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Examining Multiple Dimensions of Teacher Quality: Attributes, Beliefs, Behaviours, and Students' Perceptions of Effectiveness

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Abstract

This thesis focuses on the structure and relatedness of multiple dimensions of teacher quality. Specifically, two studies are presented as to how critical teachers' beliefs are as a dimension of teacher quality in relation to teachers' non-academic competencies, their observed practices in the classroom, and their students' perceptions of effectiveness.

The first study aimed to determine how various types of teachers' beliefs empirically linked to quality teaching and learning relate to teach other, and whether these beliefs could be reduced into a set of higher-order teacher beliefs, utilising confirmatory and exploratory factory analysis. Primary and high school teachers in Victorian government schools (n = 663) completed an extensive teacher beliefs questionnaire that examined pedagogical beliefs, motivational beliefs, and beliefs about students.

The second study aimed to explore the relationships between teachers' non-academic capabilities their beliefs and measures of quality teaching. Participants and alumni from the Teach For Australia program, all current high school teachers (n = 68), completed a revised form of the teacher beliefs questionnaire from the first study and had their selection data for Teach for Australia accessed. They also utilised the Visible Classroom tool to audio-record multiple teaching episodes and administered the Tripod student perception survey anonymously to their students. Data from these four measures were examined through a combination of quantitative methods, including factor analysis, structural equation modelling, and hierarchical cluster analysis.

Three higher order beliefs were identified: social/deep beliefs focusing on education for the purpose of improving society and/or addressing the needs, relationships, and support of individual students; surface/fixed beliefs, which combined the characteristics of fixed mindset in tandem with surface views of teaching and learning; and personal utility purposes for choosing to teach. Many types of teachers' beliefs failed to predict their use of quality

teaching practices or students' perceptions of teaching, although self-efficacy and intrinsic motivation, beliefs about assessment, and surface/fixed beliefs were important exceptions. Teachers' non-academic competencies assessed prior to becoming a teacher generally failed to predict their quality of teaching, even within the first 1-2 years of commencement of teaching. More frequent use of empirically supported instructional practices related to delivery of instruction predicted better student perceptions of teaching, while at the same time more frequent use of empirically supported instructional practices related to directing students and correcting both academic work and student behaviour predicted poorer student perceptions of teaching. Student perceptions of teaching primarily clustered into two categories, perceptions of the quality of student behaviour in the classroom, and of their teachers' general instructional capability, at odds with prior research arguing that student perception surveys measure an array of key aspects of quality teaching. A profile of teacher quality emerged, which involved active, teacher-led instruction with a high ratio of explicit instructional practices to directing and corrective practices, with high levels of student satisfaction of quality of teaching, underpinned by pro-assessment beliefs and the strong rejection of surface/fixed beliefs.

The research confirms what previous conceptualisations of teacher quality include a combination of inputs (such as beliefs), processes (quality teaching practices) and products (student outcomes, student perceptions, etc.) and that the process of teacher quality is not only multi-faceted, but multi-staged. The research also illustrates the benefits of utilising multiple measures or sources of feedback in efforts to improve teacher quality. There is an opportunity to improve teacher quality in policy, teacher education and teacher professional learning that emphases active teaching and a core set of high leverage practices that such teachers regularly employ, underpinned by a small but critical set of beliefs that support best practice.

Attending to particular types of teacher beliefs may be essential to catalysing teacher change. The results of the dissertation call for further research drawing together teacher quality and teacher beliefs, with particular emphasis on multidimensional models, an effort that will ultimately serve to paint a fuller picture of what is meant by quality teaching, which in turn will fuel efforts to continuously improve it.

Declaration

This is to certify that:

1. This thesis comprises only my original work towards the degree of Doctor of Philosophy except where indicated in the preface.
2. Due acknowledgement has been made in the text to all other material used.
3. This thesis is fewer than 100,000 words in length, exclusive of tables, maps, bibliographies and appendices.

Michael Witter

25 April 2020

Preface

1. This thesis is comprised of my own original work. I have conceptualized, undertaken the data modelling (e.g., modelling the relationships in the data and producing the data sets) and statistical analyses, and written all the content presented within this thesis.
2. None of the work presented has been submitted for other qualifications.
3. No third party editorial assistance, either paid or voluntary was used to produce this thesis. The supervisory team provided detailed feedback, commentary, and edits.

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I would like to first thank the students and staff at the Science of Learning Research Centre at Melbourne University. These incredible people have been peers, friends, thought partners, and personal tutors who have done everything from pointing me to important research, teaching me statistical methods and how to navigate ethics, to providing feedback on my work throughout this journey. In my case, it truly took a village of PhD students to raise this one!

This dissertation simply would not have happened were it not for the support provided by Teach For Australia (TFA), and in particular CEO Melodie Potts Rosevear and General Manager Kallie Rougos. Melodie seeded the idea of my pursuing a PhD well before I finally built up the nerve to commit, and has maintained a keen interest in the work throughout. She and Kallie have been fantastic advocates of this opportunity and have enabled me to adapt my role in the organisation to align with and leverage this opportunity. The investment from TFA has been deeply appreciated and reflects our shared focus on ensuring that teacher quality remains a key priority for increasing equity in Australian education. I would also like to extend my immense gratitude to the staff of TFA, and in particular my past and current teammates, who continue to inspire me to be my best for the benefit of others, and who were largely responsible for inspiring the ideas and focus areas that evolved into this thesis. Lastly, I want to thank all the TFA Associates who have participated in the program, as they were the single greatest inspiration for the research I undertook, and in particular, I thank the TFA Associates and alumni who participated in this research.

I am also filled with overwhelming gratitude to my supervisory committee, including Dr. Gerard Calnin, Associate Professor Peggy Kern, Dr. Eeqbal Hassim, and Prof. John Hattie. Gerard, as former committee chair, and Peggy as current committee chair, went above and beyond, providing coaching, mentorship, and sound advice throughout. I could

not have asked for better supervisors than Eeqbal and John. Eeqbal provided wisdom and guidance to challenge my perspectives, explore avenues I otherwise would not have considered, and helped me sharpen my thinking and writing. John has been an exceptional mentor. His style has perfectly suited and adapted to my needs as a learner, and provided an incredible apprenticeship into academia and educational research. John struck the perfect balance between providing me with autonomy, choice, and self-direction, while at the same time helping me plan, manage and execute my work in tangible pieces, providing intensive tutorials in every aspect of the research along the way. John seemed to know I had decided to pursue the PhD before I did myself, and it was his excitement about the opportunity, his belief that I could be successful, and his willingness to supervise me that made the decision to tackle the PhD an easy and obvious one.

Finally, I would like to thank my wife, Maddie, and my children, Gigi, Milo, Juniper and Louie, for their tolerance and support for the years it has taken me to complete this work, and for inspiring me to care about this work in very real and personal ways. Becoming a father has given me a far deeper understanding and appreciation of the role and value of teachers in the lives of all children, and fuelled my sense of urgency and value of the topics I've chosen to study. Among their many strengths, I am blessed to have four children who are vivacious, deeply curious, and who love to learn. Their strengths have fuelled my fire, especially during the most challenging moments of this work. I end these acknowledgments with overwhelming gratitude for my wife, Maddie. I have never known a better teacher and expert at helping others to grow and thrive in classrooms and schools, and her exceptional capabilities as an educator have been and will continue to be my greatest source of inspiration and motivation as an educator myself.

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Chapter 1: Introduction

Nearly everyone has an opinion about and a stake in teacher quality, including policymakers, parents, students, school leaders, administrators, researchers, taxpayers, and of course teachers. This occurs despite a relative lack of common understanding or agreement regarding what the term actually means. Teacher quality is often conflated and confused with other terms, such as quality teaching or teacher effectiveness, which are mistakenly treated as synonyms. Teacher quality, however, is broader than these other terms, and encompasses the attributes and characteristics of teachers, their qualifications and experience, their actual teaching skills and practices, and their impact on students' academic performance (Strong, 2011).

Teacher quality is one of if not the most important of the elements that drive a high performing educational system (Darling-Hammond & Rothman, 2011). Supported by decades of research, it is largely agreed that teachers are a major factor influencing students' learning outcomes, with up to thirty percent of the variance in student achievement attributable to teacher effects (Hattie, 2003). The effects of having a quality teacher are cumulative and additive, with clear evidence that students performing initially at the same level will experience highly divergent achievement outcomes over time when taught by teachers of varied levels of quality (Darling-Hammond, 2000; Sanders & Rivers, 1996). The productive or destructive power of teacher quality on student achievement makes it more deserving of attention than many other tried or suggested strategies for lifting student outcomes (Darling-Hammond, 2000). Given this reality, it is concerning that quality teachers are often disproportionately distributed across schools, with educationally disadvantaged students in higher-needs schools are more likely to have access to lower quality teachers, whereas advantaged students are more likely to have higher quality teachers (Goldhaber, Lavery, & Theobald, 2015; Sanders & Rivers, 1996). In Australia, Leigh (2010) suggested

that the achievement gap between indigenous and non-indigenous Australian students could be closed in seven years if indigenous students had continuous access to the highest quality teachers in the country.

It is no surprise, then, that significant efforts have been made to raise teacher quality in numerous countries, including Australia, for many years. The importance of teacher quality is reflected in decades of Australian Commonwealth policy and initiatives. The focus on a teacher quality agenda has included the development of the Australian Curriculum and the establishment of the Australian Institute of Teaching and School Leadership to promote excellence in teaching, as well as the formation of the National Professional Standards for Teachers (Francis, Newham, & Harkin, 2005). More recent policy initiatives, including the federal government's *Students First* plan, sought to place teacher quality at the centre of its agenda (Department of Education and Training, 2016). This plan signalled a shift towards focusing on the role of initial teacher education and teacher selection as key levers for raising teacher quality in Australia. Furthermore, in 2014 the Australian government established a Teacher Education Ministerial Advisory Group to review initial teacher education in Australia and set forth a comprehensive set of recommendations to increase the quality of programs and by their impact on teacher quality. The group's signature report concluded that the quality of teachers and their teaching must increase if Australia is to remain globally competitive, meet the demands of its current and future economy, reduce inequity, and achieve the holistic learning goals for all students set out in the Melbourne Declaration on Educational Goals for Young Australians (Craven et al., 2015).

Greater emphasis has subsequently been placed in teacher education programs on selection criteria of non-academic competencies and increased accreditation requirements for teacher education programs, including teacher performance assessments as a program completion requirement, and the assessment of the literacy and numeracy skills of graduating

teacher education students (AITSL, 2015; Mayer, 2015; Mayer, Allard, Moss, & Dixon, 2016). However, in the wake of many years of efforts, student outcomes do not seem to be improving despite substantial investments in raising teacher quality (Thomson, De Bortoli, & Underwood, 2017; Thomson, De Bortoli, Underwood, & Schmid, 2019). While the potential benefits of more recent efforts may not yet be visible, there is cause for concern that policy initiatives have done little and will continue to do little to catalyse visible improvements in quality teaching and by extension improved student outcomes (Bentley & Savage, 2017).

Years of teacher quality investments should be rewarded by improved student achievement, as well as other non-academic outcomes. However, a review of the Programme for International Student Assessment (PISA) data taken from the Organisation for Economic Co-operation and Development(OECD) in 2015 highlighted the continued decline in the average performance of Australian students in mathematics, reading, and science as well as a lowering of Australia's comparative standing in these areas with other participating countries, many of whom continue to make significant improvements (Thomson et al., 2017). Equally concerning are the continued gaps illustrated by PISA data between low and high socioeconomic status (SES) students and indigenous and non-indigenous students. The difference between students' performance in mathematics, science, and reading in the highest and lowest quartiles of SES is equivalent to approximately 2.5 years or more of schooling, and indigenous students in Australia perform well below the OECD average (similar to those of Mexico and Kazakhstan), with reading, science and mathematics results that equate to 2.5 years or greater difference with non-indigenous students. With all the resources and policy interventions targeted towards improving teacher quality, the PISA data raises the question: why have investments in raising teacher quality not translated to improvements in academic achievement for Australian students?

It has been argued that teacher quality in Australia has been the result of lower standards for entry into teaching, teacher pay levels that are comparatively lower than in prior decades when adjusted for inflation (Leigh & Ryan, 2008), a continued lack of clear evidence-based standards for instructional effectiveness (Ingvarson & Rowe, 2008), as well as the need for improved initial teacher education that ensures stronger evidence of quality and impact on participants (Louden, 2008). An important criterion for identifying and selecting particular education reforms that aim to raise teacher quality should be a basis in evidence linking a particular strategy to improved student outcomes (Sonnemann & Goss, 2018). Yet, as this thesis will later highlight in greater depth through its review of the relevant literature, current efforts may be misguided for three reasons. First, the connections between some if not most of the strategies underway and improved student learning outcomes is often weak at best and at worst non-existent. Second, there is a weak Australian evidence base indicating what drives teacher quality most and what interventions are most likely to raise it. Third, there is a continued lack of definitional clarity around what is meant by teacher quality, which is a pre-requisite to the effective identification of the key opportunities for improvement at the policy level but also the practical one that is addressed through initial teacher education and teacher professional learning.

Thus, to address the fundamental question of how best to raise teacher quality in Australia, it is important to highlight and address what we mean by quality, overcome misconceptions and issues in the existing research base that aims to draw links between various factors of teacher quality and its impact on students, and test assumptions about teacher quality by studying its application in an Australian context. Teacher quality is a qualitative concept, even when its measurement is undertaken, as this thesis does, in a quantitative manner. It is impossible to define teacher quality without making value judgements that either implicitly or explicitly position some teachers as better or higher

quality than others, which some consider particularly challenging if not problematic given the diverse contexts in which teaching occurs as well as the potential issues that arise when scrutinizing its measurement(Berliner, 2005). While teachers' value-added to student learning gains may underpin efforts to understand and raise teacher quality, this thesis follows the line of thinking that value-added alone should not stand in as a complete definition of teacher quality. What conventional wisdom tells us that teacher quality is complex and multidimensional, is not fully reflected in current policy, not sufficiently understood by researchers, and not systematically acted upon by practitioners.

It is increasingly understood and accepted that teacher quality is multidimensional, which is to say that it has multiple facets, and is best identified and understood through multiple measure approaches(Goe, 2007; Goe, Bell, & Little, 2008). This notion has been underscored by growing resistance towards singular use of value-added approaches to characterising teacher quality as the ability to produce high achievement gains on standardised tests (Darling-Hammond, 2015; Petek & Pope, 2016) and research highlighting the array of student outcomes types that teachers can positively impact, which includes both cognitive and non-cognitive factors (Chetty, Friedman, & Rockoff, 2011, 2014). Teacher quality as a multidimensional construct has been supported by an acknowledgement and growing understanding of the increasing societal demands placed on teachers and the increasing complexity of the role of a teacher and what therefore constitutes a quality teacher (Muijs, 2006). It has also been highlighted in research indicating that educational effectiveness is the product of multiple, dynamic, interactive factors, of which multiple distinct facets of teacher quality may play an integral role (Creemers & Kyriakides, 2006; Muijs, Campbell, Kyriakides, & Robinson, 2005).

Arguably, the most well-known research project that illustrated the multidimensionality of teacher quality was the Measures of Effective Teaching (MET)

Project. The MET addressed the meaning and measure of teacher quality by exploring multiple potential factors and outcomes, including teacher pedagogical knowledge, performance on observation rubrics, and value-added to student achievement gains based on standardised tests. The MET pursued and ultimately endorsed a composite approach to identifying and measuring teacher quality, based on a number of the measures it studied, particularly for the purposes of identifying, retaining, and rewarding quality teachers, providing feedback for all teachers and informing professional improvement efforts for schools and districts (Cantrell & Kane, 2013). A similar endorsement of a composite approach to teacher appraisal and feedback in Australian schools was advocated by Jenson (2010), who argued that inaccurate, poorly descriptive and non-comprehensive measures were hindering teacher quality and professional growth in Australian schools.

More than three decades ago, Fenstermacher (1978) argued that the aim of teacher education and professional development activities should be to support teachers to shift their subjectively reasonable beliefs towards objectively reasonable beliefs in line with more effective ways of teaching. Yet research on teacher beliefs and research on quality teaching remain largely separate. A conceptual model is needed that can situate particular beliefs associated with teacher quality within a teacher quality paradigm and measurement model would help bridge this gap in the research. Although numerous studies have examined what characteristics most influence teacher quality, including some that examine particular beliefs, there is limited research that has brought together systems of teacher beliefs (i.e., the structure and interaction between multiple distinct types of beliefs, and examined their relationship to measures of quality teaching). Yet, research on teacher beliefs suggests that there are particular categories of teacher beliefs that influence teachers to teach in ways that are more effective than others, and that within these categories, there are particular beliefs that promote higher quality teaching than others (Fives & Buehl, 2012; Pajares, 1992). A

comprehensive model of these beliefs, tested against additional measures of teacher quality, could make a significant contribution to research in both the fields of teacher beliefs and teacher quality.

Research Aims

The overarching question that framed this thesis was whether and how a multidimensional approach to defining and measuring teacher quality that includes teachers' beliefs can improve our understanding of teacher quality and the relationships between its constituent elements? In particular, the thesis aimed to test the replicability of research and findings on teacher quality factors in Australian classrooms and schools, and whether teachers' beliefs should be viewed as an important dimension of teacher quality. A key aim of this thesis was to contribute new knowledge about the structures and relatedness of multiple dimensions and measures of teacher quality within an Australian educational context.

Improved knowledge in this area has numerous potential benefits and applications. The first is to establish a stronger research base regarding teacher quality and its key elements in an Australian context. The second is to address the relationship between proposed elements of teacher quality in a way that may better serve those actively seeking to enhance teacher quality through systemic means such as policy initiatives or initial teacher education. The third is to provide evidence to inform school and teacher led efforts to improve teaching and learning in schools, which hinges on understanding the various factors that affect quality of teaching, including latent factors such as beliefs and other characteristics. To achieve these outcomes, four key issues are identified.

The relationships and higher order structure of teachers' beliefs and core belief systems of teachers. The first relevant issue is how a large array of teachers' beliefs about pedagogy, students, and their own personal motivational beliefs, interact with each other and form into a smaller but robust set of higher order beliefs. While the literature review will

elaborate on definitional challenges regarding what a belief is (and is not), this dissertation adopts a working definition aligned with Pajares'(1992)description of belief as a judgement of the truth or falsity of a proposition, underpinned by a key conclusion that can be arrived at upon reviewing teacher beliefs research to date: that teachers' beliefs are likely important factors in predicting or explaining teachers' practices (Fives & Buehl, 2012). It is thus suggested that by examining a multitude of beliefs empirically linked to quality teaching in relation to other measures of quality, the importance of teacher beliefs as an element of teacher quality can be better understood. Additionally, by examining beliefs as a system, new beliefs constructs may be identified and investigated as components of teacher quality.

