr>
<tr>
<td>Of Performance-approach goals</td>
<td>.66*</td>
</tr>
<tr>
<td>Of Performance-avoid goals</td>
<td>-.23*</td>
</tr>
<tr>
<td>Of Self-regulatory strategies</td>
<td>.40*</td>
</tr>
<tr>
<td>Of Self-efficacy for self-regulation</td>
<td>.59*</td>
</tr>
<tr>
<td>Of Conceptual writing strategies</td>
<td>.46*</td>
</tr>
<tr>
<td>Of Procedural writing strategies</td>
<td>.17*</td>
</tr>
<tr>
<td>Of Enactive mastery</td>
<td>.19*</td>
</tr>
<tr>
<td>Of Social persuasion</td>
<td>.09</td>
</tr>
<tr>
<td>Of Modeling</td>
<td>-.14*</td>
</tr>
<tr>
<td>Of Optimism</td>
<td>.59*</td>
</tr>
<tr>
<td>Of Active perfectionism</td>
<td>.44*</td>
</tr>
<tr>
<td>Of Gender</td>
<td>-.16*</td>
</tr>
</tbody>
</table>

* p<.05

The strongest total effects on year 11 mathematics grades were by year 10 mathematics grades ($\beta=.71$), mastery goals ($\beta=.70$), performance-approach goals ($\beta=.65$), mathematics anxiety ($\beta=-.60$) and mathematics test self-efficacy ($\beta=.59$). Optimism ($\beta=.55$) and self-efficacy for self-regulation ($\beta=.54$) also demonstrated rather strong effects on year 11 mathematics grades.

There was only one non-significant contribution, by social persuasion, to year 11 mathematics grades, although contributions by several other
variables (modeling, gender, enactive mastery) were small, and thus of little practical significance.

All standardised total effects on Year 11 mathematics performance are summarised in Table 55.

Table 55

**Standardised Total Effects in the Integrated Situational and Dispositional Model of Year 11 Mathematics Performance**

<table>
<thead>
<tr>
<th>Effect on Year 11 mathematics performance</th>
<th>Standardised total effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Of Year 10 mathematics grade</td>
<td>.71*</td>
</tr>
<tr>
<td>Of Mathematics anxiety</td>
<td>-.60*</td>
</tr>
<tr>
<td>Of Mathematics self-efficacy (class)</td>
<td>.36*</td>
</tr>
<tr>
<td>Of Mathematics self-efficacy (test)</td>
<td>.59*</td>
</tr>
<tr>
<td>Of Mastery goals</td>
<td>.70*</td>
</tr>
<tr>
<td>Of Performance-approach goals</td>
<td>.65*</td>
</tr>
<tr>
<td>Of Performance-avoid goals</td>
<td>-.27*</td>
</tr>
<tr>
<td>Self-regulatory strategies</td>
<td>.38*</td>
</tr>
<tr>
<td>Of Self-efficacy for self-regulation</td>
<td>.54*</td>
</tr>
<tr>
<td>Of Conceptual mathematics strategies</td>
<td>.38*</td>
</tr>
<tr>
<td>Of Procedural mathematics strategies</td>
<td>.24*</td>
</tr>
<tr>
<td>Of Enactive mastery</td>
<td>.17*</td>
</tr>
<tr>
<td>Of Social persuasion</td>
<td>.06</td>
</tr>
<tr>
<td>Of Modeling</td>
<td>-.11*</td>
</tr>
<tr>
<td>Of Optimism</td>
<td>.55*</td>
</tr>
<tr>
<td>Of Active perfectionism</td>
<td>.42*</td>
</tr>
<tr>
<td>Of Gender</td>
<td>-.13*</td>
</tr>
</tbody>
</table>

* p<.05
14.4 Chapter summary

One aim of Study 3 was to re-test the competing English and mathematics performance models from Study 2, in order to demonstrate their robustness in the sample when tested prior to and during the VCE. Analyses of the competing models in year 11 revealed that these models explained between 15% and 75% of the variance in VCE year 11 English performance and between 16% and 72% of the variance in VCE year 11 mathematics performance. A second aim of Study 3 was to test a model of performance in English and mathematics that was an integration of the constructs that comprised the competing models. Analyses of these models revealed that the combined variables explained 71% of the variance in year 11 English performance and 70% of the variance in year 11 mathematics performance. For both integrated models, past grades, mastery goals and performance-approach goals made the greatest total contributions to VCE grades.
CHAPTER FIFTEEN

STUDY THREE - DISCUSSION

Twelve months after Study 2, the competing models of English and mathematics performance based on 1) self-efficacy theory, 2) target and purpose goals, 3) positive psychology, and 4) cognitive and self-regulatory strategies were re-tested among the same sample of students who at this time were in their first year of VCE (year 11). These re-tests were undertaken to assess the robustness of the performance models from pre VCE year 10 to VCE year 11. The assessment of the robustness of models over time using a test re-test design such as that adopted in the current study was recommended by Littler and Innes (1999).

Where year 11 models do not differ substantively or substantially from year 10 models, the focus of discussion in this chapter will be on the robustness of each model over time. However, where models do differ over time, the focus of discussion will be on both the interpretation of the year 11 model as well as on the lack of robustness over time. At the end of this chapter, analyses pertaining to the integrated performance model that was tested at the end of Chapter 14 will also be discussed.

15.1 Self-efficacy based models of performance

Six performance models based on self-efficacy theory were re-tested in this study: three models of year 11 English performance and three models of year 11 mathematics performance, each based on the three coping clusters identified in the year 10 study and confirmed in the current study.
Results of the current study revealed no significant differences in coping cluster membership from year 10 to year 11. These results can be taken to indicate that coping orientation was quite stable among this sample between the ages of 16 and 17 years – at least insofar as school-related coping orientation is concerned. This indication supports the recommendation made in the previous study that future research should focus on understanding why students choose to manage their school-related demands in particularised ways, since students’ coping orientations bear, at least, upon the social cognitive variables that facilitate high academic grades, such as high levels of class and test self-efficacy and low levels of anxiety.

Understanding why students use certain coping orientations has the potential to inform school counselling programs aimed at fostering the most facilitative coping orientation among students. According to the current results, the most facilitative coping orientation with respect to both VCE year 11 English performance and VCE year 11 mathematics performance is a combined orientation, whereby students use both approach and avoidance coping. These results can be taken to suggest that the best scenario for performance in English and mathematics in the VCE is when students have a range of divergent coping strategies at their disposals with which to manage the demands of school.

The benefits of having a diverse range of coping strategies in the VCE might reflect the fact that VCE students indeed face a diverse range of demands. Thus, there may be certain instances when approach coping strategies such as ‘seeking advice from others’, for instance teachers, and
‘taking control of the situation’, for instance doing regular study, might facilitate performance. However, there might also be instances where avoidance coping strategies such as ‘ignoring the problem’ might facilitate performance. For instance, it might be beneficial to performance for students to ignore potential problems over which they have no control, rather than wasting time trying to approach such demands. It might be that avoidance coping in situations that cannot be altered may actually be quite proactive, by, for instance, reducing negative feelings about situations that may in turn impact on performance.

From the results of this study it is therefore recommended that higher level VCE students be taught a range of approach and avoidance coping techniques and also be taught to identify the types of academic scenarios in which approach or avoidance coping strategies might be best applied. This knowledge will help to provide students with a full set of coping techniques with which to manage the diverse range of demands that they will encounter in the VCE. Furthermore, the current results indicate that it is important for future research to investigate the wider impact that a combined coping orientation might have over behaviour in a more general sense, because the selective use of both approach and avoidance coping strategies appear to facilitate, at least, the attainment of high academic grades.

In terms of the robustness of the self-efficacy models from pre VCE year 10 to VCE year 11, the percentages of variance explained by the variables in the year 11 English performance models were highly similar to the year 10 models, with no corresponding model differing by more than 14%, in terms of
variance explained, across the two years. These results can be taken to suggest that the explanatory power, overall, of social cognitive variables transcends the different, and more urgent, types of demands that are present in the VCE years.

Further support for the robustness of these self-efficacy models from pre VCE year 10 to VCE year 11 comes from the observation that the beta weights within the six year 11 self-efficacy models were also highly comparable to the year 10 models. The greatest variations between the year 10 and 11 self-efficacy models were seen among combined copers, where the discrepancy between the beta weights for class and test self-efficacy – in both writing and in mathematics – on performance were much larger among the pre VCE sample. When the students reached VCE, there was less of a discrepancy between the effects of class and test self-efficacy on performance.

These results can be interpreted to suggest that in the VCE year, contextual differentiation in self-efficacy perceptions is less salient when it comes to predicting final grades among combined copers. In pre VCE year 10, the contributions of class self-efficacy to English and mathematics performance were markedly greater than the contributions of test self-efficacy to English and mathematics performance among combined copers. These same differences were not observed across the years for approach or avoidance copers.

The fact that a contextually broad range of efficacies is influential over performance for combined copers in year 11 seems consistent with their propensity to utilise a broad range of strategies with which to manage the high demands of the VCE. While not directly indicated by the current data, it is
possible that these combined copers may simply seek to see the bigger picture when it comes to a whole host of school related, and non-school related, variables. For instance, combined copers might also rely on other more globally-oriented expectancies, such as optimism or locus of control expectancies, to understand their worlds and to determine their behaviour.

In terms of other variables in the year 11 self-efficacy models, the observation that Bandura’s (1997) theoretical sources of self-efficacy were again not remarkably influential over levels of mathematics and writing self-efficacy (either in class or in tests), adds weight to the recommendation arising from the previous study that further sources of self-efficacy need to be identified.

Two possible sources of self-efficacy identified in Chapter 13 of the current thesis are related self-efficacies (e.g., self-efficacy for rudimentary junior school algebra may inform self-efficacy for advanced high school algebra) and the subjective interpretation of mastery information. It is suggested that future studies should address as a priority the identification of further sources of self-efficacy, because a clearer understanding of the sources of self-efficacy will inform intervention strategies aimed at enhancing these perceptions among both pre VCE and current VCE students.

15.2 Goal Based Models of Performance

Two goal-based models of performance were each re-tested in English and in mathematics in year 11: a target goal model and a purpose goal model. The percentages of variance explained by the target goal models in English and mathematics performance models were 42% and 49% respectively. The
percentages of variance explained by the purpose goal models in English and mathematics performance were 71% and 72% respectively.