Teacher beliefs as a predictor/indicator of quality teaching. The second relevant issue is whether and to what extent teacher beliefs predict or correspond with measures of effective teaching. There is contradictory evidence from prior research as to whether or not beliefs are reliable predictors of correspondingly appropriate behaviours (Fives & Buehl, 2012), but far fewer studies exist that examine the relationship between validated measures of teacher quality and teachers' beliefs, with virtually none canvassing a large array of teachers' beliefs or beliefs as a system. By examining an array of beliefs, including higher order factors, in relation to established measures of high quality classroom practice and student perception surveys predictive of additional measures of effective teaching, this thesis situates teacher beliefs within a teacher quality paradigm to examine the extent to which beliefs empirically suggested to relate to quality teaching predict multiple measures of it.

Establishing a profile of the quality teacher. The third is whether a composite profile of a high-quality teacher can be identified based on the relationship between multiple measures. There have been prior attempts to characterise a profile of the quality teacher (Brophy, 1986; Goe, 2007; Tucker & Stronge, 2005). Such profiles have been limited in that they have largely been compilations of factors studied independently across a variety of

studies, as opposed to integrated within particular studies. Furthermore, there is, based on attempts to identify relevant research as part of this dissertation's literature review, little evidence of such research applied to the Australian context, including attempts to validate teacher quality profiles based on studies of Australian teachers. By examining teacher characteristics and their relationship to measures of effective teaching, it may be possible to establish a profile of particular beliefs and critical attributes, quality teaching practices or behaviours, and expected outcomes that together provide a more complex perspective that takes into account the teacher attributes, actions, and outcomes that together suggest a fuller profile of the quality teacher.

The use of multidimensional approaches to identify and measure teacher quality. The fourth is whether a fuller meaning of teacher quality can be elicited through the use of a multidimensional approach that examines teachers' non-cognitive attributes, their beliefs, their practices, and their students' outcomes. The MET Project was the largest attempt to establish a multidimensional model for identifying and measuring effective teachers and their teaching (Cantrell & Kane, 2013; Kane, Kerr, & Pianta, 2014). Implicit in this approach is the notion that multiple components represent relevant parts of a broader overall view of teacher quality. But central to this perspective, and to much of the research on teacher quality, is the notion that an effective teacher is a teacher who is particularly able to help their students make learning gains (Hanushek, 2002). This view assumes that composite or multi-measure approaches illustrate various indicators or elements of the teacher and their teaching that indicate or promote better learning outcomes for students. This study puts the notion to the test that measures used in multidimensional or composite models, whose various measures may be and often are created independently of each other and later used as part of such a model, do in fact reflect a common and coherent implicit theory of effective teaching, its antecedents and impact. This thesis tests an approach to measuring teacher quality in an

Australian school context that includes multiple components, examining the relatedness of such measures and testing the assumption that the measures themselves were different sides of the same coin.

Boundaries around the Research Scope

The thesis addresses a particular set of teacher attributes measured at the point of selection into teaching. This includes characteristics such as resilience, organisation, and communication skills, but does not cover the breadth of other potential areas that one could argue are important factors influencing quality teaching, such as social intelligence, humour, gratitude, and optimism, which may also be predictive of effective teaching (Duckworth, Quinn, & Seligman, 2009b; Park & Peterson, 2009b; Robertson-Kraft & Duckworth, 2014). This thesis utilised two types of measures supported by the results of the MET study, and specifically adopted one of the actual measures utilised in the MET, the Tripod student perception survey. While the MET made more extensive use of high-inference observational measures of teaching, for this thesis, I opted to utilise a low-inference measure of teaching practice via classroom observation. This meant that the research focused on frequency of use of particular practices, as opposed to a high-inference approach that might have provided more nuance regarding the quality of practices employed by teachers. A low-inference approach enabled the robust and efficient measurement of classroom teaching possible as part of this thesis, which would have been problematic had a high-inference observational measure been attempted. This is primarily because high-inference measures require the use of highly trained expert observers, moderation and inter-rater reliability testing, and multiple observations for each teacher to ensure findings are sufficiently reliable, and in spite of this, still suffer from methodological concerns regarding rater consistency and objectivity (Cohen & Goldhaber, 2016; Ho & Kane, 2013). A low-inference approach offered greater objectivity and a more effective use of resources for the project, at the potential cost of a more detailed

analysis of the varied levels of quality within the realm of teachers' practices. A final limitation in the scope of this study was the exclusion of a learning gains measure. A common feature in composite approaches is the teacher value added measures drawn from examining students' gains on standardised achievement tests. Given the lack of standardised tests that can be pegged to specific teachers in Australian schools, as well as the breadth of subject areas of participants in this study, this aspect of teacher quality was not directly examined in the thesis. As a consequence, perspectives on teachers' contribution to student academic growth must be extrapolated on the basis of the other measures, or taken as an uncertain element of teacher quality in this research. For this reason, the second study made use of one measurement instrument, the Tripod Student Perception survey, which has been demonstrably correlated in numerous studies to teacher value-added to student achievement (Kuhfeld, 2017). The study additionally incorporated an observational measure of teaching, Visible Classroom, constructed within a framework of teaching practices determined most effective based on decades of meta-analytic research examining influences on student achievement (Skipp & Tanner, 2015; Hattie, 2009).

Theoretical Perspective

Chapter 2 unpacks the theoretical and empirical underpinnings and rationale for this thesis. But to provide context and perspective, this section grounds the research aim and the key issues identified above in theory, and key terms of reference pertinent to the research that informed and was conducted within this thesis By doing so, this section illustrates the unique features and intersections between research related to teacher beliefs, teacher evaluation and teacher quality, and sets the foundation for the significance of the thesis. This section establishes the underlying empirical basis for the hypotheses that are put forth to address the research aim of this thesis.

Defining Teacher Quality. While the importance of teacher quality is nearly universally agreed upon as a factor in student achievement, there is no clear agreement regarding what parts of it are important nor is there a common and consistent definition of the term (Goe, 2007). However, there are a number of consistent characterizations of teacher quality, which Strong (2011) grouped into four key areas. These are teacher qualifications (e.g., certification, experience), personal attributes (e.g., kindliness, patience, humour), pedagogical skills and practices (e.g., classroom management, use of assessment, clarity), and teacher effectiveness (student learning outcomes.) In a theoretical framework highlighting the interaction between these elements, Goe (2007) identified characteristics (including beliefs) and qualifications as inputs to teacher quality, teacher skills and practices as a process (quality teaching), and teacher effectiveness as the outcome. Goe's visual representation of this framework is illustrated in Figure 1.1.

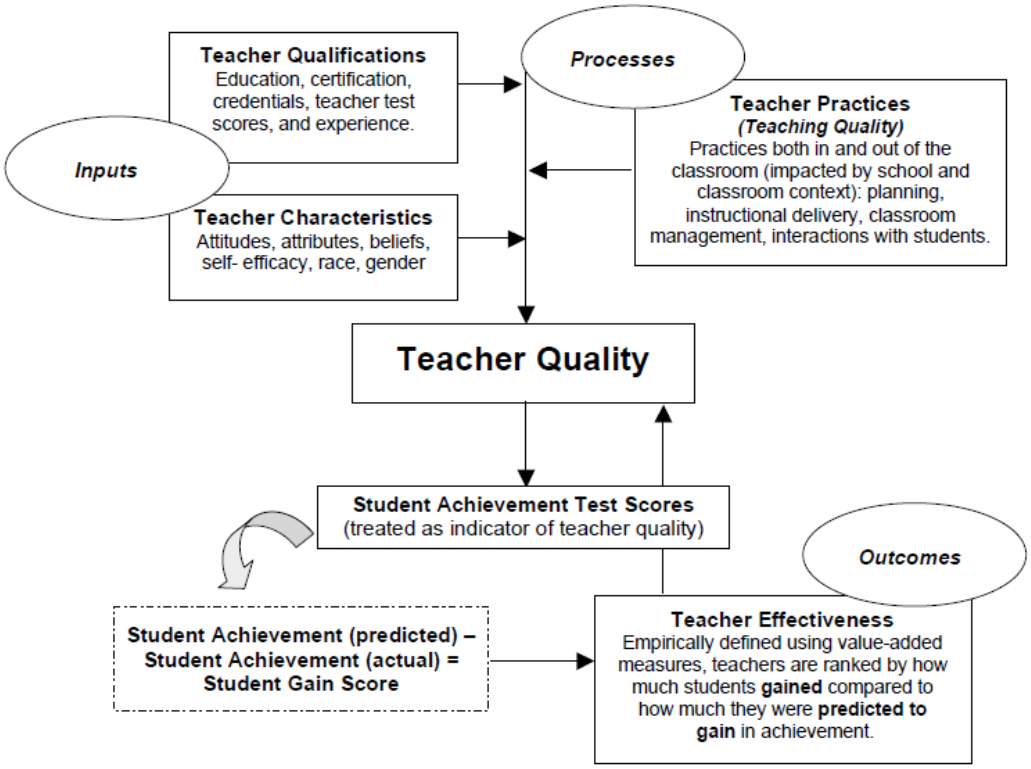

Figure 1.1. Goe's graphic representation of a framework for teacher quality.

Goe's framework supports a number of key arguments that have shaped the theoretical basis for this dissertation, as well as the methods undertaken in its research. First, teacher inputs shape the quality of their practices, and those practices in turn shape their outcomes. Second, whereas teacher quality is a process that eventuates in student outcomes, the process is not uni-directional. Teachers' practices are not just shaped by their qualifications and characteristics; they also shape and contribute to the evolution of those qualifications and characteristics. Third, the line between teacher inputs and student outcomes is not direct, but rather, it is mediated by teaching practices. This suggests that attempts to measure and understand teacher quality factors by only examining teacher inputs and student outcomes could be problematic, as the relationship between inputs and processes, as well as processes and outcomes, would be left out of the equation.

Terms such as teacher quality, quality teaching, and teacher effectiveness are at times conflated or used synonymously both in research, policy and practice. Goe's model provides a helpful distinction in terms and largely informs the working definitions used in this thesis. Teacher quality can thus be characterised as the teacher inputs (qualifications and characteristics), practices (quality teaching), and outcomes (teacher effectiveness) that contribute to and reflect enhanced learning outcomes for students. Fenstermacher and Richardson(2005) helped qualify the need to distinguish between these elements. They wrote:

> There is currently a considerable focus on quality teaching, much of it rooted in the presumption that the improvement of teaching is a key element in improving student learning. We believe that this policy focus rests on a naive conception of the relationship between teaching and learning. This conception treats the relationship as a straightforward causal connection, such that it could

> be effective, it could be sustained under almost any condition, including poverty, vast linguistic, racial or cultural differences (p. 205)

The authors described two distinct elements that comprise quality teaching. *Good teaching* focuses on the task elements of teaching, which "accords with high standards for subject matter content and methods of practice and teaching." Good teaching "is teaching that comports with morally defensible and rationally sound principles of instructional practice." (p. 189) *Successful teaching* focuses on outcomes and is defined as teaching that yields the intended learning. Because successful learning is not necessarily simply the effect of good teaching, the authors suggested that the two elements are distinct, and one does not always entail the other. It is therefore theoretically possible that some good teaching is in fact, not successful. Successful teaching is shaped by a number of contextual factors that operate independently of the teacher, including student characteristics, school characteristics, and environmental factors, among other things. Conversely, the importance of these factors suggests that successful teaching may be theoretically possible in spite of poor teaching, particularly if factors unrelated to the teacher play a significant role in learner success. It has been argued that there is an over-attribution of student outcomes to teacher quality factors (Kennedy, 2010). Distinguishing between multiple elements of teacher quality upholds the critical role of the teacher in shaping student outcomes without dismissing the other factors that also contribute.

Measurement of Teacher Quality. The first part of this section highlighted the issues related to conceptualising and defining teacher quality, and the following part of this section will ground the thesis in theoretical perspectives related to its measurement. The measurement approaches in teacher quality research have evolved significantly over the years, as outlined by Cochran-Smith (2001). From the 1950s through the 1960s, the prominent focus was the study of the attributes and qualities of good teachers, measured

through explorations of their personal characteristics, such as integrity, sensitivity, and creativity. In the 1960s through the 1980s, research became more focused on identifying the strategies, processes, and behaviours of effective teachers. Process-product studies in which the effect of teacher behaviours on pre-post study measures of student achievement were used to identify effective and ineffective teaching practices. Also within this period, the use of value-added modelling as a means of measuring teacher effectiveness was introduced (Hanushek, 1971). With increasingly complex statistical methods supported by technological developments, teacher quality measures frequently employed quantitative methods, with particular emphasis on the use of student standardized achievement data both for the purpose of studying teaching effectiveness and to determine whether particular teacher inputs or teaching practices predicted better learning outcomes or gains for students. In the 1990s, teacher knowledge became a focal point of teacher quality research. This led to greater emphasis on designing clear standards for teacher knowledge, and expanded upon previously identified elements of effective teaching practice to include elements that might be less or not at all visible in a classroom observation, such as teachers' content pedagogical knowledge, reflective capacity, and professional engagement practices.

In the 1990s and through to today, a focus on outcome measures of teacher quality grew out of the development of tools and technologies enabling the measurement of teacher effects on student achievement gains based on standardised tests. Goe, Bell, et al. (2008) suggested that changing trends in conceptions of teacher quality or teacher effectiveness have at times been driven by the development of new instruments, technologies, and measurement methods, creating phenomenon in which the measure of quality ultimately defines it, as opposed to researchers first defining effectiveness and then determining how best to measure it. They speculated that the disagreement about how best to measure teacher quality may be more fundamentally about the lack of consensus around a definition of it.

Teacher Beliefs. Teacher beliefs research emerged as early as the 1950s, largely fuelled by the intention to establish beliefs as a construct that could help explain differences in teachers' practices, experiences, and outcomes with students(Fives & Buehl, 2012). Numerous definitions of teacher beliefs have been put forth. Skott (2014), for example, defined teachers' beliefs as forms of personal knowledge, mental constructs subjectively assumed to be true, with both affective and cognitive aspects. Teachers' beliefs are cognitive in that they may relate to particular topic or aspect of their knowledge, but also affective in that the teacher will "feel" or take a subjective view related to that topic. For example, a teacher may believe that the most effective way to teach is to use inquiry-based methods, or that the most important elements of the curriculum are those that nurture students' self-esteem, while another teacher could believe the opposite. The combination of affective versus cognitive elements may help differentiate beliefs from "emotions" or "feelings." Kagan (1992) described two key features of teacher beliefs supported by numerous studies that may contribute towards an understanding of its meaning: first, teachers' beliefs are relatively stable and resistant to change and second, teachers' beliefs are largely congruent with their style of teaching. Kagan's definition would suggest that an observation of a teacher's behaviour in the classroom would generally be consistent with their beliefs, and that their beliefs would be generally consistent over time and across contexts. Pajares defined teachers' beliefs as "An individual's judgment of the truth or falsity of a proposition" (1992, p. 316). Pajares' definition is intentionally more abstract, and avoids the specificity of characteristics that may be as of yet not agreed upon by researchers in this area.

The lack of conceptual and definitional alignment regarding teacher beliefs formed the central focus of Pajares' seminal review, but continues unresolved in contemporary research. Fives and Buehl noted four key areas where definitions of teacher beliefs tend to diverge. The first is the extent to which teachers' beliefs are implicit or explicit. The second

is whether teachers' beliefs are stable or dynamic. The third is whether teachers' beliefs are distinct from teachers' knowledge. The fourth is whether teachers' beliefs should be viewed as individual or part of a bigger system. While consistent definitional agreement of the teacher beliefs construct has not been achieved, there is consistent agreement amongst researchers in this area that beliefs play an important role in the experiences of teachers, and remain a valuable construct worthy of further study in educational research.

There are a number of ways in which teachers' beliefs can be viewed as important. Some have argued that teachers' beliefs significantly influence the ways in which teachers interpret and engage with teaching, relating to planning, instructional decisions, and classroom practices (Calderhead, 1996; Kagan, 1992; Pajares, 1992). Hoffman and Seidel (2014) argued that particular beliefs drive teaching practices that promote superior learning outcomes for students, and that "the precise measurement of beliefs is a prerequisite to help teachers understand how beliefs can influence superior learning outcomes via adaptive and constructive pedagogy" (p. 106). Fives and Buehl (2012) suggested that teachers' beliefs act as filters, frames, and guides. Teachers' draw upon particular beliefs to help them interpret and make meaning of their experiences, to define or conceptualise challenges, and to guide their decisions.

As a key tenant of teacher quality research is the relationship between particular teaching practices (quality teaching) and improved learning outcomes as a consequence (teacher effectiveness), teacher beliefs research provides a theoretical basis for the role of beliefs as a presage or precursor factor to quality teaching. It could thus be argued that the capacity to drive improvements in teacher quality hinges to some extent upon our ability to effectively understand and cultivate the beliefs that optimise student learning. Fenstermacher (1978) argued that a better alignment between teacher beliefs and teacher quality research was essential, given the critical role that beliefs change plays in behaviour change amongst

teachers. He suggested that the aim of teacher education and professional development activities should be to support teachers to shift their subjectively reasonable beliefs towards objectively reasonable beliefs in line with more effective ways of teaching. Guskey (2002; 2020) similarly noted the criticality of teachers' beliefs in relation to teacher quality, arguing that efforts to improve teaching practice via professional development hinged on beliefs change, which itself hinged on teachers experiencing improvements in learning for their students that could be attributed to this development.

This thesis views teachers' beliefs as an important element of either teachers' absolute effectiveness as well as their capacity to increase their effectiveness. In essence, teachers' beliefs are an element of teacher quality. This thesis proposes and proceeds with a working definition of teachers' beliefs that suggests beliefs are as Pajares suggests a type of judgment, related to particular areas of teacher knowledge. Beliefs can be implicit or explicit, and while beliefs may be relatively stable as multiple researchers suggest, the highly situational nature of beliefs makes them inevitably dynamic in some contexts. Teachers' beliefs are both individual but also systemic, meaning that while distinct beliefs can be isolated from others, beliefs relate to and interact with each other as parts of larger structures, or systems. This working definition is more inclusive than many prior researchers' and therefore largely resolves the diverging lines of agreement that Fives and Buehl (2012) highlighted in their review of teacher beliefs research.

Multidimensional Approaches to Teacher Evaluation. Multidimensional models and composite approaches to measuring teacher quality have grown out of teacher evaluation research. While this area intersects with teacher quality research, the underlying purposes behind the two fields should be distinguished. While teacher quality research is concerned with the inputs, processes and products of teachers who contribute positively to their students' learning lives, teacher evaluation is concerned with collecting and using

information to make judgments about the worth, or quality of teachers and teaching (Darling-Hammond, Wise, & Pease, 1983). Teacher evaluation seeks to provide performance data to support decisions for tenure, retention, compensation, performance management, and the allocation of professional development (Mihaly, McCaffrey, Staiger, & Lockwood, 2013). Therefore, teacher evaluation has the power to dramatically shape the personal and professional experiences of teachers and schools.

With increasing accountability on teachers, schools, and systems, in part delivered through teacher evaluation systems, multidimensional models provide a number of benefits and safeguards to address the high stakes nature of teacher evaluation. The MET (Measures of Effective Teaching) Project tackled the challenge of measuring teacher quality by exploring multiple measures, as a means "to improve the quality of information about teaching effectiveness, to help build fair and reliable systems for teacher observation and feedback." (Cantrell & Kane, 2013, p. 3). Measures in the project included student achievement gains on standardised tests as well as more cognitively challenging assessments, student perception surveys, and classroom observations utilising instruments measuring levels of specific teacher practices. The study's culminating findings (Cantrell & Kane, 2013) cautioned against overreliance on one particular measure, suggesting that "heavily weighting a single measure may incentivize teachers to focus too narrowly on a single aspect of effective teaching and neglect its other important aspects" (p. 11). The rationale for a multidimensional approach to describing and measuring teacher quality is supported by the project's conclusion that such an approach indicated multiple aspects of teacher quality, increased the consistency and reliability of ratings, and demonstrated greater year-to-year stability in teacher evaluation.

For the purpose of improving teacher quality, multidimensional approaches may be very beneficial. Jensen (2010) was highly critical of the state of teacher appraisal and

feedback in Australia, suggesting that teachers wanted not only more but better feedback on their performance, and that inaccurate, poorly descriptive, and non-comprehensive measures and processes were hindering teacher quality and professional growth in Australian schools. He argued for a "balanced scorecard" approach to teacher appraisal and feedback, drawing across multiple measures, including but not limited to those utilised in the MET study. The growing popularity of multidimensional models for teacher evaluation reflects and promotes an understanding that the demands of teaching and teachers are complex, multifaceted, and potentially increasing compared to prior societal demands on teachers (Muijs, 2006). Multidimensional models, including those that aim to create a single index composite, should be built out of an underlying theoretical framework first (Commission, 2008). Thus, a multidimensional model of teacher quality should begin with an underlying theory of important teacher inputs, related quality teaching behaviours (that is, their key practices), and consequential learning outcomes for students, including but not limited to academic growth.

Theoretical Framework

Bringing these theoretical perspectives together, this thesis aims to bridge theoretical knowledge from three key areas of research: teacher quality, teacher beliefs, and teacher evaluation. Specifically, this framework suggests that key input factors, including teacher beliefs and non-academic capabilities relate to teachers' use of quality teaching practices, which in turn shape students' perceptions of quality teaching. By utilising measures of teaching practice and student perception of teaching with empirical connections to improved student outcomes, both measures can be treated as proxies for teacher effectiveness. By building a multidimensional measurement model of these constituent elements through the lens of teacher evaluation, the theoretical teacher quality framework can be tested. The theoretical model illustrated in Figure 1.2 forms the basis for the studies conducted in this thesis.

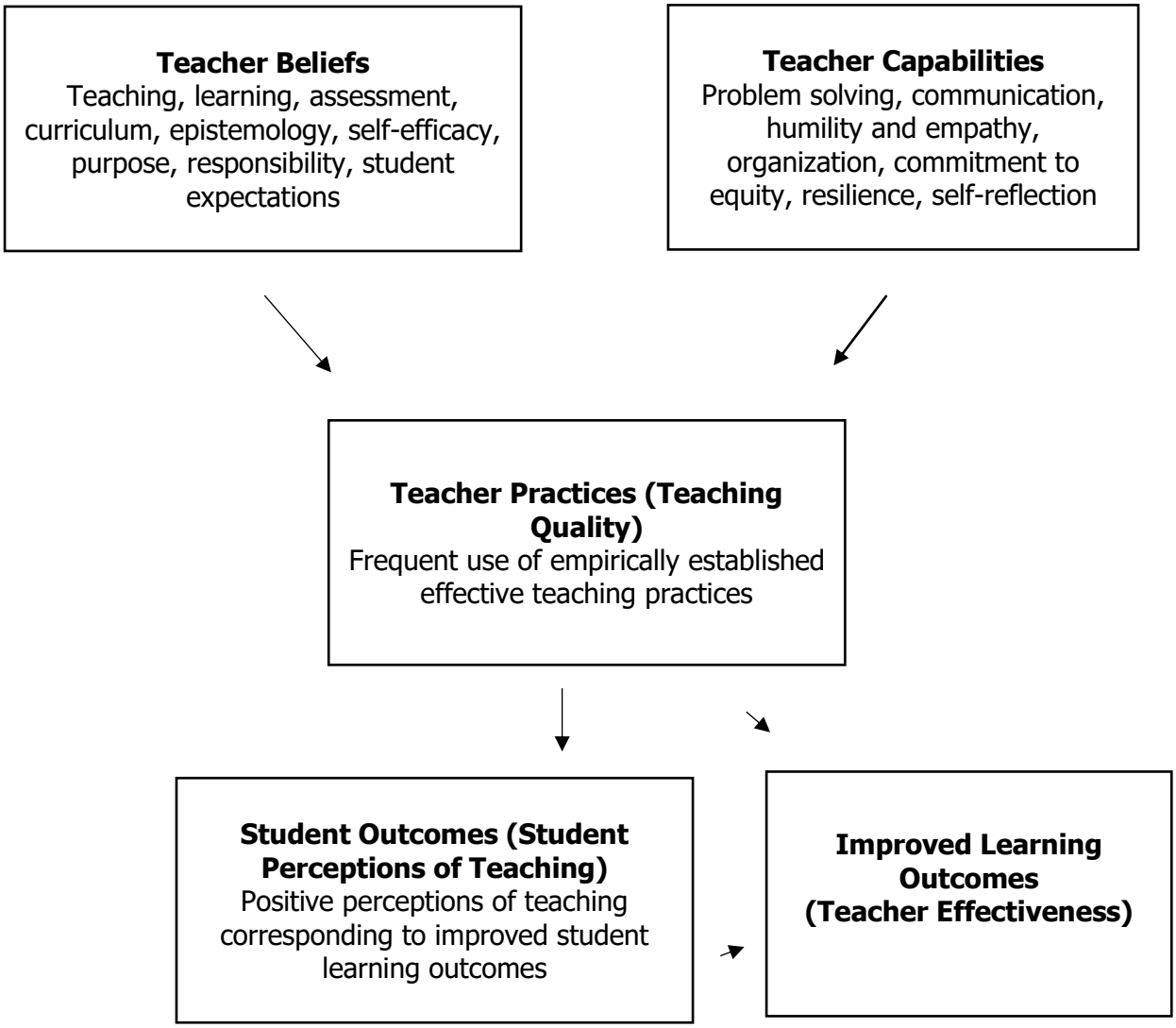

Figure 1.2. A theoretical model of teacher quality.

Significance

This thesis builds on the existing knowledge base internationally on teacher quality while adding new findings in an Australian context. The research uniquely contributes to understanding of the relatedness between teacher beliefs purported to align with more effective teaching practices, and by extension contributes to the unresolved debate regarding the congruence between beliefs and behaviours. It contributes to understandings of the connectedness between non-academic teacher characteristics at the point of commencing teaching and later performance indicators. The studies offer new insights regarding the

relationship between teachers' use of particular teaching practices and their students' perceptions of effectiveness. As a whole, the research explores the relatedness between multiple measures of teacher quality to expand upon previously attempts efforts in teacher quality research and tests whether multidimensional modelling of teacher quality makes it possible to establish particular profiles of high quality teachers reflected across multiple factors.

More specifically, this thesis makes a significant theoretical contribution by addressing the role that teachers' beliefs play in a teacher quality framework. Teacher beliefs research has attempted to link beliefs and practice (Beswick, 2005; Enyedy, Goldberg, & Welsh, 2006; Mitchell & Hegde, 2007) but there is a very limited evidence base linking teachers' beliefs with their students' outcomes (Fives & Buehl, 2012). This thesis offers a more complete picture of how beliefs mediate practices, which in turn mediate students' experiences of teacher quality. Furthermore, this thesis provides insights into how a wide array of teachers' beliefs function systematically to relate to measures of teacher quality. As beliefs connect to quality teaching practice or improved student achievement, this research identifies new systems of beliefs that support (or hinder) teacher quality. By enlisting measures of teacher quality that have been previously validated and quantitatively linked with improved student learning outcomes, the importance of teacher beliefs can more meaningfully be put to the test.

In addition, this thesis contributes theoretically to the exploration of the meaning and construct of teacher quality, by exploring the compatibilities and incompatibilities between indicators and measures of teacher quality that are assumed to be different sides of the same coin. Employing and studying a multidimensional model of teacher quality provides the opportunity to test the implicit assumption that underpins most teacher quality research: that the various indicators of quality teaching *should* point us to better learning outcomes for

students. This thesis tests whether the simplicity of that assumption holds up in light of what is indicated by examining multiple measures of teachers' qualities and their actual teaching.

This thesis also contributes findings on the form, function and relatedness of multiple purported indicators of teacher quality in the Australian context. Much of the research informing policy and practice regarding the characterisation, measurement, and strategies to address teacher quality, are drawn from outside of Australia, and in particular the US. It is unclear if beliefs factors and relationships identified through studies of American teachers manifest reveal themselves similarly amongst Australian teachers, particularly given the role that cultural characteristics play in shaping the development and enactment of teachers' beliefs, coupled with potential challenges in applying measures of particular beliefs across cultural contexts (Fives & Buehl, 2012). With very limited Australian-based research in the use of student perception surveys, non-academic competencies as teacher quality indicators, this thesis provides an opportunity to test the transferability of teacher quality research into the Australian context. Given the paucity of teacher quality and teacher effectiveness research conducted in Australian classrooms, this thesis also provides numerous new insights regarding teacher quality in Australian classrooms, and to my knowledge, offers a first attempt at testing a multidimensional model of teacher quality in Australian educational research.

Organisation of the Thesis

Chapter 2 provides a literature review that expands on this introduction to highlight in greater depth the knowns and unknowns of teacher quality research, the empirical basis for teacher beliefs that should predict higher quality teaching and teacher effectiveness, and the validity of particular measures of teacher quality included in multidimensional teacher evaluation approaches. The chapter provides the context and situates the research conducted for this thesis.

Chapters 3 and 4 present the two studies conducted as part of this thesis. Chapter 3 describes the methods and data used to identify a set of teacher beliefs' factors and determines the higher order structure drawn out of pre-existing research suggesting a connection to teaching quality. It includes the results of the study and implications for further research and practice. Chapter 4 describes the methods and data used to test a multidimensional teacher quality model that included inputs such as teachers' beliefs (informed by the results of the first study) and non-academic competencies, teachers' observed use of empirically validated high quality teaching practices, and students' perceptions of teacher effectiveness.

Chapter 5 provides a discussion of the findings of this thesis, which ties together the findings and draws broader conclusions about the relationships and higher order structure of teachers' beliefs and core belief systems of teachers, teacher beliefs as an indicator of practice and outcomes, multidimensional profiles of teacher quality, and the use of multidimensional or composite models to shape new meaning of teacher quality. The chapter also discusses possibilities of future research is provided to highlight limitations in the research and expand upon the findings presented here in service of improving understandings about teacher quality, its meaning and its measurement.

Chapter 2: Literature Review

This chapter expands upon the theoretical perspective established in the prior chapter and establishes the empirical bases that informed the thesis' theoretical framework, study designs, and analytical approaches. First, amongst the key characterisations of teacher quality identified in the prior chapter (teacher inputs such as experience and qualifications, practices, and teacher value-added to student academic growth), this chapter will present what is known and still uncertain based on research to date in this field. Second, the construct of teacher beliefs is expanded upon, with particular attention to the types of beliefs that have empirically been linked to teacher quality. A taxonomy of "quality" teacher beliefs is proposed on the basis of studies linking particular beliefs to measures of quality teaching that informs the design of this thesis' studies. Third, the use of multiple measure approaches to measure teacher quality is expanded upon, with particular attention to the literature supporting teacher characteristics such as non-academic competencies, the use of classroom observations to measure quality teaching practice, student perceptions of teacher effectiveness, and student learning gains as important indicators of teacher quality. The review concludes by clarifying gaps in the existing literature that led to the research questions around which this thesis is centred.

Teacher Quality Research

This section expands upon the prior chapter's overview of teacher quality research, including its evolving foci, the evidence (or lack of evidence) for proposed components of teacher quality, and the construct's challenges in arriving at definitional clarity and consistency. In spite of a lack of agreement regarding the meaning of teacher quality, the majority of research in this field over the past forty to fifty years has sought out relationships between various factors related to teachers and teaching (inputs) and student achievement or

academic growth (the key output), often on standardized tests. Seminal papers and reviews of teacher quality research are largely drawn from studies of this nature (Darling-Hammond, 2000; Goe, 2007; Hanushek, 2002; Naylor & Sayed, 2014; Rice, 2003; Strong, 2011; Wayne & Youngs, 2003). This section of the thesis draws largely from such studies, and is organized around three themes: the recurrent features of profiles of teacher quality, research that does or does not confirm the relationship between particular teacher quality characteristics or inputs with student achievement gains, and the development and use of value-added as an indicator of teacher quality.

Building profiles of teacher quality. Researchers have attempted to create profiles of quality teachers, highlighting a variety of key indicators purported to promote or reflect better outcomes for students. Three significant examples are provided that are illustrative of the common themes of this research area.

In the first example, Brophy and Good(1984) reviewed over a decade of research linking teacher behaviours to student outcomes. This resulted in a profile primarily of teacher practices they associated with quality teaching, noting in particular the importance of "active teaching" in effective classrooms (where students spend most of their time being taught or closely supervised by teachers), high quality classroom management, brisk pacing, teacher clarity when delivering instruction, and the teachers' ability to create high success rates for learners within lessons. The authors also noted some qualities that expanded beyond teacher actions, including the value of higher expectations for students, an orientation towards focusing on instruction and learning activities, and a business-like approach to teaching that emphasized time on task.

In the second example, Stronge and Tucker (2005, p. 2) identified ten qualities of effective teachers. According to the authors, they:

- have formal teacher preparation training.

- hold certification of some kind (standard, alternative, or provisional) and are certified within their fields.
- have taught for at least three years.
- are caring, fair, and respectful.
- hold high expectations for themselves and their students.
- dedicate extra time to instructional preparation and reflection.
- maximize instructional time via effective classroom management and organization.
- enhance instruction by varying instructional strategies, activities, and assignments.
- present content to students in a meaningful way that fosters understanding.
- monitor students' learning by utilizing pre- and post-assessments, providing timely and informative feedback, and reteaching material to students who did not achieve mastery.
- demonstrate effectiveness with the full range of student abilities in their classrooms, regardless of the academic diversity of the students.

The third example comes from Goe, Bell et al.(2008), who suggested the following profile of a quality teacher:

- Effective teachers have high expectations for all students and help students learn, as measured by value-added or other test-based growth measures, or by alternative measures.
- Effective teachers contribute to positive academic, attitudinal, and social outcomes for students such as regular attendance, on-time promotion to the next grade, on-time graduation, self-efficacy, and cooperative behaviour.
- Effective teachers use diverse resources to plan and structure engaging learning opportunities; monitor student progress formatively, adapting instruction as needed; and evaluate learning using multiple sources of evidence.

- Effective teachers contribute to the development of classrooms and schools that value diversity and civic mindedness.
- Effective teachers collaborate with other teachers, administrators, parents, and education professionals to ensure student success, particularly the success of students with special needs and those at high risk for failure. (p. 11)

All three examples reflect a number of general features relevant to attempts to build teacher quality profiles. The first key feature is that such profiles do not comprehensively represent the range of practices empirically supported as effective at raising student achievement gains, but rather attempt to distil a limited number of general, presumably high leverage teaching practices. The practices emphasized by different authors overlap, but also vary, and are borne out of a multitude of studies providing a solid empirical basis in support of these practices. Brophy and Good's research was a seminal synthesis of process-product research that had been conducted to date that focused on relationships between observable teacher behaviours measured by trained observers and measured achievement gains of students in mainstream educational settings. Stronge and Tucker's profile is distilled from dozens of studies, including some of the most well-known and frequently referenced in teacher quality research (Darling-Hammond, 2000; Hanushek, 1971; Hattie & Timperley, 2007). Goe et al. nominated five key practices that were conceptualised after an extensive review of teacher quality research, much of it overlapping with research that informed the prior models. The authors then invited an array of experts in the field to provide further feedback to strengthen the identification and articulation of these practices. Then the authors tested and validated their model against a synthesis of research that included more than 120 articles that met their inclusion criteria that the research be empirical and include measures of teacher effectiveness or classroom practice as well as measures of student outcomes.

Whilst the profiles and practices highlighted by these models are well-supported by linkages to improved learning outcomes for students, they also reflect a persistent challenge in identifying the practices of quality teachers. If claims around effective teaching practices are based on their positive correlation to improved student achievement gains, as is generally the case, then nearly everything teachers do can be claimed as effective practice. Hattie (2009) found that between 90-95% of all influences on student achievement are positive: in essence, as Hattie put it, "Virtually everything works. One only needs a pulse" (p. 16). Profiles that identify a discrete and non-comprehensive set of teaching practices essentially privilege certain practices over others, including others that may be effective or valued based on a particular set of criteria, including but not limited to the degree of impact on student learning associated with that practice. Consequently, most models of quality teaching can be viewed simultaneously as valid and trivial, depending on the criteria used to define and identify key practices. The challenge Hattie raised is not in determining what works in terms of such practices, but what works best. While Hattie argued that average effect sizes of teacher influences can be utilised to differentiate between low, medium and high influences, with a hinge point of d = .4 to indicate where influences, including practices, fall into the zone of desired effects, such a methodology has not been widely applied to or accepted within teacher quality research as a way to determine not just which practices may set apart quality teachers from their peers, but also which practices are most central to their effectiveness.