15.2.1 Target Goal Models

The target goal model of performance was robust from year 10 to year 11 in mathematics, however optimism became a significant predictor of VCE year 11 grade goals in the year 11 English model, where it had not made any significant contribution to English grade goals in year 10. Overall, these models indicated that a combination of cognitive strategies and global (optimism) and specific (self-efficacy) self beliefs inform the outcome goals that students have for their final grades both prior to and during the VCE. However, these predictor variables did not combine to explain a great deal of the variance in these outcome goals – either in the English or the mathematics context. In fact, no more than 30% of the variance in grade goals was explained by the target goal model.

It is thus important for future research to identify further factors that do inform students' target goal-setting. Indeed, the results of the current study can be taken to suggest that the identification of such factors is of particular importance in the VCE years, since the beta weights from target goals to final grades in English and mathematics were substantially larger among the sample when they were in VCE year 11, as opposed to pre-VCE year 10. Since students who set high VCE grade goals tend to achieve high grades, it is clearly important that the processes that lead students to set these high goals are understood. Such understanding has the potential to inform school counseling
practices aimed towards facilitating high grades through these goal setting processes.

It may be that students' grade goals are more influential over performance in the VCE, as opposed to pre VCE, because VCE grades have broad implications for many students' futures. Thus it may be that students who set high grade goals in the VCE strive hard to achieve them — and indeed do achieve them — because the implications of this achievement are particularly salient at the VCE level.

Despite the indication of these data that optimism and self-efficacy contribute indirectly to performance in the VCE, the relationships between these latter variables and target goals in this study were not strong. In light of the small beta weights, it should not be inferred that to simply instill positive thinking and favourable self-pereceptions in these higher level students will be a remedy for poor performance. Indeed, rather like Bandura's (1997) argument that social persuasion that is perceived as inauthentic is not in fact persuasive, misplaced optimism and overly-inflated self-efficacy are unlikely to manufacture good grades. Excessive optimism and inaccurate efficacy perceptions might thus need to be tempered, since these might lead to unrealistic grade goals, and to many students ultimately falling short of these goals.

15.2.2 Purpose goal models

Of all the performance models re-tested among sample in their first VCE year, none altered as greatly, statistically, as the purpose goal models. While purpose goals explained 40% and 31% of the variance respectively in
year 10 English and mathematics performance, they explained 71% and 72% of the variance respectively in VCE English and mathematics performance.

Both prior to and during the VCE, mastery goals had similar contributions to performance both in English and mathematics. These results can be taken to suggest that it is important to performance at each of these stages for students to espouse goals aimed at learning and task mastery. These results were expected, but it important that they have been observed because while they replicate many previous studies (e.g., Hollenbeck & Brief, 1987; Locke & Latham, 1990; Phillips & Gully, 1997), it is the first time that they have been observed among Australian VCE students.

Performance-avoid goals also made similar negative contributions to English and mathematics performance both prior to and during the VCE, indicating that students’ aims to avoid appearing incompetent detract from their performance regardless of VCE status. It may be that the fear of appearing incompetent arouses debilitating anxiety in these students or it may be that it distracts students from learning. Clearly though, these results can be interpreted to suggest that it is important for teachers to be aware of the types of purpose goals that their students espouse and to encourage students to adopt more mastery-oriented and less performance-avoid oriented goals.

Implications of the current results with relation to performance-approach goals is less categorical. In terms of the contribution to grades of performance-approach goals, results showed that this contribution differed as a function of school subject and as a function of year level. In terms of differences as a function of school subject, this difference was only apparent
when students were in year 10. In year 10, performance-approach goals made no contribution to English grades, but a positive contribution to mathematics grades. In year 11, performance-approach goals made a positive contribution to both English grades and mathematics grades. That is, in year 10, mathematics students performed better if they aimed to outperform others, but in year 11, students performed better in both English and in mathematics if they aimed to outperform their peers.

In terms of year-level differences, the contribution of performance-approach goals to English and mathematics performance in the VCE ($\beta=.55$ and $\beta=.59$) far exceeded its contribution to English and mathematics performance prior to the VCE ($\beta=.09$, ns, and $\beta=.23$). These data have many implications. Firstly, they might be interpreted to suggest that students’ perceptions of mathematics, generally, as a competitive domain might have some bearing on their mathematics grades, since students who aimed to outperform others performed better in mathematics across both years. Thus it might be that the increasingly technologically-based world in which we live inflates the perceived importance of competence in science-based subjects, such as mathematics. The perceived importance of competence in mathematics is possibly a positive thing, since mathematics is often a pre-requisite subject for entry to many tertiary courses, however for some students such perceived importance might well contribute to anxiety over not performing well, which indeed may become a self-fulfilling prophecy. While mathematics is undoubtedly important to many students in the VCE, it is also important that
students do not over inflate its importance to the extent that this debilitates performance.

In English, performance-approach goals did not operate similarly across the years. While students who aimed to outperform others in VCE English did receive high grades, this purpose goal was not influential in pre VCE English grades. These data might be taken to suggest that these year 10 students did not view pre VCE English as a particularly competitive domain, thus how students fared in relation to their peers was unimportant in the prediction of grades. VCE English (where a failure in English means a failure in the VCE) is perhaps perceived as more competitive than year 10 English, hence explaining why performance approach-goals became important to English performance at this later stage.

In combination, students who espoused high mastery and performance-approach goals and low performance-avoid goals in VCE English and mathematics performed well in these subjects and effect sizes of these contributions were moderate. These results can be interpreted to suggest that students should be encouraged both to master their school material and to aim to outperform their peers at the level. While this latter suggestion might seem more appropriate to the corporate world, in reality many VCE students are up against their peers for highly sought after tertiary places. These data seem to indicate that setting performance-approach goals is one way in which they may help to secure such a place for themselves.
15.3 Positive Psychology Models

Two models of performance based on the positive psychology variables optimism and active perfectionism were re-tested in English and in mathematics in VCE year 11. The percentages of variance explained by these models in VCE year 11 English and mathematics were 62% and 63% respectively.

While there was not a lot of difference in the amount of variance explained in English and mathematics performance by those models across the years, the indirect contribution to English and mathematics performance by active perfectionism increased substantially in the VCE year 11 study, due to increases in its contributions to mastery goals and grade goals. These results can be interpreted to suggest that the effects that active perfectionism has on target and purpose goals is a function of year level. According to these results, at higher (VCE) levels, active perfectionism is an important contributor to these motivational constructs, which themselves contribute directly to VCE grades.

Indeed, while the contributions of both the positive psychology variables to VCE English and mathematics performance were indirect, they were nonetheless substantial (English: optimism $\beta$=.52, active perfectionism $\beta$=.49; mathematics: optimism $\beta$=.53, active perfectionism $\beta$=.52) in both subject contexts. These results can be taken to suggest that both optimism and active perfectionism are important contributors to well-being in the educational context, and hence lend support to the efficacy of studies that focus on well-
being and the roles of adaptive qualities (e.g., Seligman & Csikszentmihalyi, 2000).

From the current results it is recommended that students who have an inherent sense of optimism and who set high standards for themselves in the VCE should indeed be encouraged to think and behave in these positive ways at the VCE level. As well as encouraging students, the results of this study can also be taken to suggest that enlightening parents on the beneficial effects that their positive criticism can have on students’ performance will also be indirectly beneficial for students’ performance.

Nevertheless, it is possible that parental criticism that is perceived as inauthentic might not be favourably received by students. Thus, parents should perhaps avoid lavishing their children with praises that are “empty homilies” (Bandura, 1997, p.106), and instead give praise where it is due, but avoid overly harsh negative criticism.

15.4 Skill based models

Four skill-based models of performance in English and mathematics were re-tested in VCE year 11: models for English and mathematics based on students’ use of self-regulatory skills and models for English and mathematics based on students’ use of cognitive skills.

15.4.1 Self-regulatory skill based models

The self-regulatory skill-based models of year 10 English and mathematics performance were robust in the VCE year 11 study. Both prior to and during the VCE, students’ final grades in English and mathematics were predicted by a combination of high past grades, their use of self-regulatory
skills and their self-regulatory efficacy. These results can be taken to suggest that like the self-efficacy models discussed at the beginning of this chapter, the predictive ability of these further social cognitive variables transcend both subject context and VCE status.

While educators and parents will be heartened to see that the self-regulatory efforts made by students in the VCE were rewarded with good grades in the current study, it is important to note that students' perceptions of their abilities to self-regulate their learning contributed more to performance in VCE English and VCE mathematics than did their actual self-regulatory strategies. This latter result is evidence of the power of self-efficacy beliefs and, together with results of the earlier self-efficacy models and the positive psychology models, demonstrates the value that positive thinking can have on performance.

Despite the fact that self-regulation comes from within (i.e., it is not other-regulated [see Pintrich, 2000]), the potential still exists for teachers and parents to encourage self-regulation through their social persuasion of students' self-regulatory efficacy. Thus it is recommended that teachers and parents provide VCE students with positive feedback about their self-regulatory competence, which should, in terms of Bandura's (1997) theory, impact positively on their self-efficacy for self-regulation and hence their propensity to engage in facilitative self-regulatory strategies.

15.4.2 Cognitive skill based models

The cognitive skill-based models were robust across the years for mathematics, where the use of conceptual strategies contributed positively to
performance and the use of procedural strategies contributed negatively to performance. In English however, while the use of conceptual strategies contributed positively to performance both pre-VCE and during the VCE, the use of procedural strategies contributed positively to performance in the VCE, but did not contribute to performance in year 10.

These latter results might point to the critical importance of English in the VCE, where a fail in VCE English means a fail in the VCE. It might be that due to the importance of English at this level, procedural errors, such as spelling and grammatical errors, have a greater impact on English grades because they are dealt with more harshly at this level.

While the effects of conceptual and procedural strategy use on performance in year 11 were not large, clearly it important for students to have access to both conceptual and procedural cognitive skills in order to facilitate high performance in VCE English and mathematics. Thus, it is important to ascertain whether students both understand what they are taught, as well as remember the algorithms and processes of writing and mathematics.

15.5 The integrated models

In the discussion of the year 10 study, it was suggested that an integrated model of performance that combines commensurate constructs from the competing models be tested in the year 11 study. This suggestion was made earlier by Pajares’ (1996), who recommended that researchers try to combine variables from commensurate paradigms in order to better explain academic performance.
Results from the analyses of this model in VCE English and VCE mathematics revealed that while substantial proportions of the variance in performance were explained (71% in English and 70% in mathematics), these were comparable to the self-efficacy models and the purpose goal models and only marginally better, in terms of variance explained, than the models based on positive psychology and the use of self-regulatory skills. Thus, in terms of parsimony, this integrated model is not preferable to these four competing models.

15.6 Conclusions

The performance models based on self-efficacy, grade goals, positive psychology and self-regulatory skills were each robust across the pre VCE and VCE years. Statistically, the best performance model in the VCE was the self-efficacy model among combined copers, however this model was only tested among the 61 combined copers in the year 11 sample. Clearly if self-efficacy models are to be tested by coping orientation in future studies, larger sample sizes are required.