A second feature of profiles such as those previously highlighted is the inclusion of teacher characteristics that relate to particular beliefs or traits. The next section delves more deeply into teacher beliefs that have some empirical connection to effective teaching, but the three prior examples provide some helpful indications of the types of "internal" teacher factors that are often labelled as important markers of teacher quality. Recurrent themes in

this area include such things as high expectations for students (Rubie-Davies, 2014), teacher enthusiasm (Keller, Hoy, Goetz, & Frenzel, 2016), kindness and caring (Cruickshank, Jenkins, & Metcalf, 1995), and optimism and perseverance (Duckworth et al., 2009b), among others.

A third feature is the indication of the expanded role of the teacher beyond just delivering instruction. With an increased emphasis on the bodies of knowledge such as content knowledge, content pedagogical knowledge, and general pedagogical knowledge, viewed by many as critical to the professional expertise of teachers (Shulman, 1987), the role of the teacher and expected actions of effective teachers reflect expanding notions of the teacher's role. It is an assumption that effective teachers do not just teach well, but also demonstrate a wide body of knowledge about learners, learning, and teaching, but that they also communicate and engage effectively with parents and carers, engage in reflective practice, and invest in professional engagement as part of efforts to continuously improve.

A fourth feature of such profiles is that they describe the outcomes of teaching as making a positive contribution to student learning. It is worth noting, and reflected in the profile examples, that effective teachers are expected to improve not only academic outcomes, but also social/emotional learning for their students. This is consistent with a shifting societal expectation on the role of teachers to address a wider range of student outcomes which has in turn shifted conceptions of what outcomes effective teachers produce (Muijs, 2006).

Profiles of the traits, actions, role expectations and outcomes of effective teachers are arguably built on an empirical basis that connects these factors to measured improvements in student outcomes. One methodological issue in the way in which particular profiles of teacher quality are constructed is the lack of a clear criteria for inclusion of particular factors over others. For example, the basis for noting the importance of teacher experience may be a

series of studies highlighting a positive relationship between teacher experience and student academic gains. Such a connection may be misleading in the absence of accounting for the size of such an effect, and the simple inclusion on the basis of some positive correlation is problematic given the prior point that most teacher-based influences on student learning outcomes have at least some positive impact. Therefore, positive correlation alone is potentially too low of a bar to back claims related to teacher quality. Yet, much of the literature highlighting important teacher characteristics fails to provide criteria for inclusion. Another related issue is a lack of consistency between and even within such profiles when it comes to what evidence may be deemed valid. For example, a profile may use student achievement data to identify particular characteristics deemed important, such as licensure, and at the same time, draw upon qualitative research or student questionnaires identifying the importance of traits such as creativity. Thus, efforts to progress a profile of teacher quality are hindered by failing to draw from a reliable, rigorous, and consistent base of evidence.

Teacher characteristics as indicators of teacher quality. Possibly as a consequence of persistent challenges to establish a consistently agreed upon profile of teacher quality, much of the teacher quality research, including seminal reviews of the literature, has tended to focus on teacher characteristics such as teacher preparation, test scores, years of experience, additional coursework, certification, and even gender, and their relationship to students' academic achievement results on standardized tests. As value-added research became increasingly more common in education with the introduction of Hanushek's earliest studies (1971), it became possible to isolate teacher qualities and examine their direct connections with standardised tests, which were also becoming increasingly more common, and ultimately a typical inclusion criterion for researchers attempting to synthesise broader understandings of teacher quality factors in light of extant research. The results of this research have provided some valuable insights regarding the benefits of particular

characteristics, differences in particular factors from one subject area to the next, and a large degree of uncertainty or failings to identify the characteristics that systems should focus on in their efforts to raise teacher quality.

Teacher experience is an important part of teacher quality research, and an area whose importance is contested. Numerous studies have attempted to link student achievement gains to teacher levels of experience, and advocates of experience as a key attribute of teacher quality highlight research that illustrates the positive relationship between experience and student achievement. However, such an assertion would be oversimplified and overstated. In a review of the research findings on teacher quality, focusing on the relationship between particular teacher attributes and student achievement gains, Rice (2003) noted the trend that more experience generally associates positively with student achievement, and that quality tends to rise in particular in the first 3-5 years in the classroom. Interestingly though, the relationship between quality and experience then tends to disappear. Even acknowledging that experience makes a positive difference in the first five years of teaching, the magnitude of the effect does not appear particularly compelling, nor does it account for much of variance in teachers' valued-added to student achievement. Goldhaber (2007; 2000) suggested that the benefits of experience are overall very small if not statistically insignificant, and determined in his analysis of teacher value-added modelling that only about three percent of the variance in student achievement results could be explained by teacher credentials such as experience and degree level. He argued that a far better predictor of teacher effectiveness is their students' achievement gains from prior years. Essentially, teachers with little experience can be highly effective, just as teachers with a large amount of experience can highly ineffective (Darling-Hammond, 2000), altogether suggesting that we must look to other factors in both defining and measuring teacher quality. Leigh (2010) drew a similar conclusion in a study of Australian teachers. He noted a significant effect of teacher

experience in the early years of their career on student achievement in both literacy and numeracy. However, he qualified this observation by also noting that when all teacher characteristics were examined together (including age, qualifications and gender), it only accounted for 1% of the variance in teacher quality. For this reason Leigh suggested that investments in teacher quality would improve learning outcomes at the system level, and that levers such as overall better pay -- a factor he and Ryan (2008) argued had lowered the overall quality of the teaching workforce in the 1980s and 1990s in Australia -- would be both economically sound and be as likely if not more so to lead to better learning outcomes than other strategies such as raising class size or rewarding experience.

Although at any given moment in time, teachers' experience levels, particularly after their first 3-5 years, may not be a strong predictor of their value-added to student achievement, it would be fallacious to suggest that investing in retention would not impact teacher quality. Recent research indicates that comparisons of teachers' value-added each year to their own prior experience, on average, shows that teachers continue to demonstrably improve well beyond their early career (albeit at a lower rate than their first years in the classroom) (Papay & Kraft, 2015; Kini & Podolsky, 2016). This research raises the possible concern that if teachers generally continue to improve over time, but amongst teachers, experience is not a strong predictor of quality, that too many top performing teachers leave the profession to soon. If this is the case, a general focus on retention is not the solution, but rather, a focus on retaining quality teachers would be a sound investment.

Teacher preparation, level of study, and certification have also been put forth as potential teacher quality drivers, but the evidence supporting these factors is uncertain. A review of teacher quality research by Wayne and Youngs (2003) suggested that studies confirm that students learn more from teachers who have attended higher ranked universities and achieved successful results in their past studies, although they acknowledge this may be a

reflection of other characteristics that enabled them to succeed academically, and that there is a need for further research on this as studies have been relatively limited. Certification has been put forth as an important and positive contributor to teacher quality. Yet, the overall evidence is far less conclusive. Darling-Hammond (2000) argued that "measures of teacher preparation and certification are by far the strongest correlates of student achievement in reading and mathematics, both before and after controlling for student poverty and language status" (pg. 1). In one of her best-known studies, she found the correlation between teacher certification and student achievement ranged from r = .61 to .80, which she described as a strong, significant relationship. Yet, Wayne and Youngs' review argued that when considering the breadth of similar studies up to that point in time, the findings on certification have been inconclusive, and cited multiple studies in which the relationships between teacher certification and student achievement covered the spectrum from positive and significant as in the case of Darling-Hammond's studies, to small or even negatively correlated in other studies. Rice (2003) drew a similar conclusion noting similar studies and suggested that Darling-Hammond's conclusions represent somewhat of an anomaly in the research.

It is possible that Darling-Hammond's focus on examining the certification status and student achievement results of teachers of states with notably strong teacher standards for certification and rigorous processes in place demonstrated a predictive effect specific to such states. In other states with either lower standards and/or lower quality implementation of certification processes, the relationship may be compromised. This would not suggest that certification is a poor way to measure or define teacher quality, but rather, that the quality of the standards must be high for them to be valid and reliable indicators of teacher quality. It is thus prudent to infer that the question of certification remains unresolved. In the Australian context, Leigh (2010) also tested for correlations with teacher characteristics. He found teachers with masters degrees or other further qualifications actually obtained lower test

scores with their students, that female teachers overall performed better than male teachers, and that positive correlations existed between levels of experience, as well as teacher "suitability" ratings. However, as previously mentioned, he noted that only one percent of the variation in performance could be explained by differences in teacher demographics, suggesting that the magnitude of the effects he studied was relatively small and not to be overstated as factors driving teacher effectiveness.

One interesting feature in teacher quality research is how particular factors appear to matter more or less within certain teaching disciplines. Teacher quality in mathematics stands out in particular. While reviews suggest that across disciplines, characteristics such as degrees, coursework and certification are not strong predictors of teachers' value added to student achievement, all of these factors appear to positively influence mathematics achievement, with numerous studies supporting this conclusion (Rice, 2003; Wayne & Youngs, 2003). Goe (2007) went so far as to suggest that there were strong and consistent correlations between larger effects on student achievement gains in mathematics classrooms teachers having degrees in mathematics, mathematics certifications, and higher level mathematics courses. It should be noted that Goe's and others' findings highlighting the unique nature of teacher quality in mathematics is not fully substantiated within the literature. For example, Hill, Kapitula and Umland (2011) offered evidence that mathematics teachers' contributions to student achievement were not highly correlated with their mathematical knowledge for teaching or the quality of their mathematics teaching, measured by expert observers. That said, there still remains more evidence supporting the importance of particular teacher characteristics as indicators of overall quality for math teachers than for any other discipline area.

Drawing upon research from Nye, Konstantopoulos, and Hedges (2004), Goe suggested one possible reason for most of mathematics knowledge is developed within

school, while other knowledge areas such as English are also heavily influenced by out of school factors. Regardless, Goe's conclusion is consistent with the findings of prior reviews of teacher quality research and highlight an important consideration regarding the generalisability of teacher quality research. It may very well be the case that particular factors are more or less relevant than others based on the context of teaching.

The conclusions of Goe's synthesis of teacher quality literature provides an apt summary to conclude the question of what is and what is not known regarding teacher quality research. Experience matters, but only a little, and only for the first 3-5 years of teaching. The importance of other teacher characteristics is uncertain or marginal, except in the case of mathematics teachers. Efforts to identify the key determinants of quality teaching and its outcome (teaching effectiveness) remain largely elusive to researchers in this field, leaving a number of important questions to consider. One such question is whether there are other teacher characteristics that merit further study. This includes factors such as teachers' beliefs and their non-academic capabilities (such as resilience, organisation, communication skills, etc.), both of which this thesis examined. Another question is whether or not sufficient attention exists on the mediating factors that influence teachers' enactment of particular practices and as a consequence their impact on student outcomes. The effects of perceptions of curriculum demands, school requirements, and actual students are among just a few of the potential mediators that likely work in tandem to shape teaching and learning. A third question regards the generalisability of the research. Goe noted the subject-specific differences in what teacher characteristics appear to or not to matter, but also further suggested that a wide range of contextual factors may shape different meanings of teacher quality and its characteristics that are unique to different school contexts.

Value-added and teacher quality. One approach that has been used in the literature to identify and predict quality teaching is value-added modelling, which uses statistical

modelling to map the achievement gains that students make over time linked to a particular teacher, school or school system(Koedel, Mihaly, & Rockoff, 2015). It has been used in numerous studies to demonstrate the strong influence of teacher quality on student achievement and stability of this as a measure of teacher quality over time (Kane & Staiger, 2008; Rivkin, Hanushek, & Kain, 2005; Sanders & Horn, 1998). Some proponents of value-added modelling suggest that it provides the best and clearest meaning of teacher quality. For example, Hanushek (2002), one of the pioneers of value-added modelling, noted: "Good teachers are ones who get large gains in student achievement for their classes; bad teachers are just the opposite" (p. 4). Regardless of whether one accepts this position, the literature on value-added demonstrates that it is consistently able to identify variation in teacher performance. Furthermore, numerous studies have indicated that value-added correlates with a variety of other potential measures of quality teaching, including principal evaluations of teachers, performance on classroom observation instruments, and student surveys, amongst others (Koedel et al., 2015).

In spite of its popularity and expanded use in teacher evaluation systems, value-added has garnered just as much criticism as it has support over the years. Darling-Hammond (2015) provided a synthesis of many of the common concerns raised by other researchers, including the instability of value-added analysis, its narrow focus on standardized tests, and its inability to fully account for all of the exogenous variables that influence student achievement, which she argued account for the vast majority of the variance in student achievement gains. The instability critique argues that teachers' effectiveness based on value-added between years and within particular subjects are highly subject to movement. Berliner (2013) illustrated this by describing a study of New York City teachers in which of the initial top 20% performing teachers based on value-added analysis, only 19 teachers total out of thousands managed to remain in the top 20% for four consecutive years. Another

study of 250 secondary teachers in the San Francisco Bay Area found that across years, 74-93% of teachers' effectiveness moved by 1 or more deciles, 45-63% of teachers moved by 2 or more deciles and 19-41% of teachers moved by 3 or more deciles (Newton, Darling-Hammond, Haertel, & Thomas, 2010). The authors found similarly high degrees of instability between the different courses that teachers taught. Berliner (2014) suggested that using value-added to validly and reliably identify quality teachers is nearly if not totally impossible, largely due to the "hidden" exogenous variables that are either unaccounted for or insufficiently built into value-added models. This includes the peer and compositional effects of classrooms and schools, the curriculum, school leadership, school climate, district leadership, pupil expenditure, and professional development, among other things, all of which interact to influence student achievement. However, their absence in value-added models might be misconstrued or inaccurately labelled as teacher effects.

Studies on the year-to-year stability in teachers' value-added cover a wide range, from as low to .18 and as high as .64, which may be the result of differences in the particular models used, rather than a more general lack of consistency in the results (Koedel et al., 2015). The issue of stability is impacted by the intended use of this information, and the extent to which value-added data is used in conjunction with other forms of information to support improvements in teacher quality. Issues in stability support the case for caution or outright avoidance of using value-added for the purposes of determining teacher hiring, firing, or retention. But stability issues may not encroach upon the use of this data to support teachers to set development goals or to identify areas for professional learning. Koedel et al. (2015) also noted that findings on stability of value-added are consistent with if not better than alternative performance measures of teachers and also consistent with stability of performance in other professions as well. While value-added modelling typically utilizes standardized testing data that is neither designed for the purposes of evaluating teachers, nor

does it necessarily represent the specific content teachers have taught to their students, findings from the MET study indicated that teachers' whose students performed better on standardised tests also performed comparatively better on more cognitively demanding assessment tasks that were included within the project (Cantrell & Kane, 2013).

While value-added remains contentious, its central role in teacher quality persists, and will likely continue to for the foreseeable future for a number of reasons. The use of value-added data in schools and education systems has demonstrably improved student achievement compared to instances in which this information has not been used (Chetty et al., 2014). Value-added also privileges the learning of students above all else when considering what makes a quality teacher. These benefits build a strong rationale for the continued use of value-added should as a critical component of definitions and models of teacher quality. However, there is a strong case to be made for discouraging the nearly pervasive use of value-added as the sole or primary measure of teacher quality, which essentially conflates teacher effectiveness with teacher quality, rather than situating effectiveness within a broader model that considers the important elements of who quality teachers are, what they do, and what they achieve. Goe, Bell et al. (2008) urged caution in overly narrow definitions of teacher quality, arguing that elements beyond value-added, such as professional engagement, the support of inclusivity and impact on social and attitudinal outcomes reflect the broader and increasing set of expectations placed on teachers. Thus, teacher contributions to student learning are a critical indicator of quality, but still form part of a larger whole. That said, information on teachers' contributions to student achievement continues to anchor much of the other research on teacher quality, and the validity of factors is largely based on their relationship to value-added or other measures of teacher contribution to student achievement.

Teacher Beliefs and Teacher Quality

This dissertation sought to elucidate a broader conception of teacher quality, with a particular aim to determine whether teacher beliefs should be included as part of a multidimensional model of teacher quality. This section of the literature review considers the extant research on particular teacher beliefs that draw empirical links with quality teaching and teacher effectiveness.

A taxonomy of beliefs that shape impact. Beliefs relating to teacher quality can be broadly grouped into three categories, as illustrated in Figure 2.1. The first category is best described as pedagogical beliefs, which includes beliefs about teaching, learning, knowledge, curriculum, and assessment. Conventional wisdom is reinforced by research highlighting the critical input that teachers' pedagogical beliefs have on what and how they choose to teach. Summarising the importance of pedagogical beliefs, Brown(2008b) stated:

> All pedagogical acts, including teachers' perceptions of and evaluations of student behaviour and performance (i.e., assessment), are affected by the conceptions teachers have about their own confidence to teach, the act of teaching, the nature of curriculum or subjects, the process and purpose of assessment, and the nature of learning among many educational beliefs (p. 3).

Teachers pedagogical beliefs strongly influence their teaching methods, the design and setting of learning tasks, and the demands of assessment and workload specifications they create for their classes (see Kember, 1997).

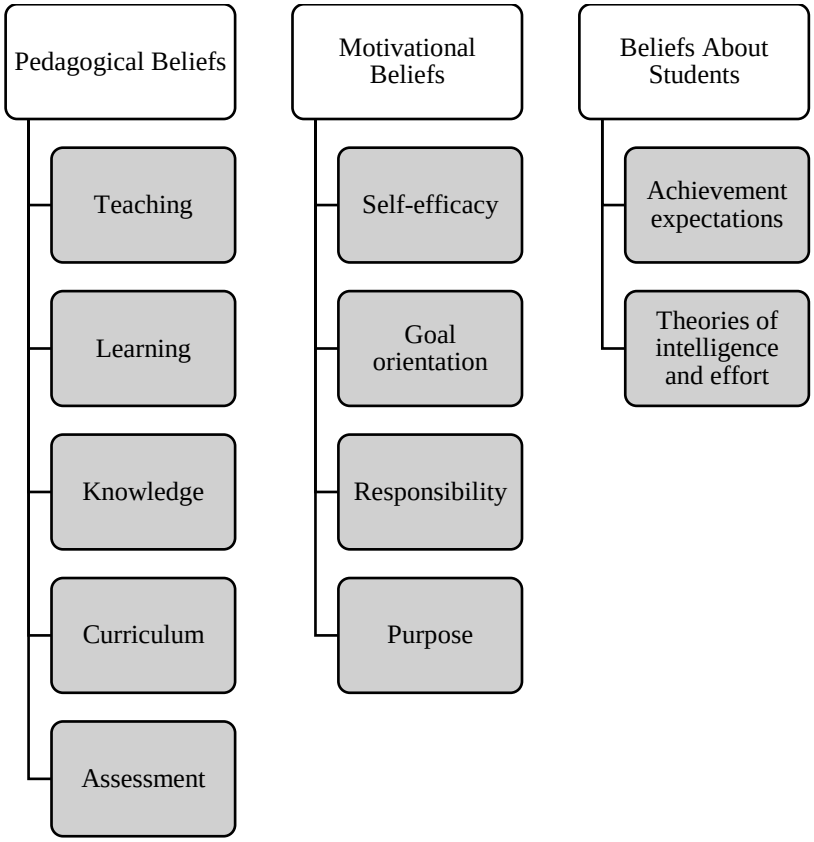

Figure 2.1 Taxonomy of Teacher Beliefs

The second category involves motivational beliefs, which refer to teachers' self-efficacy beliefs, their goal orientation, their sense of responsibility, and their purposes for teaching. The power and effect of motivational beliefs in the classroom should not be underestimated. The past decade has seen a major rise in research concerned with what motivates teachers, as expectancy-value theory, achievement goal theory, and self-determination theory, which were initially concerned with students' motivations, have since been adapted to deepen insights about teachers' motivations and their impact on everything from instructional choices and student interactions to their own instructional goals and career trajectories (Richardson, Watt, & Karabenick, 2014). This emerging research creates a strong case for teachers' motivational beliefs as an important factor influencing their quality and impact. Motivational beliefs get at the very heart of what makes teachers tick, giving them purpose and meaning, the confidence to persist, the courage to own the success or failure of

their efforts, and the mindset to focus on their growth and the growth of their students. Motivational beliefs include beliefs related to self-efficacy, goal-orientation, sense of responsibility and purposes for teaching.