When the current sample was considered as a whole, the best VCE performance model, statistically, was the purpose goal model, which explained 71% of the variance in VCE year 11 English performance and 72% of the variance in VCE year 11 mathematics performance. According to these results, students' the predictive ability of purpose goals gained a certain prominence in relation to VCE performance that was not observed in the current sample prior to the VCE. This finding can be interpreted as highlighting the importance of studying performance indicators among the same sample at different times.
points, as this differential time effect of purpose goals on performance would not have been apparent in a cross-sectional design.

While not directly indicated by these results, it may be that purpose goals become more influential to performance in the VCE years due to the great influence that VCE ENTER scores will undoubtedly have on many of these students' immediate futures. Thus differences in the reasons these students have for learning in the VCE might be critical determinants not only of their VCE grades, but also of their long-term futures.

While these results seem to suggest that purpose goals are more important to performance in the VCE than they are to performance prior to the VCE, taken in conjunction with results from the other competing performance models, these results can be interpreted to suggest that are a complex interplay of situational and dispositional indicators that facilitate performance in this Australian educational setting. Indeed the results of the integrated performance models also point to this latter conclusion, however statistically, this more theoretically complex model did not explain performance any better than several of the simpler competing models.

Overall, results of the current study can be interpreted to suggest that along with fostering mastery goals and performance-approach goals, VCE students also need to be provided with information that will help them to build a robust sense of self-efficacy and a robust sense of self-regulatory efficacy. Furthermore, optimistic VCE students, and those who set high standards, should be encouraged to think and behave in these positive ways and these students' parents should also be encouraged to respond positively to their
children’s efforts. Nevertheless, students should not be encouraged to rely entirely on their good thoughts and feelings to produce high VCE grades. According to these data, it is also important for VCE success that students can access and utilise stores of both conceptual and procedural skills in both as well as to self-regulate their own learning.
CHAPTER SIXTEEN

CONCLUSIONS AND RECOMMENDATIONS

The attainment of high academic grades is critical for many senior secondary students in Australia. High academic grades might be required for entry to tertiary courses or for post-secondary vocational training, or they might be required by employers who are seeking non-tertiary trained, post-secondary school employees. The significance of just how important high grades are at this level is highlighted by the fact that young Australians aged 16 to 18 nominate high grades as their greatest issue of concern (Hibbert et al., 1996).

In light of the importance of high grades for Australian secondary students, and the observation that many of the findings from the European and North American educational literature have yet to be validated in an Australian context, the aim of this thesis was to test competing models of performance in English and mathematics in a sample of Australian students. These competing models were tested both prior to and during the Victorian Certificate of Education (VCE) in order to determine the factors most predictive of success in these years, and hence to inform teaching and counseling practices aimed at facilitating high VCE grades.

Competing performance models were proposed based on 1) self-efficacy theory, 2) target and purpose goals, 3) positive psychology variables and 4) self-regulatory and cognitive skills. However, in order to test these models, it was necessary to develop four new scales that were not available
from the literature. These scales were developed in a pilot study and tested in a sample of year 9 students. Each of the scales was demonstrated to be both psychometrically valid and reliable, hence indicating their use in the major studies. It is also suggested that these scales will provide valuable resources for future educational research.

In the major studies, the competing models of English and mathematics performance were tested using a second sample of students. In Study 2 these students were in year 10 (pre VCE) and in Study 3, twelve months later, they were in VCE year 11. An integrated performance model, which was proposed in Study 3, was also tested in both English and mathematics when the students were in VCE year 11.

In terms of the individual competing models, results indicated that the year 10 performance models based on self-efficacy theory were robust in year 11, and practically identical solutions were obtained for each model for both years. Results indicated that students’ coping orientation influenced the impact of self-efficacy on performance, and also influenced the sources of self-efficacy, lending support to the approach adopted in these studies of analysing the self-efficacy models by coping orientation.

Nevertheless, across each of the three coping orientations, the largest effects on final grades (performance) were made by past grades (past performance), which not only had strong direct effects, but also contributed indirectly to performance through enactive mastery and self-efficacy in all but one of the self-efficacy models (the English model for combined copers). These results support the reciprocal nature of the self-efficacy / performance
relationship proposed by Bandura (1986; 1997) and also support Pajares' (1996) recommendation that researchers need to look at variables, beyond past performance, that influence self-efficacy, such as Bandura's (1997) theoretical sources of self-efficacy.

However, with regard to the latter, results of the current studies, which have also empirically investigated Bandura's theoretical sources of self-efficacy, suggest that sources of self-efficacy beyond enactive mastery, modeling, social persuasion and physiological state experiences (anxiety) need to be identified. In each of the English and mathematics models, across each of the coping orientations, these four theoretical sources of self-efficacy combined to explain no more than 44% of the variance in self-efficacy. Clearly it is important that future research addresses the unexplained variance in self-efficacy, in order to inform teaching practices and school counseling strategies that might improve perceived inefficacy, and hence improve performance.

Two further sources of self-efficacy that should be considered in future research are the influence of very early school performance and the influence of related self-efficacies. Firstly, considering the strong and direct influence of past grades on performance, it is recommended that future research focus on identifying those factors that are influential to performance in the very early school years. It seems possible that performance in these rudimentary years of schooling may set up performance patterns and expectations that in later years become self-fulfilling. Thus it may the primary school grades that are most influential over secondary school grades, even above immediate past secondary school grades.
Indeed as this final discussion is being written, the Australian Federal Minister for Education, Science and Training, Dr Brendan Nelson, has just announced funding of $40,000 for a project to be undertaken in Victorian preschools to document the early literacy and numeracy experiences of young children and the ways in which these experiences impact on early literacy and numeracy development. The results of the current study certainly indicate that this initiative should prove fruitful not only for the immediate understanding of early academic competencies, but also for the longer term school performance prospects of Australian students.

Secondly, despite self-efficacy being a content and context specific perception of competence, it is possible that self-efficacy is, to some extent, informed by different, but related self-efficacy perceptions. For instance, self-efficacy for advanced (year 11) mathematics might be partly informed by one’s prevailing sense of middle-school (year 10) mathematics. Thus, once a sense of mathematics self-efficacy is established – and this might occur very early on in the primary school experience – it might actually be this early mathematics self-efficacy that contributes to more and more complex mathematics self-efficacy perceptions. This possibility again highlights the need for future research programs to understand better very young children’s school experiences and the impact they have on their school-related thinking and behaviour.

In terms of the goal-based models, taken together, the results of these studies indicate that two purpose goals had quite different impacts on performance, in terms of strength, for year 10 and year 11 students. In the year
10 study, neither target goals nor purpose goals were particularly influential on final grades in English or in mathematics. However, when students were in the VCE year, the percentage of variance in performance explained by purpose goals increased in both subject areas by some 30%. The main contributors to this increased variance were a mastery goal orientation and a performance-approach goal orientation — those goals that indicate students' desires to understand their material and to outperform their peers. The substantial increase in the influence of these goals on performance from pre VCE year 10 to VCE year 11 can be taken to suggest that these students have responded to the competitiveness of the VCE in extremely instrumental ways — after all, it will only be by mastering their material and by outperforming others that many of these students will achieve the ENTER scores they require for entry into their chosen tertiary course, or the grades they require to impress future employers.

While it might be possible that performance-approach goals could hinder the formation of close-knit, supportive peer networks that may facilitate learning throughout the demanding VCE years, the results of these studies can be taken to suggest that performance-approach goals are nonetheless influential means to important ends in the VCE. Thus, while not intending to set students against their friends and their peers, it is recommended that VCE students be encouraged to set their goals in terms of both internal performance referents, such as task mastery, and normative performance, such as beating others. Perhaps as well as encouraging students to do their best, these results also appear to indicate that if teachers were able to orchestrate friendly rivalries
between appropriate dyads, or groups of students, this process might well aid each of these students in achieving high ENTER scores.

The models of positive psychology indicated that students’ well-being is important to their academic success as it drives several processes that directly inform school grades. Feelings of well-being, embodied in the current studies as a global positive outlook (optimism) and the tendency to set high standards and receive positive parental criticism (active perfectionism), were associated with good grades, through their impact on goals and self-regulation. These good grades may, in part, demonstrate to students the authenticity and efficacy of their positivity, and in turn predict the future robustness of students’ positivity.

The benefit to school performance of an optimistic disposition is significant because it is influential over three key performance predictors: target goals, purpose (mastery) goals and self-regulation. Clearly a sense of optimism goes some way towards driving these facilitative processes by instilling a belief in their effectiveness. Students should thus be encouraged to become, or to remain optimistic in relation to their schoolwork.

The benefits to school performance of active perfectionism were indirect, through self-regulation. Considering that active perfectionism did not contribute to mastery goals, it is recommended that future research assess the impact of active perfectionism on mastery goals and on performance-approach goals, since these latter goals had a strong influence on VCE performance. It might be that teachers and parents should encourage their students to set their high standards in terms of both mastery goals and normative performance, and
that parents should reinforce the importance both of doing your best and normative performance in year 11 by framing some of their positive criticism in those terms.

The models based on self-regulatory skills were robust across years 10 and 11 and demonstrated the strong influence of self-efficacy for self-regulation on performance, above the influence of self-regulation itself. Indeed, the self-efficacy for self-regulation was an even stronger informant of performance than either of the content and context specific self-efficacies proposed in the first self-efficacy models. This result can be taken to indicate that it is students’ perceptions of ‘process-efficacy’ (e.g., I am good at studying), rather than ‘outcome-efficacy’ (e.g., I am good at algebra in class) that best explains their final grades. If this is the case, these students seem to be attributing quite a simple causal relationship from self-regulation to performance. Perhaps it is the perceived causal relationship between self-regulation and performance that in part drives self-regulation, beyond students’ belief that they are proficient self-regulators.

Results of these studies certainly indicate that students, both pre VCE and during VCE, should be encouraged to self-regulate their learning. This teaching should include instruction on the broad range of self-regulatory strategies proposed by Zimmerman (1986) and should be followed with feedback that will inform a positive sense of self-regulatory efficacy. However, these studies indicated that while cognitive skills based on the use on conceptual and procedural strategies contributed significantly to year 10 and year 11 performance, their impacts were of little practical significance.
Teachers should thus concentrate their efforts on teaching self-regulatory skills, above these cognitive skills.

Results of the final integrated models for English and mathematics in year 11 did not explain a greater percentage of the variance in performance than the self-efficacy models or the purpose goal models, thus in terms of parsimony, these models were not preferred. Nevertheless, theoretical models that do incorporate constructs from commensurate paradigms are still to be encouraged because their potential for theoretical enlightenment remains an under explored avenue in educational research.

In conclusion, these studies have provided an important investigation into the situational and dispositional indicators of school performance not previously undertaken in an Australian setting. The results also demonstrate the importance of modeling school performance at discrete year levels and in discrete subject domains, where different pressures and expectations might bear upon the factors that combine to explain school performance.

Future studies would benefit from larger sample sizes, particularly in the more complex models, in order to improve subject to variable ratios. Further research is also required to test the current models in more diverse subject domains.

A limitation of the current research was the inability to recruit a representative Victorian sample that also included students from State schools. In the current study, students from State schools were unable to be sampled because within the current State grading system students do not receive letter grades, but instead receive qualitative indicators of their progress towards a
benchmark. This latter type of grading could not be used in the performance models in these studies.

While results from the tests of these models have provided the first Australian data on a broad range of situational and dispositional indicators of performance both prior to and during the VCE, it is important that these models now be tested among Australian year 12 students as this penultimate school year may also bear importantly upon the situational and dispositional indicators of school performance.
REFERENCES


and the mathematical mystique. Baltimore, MD: Johns Hopkins University Press.


Abstracts International Section A: Humanities and Social Sciences, 60(3-A), 0590.


APPENDIX A1

DEAKIN UNIVERSITY ETHICS COMMITTEE
LETTER OF APPROVAL TO CONDUCT RESEARCH

STUDY 1
MEMORANDUM

TO: Ms Ingrid Nielsen
Psychology
Melbourne

FROM: Secretary, Deakin University Ethics Committee (DUEC)

DATE: 8 June 2000

SUBJECT: PROJECT: EC 120-2000 (Please quote this project number in future communication.)
PILOT STUDY OF INSTRUMENTS TO TEST A MULTIDIMENSIONAL MODEL OF ACADEMIC PERFORMANCE AND FULFILMENT

The above project was considered at DUEC Meeting 3/00 held on 5 June 2000. The Ethics Committee decision is as follows.

THAT APPROVAL BE GIVEN FOR MS INGRID NIELSEN, UNDER THE SUPERVISION OF DR KATE MOORE, PSYCHOLOGY, TO UNDERTAKE THIS PROJECT FROM 5 JUNE 2000 TO 31 DECEMBER 2000 SUBJECT TO EVIDENCE OF APPROPRIATE AUTHORITY TO UNDERTAKE RESEARCH IN SCHOOLS.

Standard on-going ethics clearance has been given for the above project, subject to evidence of authority to undertake research in schools is required. A photocopy of any letter of authority from the Government or Catholic Schools' Offices needs to be forwarded to my office for DUEC noting.

Notwithstanding the above, the standard conditions for on-going ethics clearance are given on the accompanying page. Please contact me if you have any queries or concerns about the DUEC decision. I can be contacted on (03) 9251 7123 (or x17123). The DUEC project number should be quoted in any communication.

Signature Redacted by Library

Keith Wilkins
Secretary, DUEC
Email: keithwil@deakin.edu.au
APPENDIX A2

DEAKIN UNIVERSITY ETHICS COMMITTEE
LETTER OF APPROVAL TO CONDUCT RESEARCH

STUDIES 2 & 3
MEMORANDUM

TO: Ms Ingrid Neilson  
     Psychology  
     Melbourne

FROM: Secretary, Deakin University Ethics Committee (DUEC)

DATE: 8 June 2000

SUBJECT: PROJECT: EC 121-2000  (Please quote this project number in future communication.)

AN INTEGRATED MULTIDIMENSIONAL MODEL OF ACADEMIC PERFORMANCE AND FULFILMENT: SOCIAL COGNITIVE, MOTIVATIONAL AND DISPOSITIONAL FACTORS

The above project was considered at DUEC Meeting 3/00 held on 5 June 2000. The Ethics Committee decision is as follows.

THAT APPROVAL BE GIVEN FOR MS INGRID NIELSEN, UNDER THE SUPERVISION OF DR KATE MOORE, PSYCHOLOGY, TO UNDERTAKE THIS PROJECT FROM 5 JUNE 2000 TO 31 DECEMBER 2001 SUBJECT TO EVIDENCE OF APPROPRIATE AUTHORITY TO UNDERTAKE RESEARCH IN SCHOOLS.

Standard on-going ethics clearance has been given for the above project, subject to evidence of authority to undertake research in schools is required. A photocopy of any letter of authority from the Government or Catholic Schools' Offices needs to be forwarded to my office for DUEC noting.

Notwithstanding the above, the standard conditions for on-going ethics clearance are given on the accompanying page. Please contact me if you have any queries or concerns about the DUEC decision. I can be contacted on (03) 9251 7123 (or x17123). The DUEC project number should be quoted in any communication.

Signature Redacted by Library

Keith Wilkins  
Secretary, DUEC  
Email: keithwil@deakin.edu.au
APPENDIX B1

LETTER TO CATHOLIC EDUCATION OFFICE
SEEKING PERMISSION TO APPROACH PRINCIPALS
Reverend Tom Doyle
Catholic Education Office
383 Albert Road
EAST MELBOURNE VIC 3002

Dear Reverend Doyle,

My name is Ingrid Nielsen and I am currently undertaking a PhD in Psychology at Deakin University under the supervision of Dr Kate Moore. This purpose of letter is to introduce you to the main aims of my PhD study and to request your permission to conduct the research in Victorian Catholic secondary schools.

As part of a three year study, I am investigating factors that contribute to academic achievement prior to and during the VCE. In order to conduct this research, I require information from year 9, 10 and 11 students pertaining to their own school experiences. This would involve students completing a series of questionnaires.

The main aim of the study is to test competing models of academic achievement subsuming motivational variables (e.g., goal orientation), self-beliefs (e.g., anxiety, coping style), dispositional variables (e.g., perfectionism) and skills (e.g., work and study strategies). As previous models of academic achievement have concentrated on only small groups of variables, it is intended that this comprehensive approach will provide richer detail on the interplay of internal and external sources of academic achievement as well as inform strategies to help students achieve academic goals.

In order to test the model, it will first be necessary to develop some questionnaires not available in the literature and to run a pilot study to validate these against other measures. For the purposes of establishing the psychometric properties of these questionnaires, Year 9 students would be asked to complete seven brief
questionnaires, taking about 20 to 30 minutes. The importance of this pilot study cannot be underestimated, as it will help to ensure that the constructs described in the proposed model are measured accurately and thus yield valid and reliable results.

To test the proposed models, Year 10 students would be asked to complete a series of questionnaires, taking about 1 hour, on two occasions: firstly in the middle of year 10, and then in the middle of year 11. The purpose of the follow-up study is to assess changes from pre-VCE to the first VCE year. Ideally, the year 9 and 10 students would be administered the questionnaires in early July 2000 and the year 10 students would be administered the questionnaires again in July 2001 (i.e., during year 11).

After obtaining consent from Principals and parents, students will be invited to complete the questionnaires in one sitting. No identifying information will be required, although year 10 students will be asked to supply a code word so that responses in year 11 can be matched with year 10 responses. Typically, this code is a combination of letters from parents’ names (e.g., Joan and Bill becomes JOABIL). All information is strictly confidential and anonymous. Only group data will be published and no individual school will be identified. All results will be made available to you.

At the start of the questionnaire sitting, I will introduce the study and advise students that they are free to withdraw from the study at any time, without penalty. I will remain during the sitting to help students with any queries that may arise and to collect all questionnaires at the end of the sitting.

It is anticipated that the study will involve 300 students from a cross section of Catholic and Independent schools in both metropolitan Melbourne and Victorian regional locations.
The importance of an investigation into academic achievement such as this is far-reaching. As many students view VCE as a pivotal springboard into adulthood, it is critical that we more fully understand the mechanisms that drive achievement at this period. A greater understanding of these processes may inform teaching practices and counseling approaches for students who are contemplating or studying their VCE.

I would greatly appreciate if permission were granted to allow me to conduct my research in Catholic secondary schools and I attach the questionnaires for your consideration. Ethics clearance is currently being obtained for the study from the Deakin University Ethics Committee. Should you require any further details, you can contact me at Deakin University on 9251 7154, or Dr Kate Moore on 9244 6475. I would be happy to discuss this further with you if you should have any concerns.

Thankyou for taking the time to read this letter. I look forward to a favourable reply.

Yours sincerely,

Ingrid Nielsen
APPENDIX B2

LETTER OF APPROVAL TO CONDUCT RESEARCH FROM CATHOLIC EDUCATION OFFICE
Ms I Nielsen
C/- Dr K Moore
School of Psychology
Deakin University
221 Burwood Highway
BURWOOD VIC 3125

Dear Ms Nielsen,

I am writing with regard to your letter of 14 June 2000 in which you referred to your forthcoming research project into factors that predict academic achievement prior to and during the VCE. I understand that this research is part of your studies for a PhD at Deakin University. You have asked approval to approach Catholic secondary schools in Victoria as you wish to involve students in Years 9-11.

If you wish to involve schools outside the Archdiocese of Melbourne, you will need to get approval from the Directors of Catholic Education of the country dioceses. Their addresses are as follows:

**Diocese of Ballarat**
- Mr Larry Burn
- Director of Catholic Education
- Catholic Education Office
- PO Box 576
- Ballarat Vic 3353

**Diocese of Sandhurst**
- Mr Denis Higgins
- Director of Catholic Education
- Catholic Education Office
- 181 McCrae Street
- Bendigo Vic 3550

**Diocese of Sale**
- Dr Therese D'Oraa
- Director of Catholic Education
- Catholic Education Office
- PO Box 322
- Warragul Vic 3820

However, I am pleased to advise that, in relation to schools in the Archdiocese of Melbourne, your research proposal is approved in principle subject to the following standard conditions.
1. The decision as to whether or not research can proceed in a school rests with the School Principal. So you will need to obtain approval directly from the Principal of each school that you wish to involve.

2. You should provide each Principal with an outline of your research proposal and indicate what will be asked of the school. A copy of this letter of approval, and a copy of notification of approval from the Ethics Committee, should also be included.

3. No student is to participate in research study unless s/he is willing to do so and informed consent is given by a parent/guardian.

4. You should provide a list of schools which have agreed to participate in the research project to the Information Services Unit of this Office.

5. Any substantive modifications to the research proposal, or additional research involving use of the data collected, will require a further research approval submission to this Office.

6. Data relating to individuals or schools are to remain confidential.

7. Since participating schools have an interest in the research findings, you should discuss with each Principal ways in which the results of the study could be made available for the benefit of the school community.

8. At the conclusion of the study, a copy or summary of the research findings should be forwarded to the Information Services Unit of the Catholic Education Office.