The third category in this proposed taxonomy is best described as beliefs about students. It includes teacher expectations, which have been examined for decades, with many studies as well as a number of reviews and meta-analyses highlighting the visible relationship between teacher expectations and student achievement outcomes (Brophy, 1983; Jussim & Harber, 2005; Rosenthal & Rubin, 1978). It also includes beliefs about students' intelligence and effort, an area of research that has been fuelled largely by studies of achievement goal theory and growth mindset (Blackwell, Trzesniewski, & Dweck, 2007; Dweck, Walton, & Cohen, 2011; Dweck, 1986) and to some extent epistemological beliefs as well, particularly those related to innate ability (Schommer-Aikins, 2004). Taken as a whole, this thesis hypothesises that some or all of these categories of belief relate to teacher quality and impact, and that within these categories, there are likely to be particular teacher beliefs that correlate better than others with measures of teacher quality.

Beliefs about Teaching. A common thread across many of the studies of beliefs about teaching is the dichotomous grouping of these beliefs into two broad categories: student-centred and teacher-centred (Fives, Lacatena, & Gerard, 2014). As illustrated in Figure 2.2, Kember (1997) suggested that teacher-centred beliefs about teaching view teaching as a content-oriented activity focused on imparting information and transmitting knowledge to students, while student-centred beliefs about teaching view teaching as a learning-oriented activity focused on facilitating understanding, conceptual change and intellectual development.

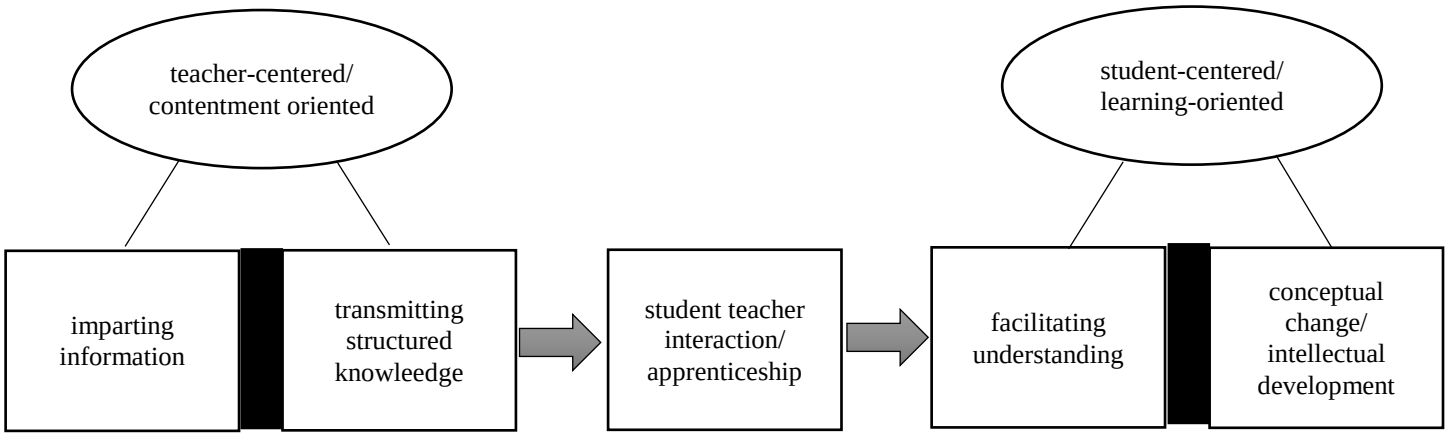

Figure 2.2. Kember's (1997) multiple-level categorisation model of conceptions of teaching.

Kember suggested that beliefs about teaching are not purely binary, and that teachers' beliefs and practices, although generalizable, may at times sit across different points on this continuum. Kember's model is highly consistent with the work of Collins and Pratt (2010), who identified five categories of conceptions of teaching. The first is transmission beliefs, which assume the teacher's responsibility is to present the content accurately and efficiently to learners, and it is the learners' responsibility to master that content. The second is apprenticeship beliefs, which assume the teacher is a capable practitioner of what they teach, and that the teacher should regularly demonstrate best practice and guide students to gradually do more of the work. The third is developmental beliefs, which assume that good teaching begins with learners' prior knowledge and a commitment to changing students' thinking by focusing on increasing complexity and deeper understanding of the content. The fourth is nurturing beliefs, which emphasize the need to respect the learner's self-concept and self-efficacy, and the need for teachers to care deeply about their learners and support effort as much as achievement, striking a balance between challenging students to do their best while still supporting and nurturing their efforts to be successful. The fifth conception category, social reform, emphasizes the pursuit of social change more than individual learning, the commitment to social issues and social change and the need to ground teaching

in communicating what changes must take place in society. By studying these as independent factors, Pratt has demonstrated the possibility that teachers may endorse multiple teaching beliefs in tandem, including those that would seemingly be at odds or at different points in Kember's continuum. Although Kember and Pratt's studies have been primarily focused on university students, the model has been supported in studies of secondary school and cross-cultural settings as well (Chen, Brown, Hattie, & Millward, 2012).

Beliefs about Learning. Fives, Lacatena, et al.'s (2014) review of the empirical literature on teachers' beliefs about teaching and learning presented concerns with the lack of studies focusing on teacher beliefs about learning after only being able to identify a few studies that singled out learning beliefs from the 59 final articles that met their review criteria. Brown (2008b) noted that the majority of research on learning beliefs has focused on students', rather than teachers', beliefs about learning teachers. This may be one reason why there are few studies focusing on teacher beliefs about learning. Fives, Lacatena et al. also noted the confusion around how to situate "constructivist" teaching beliefs in this area. The authors suggested that many studies describing teacher constructivist beliefs offer at best a vague description of the term and conflate notions of constructivist teaching with constructivism as a theory of learning. They further critique what they describe as teacher beliefs research that is responsible for "the convergence of theories of learning with methods of teaching in ways that fail to fully articulate their similarities and differences" (p. 250). The different factors that underpin beliefs about learning highlight the need to distinguish them from beliefs about teaching. Furthermore, the possibility that teachers may hold pluralistic views of both teaching and learning reinforces the need to separate the two areas in research to gather richer information about the complexity of teaching and learning beliefs that teachers possess.

Marton and Säljö (1976) produced some of the earliest work on learning beliefs in their studies of university students. Researchers identified distinct levels of processing based on reading tasks and answers as well as interviews, which they labelled *surface* and *deep*. Deep processing was distinguished by a focus on finding the purpose of a text, drawing appropriate conclusions, and engaging actively with the content. Surface processing was distinguished by a "reproductive" conception of learning that focused on recalling the details presented, with comparatively passive engagement. Follow up studies have supported a

continuum of surface-deep beliefs students possess about learning (Biggs, 1987a; Entwistle, 1997b; Purdie & Hattie, 2002).

Biggs initially proposed three types of learning beliefs, reflected by particular motivations and self-reported strategies. The surface belief was characterised by primarily extrinsic motivators, like fear of failure, and strategies such as reproduction of information and rote learning. The deep approach was characterised by intrinsic motivators like genuine interest in the content and a sense of satisfaction derived from study, and strategies focused on maximising meaning and expanding understanding. Biggs also identified a third approach, achieving, motivated by a desire to obtain the highest grades with strategies focused on organising time, working space, and investment in a manner that produces the best academic results, later revised and removed to include just surface and deep factors (Biggs, Kember, & Leung, 2001) .

Purdie and Hattie (2002) identified six distinct types of learning beliefs that mapped against surface and deep factors of learning. The authors also noted a relationship between the number of different beliefs students held and their self-reported academic performance, discovering that the self-rated academic achievement of students who endorsed all six conceptions of learning was higher than that of students who believed in fewer categories. For this reason, the authors suggested that versatile and flexile (as opposed to limited) beliefs about learning promote greater academic achievement. In the context of teachers' beliefs about learning and their actual impact, Purdie and Hattie's findings demonstrate the need for research that examines not only the correlations between isolated beliefs and measures of teacher quality, but also to explore the extent to which complexity of beliefs and capacity to hold pluralistic conceptions of learning relate to measures of effective teaching.

Epistemological Beliefs. A related but distinct category of teacher beliefs concerns knowledge, drawn from the study of epistemological beliefs (Perry Jr, 1999). Hofer and Pintrich (1997) defined epistemological beliefs as concerning "how individuals come to know, the theories and beliefs they hold about knowing, and the manner in which such epistemological premises are a part of and an influence on the cognitive processes of thinking and reasoning" (p. 88). Schommer-Aikins (1990) studied the extent to which teachers demonstrated five hypothesised epistemological beliefs: simple knowledge (contrasted with complex knowledge), omniscient authority (e.g., knowledge is handed down by experts rather than derived from reason), certain knowledge (as opposed to tentative), innate ability (similar to fixed mindset), and quick learning (meaning learning is quick or not at all). Although omniscient authority did not emerge as a clear factor, her studies confirmed the other four factors. Debacker, Crowson et al. (2008) raised concerns regarding the validity of the measure used to produce these factors, noting that essentially an equal number of follow up studies by Schommer-Aikins were unable to produce the same four factor model. Wanting to address this, a new instrument, the Epistemological Beliefs Inventory (EBI) was developed to attempt to demonstrate reliability of the original five epistemological factors in Schommer's original work (Schraw, Bendixen, & Dunkle, 2002). The authors of this study confirmed these factors with sufficiently high correlations with the revised items and no loading of these items across multiple factors, thus improving upon Schommer's original instrument design.

There is still no consensus as to whether or not simple knowledge, certain knowledge, omniscient authority, quick learning and innate ability are all truly factors that represent actual epistemological beliefs. Hofer and Pintrich (1997) argued that quick learning is a factor concerning learning as a process and while beliefs about learning may be related to epistemological beliefs, and they are therefore conceptually distinct. They further suggested that the innate ability beliefs "concern the nature of intelligence as a personal, psychological

trait of an individual. As such, it is not clearly a dimension regarding the nature of knowledge as a general epistemological and philosophical question" (p. 109). In the context of teacher beliefs, innate vs. fixed ability beliefs, which Schommer drew from Dweck and Legget's research on personal theories of intelligence (Dweck & Leggett, 1988), may better be represented as motivational belief, as well as a belief about learners, as opposed to a pedagogical belief, and is positioned within this thesis as such. However, all factors do represent beliefs that likely impact upon what and how teachers choose to teach, and their students' learning, and merit further exploration in relation to measures of teacher quality and impact.

Curriculum and assessment beliefs. The study of teachers' beliefs about curriculum and assessment, while strongly connected to beliefs about teaching and learning, is beginning to develop its own unique body of research. Brown (2008a) suggested placing assessment beliefs within a broader grouping of "instructional beliefs" that include beliefs about teaching, learning, curriculum, which he suggested interact in hierarchical, complimentary and often pluralistic ways to shape teachers' practices. Brown identified four key conceptions of Assessment: (1) a belief that assessment is useful in improving teacher instruction and student learning by providing quality information for decision making, (2) a belief that assessment is about accountability of students, (3) teachers or schools are made accountable through internal or external evaluations, and (4) assessment is irrelevant and/or potentially harmful to the work of teachers and lives of students. These conceptions of assessment are distinct from aforementioned models teaching beliefs, suggesting that teachers' beliefs about the purposes of assessment play a crucial role in their assessment choices and teaching practice, and vice versa. Perspectives on assessment may form a crucial mind frame for supporting teaching that focuses on evaluating impact (Hattie, 2012). With

increased emphasis on assessment at the classroom, school and system level, these beliefs and practices will become that much more relevant and worthy of study.

Beliefs about curriculum, while likely related to teaching beliefs, may also be quite distinct and worth investigating as distinct pedagogical beliefs related to quality and impact. Cheung (2000) studied teachers' beliefs about the purpose of curriculum and identified four major orientations: (1) a humanistic conception that advocates that the student is the centre and source of all curriculum, (2) a social reconstructionist orientation that sees school and curriculum as a means by which we can direct social reform or change, (3) a technological orientation focused on finding efficient means of reaching planned learning objectives, often through the use of modern technology, and (4) an academic orientation aimed at developing students' rational thinking and inquiry skills. Chueng's (2000) measurement tool aligned to these four orientations suggests that large proportions of teachers possess pluralistic views about curriculum, endorsing multiple orientations simultaneously.

Brown found that particular curriculum and assessment conceptions appeared to share elements of continuums identified in models of teaching and learning beliefs. For example, he found that technological beliefs aligned with elements of surface learning beliefs, while humanistic and academic beliefs aligned with deep learning beliefs. One of the strongest features in Brown's research is his identification of a number of archetypical belief systems shared by groups of teachers in his studies by studying multiple types of beliefs. His research highlights the complexity, multidimensionality and relatedness of teachers' pedagogical beliefs. However, Brown himself acknowledged the lack of correlational studies of teachers' curriculum and assessment beliefs and measures of their effectiveness and suggested this as a future direction for research. The integration of these beliefs into a composite model of teacher quality will address this need and further the research in these areas.

Pedagogical Beliefs and Teacher Quality. Regarding the relationship between teachers' pedagogical beliefs and measures of their effectiveness, studies suggest that student-centred beliefs about teaching and deep orientated beliefs about learning correlate with better cognitive outcomes for students. Staub and Stern (2002a) studied teachers' beliefs about how students best learn and are taught mathematics with a group of German primary school teachers and found a strong positive correlation ($r = .44$) between the teachers who more strongly endorsed a cognitive constructive set of beliefs with those teachers who also set tasks that required students to use conceptual understanding and not just performance oriented tasks. Additionally, better achievement results correlated with stronger orientation towards a cognitive constructivist approach, with items most closely aligning with student-centred beliefs about teaching. These results are consistent with a number of other studies focused on mathematics teachers, including a study by Askew (1997) who found that teachers with "connectionist" teaching and learning beliefs, which aligned well with Kember's (1997) descriptions of apprenticeship teaching, had students make greater gains than those classes with discovery-orientated and transmission-orientated teachers. Similar results were replicated in a follow up study by Mujis and Reynolds (2001). Kember (1997) studied the relationship between the beliefs of university level instructors and the learning beliefs indicated by their students at multiple points within a particular course, using the deep vs. surface aligned Study Process Questionnaire (Biggs, 1987b). Kember observed that the underlying teaching beliefs had a significant effect on the students' learning beliefs, with departments with high mean scores endorsing a direct transmission approach depressing or decreasing students' deep learning beliefs, while departments more strongly endorsing learning facilitation were less likely to promote a surface approach amongst their students. While the research connecting pedagogical beliefs and measures of teacher quality is somewhat lacking, there is ample evidence to suggest that these beliefs should relate to

teacher impact and that particular beliefs are more likely than others to optimise student learning.

Teacher self-efficacy beliefs. Although teachers' motivations are likely to influence their behaviours and outcomes in the classroom, models of teacher quality, effectiveness and impact tend to ignore or fail to operationalize motivational beliefs as a key element of quality and impact, when it is quite possible that there are optimal motivational beliefs that correlate with other measures of teacher quality. The first among such beliefs relate to teacher self-efficacy. Woolfolk Hoy et al. (2009) suggested that "among the many beliefs teachers might hold, few are as powerful as their self-efficacy for teaching – a belief that can trump others in the complex process of navigating classroom life" (p. 627). Rooted in Bandura's (1977) social-cognitive theory of motivation, self-efficacy theory posits that our actions and our persistence in acting is triggered by our beliefs in our effectiveness to carry out particular tasks as well as our expectations of likely outcomes. Teachers' beliefs about their capabilities to teach effectively may be one of the few characteristics in classrooms consistently demonstrating relationships to teachers' behaviours and the learning of their students (Woolfolk, Rosoff, & Hoy, 1990).

The past 30-40 years of research in the field has evolved the conceptualization of teacher self-efficacy, as early researchers (Ashton & Webb, 1986; Gibson & Dembo, 1984; Guskey, 1988) first began to produce evidence that teachers held beliefs about their ability to execute particular practices and successfully accomplish particular results in the classroom. Early constructs of teacher self-efficacy resulted in measures that led to two important findings, when examined in relation to various outcomes: first, that these self-efficacy beliefs moderated teachers' behaviours in ways that affected students' learning, and second, that teachers with high efficacy beliefs were more likely to attain better academic results with

their students (Ashton & Webb, 1986). How self-efficacy moderates behaviour and influences teacher effectiveness is elaborated upon in the paragraphs that follow.

Tschannen-Moran, Hoy et al. (1998, p. 233) defined teacher self-efficacy as "the teacher's belief in her or his ability to organize and execute the courses of action required to successfully accomplish a specific teaching task in a particular context" (p. 22). Dellinger, Bobbett et al. (2008, p. 752) defined teacher self-efficacy beliefs as "a teacher's individual beliefs in their capabilities to perform specific teaching tasks at a specified level of quality in a specified situation" (p. 753). Both definitions suggest that teachers' efficacy beliefs largely pertain to the actions or tasks that teachers undertake in their roles, as well as the situational nature of those beliefs (Woolfolk Hoy et al., 2009). However, teacher self-efficacy research has struggled to clarify and build consensus amongst of its meaning and measure (Dellinger et al., 2008; Pajares, 1992; Tschannen-Moran & Hoy, 2001; Wheatley, 2005). The focus of teacher self-efficacy measures has varied widely, from focusing on everything from classroom management and student motivation to student social outcomes and professional consultancy (Labone, 2004). The earliest inspiration for studies in this field was Rotter's work on locus of control theory (Rotter, 1966). This served as part of the basis for one of the earliest studies of teacher self-efficacy carried out by RAND researchers (Armor, 1976). Self-efficacy meanings and measures have since largely moved away from a locus of control framework and stayed in line with Bandura's research.