I wish you well with your research study. If you have any queries concerning this matter, please contact Mr Mark McCarthy of this Office.

With every best wish,

Yours sincerely,

Signature Redacted by Library

(Rev. T. M. Doyle)
DIRECTOR OF CATHOLIC EDUCATION
APPENDIX B3

INVITATION TO SCHOOL PRINCIPALS
TO PARTICIPATE IN THE RESEARCH
Dear Name,

My name is Ingrid Nielsen. I am PhD student in the School of Psychology at Deakin University, under the supervision of Dr Kate Moore. I am writing to determine if students at your school would be interested in participating in a study to test a model of academic achievement from pre-VCE to the first VCE year. As many students view VCE as a pivotal springboard into adulthood and their future career, it is critical we more fully understand the mechanisms that drive academic achievement at this period.

Although there has been much research into student achievement, several considerations have not been clearly addressed. Firstly, previous models have focused only on small groups of variables. The proposed model describes four classes of variables: self-beliefs (e.g., anxiety), motivation (e.g., goal orientation), dispositions (e.g., perfectionism) and skills (e.g., work and study strategies) as impacting on achievement. It is anticipated this comprehensive model will provide rich detail on the interplay of internal and external sources of achievement.
Secondly, whether achievement models differ across academic domains is not well understood. Since the nature of subject material across areas such as English and mathematics is very different, it is important to assess whether models of achievement are stable or variable across different domains.

Finally, since performance in the VCE is critical to many students' career aspirations, it is most important to understand how achievement models might differ from pre-VCE to VCE. One factor that might be important at this point in students' academic careers is the process they undergo to choose their VCE units. The American literature indicates that some college students enjoy elective subjects more than compulsory subjects, but by dichotomising the 'choice' process in this way, much information may be lost. For example, it is likely many people are asked for input into choosing students VCE units. Such people might include parents, siblings, teachers and school counselors. It is important to ascertain how choice impacts on achievement. It seems particularly likely that academic goal motivation might differ according to how units are chosen.

This study aims to test a model of academic achievement tracking a group of pre-VCE year 10 students through their first VCE year. In so doing, the research aims to:

- assess structural models of academic achievement for English and mathematics
- assess the need for separate models for male and female students
- assess the impact that VCE unit choice processes have on achievement in the VCE

To test the model, it will first be necessary to develop four questionnaires not available in the literature and to run a pilot study to validate these measures. To establish psychometric properties of the questionnaires, Year 9 students would be asked to complete seven brief questionnaires, taking no more than 30 minutes (attached). The importance of this process cannot be underestimated. It will help to
ensure that factors proposed in the model are measured accurately and thus yield valid and reliable data.

To test the model, Year 10 students would be asked to complete a series of questionnaires, taking about 1 hour, on two occasions: in the middle of year 10, and then in the middle of year 11 (attached). The purpose of the follow-up study is to assess changes from pre-VCE to VCE study. Ideally, year 9 and 10 data would be collected in July-August 2000 and the year 10s would be followed-up in July 2001 (i.e., during year 11).

Permission to conduct these studies in Catholic secondary schools has been granted by the Catholic Education Office (attached) pending permission from Principals, students and parents. Ethics clearance to conduct the studies has also been granted from the Deakin University Ethics Committee (attached). It is anticipated that the pilot and longitudinal studies will each involve 300 students from a cross-section of Catholic and Independent schools in both Melbourne and regional Victoria. Permission to approach parents and students at your school will help ensure a representative sample of Victorian students.

With your approval and after obtaining parental and student consent, students will be invited to complete the questionnaires in one sitting. At the start of the sitting, I will introduce the study and advise students that they are free to withdraw from the study at any time. I will remain to help students with any queries and to collect questionnaires at the end of the sitting.

No identifying information will be required, although year 10s will be asked to supply a code word so that their year 11 responses can be matched with year 10 data. All information is strictly confidential and anonymous. Only group data will be published and no individual school will be identified. All results will be made available to you.
The importance of a longitudinal investigation such as this cannot be underestimated. Objective achievement indices have implications for students' future study and employment, while subjective achievement indices have implications for students' psychological well-being. A better understanding of these processes may inform teaching and counseling practices for students contemplating or studying their VCE.

I would greatly appreciate your permission to conduct my research in your school and I attach the questionnaires and a proposed timeline for the studies for your consideration. Should you require any further details, you can contact me at Deakin on 9251 7154, or Dr Kate Moore on 9244 6475. I would be happy to discuss this further with you if you should have any concerns.

Thankyou for taking the time to read this letter. I look forward to a favourable reply.

Yours sincerely,

Ingrid Nielsen

Dr Kate Moore
APPENDIX C1

PLAIN LANGUAGE STATEMENT
STUDY 1
My name is Ingrid Niclsen and I am a Doctor of Philosophy (PhD) student from the School of Psychology at Deakin University under the supervision of Dr Kate Moore.

I wish to carry out a brief study for which I am seeking volunteers in year 9. The study is designed to evaluate a series of questionnaires that will be used in the future to investigate factors related to academic achievement. The data will provide information on four new questionnaires. This will contribute to two follow-up studies into the academic achievement of pre-VCE and VCE students. Results from the study have the potential to inform teaching methods and counseling practices for students contemplating or studying their VCE. The Education Department of Victoria, the Principal of your school and the Ethics Committee of Deakin University have all given their approval for this research to take place.

If your child is interested, and you consent for him or her to participate in this study, he/she will be asked to complete eight brief questionnaires, taking about 30 minutes. Some of the questionnaires relate directly to feelings about schoolwork. For example, "how confidently can you complete an algebra problem" (very confident to not confident at all). Students will be asked to consider the strategies they use to tackle certain types of problems (e.g., "Try to memorise what to do rather than understand what it all means" (very much to not at all). They will also be asked about their reactions to certain tasks (e.g., "Maths makes me feel uncomfortable and nervous" (not at all to very much) or "I'm nervous about writing" (very much to not at all).

There are no right or wrong answers and I do not anticipate that completing any of the questionnaires will be upsetting for anyone, but should you or your child be concerned by any aspect of the study, please contact a teacher or the school counselor who will have been notified of this study. If you consent to your child's participation, and then change your mind, or your child should not agree, or change their mind, your child can withdraw from the study at any time without penalty.

Please note that completion of the questionnaires is entirely confidential and no identifying information is required. Please also be assured that all data will be securely locked in the School of Psychology building at Deakin University for a minimum of six years to comply with University policy. Only group data will be published and I will provide the school with summary of over all results.

If you would like any further information about this study, please do not hesitate to contact me at Deakin on 9251 7154, or my supervisor on 9244 6475.
APPENDIX C2

PLAIN LANGUAGE STATEMENT
STUDIES 2 & 3
My name is Ingrid Nielsen and I am a Doctor of Philosophy (PhD) student from the School of Psychology at Deakin University under the supervision of Dr Kate Moore. I wish to carry out a two-year study for which I am seeking volunteers currently in year 10.

The study is designed to investigate factors related to academic achievement. Volunteers are sought from year 10 students in Victoria, who will then be asked to participate in a follow-up study in year 11. The purpose of the second study is to see whether there are differences in the factors associated with achievement before VCE and during VCE. Results from the study have the potential to inform teaching methods and counseling practices for students contemplating or studying their VCE. The Education Department, the Principal of your school and the Ethics Committee of Deakin University have all given approval for this research to take place.

If you consent for your son/daughter to participate in this study, he/she will be asked to complete a series of questionnaires in the middle of year 10, and again in the middle of year 11. Some questions relate directly to feelings about school, for example, "how well can you complete an algebra problem" (Not at all to very well). Students will be asked to imagine a situation where they don't do well at school and consider how they may cope with this (e.g., "feel miserable", "seek advice from others" (never to always). They will also be asked to consider the strategies they use to tackle certain problems (e.g., "try to memorise what to do rather than understand what it all means" (not at all to very much). Students will be asked about their reactions to certain academic tasks (e.g., "Maths makes me feel uncomfortable and nervous" or "Getting good grades boosts my writing confidence" (not at all to very much). Some questions will ask about reactions and feelings towards school in a broader context (e.g., grades most often reflect the effort you put into classes (very much to never).

There are no right or wrong answers. Rather, I am interested in how responses differ from pre-VCE to VCE study. I estimate that it will take about 45-60 minutes to complete the questionnaires in each sitting. I do not anticipate that any of the questionnaires will be upsetting for anyone, however should you or your son/daughter be concerned by the study, please contact a teacher or the school counselor who will be notified of this research. If you consent to their participation, and then decide against it, or your child decides against it, they can withdraw from the study at any time without penalty.

Please note that completion of the questionnaires is entirely confidential, and although it will be necessary to be able to identify participants for the purpose of combining data from the two studies, please be assured that all identities will be coded. All information will be securely locked in the School of Psychology building at Deakin University for a minimum of six years, to comply with University policy. Only group data will be published and a summary of the results will be available to the school.

If you would like any further information about this study, please do not hesitate to contact me at Deakin on 9251 7154, or my supervisor on 9244 6475.

Thankyou for your time in considering this study. A consent form to be signed by you is attached. Please ask your child to return it to the school.
APPENDIX D1

QUESTIONNAIRES USED IN STUDY 1
PILOT STUDY OF QUESTIONNAIRES TO TEST
A MULTIDIMENSIONAL MODEL
OF ACADEMIC ACHIEVEMENT
JULY - AUGUST 2000

THANK YOU FOR AGREEING TO PARTICIPATE IN THIS STUDY

THERE ARE NO 'RIGHT' OR 'WRONG' ANSWERS
TO ANY OF THESE QUESTIONS

WE ARE INTERESTED IN YOUR OPINIONS ONLY

DO NOT SPEND TOO MUCH TIME ON ANY ONE QUESTION

PLEASE ANSWER ALL THE QUESTIONS
Demographic information

Please complete the following questions about yourself. Remember that all your answers are strictly confidential and anonymous.

1. Please indicate your age in years and months: _____ years and _____ months

2. Are you male or female (circle one)

Questions 3 and 4 ask you to remember some grades you have received in the past. If you cannot remember them exactly, please estimate your grade for these subjects.

3. Please circle the grade you received at the end of year 8 for:

4. Please circle the grade you just received for your midyear year 9 result for:

5. Please circle the grade you are aiming for at the end of year 9 for:
The following questions ask you to estimate your own mathematics ability. On a scale of 1 to 5, how confident are you that you can perform each of the following tasks in a mathematics class?