Bandura's social cognitive theory informed and helped shape his conceptualization of self-efficacy theory (p. 34; 1977), which hypothesized that self-efficacy was a significant driver of motivation. Bandura suggested four major sources of influence on efficacy expectations: performance accomplishments, vicarious experiences, verbal (or social) persuasion, and physiological (including emotional) arousal. In the context of teaching, he noted that teacher self-efficacy largely came down to beliefs in one's ability to motivate and

promote learning (1993). However, Bandura also distinguished between efficacy beliefs that relate to our ability to perform particular tasks vs. beliefs that relate to our ability to achieve particular outcomes, or outcome expectancies, which has prompted further debate around teacher self-efficacy constructs, with some researchers critiquing the inclusion of outcome expectancies in teacher self-efficacy surveys (Tschannen-Moran & Hoy, 2001; Wheatley, 2005). Gibson and Dembo (1984) designed the once popular *Teacher Efficacy Scale (TES)* that separated Bandura's self-efficacy theory and outcome expectancy elements into two factors. The first, *personal teaching efficacy*, measured the specific tasks or practices of teaching, and the second, which they called *teaching efficacy*, captured the outcome expectancies of teaching. These two factors were found to be uncorrelated, meaning a teacher could feel highly efficacious about their ability to perform the tasks of teaching while simultaneously feeling low levels of confidence in their ability to influence or control the successful learning outcomes of their students. Criticisms were raised in later studies around the validity and measurement tools of these two factors (Henson, 2001; Tschannen-Moran & Hoy, 2001), resulting in the development of updated conceptualizations and measures of self-efficacy no longer including factors related to locus of control or outcome expectancies, and concentrating on particular teacher tasks (Dellinger et al., 2008; Gibbs, 2003; Tschannen-Moran & Hoy, 2001).

Tschannen-Moran et al. (1998) attempted to describe the relationship between teacher self-efficacy, related behaviours, and the impact this has on student outcomes. She argued that teachers' judgments of their efficacy are the result of an interaction between their own analysis of the factors that make a particular task easy or difficult and their self-assessment of their abilities and limitations specific to the task. In this model, not only does teacher efficacy appear to influence teacher and school outcomes, but situational factors (such as school or students' characteristics) also impact teachers' sense of efficacy, suggesting a

potentially reciprocal relationship. A comprehensive review of 88 studies of teacher efficacy beliefs (Ross, 1994) concluded that a number of organizational or environmental characteristics (as opposed to teacher related characteristics) related to higher levels of efficacy. This included the level of school (with elementary teachers' generally expressing higher self-efficacy than teachers in middle and high school), students who are relatively orderly and of higher ability, schools characterized by low stress, and leadership responsive to teacher needs. Ross (1998) further noted that teacher efficacy is generally higher when teachers are teaching within their areas of perceived expertise, when they feel their workloads are moderate, and when they feel the culture of their school is collaborative and cooperative.

Beyond their impact on teachers' other beliefs and consequence behaviours, Woolfolk Hoy and Davis (2009) suggested that self-efficacy beliefs also create direct consequences on students' beliefs and behaviours, such as time spent on learning, clarity and motivation for tasks, pursuit of challenging learning goals, effort, persistence, and intrinsic motivation. They also suggested indirect consequences for students such as positive or negative interest in subject matter, emulation of teacher behaviour and attribution of success and failure, and relational consequences such as connectedness, conflict management, personal responsibility for learning, and pro-social behaviours. Thus, self-efficacy beliefs are likely to impact not only cognitive outcomes for students but also non-cognitive outcomes such as self-regulation, long term goal pursuit, persistence, and resilience. Midgely et al. (1989) observed this trend in a two-year study of mathematics classrooms in which they noted the rate of change within the school year in students' self-expectancies, perceived performance and perceived task difficulty as the students moved between teachers in each year. The authors found that students who moved from high to low self-efficacy teachers between years ended the second year with the lowest expectancies and perceived performance. They also found that this relationship was more pronounced for low-achieving students.

In a review of teacher efficacy studies, Henson (2001) summarised several key findings on efficacious teacher behaviours. He suggested that efficacious teachers persist with struggling students and criticize them less after incorrect student responses, that they are more likely to agree that a low SES student should be placed in a regular education and less likely to refer students for special education, that they are more willing to experiment with methods of instruction, seek improved teaching methods, and experiment with instructional materials. Ross (1994, 1998) argued that teachers with higher self-efficacy are more willing to learn about and implement new teaching techniques, particularly those which are more challenging and demanding, but ultimately better for student learning, a finding supported by earlier research (Gibson & Dembo, 1984).

While there are far more studies linking self-efficacy to quality teaching behaviours, a number of studies have also found clear evidence of relationships between teacher self-efficacy beliefs and student academic achievement (Ashton & Webb, 1986; Anderson, Greene, et al., 1988). Ashton and Webb studied 48 teachers' self-efficacy beliefs and their students' achievement results on a high school mathematics test, reporting significant relationships between the students' results and the teachers' levels of efficacy, based on multiple measures. They found a correlation of r = .78 between student achievement and the aforementioned RAND locus of control statements, and a correlation of r = .50 between student achievement and the Webb efficacy measure (Ashton, 1982). Anderson, Greene et al. (1988) examined relationships between and among 24 teachers' sense of efficacy and thinking skills and their students' thinking skills and academic achievement. Their self-efficacy survey included both the Gibson and Dembo TES as well, which they found to correlate to student efficacy amongst a sample of nine third grade teachers (r = .78 for personal efficacy and r = .54 for teaching efficacy). They found a much weaker correlation in a sample of sixth grade teachers (r= .20 for personal efficacy and .20 for teaching efficacy.)

Any reason why this major change? One methodological limitation in Ashton and Webb's as well as Anderson, Greene et al.'s studies was their low sample sizes of just 48 and 24 teachers respectively in each study. Another potential limitation of these studies was the use of teacher efficacy questionnaires that have since undergone significant scrutiny (Tschannen-Moran & Hoy, 2001).

More recent research has supported the results of these earlier studies (Brown, 2012; Muijs & Reynolds, 2001; Whitley, 2010), and the balance of evidence suggests that self-efficacy has a small but generally positive connection with teacher quality. Klassen and Tze (2014) conducted a meta-analysis of research linking self-efficacy beliefs to external measures of students' achievement or evaluation of teaching performance, finding 31 studies that met this criteria published between 1985 and 2013 (which also included sufficient information to calculate effect sizes from zero-order correlations.) The authors sought out unpublished papers and dissertations to check for publication bias, noting in their analysis that publication bias did not appear to be an issue impacting the overall research in this area. They found that while nearly a quarter of studies produced negative correlations between self-efficacy and teacher quality, on balance the overall correlation between teacher self-efficacy and measures of quality was positive, although relatively small at $r = .12$. Klassen and Tze argued that effect sizes of this magnitude for this particular factor have the potential to make a large contribution to student achievement as they are uncorrelated with other predictors (such as student and school characteristics) and also have the potential to cumulate over time (if students continuously have access to higher self-efficacy teachers over time, their results will continue to improve each year, when all else is equal.) The existing body of evidence reflects the conventional logic that it is an important aspiration for teachers to have high levels of self-efficacy. Teachers who believe in their capacity to effectively undertake the variety of practices required to be effective in the classroom are more likely to increase

effort, persist, challenge themselves and their students, and embrace positive changes that may enhance their teaching and students' learning. While self-efficacy is a not a pre-requisite for positively impacting students' learning outcomes, teachers with higher self-efficacy are more likely to produce better achievement outcomes for their students. Self-efficacy is arguably the most researched of all teacher's beliefs, and having been extensively put to the test, has earned a place in any model of teacher quality that includes teacher beliefs.

Achievement goal beliefs and implicit beliefs about intelligence and effort.

Another potentially critical type of motivational belief affecting teacher quality relates to teachers' goals. Achievement goal theory suggests that our goal orientation plays a major role in motivating our behavioural choices (Butler, 2014). A substantial amount of the research in this field has focused on studies of student motivation, with strong evidence to suggest that the types of goals that motivate students, in tandem with their implicit beliefs about intelligence, impact upon students' motivation to learn, their responses to academic challenge, and their ultimate academic achievement gains (Blackwell et al., 2007; Dweck & Molden, 2000; Dweck, 1986). Butler (2014) argued that the particular types of goals that students and teachers possess greatly influence their perceptions, strategies, and outcomes. These goals are broadly conceptualised as dichotomous and focused on *mastery* vs. *ability*. Mastery goals suggest a motivational purpose centred on improving skills and understanding, while ability goals suggest a motivational purpose centred on demonstrating high or masking low ability (Dweck, 1986; Miller, Greene, Montalvo, Ravindran, & Nichols, 1996). Individuals more strongly endorsing mastery goals are described as having an *incremental* or *growth mindset*, and those with ability goals are described as having an *entity* or *fixed mindset* (Dweck, 2006; Dweck, 1986, 2000). Dweck suggests that students with a growth mindset tend to believe that intelligence is malleable, and successful learning, particularly in the face of challenges and setbacks, is often the result of effort. In contrast, those with a fixed mindset are more inclined to believe that intelligence and academic capabilities are stable and pre-determined by factors unrelated to effort, such as innate ability, talent or intelligence.

One of the most important arguments supported by this field of research is that students with a *growth mindset* about their intelligence tend to achieve more than students with *entity* or *fixed mindsets*. This was illustrated quite clearly in two studies that found that students with growth mindsets and mastery goals experienced increases in motivation and

performance and generally improved academically while students with fixed mindsets and ability goals experienced declines in both motivation and performance (Blackwell et al., 2007). An intervention study designed to facilitate the shift from fixed to growth mindset in students was able to reverse this downward trajectory while the control group continued to decline in motivation and performance. A general conclusion drawn from the study and consistent with much of Dweck's research is that teachers should endeavour to support students to focus on mastery goals and a growth mindset (Dweck & Molden, 2000). Dweck referred to "academic tenacity" as a set of non-cognitive and motivational factors that promote long-term learning and achievement, and proposed that one of the key ways in which teachers could foster academic tenacity was by promoting a growth mindset and mastery goals in the classroom (Dweck et al., 2011). It stands to reason that teachers who themselves have a growth mindset about intelligence and are motivated by mastery goals would be more likely to foster such beliefs in their students.

Dweck and Molden (2000) suggested that teachers' incremental (growth) mindsets vs. entity (fixed) mindsets link directly to particular behaviours that may in turn affect student learning outcomes (2000). However, there is limited research focusing on teachers' achievement goals and implicit beliefs about intelligence, and even less research on the impact of those beliefs on student outcomes (Jones, Bryant, Snyder, & Malone, 2012; Lynott & Woolfolk, 1994). The majority of research on growth mindset in education has focused on the relationship between students' mindsets and academic achievement, and the impact of growth mindset interventions amongst groups of students. Nonetheless, there is evidence suggesting that a number of teacher behaviours consistent with research on effective teaching practices appear to correspond to (or presuppose) beliefs of intelligence as malleable and an orientation towards mastery goals. These particular practices and behaviours may be factors

that are mediated by the effects of teachers' beliefs about intelligence and their goal orientation.

Butler (2007, 2014) found particular connections between teachers' instructional practices and the implicit messages they may send about behaviours that are commonly associated with mastery goals and growth mindset. Noting the association between performance orientated beliefs and work avoidance behaviours, Butler argued that teachers who construe help seeking as an indication of low ability are more likely to inhibit students from asking questions and seeking help. Teachers with mastery orientated beliefs are more likely to convey that asking questions is a good way to learn and also more likely to respond to students' questions in ways that are validating and supportive, conveying the message that help-seeking behaviours are integral to academic success and not a reflection of weakness, failure or unintelligence. In classrooms with performance orientated and work avoidant teachers, it is likely to find lower levels of perceived support and higher levels of perceived inhibition. In contrast, mastery-oriented teachers' classrooms are more likely to have teachers encouraging students to ask questions and seek support.

Both Butler (2014) and Dweck et al. (2011) noted a relationship between mastery orientation and incremental/growth mindset in teachers and an instructional emphasis on deep learning. The alignment between deep learning strategies and mastery oriented beliefs was identified in a study which correlated mastery-oriented instructional practices with mastery beliefs in teachers (Retelsdorf, Butler, Streblow, & Schiefele, 2010). Those reporting mastery-oriented beliefs were more likely to self-report instructional practices that encouraged independent and critical thinking, presentation of problems and questions with several potential solutions, and emphasis on deep over surface learning. Butler speculated that the relationship between mastery beliefs and deep learning approaches may exist because teachers driven by mastery beliefs value learning that requires critical thinking. This is

consistent with Biggs' and Telfer's (1987) conceptualisation of deep vs. surface learning beliefs, which suggests that motivational beliefs associated with deep learning tended towards intrinsic factors such as a desire to deepen understanding, genuine interest in the content, and focus on improvement. Butler further suggested that teachers with mastery goals are more likely to endorse practices that support student autonomy, while teachers with ability goals are more likely to endorse practices that emphasise more teacher control and less student autonomy. High autonomy practices tend to be more associated with student-centred approaches to teaching (Co-operation & Development, 2009), which in turn tend to associate to conceptions of learning as deep as opposed to surface (Kember, 1997).

Some of Dweck's most compelling findings related to the type of praise or feedback teachers gave their students. Mueller and Dweck (1998) published the results of six studies they conducted studying the effects of different types of praise and determined that praise focusing on students' intelligence caused far more harm than good. In contrast, praise focusing on effort had a comparatively positive effect. When praise and feedback was focused on effort as opposed to intelligence, students' goal orientations were found to be more likely focused on effort and continuous improvement, learning new skills and taking up more challenging content, and their achievement gains were higher. Students who experienced more ability or intelligence focused praise from their teachers made far less academic growth, and focused their goals on looking able and smart. Consequently, the authors found that students initially performing at the same achievement level would experience differential achievement outcomes dependent upon the type of praise they received from their teachers.

Admittedly, Dweck's earlier studies have proven difficult to replicate, especially at the level of impact she originally reported, but this does not negate that at least some associations have been found across a range. For instance, a dual meta-analysis of studies

first of the relationship between growth mindset and academic achievement and second of the effect of growth mindset interventions suggested that there is a small but positive and significant correlation between mindset and achievement, and that overall, interventions have a small but positive effect (Sisk, Burgoyne, Sun, Butler, & Macnamara, 2018). The researchers noted the lack of heterogeneity of the studies when considering the impact and importance of growth mindset amongst academically at-risk and low SES students, indicating that these students benefit far more from such interventions than their counterparts.

Hattie and Timperley's (2007) research on the power of feedback provides insights into how growth-mindset informed practices might translate into effective feedback. They identified four key levels at which effective feedback works: the task level (how well tasks are understood/performed), the process level (the main process needed to understand/perform tasks), the self-regulation level (self-monitoring, directing, and regulating of action) and the self-level (personal evaluations and affect about the learner). The latter two levels are particularly relevant to Dweck and Mueller's research on praise. Hattie and Timperley suggest that provision of feedback at the self-regulation level prompts students to reflect on effort, review and set personal goals, and build metacognitive awareness. Self-regulation level praise implies greater student autonomy, self-control, self-direction, and self-discipline. These are all concepts well aligned with a mastery orientation. Feedback at the self-level provides information that enhances effort, engagement, task quality, or self-efficacy. This is consistent with Dweck and Mueller's(1998) research suggesting that praise focusing on effort positively affects student achievement while praise focusing on ability, intelligence, or competence can have lesser or potentially harmful effects.

More recent research applying achievement goal theory to teachers has identified a new focus of goal orientation: striving to connect (Butler, 2012). Butler extended her own model of teacher goal orientation to include items that focused on teachers' motivation to

build caring and close relationships with students. Butler (2014) later suggested the need for including this additional factor after discovering that teacher mastery goals did not entirely predict students' reports that they would indeed turn to their teachers for needed help and explanations. In Butler's 2012 study, only relational goals predicted teacher social support. However, relational goals also predicted mastery instruction. This suggests a possible correlation between teacher behaviours that provide strong instructional and emotional support, such as investing greater attention toward students, providing more constructive feedback on student work, and offering more encouragement to students (Hamre & Pianta, 2005), and mastery orientation beliefs.

The existing research provides sufficient evidence to suggest firstly that teachers' goal orientations and implicit views of intelligence affect their behaviour in the classroom, and secondly that beliefs reflecting a mastery orientation and growth mindset are consistent with practices and behaviours considered quality teaching. Teachers' beliefs about intelligence and orientation towards performance or mastery goals can have effects (potentially direct or indirect) on their students' beliefs and orientations in addition to their actual academic achievement. Although further studies are needed examining the relationship between teachers' goal orientations and validated measures of quality teaching and impact, there is a well-established empirical base to encourage such further research.

Teacher responsibility beliefs. Teacher responsibility is very much about the extent to which teachers take ownership over what is and what should be occurring in their classrooms. Much of the early work examining teachers' beliefs about their responsibilities grew out of the earliest research on teacher self-efficacy. The initial RAND self-efficacy measure (Armor, 1976) was based on Rotter's (1966) locus of control theory, which focused on examining the internalization or externalization of responsibility for outcomes. Guskey (1981) advanced this early research in his studies of self-efficacy, first developing a

responsibility for student achievement teacher survey using locus of control as the basis for studying teachers' attributions of successes and failures in the classroom. Guskey (1988) found that teachers who demonstrated a greater locus of control, that is, those who took more responsibility for their students' successes and failures, also demonstrated a variety of positive teaching behaviours. He found they were more likely to experiment with different materials and methods of instruction, they were more likely to seek improved methods of instruction, they had more positive attitudes towards curriculum implementation and were more likely to endorse and report methods of teaching that were mastery oriented. As self-efficacy research became more strongly influenced by Bandura's (1977) studies, the development of measures moved away from examining teacher responsibility and towards self-efficacy as reflected by teachers' beliefs about their ability to successfully perform various aspects of teaching(Dellinger et al., 2008; Gibson & Dembo, 1984; Pajares, 1997; Tschannen-Moran & Hoy, 2007). Critiques of the construct of self-efficacy measures that in fact looked more at internalized and externalized responsibility(Tschannen-Moran & Hoy, 2001) supported the movement away from studying teachers' sense of responsibility. While responsibility may be distinct from self-efficacy, it still represents a promising and potentially crucial aspect of teacher quality and impact.

Guskey and Passaro (1994) suggested that internal vs. external responsibility was an additional dimension to teacher efficacy. The authors adapted Woolfolk's and Hoy's(1990) updated, more reliable version of Gibson and Dembo's earlier self-efficacy measure to better understand the distinction between teachers' efficacy beliefs and their beliefs about control. Guskey and Passaro found little evidence to support a personal efficacy vs. general teacher efficacy distinction, but found a distinction between teachers' perceptions of the extent to which they can influence how well students learn, a difference in internal vs. external locus of control. Guskey and Passaro also found a correlation between teachers' self-efficacy

beliefs and their internalization vs. externalization of teacher influence, but concluded that the evidence from the study indicated that the two factors appear to operate independently.

Further research on teacher responsibility has suggested that self-efficacy, locus of control, and teacher sense of responsibility are all separate and distinct constructs (citation?). The notion that locus of control and responsibility are one in the same is problematic in that it operationalizes responsibility as the teacher's attribution of controllable causality, which may not be sufficient to define responsibility (Lauermann & Karabenick, 2013). Lauermann and Karabenick suggest that causal attributions may tell us about the internal or external reasons teachers explain what may have happened (e.g., a student didn't succeed with an assignment because the teacher did not prepare it effectively (internal) or because the student didn't work hard enough (external)), but responsibility beliefs are more concerned with teachers' perceptions of what should be true. This distinction highlights the need for further exploration of the construct of teacher responsibility and in the development of reliable measures, particularly in the interest of using those measures to explore relationships between teachers' responsibility beliefs and measures of effective teaching. Lauermann and Karabenick's test of a new teacher responsibility scale distinct from locus of control-based measures confirmed the distinction between self-efficacy, locus of control and responsibility as types of teacher beliefs.

The potential relationship between responsibility and teacher quality is supported by studies of collective responsibility, which have demonstrated that in schools where teachers take collective responsibility for their students' academic success or failure (as opposed to blaming students), achievement gains are significantly higher (Lee & Smith, 1997). Further studies would help clarify the extent to which responsibility beliefs relate to measures of teacher quality at the classroom level, but there is good reason to promote further research and test responsibility as a quality teacher belief.

Teachers' purposes for teaching. Why one chooses to teach, their motivations, should impact upon how they teach. Expectancy value theory (Wigfield & Eccles, 2000), self-determination theory (Ryan & Deci, 2000), and achievement goal theory (Butler, 2014) may help shed light on the antecedents and consequences of teachers' motivations. Earlier applications of these theories tended to focus on students, although a number of studies in the past few decades have begun to explore how these theories can help us understand teacher motivations and their impact on teacher behaviours. Taken together, these theories offer us a core set of key "purpose" beliefs that influence teaching and potentially impact upon student learning, including: self-perceptions of ability and likely outcome (not dissimilar from self-efficacy theory), intrinsic (or extrinsic) value, personal and social utility values, autonomy, mastery vs. ability orientation, and connectedness.

Expectancy value theory suggests that two key direct influences on motivation are expectancies (of success) and values, which also influence performance, effort and persistence (Wigfield & Eccles, 2000). Watt and Richardson (2007; 2012) applied this theory to teacher motivation and purpose, focusing in particular on studying the motivations of pre-service student teachers. Their FIT-Choice theoretical model suggests that among the common values motivating teachers to choose teaching as a profession are "intrinsic value" (which is likened to genuine interest and enjoyment), "personal utility value" (which includes job security, time for family, and job transferability), and "social utility value" (which includes a desire "to shape the future of children", "enhance social equity", "make a social contribution", and "work with children and adolescents.") (Watt & Richardson, 2007, p. 176). Watt and Richardson also determined that a motivational category of choosing teaching as a fallback career was applicable to a number of the pre-service teachers.

Although this model has not been applied to explore the relationship between the values motivating individuals to teach with measures of their quality or impact, Watt and

Richardson (2014) followed up with pre-service teachers up to eight years after their initial teacher education to determine how initial motivations for choosing teaching impacted upon teaching style and early career engagement. Teachers who initially self-rated highly on social utility motivations were more likely to exhibit higher levels of persistence, which in turn predicted more positive expectations for students, stronger feelings of relatedness to students, and less likelihood of responding negatively to students' mistakes. On the other hand, those who considered teaching a fallback option had lower levels of planned career persistence, level of effort, leadership aspirations and reported negative teaching behaviours due to lowered persistence. Intrinsic value was so highly interrelated with social utility values and negatively correlated with fallback that it was excluded from analysis.

Watt and Richardson's model suggests that higher quality and higher impact teachers are more likely to be those who choose to teach because of factors such as higher self-perceptions of their teaching ability and outcome expectancies, intrinsic value reflected by genuine interest and enjoyment in the tasks of teaching, social utility values like shaping the future of students, enhancing social equity and working with youth, a strong sense of autonomy, a mastery orientation focused on learning and growth vs. proving ability, and a sense of connectedness. Relating teacher purpose to measures of teacher quality will allow researchers to confirm what should be intuitively true: that an element of what makes teachers effective in the classroom is why they choose to teach.

Teachers' beliefs about students: Expectations. Beliefs about students form the third major area in this thesis' taxonomy of teacher beliefs. Implicit beliefs about intelligence, previously discussed as a motivational belief situated within achievement goal theory, sits within this taxonomy as a belief about students in recognition that teachers' beliefs about intelligence may be self-referential or informed by their experiences with particular students (see "Achievement goal beliefs and implicit beliefs about intelligence and effort" section). This section will focus on teacher expectations.

Teacher expectations have been examined and debated in educational research for nearly fifty years. The landmark *Pygmalion in the Classroom* study (Rosenthal & Jacobson, 1968) launched research on the effects of expectations in classrooms with a stunning assertion: teachers' high or low expectations for students directly influence student achievement gains. Assigned to random children but told that certain students' prior results predicted high achievement, whom they labelled as "growth spurters," Rosenthal and Jacobson observed the effects of these manipulated teacher expectations on students' performance. Teachers' differential expectations led the falsely labelled "growth spurters" to outperform the "average" control group. In particular grades, the effects they noted were dramatic, with IQ gains for the high expectancy students of more than 15 points for first graders and 9 points for second graders by the end of the school year. The study's conclusion was that teachers had the power to create self-fulfilling prophecies in student achievement based on their expectations for students.

The validity of Pygmalion study was quickly disputed, and a longstanding debate launched as to whether and to what extent teacher beliefs actually shaped student achievement in classrooms. Reviews of the study took issue with both its methodology as well as the interpretation of the results (Elashoff & Snow, 1971) and additional attempts to replicate its results generally failed to demonstrate significant effects, as evidenced when

Spitz(1999) reviewed 17 studies that followed Pygmalion, with only one producing evidence supporting the original study's conclusions. But Rosenthal and Rubin (1978) conducted a meta-analysis of studies of self-fulfilling prophecy across a variety of contexts (including experimental studies conducted on both animals and humans and naturalistic studies in workplaces and schools), finding that more than a third of these studies overall supported the self-fulfilling prophecy theory, with a similar proportion of the studies conducted in classrooms. Further research suggested that the conclusions of the Pygmalion study were somewhat overstated, but that self-fulfilling prophecies can and do happen in classrooms, and that they have at least a moderate effect on students' achievement outcomes with a correlation of r = .10 to .20 (Brophy, 1983; Jussim & Harber, 2005; Rosenthal & Rubin, 1978; Smith, Jussim, & Eccles, 1999). Brophy suggested that this correlates to expectations affecting roughly 5-10% of students (1983). Brophy suggested that for those students the effect of those expectations can be quite significant. Hattie's (2013) meta-analysis of studies linking teacher expectations to student achievement suggested an effect size of d = .43. This is relatively consistent with prior studies mentioned, and it should be further noted that this is also above the "hinge" point for what he labels as the zone of desirable effects for education interventions, and equivalent to the impact of just over a year's growth for students.

Teacher expectations appear to affect particular groups of students more than others. Multiple authors have observed the phenomenon of teacher expectations having particularly strong effects on the achievement of at-risk groups of students, such as students from low SES backgrounds, low-achieving students, or ethnic/racial minority students (Brophy, 1983; Jussim, Eccles, & Madon, 1996; Jussim & Eccles, 1992; Jussim & Harber, 2005; Rubie-Davies, 2014). In one of the other studies to examine expectancy effects across diverse groups of students, effects observed by teachers on students identified as low income in the study was d = .20 to .30, and for African-American students the effect was observed to be .60

or greater(Jussim et al., 1996), which is substantial and equivalent to the difference of more than 1.5 years of academic growth.

The logic of the impact of expectancy beliefs is relatively straightforward: teachers with high expectancy beliefs see greater potential in their students than past achievement would suggest, and act upon that belief in ways that lead to improved learning outcomes. However, Ferguson(2003) critiqued the way most studies of this nature benchmark expectations. He argued that most of these studies examine the effects of teacher expectations by gathering data on how students perform compared to their prior achievement. He explained (p. 493):

> Any conception of bias requires a corresponding conception of neutrality. A major reason that no consensus has emerged from scholarship concerning the importance of racial bias in the classroom is that there is no single benchmark for racial neutrality. Instead, there are at least three: unconditional racial neutrality, race neutrality conditioned on observables (including past performance), and race neutrality conditioned on unobserved potential.

Ferguson's point is that the effects of teacher expectations may be less visible when their basis is the extent to which teachers' expectations differ from student past performance. What may appear to be a small expectations effect is due to the supporting research that teachers' expectations of students are generally accurate based on past performance, and that over the course of increased interactions, these expectations become more accurate(Brophy, 1983, 1985). Ferguson suggested that this conception of neutrality assumes either unconditional racial neutrality or race neutrality conditioned on observables. However, he claimed that the unobserved potential of students (African-American, in particular) is a critical source of the bias and low expectations responsible for perpetuating the black-white achievement gap in American education in the first place. It is therefore possible that high

expectations teachers view their students as capable of achieving more than past performance would suggest by basing their expectations on the latent potential of their students, including those from backgrounds particularly vulnerable to the effects of educational disadvantage.

Beyond correlations with improved student outcomes, high expectancy beliefs appear to align with other potential measures of quality teaching. Rubie-Davies' (2014) studies of teacher expectations have focused largely on identifying behavioural differences between teachers based on their expectations. She observed that high expectations teachers engaged in a number of practices well supported by literature as high quality and high impact teaching behaviours that distinguished them from low expectations teachers, including activating prior knowledge (Loughran, 2012) scaffolding techniques to support learning and providing more frequent and high quality feedback (Hattie, 2009; Hattie & Timperley, 2007), and frequency of questioning (Brophy & Good, 1984), as well as greater use of open-ended questioning (Samson, Strykowski, Weinstein, & Walberg, 1987). Furthermore, high expectations are viewed as conditioning and supporting the creation of positive, supportive and efficient classroom climates across numerous studies of effective teacher behaviour and academic achievement (Brophy, 1986; Brophy & Good, 2000; Muijs & Reynolds, 2000; Rubie-Davies, 2014; Rubie-Davies, 2007).

In a model of beliefs that align to measures of teacher quality and impact, high expectations may be a crucial component, and at very least, should be examined in further research in relation to such measures. Multiple studies suggest that expectation effects to not accumulate but rather dissipate over time, but this process can be long-lasting for students, often taking years to completely disappear (Jussim & Harber, 2005). Even if the effects are overstated, the evidence clearly demonstrates that higher teacher expectations predict better outcomes for students, and high expectations are commonly stated as a key characteristic of quality teachers (Brophy, 1986; Goe et al., 2008; Stronge, Ward, Tucker, & Hindman, 2008).

However, it is worth noting that expectancy beliefs are often measured based on the objective comparison of teacher prediction of student achievement vs. actual outcome, when these beliefs may have a generalised aspect as well that merits further consideration. Rubie-Davies (2014) has argued for this conception of expectations, as the study of generalised expectancy beliefs about students will deepen our understanding of how teacher beliefs relate to teacher impact.

Summary. This part of the review has provided a conceptual basis for the inclusion of teacher beliefs in a composite approach to defining and measuring teacher quality. Teachers' pedagogical and motivational beliefs as well as their beliefs about students are likely to relate to measures of the quality of their teaching. Particular beliefs within the categories described in this review may be potentially indicative of higher quality teaching and more optimal learning outcomes for students. This review offers a blueprint of potentially optimal teacher beliefs.

The review includes beliefs about teaching that are not-exclusively about teacher-centred instruction and surface-learning but balance such notions alongside deep conceptions of learning and views of teaching that ensure students are apprenticed and provided with opportunities to move from surface to deep understanding of content. Some of the seminal research in this area dichotomises teacher-centred vs. student-centred and surface vs. deep learning beliefs. Yet, it is also possible that teachers simultaneously hold these seemingly conflicted beliefs because both surface and deep learning are important in the development of knowledge (Hattie, 2012; Hattie & Donoghue, 2016), and that quality teachers understand, value, and are able to balance these perspectives and translate them into practices that optimise student learning.

The review also includes motivational beliefs such as higher levels of self-efficacy, mastery-goal orientation, stronger sense of personal responsibility, and purpose driven factors

such as intrinsic motivation and a desire to make a difference in the lives of children. On balance, the research suggests that both independently as well as together, such beliefs increase the likelihood that teachers will adopt more innovative and effective practices, maintain or increase their effort, and persist in the face of classroom challenges. Research on motivational beliefs largely illustrates the reciprocal nature between motivational beliefs, teacher behaviours, and the experiences these create in the classroom, noting that as teachers' motivational beliefs shape their experiences as teachers, their experiences equally shape or reshape their motivational beliefs, creating a potentially virtuous (or vicious) circle when it comes to their quality and impact.

The review concludes by examining beliefs about students that suggest teachers' mindsets, about both themselves and their students, as well as their high or low expectations for student achievement, can and often will relate to their practice and effectiveness. The research on teacher quality and teacher beliefs both ultimately seek an answer to the same question: how do we best help teachers improve their work? The literature on teacher beliefs and teacher quality has been reviewed to propose a bridge between two fields that are inextricably connected, while at the same time insufficiently linked in the current research. It is therefore appropriate to investigate the inclusion of teacher beliefs within a composite approach to defining and measuring teacher quality and impact, which this thesis will attempt through its research studies.

Bringing these pieces together, Figure 2.3 provides a proposed theoretical model of teacher beliefs, based on the research reviewed through this section. The model expands Figure 2.1, describing within each type of belief what the literature would suggest would correspond to higher levels of teacher quality, based on their hypothesised correspondence to additional measures of quality such as use of quality teaching practices or student outcomes. For example, within beliefs about teaching, the literature would support student-centred vs.

teacher-centred beliefs. In terms of self-efficacy, the literature would suggest that higher levels of self-efficacy predict higher levels of teacher quality. The review of the available literature painted an uncertain picture regarding what types of beliefs about curriculum and assessment should predict higher or lower levels of teacher quality, so Figure 2.3 describes these beliefs as uncertain. The research conducted within this dissertation as part of study 2 tested both types of beliefs and provides suggestions regarding their connection to teacher quality. Those findings are presented in Chapter 4 and discussed further in Chapter 5.

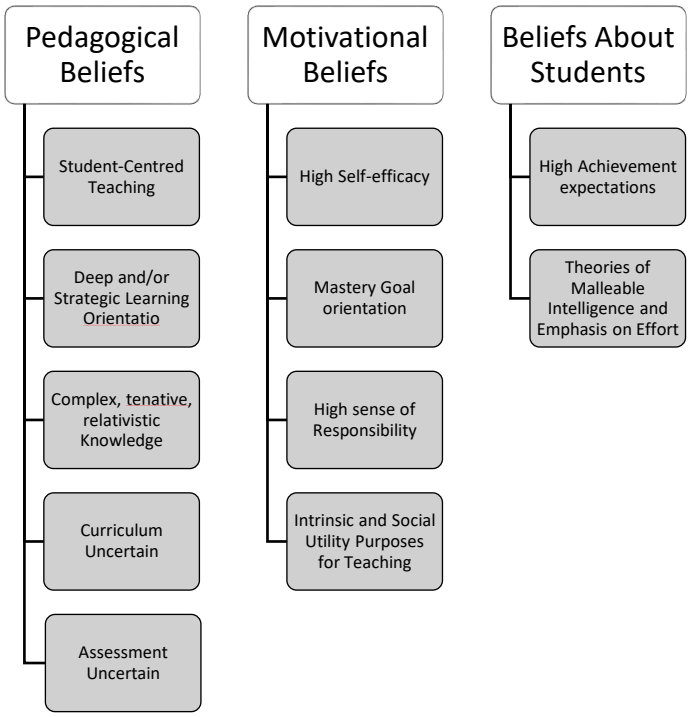

Figure 2.3. A Research-Based Hypothetical Model of Quality Teacher Beliefs

Multidimensional Models and Measures of Teacher Quality

This section considers the use of multi-measure or multidimensional approaches to characterising, identifying and measuring teacher quality. To avoid redundancy, this section will not revisit measurement approaches such as value-added analysis (discussed in the "value added and teacher quality" section of this review), demographic characteristics as teacher quality indicators (discussed in the "Teacher Attributes" section) or teacher beliefs as

a dimension of teacher quality (discussed in the "Teacher Beliefs" section). Instead, this section will describe a number of facets of teacher quality and its measurement that are recurrent in the literature. This includes the quality or quantity of effective teaching practices captured through classroom observations; the personality traits or character strengths of teachers; and the use of student surveys.

Measuring quality teaching. Teaching practice is an integral component of teacher quality, and quality teaching is not synonymous with teacher quality, but rather one of its constituent elements. Quality teaching speaks to the particular pedagogical moves that teachers make, rested on the presumption that particular practices are more or less effective at promoting student learning and can be executed with varied degrees of quality. It follows that the observational measure of teachers' use of particular practices has played a major role in the identification and evaluation of quality teaching for many decades (Gage & Needels, 1989; Pianta & Hamre, 2009). In considering measures of teacher quality, it is important to consider the manner in which observational data on teaching practice is best collected and what practices are deemed "quality" vs. those that are not.

While there are numerous instruments that have been used to collect observational data on teaching practice, instruments can be broadly categorised as low- or high-inference. Low -inference observational measures focus upon specific and generally objective teacher behaviours recorded through frequency counts, while high-inference observational measures require the observer to make a judgment regarding the quality of a particular practice (Rosenshine, 1970). Low-inference measures are beneficial because they curtail potential sources of observer bias that are difficult to completely avoid in the use of high-inference instruments (Hoyt & Kerns, 1999; Muijs, 2006). High-inference measures are beneficial in that they enable ratings of teacher practice that consider not only quantity of observed practices, but also quality. High-inference measures provide room for observers to consider

not just the use of theoretically high-quality practices, but whether they have been implemented effectively. The potential drawbacks of the two broad types of observations can be ameliorated by the use of both in gathering data on teaching practice, or by utilising one method in conjunction with another source of data related to teacher quality.