<table>
<thead>
<tr>
<th>Task</th>
<th>Not at all confident</th>
<th>Very confident</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. A simultaneous equation</td>
<td>1 2 3 4 5</td>
<td></td>
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<tr>
<td>2. Work with decimals</td>
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<td></td>
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<td></td>
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<td></td>
</tr>
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<td>5. A problem in trigonometry</td>
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<td></td>
</tr>
<tr>
<td>6. Calculate values of area and volume</td>
<td>1 2 3 4 5</td>
<td></td>
</tr>
<tr>
<td>7. Sketch a curve</td>
<td>1 2 3 4 5</td>
<td></td>
</tr>
<tr>
<td>8. Work with fractions</td>
<td>1 2 3 4 5</td>
<td></td>
</tr>
<tr>
<td>9. Determine the value of a missing side length</td>
<td>1 2 3 4 5</td>
<td></td>
</tr>
</tbody>
</table>

The following questions ask you to estimate your own mathematics ability. On a scale of 1 to 5, how confident are you that you can perform each of the following tasks in a mathematics test?

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<td>9. Determine the value of a missing side length</td>
<td>1 2 3 4 5</td>
<td></td>
</tr>
</tbody>
</table>
The following questions ask you to think about your own **writing** experiences. Circle the number from 1 to 5 which best describes how you feel about your own **writing**.

<p>| | | | | | |</p>
<table>
<thead>
<tr>
<th></th>
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<th></th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Getting good essay marks boosts my writing confidence</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>2. If I get nervous about my writing, it makes things even worse</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>3. If my classmates struggle with an essay, I feel I will struggle too</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>4. I can always write better when I’m feeling good about my work</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>5. If I’m pleased with an essay I hand in, I feel ready to tackle another</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>6. I can always write better when others believe in me</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>7. I can tell how well I will do on an essay by how well my classmates do</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>8. If I can’t make a start on an essay, nobody can boost my confidence</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>9. The essays I write are much the same standard from year to year</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>10. I expect to score about the same on an essay as the rest of the class</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>11. My writing seems to get worse if I’m criticised too much about it</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>12. My writing seems to improve, the more relaxed I am</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>
The following questions ask you to think about the different ways you approach mathematics problems. Circle a number from 1 to 5 which best represents how you solve different kinds of maths problems.

1. In maths, I try to memorise what to do rather than understand what it all means
   
   Not at all   Very much
   1 2 3 4 5

2. When it comes to maths tests, I usually try to understand an example so I can apply it to other problems
   
   Not at all   Very much
   1 2 3 4 5

3. When it comes to maths tests, I usually try to memorise the steps required to solve different sorts of problems
   
   Not at all   Very much
   1 2 3 4 5

4. To me, the values I express as decimals are very much like fractions
   
   Not at all   Very much
   1 2 3 4 5

5. If I forget how to solve a maths problem, I can usually think my way through it
   
   Not at all   Very much
   1 2 3 4 5

6. Remembering how to work out maths problems is just like remembering a recipe
   
   Not at all   Very much
   1 2 3 4 5

7. Maths is about remembering, not understanding
   
   Not at all   Very much
   1 2 3 4 5

8. Maths is easiest when I can use one problem to help me work out another
   
   Not at all   Very much
   1 2 3 4 5
The following questions ask you to think about the different ways you approach writing tasks. Circle a number from 1 to 5 which represents how you write essays or stories in English.

1. I write best when I give myself room to explore many issues
   1 2 3 4 5

2. I write best when I carefully consider the arguments I am trying to make
   1 2 3 4 5

3. I write best when I stick to a proven formula
   1 2 3 4 5

4. I write best when I carefully consider all the grammar and punctuation rules
   1 2 3 4 5

5. The way I write is to use my past essays as 'examples' or 'guides' for my work
   1 2 3 4 5

6. It's easier to write an essay if you try to relate all the ideas to each other
   1 2 3 4 5

7. When I write an essay, I think mostly about whether I have followed all the rules of English, like punctuation
   1 2 3 4 5

8. I think more about the subject matter of my essays than whether all the commas are in the right spot
   1 2 3 4 5
The following questions ask you to estimate your own writing ability. On a scale of 1 to 5, how confident are you that you can perform each of the following writing tasks IN THE ENGLISH CLASSROOM?

Not at all confident  |  Very confident
1. Correctly spell all words in a 1 page story or essay | 1  2  3  4  5
2. Correctly punctuate a 1 page story or essay | 1  2  3  4  5
3. Correctly use parts of speech like nouns, verbs or adjectives | 1  2  3  4  5
4. Write a simple sentence with good grammar | 1  2  3  4  5
5. Correctly use singulairs, plurals and verb tenses | 1  2  3  4  5
6. Write a strong paragraph that has a good 'main idea' | 1  2  3  4  5
7. Write a paragraph that support a main idea | 1  2  3  4  5
8. Organise sentences in a paragraph that clearly express an idea | 1  2  3  4  5
9. Write a well-organised paragraph with a good introduction, body and conclusion | 1  2  3  4  5

The following questions ask you to estimate your own writing ability. On a scale of 1 to 5, how confident are you that you can perform each of the following writing tasks IN AN ENGLISH EXAMINATION?

Not at all confident  |  Very confident
1. Correctly spell all words in a 1 page story or essay | 1  2  3  4  5
2. Correctly punctuate a 1 page story or essay | 1  2  3  4  5
3. Correctly use parts of speech like nouns, verbs or adjectives | 1  2  3  4  5
4. Write a simple sentence with good grammar | 1  2  3  4  5
5. Correctly use singulairs, plurals and verb tenses | 1  2  3  4  5
6. Write a strong paragraph that has a good 'main idea' | 1  2  3  4  5
7. Write a paragraph that support a main idea | 1  2  3  4  5
8. Organise sentences in a paragraph that clearly express an idea | 1  2  3  4  5
9. Write a well-organised paragraph with a good introduction, body and conclusion | 1  2  3  4  5
The following questions ask you to think about your own **writing** experiences. Circle the number from 1 to 5 which best describes how you feel about your own **writing**.

1. I get high scores on maths tests  
   | Not at all | Very much |
   | 1 | 2 | 3 | 4 | 5 |
2. My favourite teachers are often maths teachers  
   | 1 | 2 | 3 | 4 | 5 |
3. My friends have discouraged me from taking maths  
   | 1 | 2 | 3 | 4 | 5 |
4. I get good grades in maths  
   | 1 | 2 | 3 | 4 | 5 |
5. Many of the adults I admire are good at maths  
   | 1 | 2 | 3 | 4 | 5 |
6. Other people think I'm poor at maths  
   | 1 | 2 | 3 | 4 | 5 |
7. In maths, I hardly ever get the answer before my classmates  
   | 1 | 2 | 3 | 4 | 5 |
8. Most friends of mine do poorly in maths  
   | 1 | 2 | 3 | 4 | 5 |
9. My teacher has picked me out as having good maths skills  
   | 1 | 2 | 3 | 4 | 5 |
10. Among my friends, I'm often the one who works out maths problems  
    | 1 | 2 | 3 | 4 | 5 |
11. My parents have **encouraged** me to be proud of my maths ability  
    | 1 | 2 | 3 | 4 | 5 |
12. I have received awards for my maths ability  
    | 1 | 2 | 3 | 4 | 5 |
13. My role models are mostly in fields that do not involve maths  
    | 1 | 2 | 3 | 4 | 5 |
14. My friends have encouraged me to take higher level maths  
    | 1 | 2 | 3 | 4 | 5 |
15. Maths has always been a very difficult subject for me  
    | 1 | 2 | 3 | 4 | 5 |
16. My friends tend to avoid taking high school maths  
    | 1 | 2 | 3 | 4 | 5 |
17. My parents are not very good at maths  
    | 1 | 2 | 3 | 4 | 5 |
18. Teachers have discouraged me from careers which involve maths  
    | 1 | 2 | 3 | 4 | 5 |
19. I am rarely able to help friends with hard maths problems  
    | 1 | 2 | 3 | 4 | 5 |
20. People I look up to are good at maths  
    | 1 | 2 | 3 | 4 | 5 |
21. I've been encouraged to do things at school which require maths  
    | 1 | 2 | 3 | 4 | 5 |
22. I take fewer high school maths subjects than other students  
    | 1 | 2 | 3 | 4 | 5 |
23. Some of my closest friends are great at maths  
    | 1 | 2 | 3 | 4 | 5 |
24. People I look up to have **told** me not to do higher level maths  
    | 1 | 2 | 3 | 4 | 5 |
25. I work at hard maths problems until I solve them  
    | 1 | 2 | 3 | 4 | 5 |
26. Many adults I know have jobs that require good maths  
    | 1 | 2 | 3 | 4 | 5 |
27. I have always had a natural talent for maths  
    | 1 | 2 | 3 | 4 | 5 |
28. Teachers have not encouraged me to continue higher with maths  
    | 1 | 2 | 3 | 4 | 5 |
29. Many of my friends want jobs that do not require maths  
    | 1 | 2 | 3 | 4 | 5 |
30. My parents have encouraged me to do well in maths  
    | 1 | 2 | 3 | 4 | 5 |
The following questions ask for some more general feelings about mathematics. On a scale of 1 to 5, how do you feel about the following mathematics issues?

1. I find many maths interesting and challenging
   Not at all | Very much
   1 | 2 | 3 | 4 | 5

2. Given the choice, I would hesitate to take maths courses
   1 | 2 | 3 | 4 | 5

3. I have done better in maths than in other subjects
   1 | 2 | 3 | 4 | 5

4. Maths makes me feel inadequate
   1 | 2 | 3 | 4 | 5

5. I am good at maths
   1 | 2 | 3 | 4 | 5

6. I have poor maths skills
   1 | 2 | 3 | 4 | 5

7. I have always done well in maths classes
   1 | 2 | 3 | 4 | 5

8. I never do well on maths tests
   1 | 2 | 3 | 4 | 5

9. My friends come to me for help in maths
   1 | 2 | 3 | 4 | 5

10. I have never been very excited about maths
    1 | 2 | 3 | 4 | 5
THANK YOU, AGAIN, FOR AGREEING TO PARTICIPATE IN THIS STUDY

PLEASE QUICKLY SCAN THROUGH YOUR PAPER TO ENSURE YOU HAVE ANSWERED ALL THE QUESTIONS
APPENDIX D2

QUESTIONNAIRES USED IN STUDIES 2 & 3
A MULTIDIMENSIONAL MODEL OF ACADEMIC ACHIEVEMENT

AUGUST - SEPTEMBER 2000

THANKYOU FOR AGREEING TO PARTICIPATE IN THIS STUDY

THERE ARE NO 'RIGHT' OR 'WRONG' ANSWERS TO ANY OF THESE QUESTIONS

WE ARE INTERESTED IN YOUR OPINIONS ONLY

DO NOT SPEND TOO MUCH TIME ON ANY ONE QUESTION

PLEASE ANSWER ALL THE QUESTIONS
Demographic information

Please complete the following questions about yourself. Remember that all your answers are strictly confidential and anonymous. If you cannot remember exact grades, please estimate them.

1) What is your age in years and months: _____ years and _____ months

2) Are you male or female (circle one)

3) Please circle the grade you received at the end of year 9 for:

4) Please circle the grade you have just received for your midyear year 10 result in:

5) Please circle the grade you would be pleased to obtain at the end of year 10 for:

6) Please circle the grade you expect to obtain at the end of year 10 for:
The following questions ask you to estimate your own mathematics ability. On a scale of 1 to 5, how confident are you that you can perform each of the following tasks IN A MATHEMATICS CLASS?

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</tbody>
</table>

The following questions ask you to estimate your own mathematics ability. On a scale of 1 to 5, how confident are you that you can perform each of the following tasks IN A MATHEMATICS TEST?

<table>
<thead>
<tr>
<th>Task</th>
<th>Not at all confident</th>
<th>Very confident</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. A simultaneous equation</td>
<td>1 2 3 4 5</td>
<td></td>
</tr>
<tr>
<td>2. Work with decimals</td>
<td>1 2 3 4 5</td>
<td></td>
</tr>
<tr>
<td>3. Determine the degrees of a missing angle</td>
<td>1 2 3 4 5</td>
<td></td>
</tr>
<tr>
<td>4. An algebra problem</td>
<td>1 2 3 4 5</td>
<td></td>
</tr>
<tr>
<td>5. A problem in trigonometry</td>
<td>1 2 3 4 5</td>
<td></td>
</tr>
<tr>
<td>6. Calculate values of area and volume</td>
<td>1 2 3 4 5</td>
<td></td>
</tr>
<tr>
<td>7. Sketch a curve</td>
<td>1 2 3 4 5</td>
<td></td>
</tr>
<tr>
<td>8. Work with fractions</td>
<td>1 2 3 4 5</td>
<td></td>
</tr>
<tr>
<td>9. Determine the value of a missing side length</td>
<td>1 2 3 4 5</td>
<td></td>
</tr>
</tbody>
</table>
The following questions ask you to think about your own writing experiences. Circle the number from 1 to 5 which best describes how you feel about your own writing.

1. Getting good essay marks boosts my writing confidence
2. If I get nervous about my writing, it makes things even worse
3. If my classmates struggle with an essay, I feel I will struggle too
4. I can always write better when I'm feeling good about my work
5. If I'm pleased with an essay I hand in, I feel ready to tackle another
6. I can always write better when others believe in me
7. I can tell how well I will do on an essay by how well my classmates do
8. If I can't make a start on an essay, nobody can boost my confidence
9. The essays I write are much the same standard from year to year
10. I expect to score about the same on an essay as the rest of the class
11. My writing seems to get worse if I'm criticised too much about it
12. My writing seems to improve, the more relaxed I am
The following questions ask you to think about the different ways you approach **mathematics** problems. Circle a number from 1 to 5 which best represents how you solve different kinds of **maths** problems.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th>Not at all</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>Very much</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>In <strong>maths</strong>, I try to memorise what to do</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>rather than understand what it all means</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>When it comes to <strong>maths tests</strong>, I usually try to understand</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>an example so I can apply it to other problems</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>When it comes to <strong>maths tests</strong>, I usually try to memorise</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>the steps required to solve different sorts of problems</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>To me, the values I express as decimals are very much like</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>fractions</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>If I forget how to solve a maths problem, I can usually think</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>my way through it</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Remembering how to work out maths problems is just like</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>remembering a recipe</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td><strong>Maths is about remembering, not understanding</strong></td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td><strong>Maths is easiest when I can use one problem to help me</strong></td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>work out another</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The following questions ask you to think about the different ways you approach writing tasks. Circle a number from 1 to 5 which best represents how you write essays or stories in English.

1. I write best when I give myself room to explore many issues
   Not at all 1 2 3 Very much 4 5

2. I write best when I carefully consider the arguments I am trying to make
   Not at all 1 2 3 Very much 4 5

3. I write best when I stick to a proven formula
   Not at all 1 2 3 Very much 4 5

4. I write best when I carefully consider all the grammar and punctuation rules
   Not at all 1 2 3 Very much 4 5

5. The way I write is to use my past essays as 'examples' or 'guides' for my work
   Not at all 1 2 3 Very much 4 5

6. It's easier to write an essay if you try to relate all the ideas to each other
   Not at all 1 2 3 Very much 4 5

7. When I write an essay, I think mostly about whether I have followed all the rules of English, like punctuation
   Not at all 1 2 3 Very much 4 5

8. I think more about the subject matter of my essays than whether all the commas are in the right spot
   Not at all 1 2 3 Very much 4 5
The following questions ask you to estimate your own writing ability. On a scale of 1 to 5, how confident are you that you can perform each of the following writing tasks IN THE ENGLISH CLASSROOM?

<table>
<thead>
<tr>
<th>Task</th>
<th>Not at all confident</th>
<th>Very confident</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Correctly spell all words in a 1 page story or essay</td>
<td>1 2 3 4 5</td>
<td></td>
</tr>
<tr>
<td>2. Correctly punctuate a 1 page story or essay</td>
<td>1 2 3 4 5</td>
<td></td>
</tr>
<tr>
<td>3. Correctly use parts of speech like nouns, verbs or adjectives</td>
<td>1 2 3 4 5</td>
<td></td>
</tr>
<tr>
<td>4. Write a simple sentence with good grammar</td>
<td>1 2 3 4 5</td>
<td></td>
</tr>
<tr>
<td>5. Correctly use singulars, plurals and verb tenses</td>
<td>1 2 3 4 5</td>
<td></td>
</tr>
<tr>
<td>6. Write a strong paragraph that has a good ‘main idea’</td>
<td>1 2 3 4 5</td>
<td></td>
</tr>
<tr>
<td>7. Write a paragraph that support a main idea</td>
<td>1 2 3 4 5</td>
<td></td>
</tr>
<tr>
<td>8. Organise sentences in a paragraph that clearly express an idea</td>
<td>1 2 3 4 5</td>
<td></td>
</tr>
<tr>
<td>9. Write a well-organised paragraph with a good introduction, body and conclusion</td>
<td>1 2 3 4 5</td>
<td></td>
</tr>
</tbody>
</table>

The following questions ask you to estimate your own writing ability. On a scale of 1 to 5, how confident are you that you can perform each of the following writing tasks IN AN ENGLISH EXAMINATION?

<table>
<thead>
<tr>
<th>Task</th>
<th>Not at all confident</th>
<th>Very confident</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Correctly spell all words in a 1 page story or essay</td>
<td>1 2 3 4 5</td>
<td></td>
</tr>
<tr>
<td>2. Correctly punctuate a 1 page story or essay</td>
<td>1 2 3 4 5</td>
<td></td>
</tr>
<tr>
<td>3. Correctly use parts of speech like nouns, verbs or adjectives</td>
<td>1 2 3 4 5</td>
<td></td>
</tr>
<tr>
<td>4. Write a simple sentence with good grammar</td>
<td>1 2 3 4 5</td>
<td></td>
</tr>
<tr>
<td>5. Correctly use singulars, plurals and verb tenses</td>
<td>1 2 3 4 5</td>
<td></td>
</tr>
<tr>
<td>6. Write a strong paragraph that has a good ‘main idea’</td>
<td>1 2 3 4 5</td>
<td></td>
</tr>
<tr>
<td>7. Write a paragraph that support a main idea</td>
<td>1 2 3 4 5</td>
<td></td>
</tr>
<tr>
<td>8. Organise sentences in a paragraph that clearly express an idea</td>
<td>1 2 3 4 5</td>
<td></td>
</tr>
<tr>
<td>9. Write a well-organised paragraph with a good introduction, body and conclusion</td>
<td>1 2 3 4 5</td>
<td></td>
</tr>
</tbody>
</table>
The following questions ask you to think about your own mathematics experiences. Circle the number from 1 to 5 which best describes how you feel about maths.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th>Not at all</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>Very much</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>I get high scores on maths tests</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>2</td>
<td>My favourite teachers are often maths teachers</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>3</td>
<td>My friends have discouraged me from taking maths</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>4</td>
<td>I get good grades in maths</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>5</td>
<td>Many of the adults I admire are good at maths</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>6</td>
<td>Other people think I'm poor at maths</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>7</td>
<td>In maths, I hardly ever get the answer before my classmates</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>8</td>
<td>Most friends of mine do poorly in maths</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>9</td>
<td>My teacher has picked me out as having good maths skills</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>10</td>
<td>Among my friends, I'm often the one who works out maths problems</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>11</td>
<td>My parents have encouraged me to be proud of my maths ability</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>12</td>
<td>I have received awards for my maths ability</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>13</td>
<td>My role models are mostly in fields that do not involve maths</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>14</td>
<td>My friends have encouraged me to take higher level maths</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>15</td>
<td>Maths has always been a very difficult subject for me</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>16</td>
<td>My friends tend to avoid taking high school maths</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>17</td>
<td>My parents are not very good at maths</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>18</td>
<td>Teachers have discouraged me from careers which involve maths</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>19</td>
<td>I am rarely able to help friends with hard maths problems</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>20</td>
<td>People I look up to are good at maths</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>21</td>
<td>I've been encouraged to do things at school which require maths</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>22</td>
<td>I take fewer high school maths subjects than other students</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>23</td>
<td>Some of my closest friends are great at maths</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>24</td>
<td>People I look up to have told me not to do higher level maths</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>25</td>
<td>I work at hard maths problems until I solve them</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>26</td>
<td>Many adults I know have jobs that require good maths</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>27</td>
<td>I have always had a natural talent for maths</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>28</td>
<td>Teachers have not encouraged me to continue higher with maths</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>29</td>
<td>Many of my friends want jobs that do not require maths</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>30</td>
<td>My parents have encouraged me to do well in maths</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>
The following questions ask for some more general feelings about mathematics. On a scale of 1 to 5, how do you feel about the following mathematics issues?

1. I find maths interesting and challenging
   Not at all 1 2 3 4 5
   Very much

2. Given the choice, I would hesitate to take maths courses
   Not at all 1 2 3 4 5
   Very much

3. I have done better in maths than in other subjects
   Not at all 1 2 3 4 5
   Very much

4. Maths makes me feel inadequate
   Not at all 1 2 3 4 5
   Very much

5. I am good at maths
   Not at all 1 2 3 4 5
   Very much

6. I have poor maths skills
   Not at all 1 2 3 4 5
   Very much

7. I have always done well in maths classes
   Not at all 1 2 3 4 5
   Very much

8. I never do well on maths tests
   Not at all 1 2 3 4 5
   Very much

9. My friends come to me for help in maths
   Not at all 1 2 3 4 5
   Very much

10. I have never been very excited about maths
    Not at all 1 2 3 4 5
    Very much
Below are some statements about writing. Please indicate how much each one applies to you by circling a response from 1 (not at all) to 5 (very much)

<table>
<thead>
<tr>
<th>Statement</th>
<th>Not at all</th>
<th>Very much</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. I avoid writing</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>2. I look forward to writing down my ideas</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>3. I am afraid of writing essays when I know they will be marked</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>4. My mind goes blank when I start to work on an essay</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>5. I like to write my ideas down</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>6. I'm nervous about writing</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>7. People seem to enjoy what I write</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>8. I am never able to write my ideas clearly</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>9. Writing is a lot of fun</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>10. Just thinking about writing essays makes me feel nervous</td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

Below are some statements about mathematics. Please indicate the degree to which each statement applies to you by circling a number from 1 to 5

<table>
<thead>
<tr>
<th>Statement</th>
<th>Not at all</th>
<th>Very much</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. It wouldn't bother me at all to take more maths courses</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>2. I have usually been at ease during maths tests</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>3. I have usually been at ease in maths courses</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>4. I usually don't worry about my ability to solve maths problems</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>5. Mathematics makes me feel uncomfortable and nervous</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>6. I get really uptight during maths tests</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>7. I get a sinking feeling when I think of trying hard maths problems</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>8. I almost never get uptight while taking maths tests</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>9. Mathematics makes me feel uneasy and confused</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>10. My mind goes blank and I am unable to think clearly when working maths problems</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>


Below you will find another set of statements. Again, remember that there are no right or wrong answers to these statements. Tell us how true or false each statement is for you.

1. The reason I do my assignments is so the teachers don't think I know less than other students
   - Very false: 1 2 3 4 5

2. I want to do better than other students in my class
   - Very false: 1 2 3 4 5

3. I like assignments I can learn from, even if I make mistakes
   - Very false: 1 2 3 4 5

4. I do my assignments so others in the class won't think I'm dumb
   - Very false: 1 2 3 4 5

5. I would feel successful at school if I did better than most of the other students in the class
   - Very false: 1 2 3 4 5

6. An important reason I do my writing assignments is because I like to learn new things
   - Very false: 1 2 3 4 5

7. One reason I might not participate in class is to avoid looking stupid
   - Very false: 1 2 3 4 5

8. I would feel really good if I were the only student in class who could answer the teacher's questions
   - Very false: 1 2 3 4 5

9. I like assignments that really make me think
   - Very false: 1 2 3 4 5

10. One of my main goals in class is to avoid looking like I can't do my work
    - Very false: 1 2 3 4 5

11. I'd like to show my teachers that I'm smarter than the other students in my class
    - Very false: 1 2 3 4 5

12. An important reason I do my assignments is because I want to become better at my work
    - Very false: 1 2 3 4 5

13. It's important to me that I don't look stupid in class
    - Very false: 1 2 3 4 5

14. Doing better than other students is important to me
    - Very false: 1 2 3 4 5

15. I do my writing assignments because I am interested in them
    - Very false: 1 2 3 4 5

16. An important reason I do my assignments is so I won't embarrass myself
    - Very false: 1 2 3 4 5
How often do you do the following sorts of things?

1. I check over my work to make sure I did it right
2. I make an outline before I begin my work
3. I start studying well before exams, and pace myself
4. Before I begin an assignment I gather as much information as I can
5. I take notes in class discussions
6. When working, I isolate myself from things that distract me
7. If I do well on a test, I treat myself to some reward
8. When studying for a test, I go over and over things to remember them
9. If I'm having trouble with schoolwork, I ask for help from my friends
10. If I'm having trouble with schoolwork I ask for help from my teacher
11. If I'm having trouble with schoolwork I ask for help from an adult
12. When preparing for a test I review my notes
13. When preparing for a test I look over past test papers
14. When preparing for a test I look over my textbook
15. I don't have any special study strategy - I just do what the teacher says

<table>
<thead>
<tr>
<th>Always</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Never</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

How well do you think you can do the following things?

1. Finish homework by deadlines?
2. Study when there are other interesting things to do?
3. Concentrate on school subjects?
4. Take notes in class?
5. Use the library for information for assignments?
6. Plan your schoolwork?
7. Organise your schoolwork?
8. Remember information from class and books?
9. Arrange a place to study without distractions?
10. Motivate yourself to do schoolwork?
11. Participate in class discussions?

<table>
<thead>
<tr>
<th>Not well</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very well</td>
</tr>
</tbody>
</table>
These items relate to how you feel *about school in general*. How do you feel *about school*?

<table>
<thead>
<tr>
<th></th>
<th></th>
<th>Not at all</th>
<th>Very much</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>My marks most often reflect the effort I put into classes</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>I come to school because it is expected of me</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>I will determine my own career goals</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>Some people have a knack for writing, others will never write well</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>5</td>
<td>I would take a subject if I thought it would be an easy good mark</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>6</td>
<td>Teachers sometimes make an impression of you and then no matter what you do, you cannot change that impression</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>7</td>
<td>There are some subjects in which I could never do well</td>
<td>1</td>
<td>2</td>
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<tr>
<td>8</td>
<td>Student leaders and athletes get 'free rides' in class</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>9</td>
<td>I sometimes feel there is nothing I can do to improve at school</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>10</td>
<td>I would never allow social activities to affect my studies</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>11</td>
<td>There's always something I can do to improve at school</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>12</td>
<td>There are more important things than getting good marks</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>13</td>
<td>Studying everyday is important</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>14</td>
<td>For some subjects it is not important to go to class</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>15</td>
<td>I consider myself highly motivated to achieve success in life</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>16</td>
<td>I am a good writer</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>17</td>
<td>Doing schoolwork on time is always important to me</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>18</td>
<td>I learn what I have to learn, not what I want to learn</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>19</td>
<td>I spend a lot of time making decisions about school</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>20</td>
<td>I am easily distracted at school or while studying</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>21</td>
<td>I can be easily talked out of studying</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>22</td>
<td>If I get depressed, there is no way I can finish my schoolwork</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>23</td>
<td>Things at school will probably go wrong for me sometime soon</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>24</td>
<td>I keep changing my mind about my career goals</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>25</td>
<td>I could make a real contribution to the world if I work hard at it</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>26</td>
<td>At least once my social activity has affected my school work</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>27</td>
<td>I would like to finish VCE, but there are more important things</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>28</td>
<td>I plan my school work well and stick to my plans</td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>
These questions ask about your thoughts in general. How strongly do you disagree, or agree?

1. If I do not do as well as others, it means I am inferior
   Strongly DISagree  1  2  3  4  5
   Strongly agree

2. As a child, I was punished for doing things less than perfect
   1  2  3  4  5

3. Even when I do things carefully, I often feel it is not quite right
   1  2  3  4  5

4. I am very good at focusing my efforts on attaining a goal
   1  2  3  4  5

5. I expect higher performance in my tasks than most people
   1  2  3  4  5

6. I hate being less than the best at things
   1  2  3  4  5

7. I have extremely high goals
   1  2  3  4  5

8. I never felt like I could meet my parents’ expectations
   1  2  3  4  5

9. I never felt like I could meet my parents’ standards
   1  2  3  4  5

10. I set higher goals than most people
    1  2  3  4  5

11. I should be upset if I make a mistake
    1  2  3  4  5

12. I tend to get behind because I repeat things over and over
    1  2  3  4  5

13. I usually have doubts about simple everyday things I do
    1  2  3  4  5

14. If I do not do well all the time, people will not respect me
    1  2  3  4  5

15. If I do not set the highest standards, I will end up second-rate
    1  2  3  4  5

16. If I fail at school, I am a failure as a person
    1  2  3  4  5

17. If I fail partly, it is as bad as being a complete failure
    1  2  3  4  5

18. If someone does something better than me, I feel like I failed
    1  2  3  4  5

19. It is important that I be thoroughly competent in everything
    1  2  3  4  5

20. It takes me a long time to do something “right”
    1  2  3  4  5

21. My parent set very high standards for me
    1  2  3  4  5

22. My parents expect excellence from me
    1  2  3  4  5

23. My parents have higher expectations for my future than I do
    1  2  3  4  5

24. My parents never tried to understand my mistakes
    1  2  3  4  5

25. My parents want me to be the best at everything
    1  2  3  4  5

26. Only outstanding performance is good enough in my family
    1  2  3  4  5

27. Other people accept lower standards from themselves than I do
    1  2  3  4  5

28. People will probably think less of me if I make a mistake
    1  2  3  4  5

29. The fewer mistakes I make, the more people will like me
    1  2  3  4  5
These questions also ask about your thoughts in general. How much do they apply to you?

<table>
<thead>
<tr>
<th>Statement</th>
<th>Not at all</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. In uncertain times, I usually expect the best</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>2. It's easy for me to relax</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>3. If something can go wrong for me, it will</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>4. I'm always optimistic about my future</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>5. I enjoy my friends a lot</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>6. It's important for me to keep busy</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>7. I hardly ever expect things to go my way</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>8. I don't get upset too easily</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>9. I rarely count on good things happening to me</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>10. Overall, I expect more good things to happen to me than bad</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td></td>
</tr>
</tbody>
</table>

These final questions ask about how you deal with problems at school. If you were having a problem at school, what would you do about it?

<table>
<thead>
<tr>
<th>Statement</th>
<th>Never</th>
<th>Always</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Work out why it is a problem for me</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>2. Report the matter to someone in authority (e.g., a teacher)</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>3. Discuss it with my friends</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>4. Take control of the situation</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>5. Examine my alternatives</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>6. Tell others about it</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>7. Feel miserable</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>8. Identify the source of the problem</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>9. Think about my reaction to the problem</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>10. Hope or pray for it to go away</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>11. Seek advice from others</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>12. Take a positive approach and see it as a challenge</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>13. Get more information about the situation</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>14. Try to work out a solution</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>15. Hope for a solution to appear</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>16. Ask myself why it is a problem</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>17. Seek help from others</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>18. Keep my fingers crossed that it will go away</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>19. Try to get rid of the problem</td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>
THANKYOU, AGAIN, FOR AGREEING TO PARTICIPATE IN THIS STUDY

PLEASE QUICKLY SCAN THROUGH YOUR PAPER TO ENSURE YOU HAVE ANSWERED ALL THE QUESTIONS
PUBLICATIONS AND PRESENTATIONS ARISING FROM THIS THESIS