Whether utilising a high-inference or low-inference approach to identifying and measuring quality teaching practice, a persistent question is which practices are reflective of quality teaching. It is impossible for any observational framework and instrument to capture the full range of teacher practices that play a role in contributing to student learning. Hattie (2018) has identified over two hundred teaching-related positive influences on student achievement. While a number of these involve the application of particular implementations that may or may not be relevant in all teaching contexts (e.g., distance learning, team teaching, peer tutoring, etc.), the majority of teaching-related influences on student achievement relate to practices that could be consistently applied in most classroom contexts (use of learning goals, teacher feedback, questioning, etc.). That said, each framework for quality teaching and its accompanying measurement approach will invariably privilege particular practices over others, often without providing a clear rationale or criteria for the inclusion or exclusion of particular teaching moves.

Evidence-based quality teaching. Rosenshine (2010) offered a helpful set of criteria for identifying research-based principles of quality teaching. The first criteria was that the practice be consistent with research in cognitive science. The second was that the practice be consistent with research on the practices of master teachers, drawn out of a wide range of studies in which particular practices were empirically linked to student achievement data. The third was that the practice be consistent with research on cognitive supports that help students learn complex tasks, noting the high value of instructional procedures (such as think alouds or modelling) that provide students with instructional scaffolds. As previously noted,

Hattie has suggested that because the average effect size across all influences on student achievement is approximately d = .40, and that this figure represents a type of "hinge point" whereby interventions, including teaching practices, with corresponding effect sizes above this number are aligned with better than average student achievement. It could therefore be extrapolated that a useful place to start in determining and ultimately measuring quality teaching practices would be those which have a sufficiently established evidence base that links them to student learning from a cognitive lens but also which have consistently demonstrated over time to produce better than average learning gains for students.

Marzano's (1998) meta-analysis was constructed around a theoretical model that involved four elements of human information processing: the self-system, the metacognitive system, the cognitive system, and knowledge. Marzano suggested two important priorities for identifying quality teaching practices. The first was the use of meta-analysis over narrative approaches to reviews of the research connecting student achievement to particular practices. Meta-analysis, he argued, is more likely to prevent false conclusions that can occur through review processes that are subject to the bias of reviewers who tend to focus their analysis on a portion of but not the full set of studies they are reviewing, and who may create misleading representations of the studies themselves. The second was the need for meta-analysis to avoid a common pitfall, which was the creation of overly broad categories that include studies which highlight varied effects of particular strategies that are unhelpfully bundled into a more generic descriptor. Marzano suggested that an effective meta-analysis on instruction required categories that were specific enough to inform actual classroom practice.

While the particular strategies put forth by researchers such as Hattie, Rosenshine, and Marzano have unique features that distinguish them from each other, there is a significant overlap across a number of areas that would suggest these particular practice areas, while not

a complete rendering of quality teaching elements, would be difficult to exclude. These particular areas of quality teaching practice appear across a number of significant studies linking teacher behaviours to student learning gains. Key quality teaching practices, whilst not exclusive but common to these major syntheses of the teaching research, include the following:

- Setting and sharing clear learning goals
- Classroom management, including the management of challenging behaviour
- Introducing and managing classroom routines or procedures
- Checking for understanding and tracking academic progress
- Organizing and managing resources and physical space
- Providing feedback to students
- Communicating effectively to students, including teacher clarity
- Positive relationships with and between students
- Responsiveness and flexibility during instruction
- Questioning techniques
- Reviewing
- Engaging students in cognitively demanding tasks and/or open-ended thinking

One important observation worth noting about these practices is the role they imply for the teacher. Many if not most of these practices imply an active role for the teacher in directing the attention and instruction of the class, whether as a whole, in small groups, or to individual students. Another important observation that can be drawn from this list is that it is comprised of not only practices that relate to students' academic engagement (such as providing feedback, questioning, reviewing, etc.) but also of practices that relate to the development of positive relationships, and safe and productive classrooms. A final helpful observation about this list is that its practices by and large expand beyond the notion of what

works in classrooms towards what works best. Notably, most if not nearly all of these practices are supported by meta-analytic research that suggests their frequent and effective usage leads to effect sizes that exceed the equivalent of a year's growth for students (Hattie, 2009).

Generalizability of quality teaching practice. It may be problematic to focus conceptions of quality teaching on generalizable practices that are viewed as pertinent across all discipline areas when in fact there may be particular high leverage practices that are uniquely appropriate to particular subject areas. For example, in a science classroom, the teachers' ability to engage students in investigations may be particularly critical and therefore more explicitly noted and privileged than this practice may be in a more general model. Similarly, in an English Language Arts context, it could be argued that engaging students in authentic text-based instruction is a critical practice, although this may not be the case or as critical in other subject areas.

Another important consideration is that even when a particular quality practice can be named across subjects, such as questioning, for instance, the demonstration of effectiveness in this practice in particular subject areas may entail features that are unique to the subject itself. For instance, in a history classroom, effective questioning may be particularly tied to the use of questions that are recurrent in historical research and elicit important areas of debate in historical discourse. In a mathematics classroom, effective questioning would necessarily look quite different, and may have more to do with exposing students' thought processes in tackling particular mathematical problems or identifying misconceptions. It is therefore important that observational frameworks applied within particular subject areas provide the opportunity to situate notions of quality teaching within a subject-specific lens. The MET project focused on a number of such tools, in particular the Protocol for Language Arts Teaching Observation, or PLATO (Grossman, Cohen, & Brown, 2015; Grossman et al.,

2010) and the Mathematical Quality of Instruction, or MQI instrument (Hill et al., 2008). The MET study observed that these subject specific measures of effective teaching generally positively correlated with generic measures of quality teaching, but not strongly enough to suggest that subject-specific measures may be uniquely valuable in their ability to capture facets of teaching practice that general measures do not. As a further and more recent example of this, a study (Blazar, Braslow, Charalambous, & Hill, 2017) explored the relationship between a general observational measurement instrument (CLASS) and a mathematics specific observational instrument (the Mathematical Quality of Instruction or MQI rubric). Exploratory factor analysis indicated that there was some overlap between items across general and content-specific measures, but largely found that the elements that comprised effective teaching in general were distinct from those that comprised effective teaching within the content area. While there was some correlation between the use of effective practices by teachers captured in both general and content-specific measures, the correlations were mostly weak, and in some instances, there were no detectable relationships. The implications are twofold: first, that quality teaching has both general and content-specific elements, and second, measures of both provide a more complete picture of effective teaching practice.

Observational models of quality teaching. With this background on issues related to teacher quality in mind, this section turns to approaches that have been used for capturing teacher quality. A first set of approaches for capturing quality teaching involves classroom observation models, which are consistent with these key areas of practice and are commonly used, including those used as part of the MET project. While these models do not directly measure learning, they help identify linkages between classroom behaviours and student achievement, and thus indirectly address learning (Pianta & Hamre, 2009). For example, the Classroom Assessment Scoring System (CLASS) is structured into three key domains:

emotional supports, classroom organization, and instructional supports (Pianta & Hamre, 2009). All of the above areas are reflected in the observational model's dimensions and indicators. CLASS was widely used as part of the MET study and positively associated with other measures of effective teaching, including teacher value-added and student perception survey results. The domains, dimensions, and indicators of CLASS are illustrated in Figure 2.4.

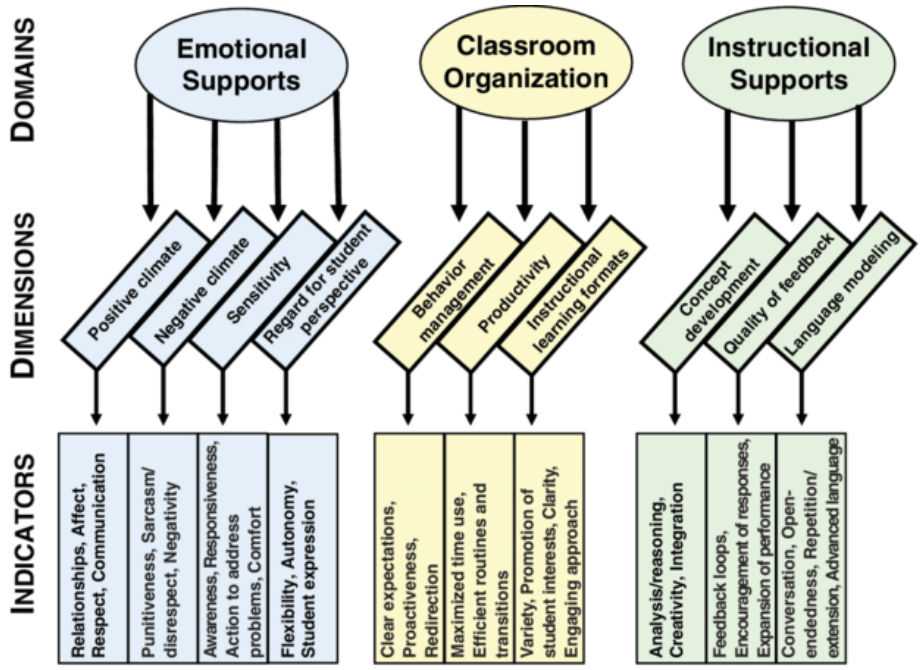

Figure 2.4. The CLASS model (Pianta & Hamre, 2009).

A second observational measure also widely implemented in the MET study was the Framework For Teaching (Danielson, 2011), the other most frequently employed non-subject-specific observation instrument in the MET Project, is similarly consistent in its adherence to the aforementioned quality teaching practices. As illustrated in Figure 2.5, the framework includes four domains, two of which are considered appropriate to a classroom observation (The Classroom Environment, Instruction) and two of which are viewed as occurring outside of a teaching episode and therefore better evidenced through other means

(Planning and Preparation, Professional Responsibilities.) Notably, all ten of the specific practices within the Classroom Environment and Instruction domains are consistent with the principles of instruction and research findings of meta-analytic studies of instructional quality.

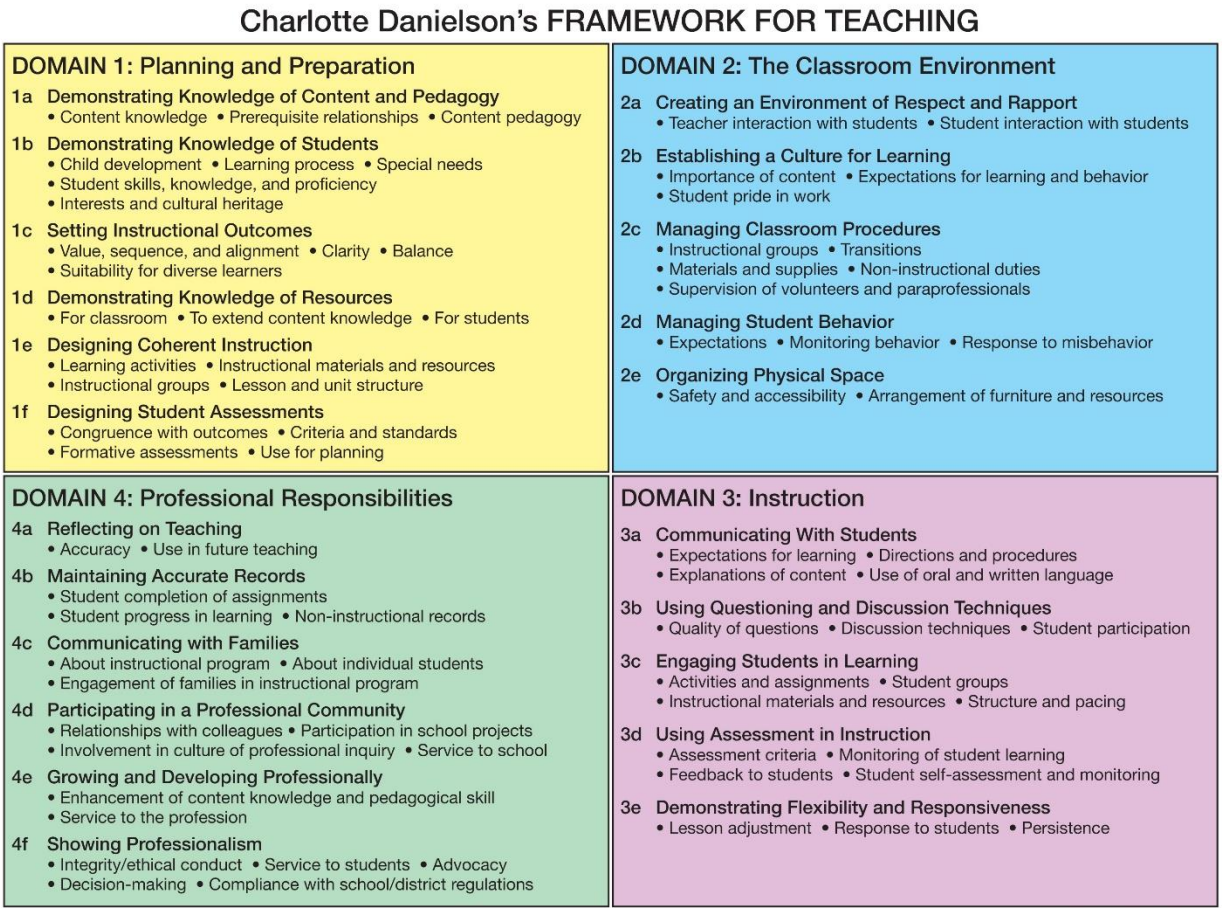

Figure 2.5. Danielson's (2011) Framework for Teaching

Quality teaching practice plays a critical role within broader conceptions of teacher quality. This part of the review explored seminal and contemporary research in this area and identified recurrent themes regarding the key behaviours that comprise quality teaching, as well as methods and considerations in measuring quality teaching practice in the classroom. A common expression is that it is relatively common knowledge "what works" in the classroom and what effective teachers do. The research highlights the truth in this sentiment, not only because most practices provide some benefit to student learning outcomes, and also because the list of such practices is overwhelmingly extensive. Thus, a key challenge that

persists in quality teaching research is whether it is possible to determine not just what works, but also what works best.

One factor underlying this challenge is the lack of a clear and consistently agreed upon criteria for including and excluding particular practices from conceptions of effective teaching. Another factor is that any framework that aims to identify and potentially taxonomise effective teaching practices is built around its own often implicit (and less often explicit) theoretical model of quality teaching. This is equally true for observational measures of quality teaching, which privilege particular practices over others.

In spite of this variation in models, measures, and practices identified as associated with quality teaching, this review illustrates a stable, recurring set of key practices that are regularly identified within the literature as connected to improved learning outcomes for students. The research suggests that these key practices are largely pertinent across content areas and year levels, but also that there may be particular quality teaching practices that are unique to content areas.

Observational measures of teaching remain the primary and arguably best way to evidence quality teaching practice, with the research suggesting that observational models can be stable, reliable, and predictive of other measures of effective teaching. However, reliability is greatly enhanced by frequency of observations, and variety of observers. Classroom observations highlight a unique and distinct dimension of teacher quality, enactment or practice. The lack of perfect correlation with student achievement is therefore not inherently problematic as teacher effectiveness measures examine what students have ultimately learnt (which is conditioned by a myriad of factors and also is not necessarily reflective of what the teacher has taught, remembering that that primary measure of teacher effectiveness is standardized tests, which are broad measures of what students known in relation to curriculum, not a test of whether students have learnt what their teachers have

taught.) Classroom observations allow for a focus on what teachers teach, and the fidelity and quality of instruction they deliver, a unique dimension to teacher quality. Classroom observation, even by trained observers, is not without potential issues. Strong (2011) identified a number of potential problems that may lead to inaccurate or flawed observational measurement, including observer confirmation bias, motivated reasoning (a converse of confirmation bias), inattentional blindness (when observers fail to notice particular happenings in the classroom due to distractions from other stimuli), and hindsight bias, among others. Some of these issues appear to be mitigated by well-designed observational protocols, well-trained and moderated observers, and also by the use of more frequent observers across multiple teaching episodes, all of which may help to increase the reliability of observational measurement and produce correlations with other measures of quality teaching, such as student perception surveys and student achievement gains on tests (Allen et al., 2013; Ferguson & Danielson, 2015; Kane & Staiger, 2012). When done well, observational measures of teaching practice can be a valuable marker of teacher quality.

Teacher attributes. A second approach for capturing teacher quality focuses on teacher attributes. The study of teacher attributes or personal qualities is arguably as old as teacher quality research itself, with many early studies of teacher quality focused particularly on identifying the personality traits, characteristics, and general attributes of quality teachers (Cochran-Smith, 2001; Decker & Rimm-Kaufman, 2008). Witty (1947) gathered letters from over 12,000 students in response to his request for them to identify the attributes of the teachers who had helped them most in school. The most common attributes he identified included a democratic attitude, kindliness, patience, fairness and impartiality, sense of humour, interest in students' problems, and flexibility. Contemporary research suggests that such attributes have become recurrent in studies over the years and remain valid and desirable attributes for teachers to this day (Bahr & Mellor, 2016). As research on teacher attributes

has sought to establish clearer distinct constructs such as beliefs, cognitive ability, and personality traits, teacher attributes continue to gain attention in definitions and conceptualisations of teacher quality. More recently, this interest has evolved into considerations related to teacher selection, with the argument that an important determining factor in selecting teachers for the profession (including selection into teacher education programs) should be "non-academic" or "non-cognitive" factors that supporters believe will lead to a workforce of more effective teachers (AITSL, 2015). As a "catch all" term that appears to encompass multiple constructs, teacher attributes, may speak to teachers' beliefs, cognitive factors, and personality traits. Whilst prior sections have considered the literature on the former two areas, the latter area will be the focus of this section, which will describe the extant research on the personality traits and character strengths as indicators of teacher quality.

Personality traits: The Big 5. Numerous studies have considered the role that personality characteristics play in quality teaching. While there are numerous definitions and models of personality, literature relevant to teacher attributes has primarily focused on traits. Borghans, Duckworth et al. (2008) define personality traits as patterns of thought, feelings, and behaviours, which are distinct from motivation, values, interests, or attitudes. Personality traits can and do change, but tend to be relatively stable across adulthood (Friedman & Kern, 2014), making it possible to consider the impact that different traits have on valued outcomes. While there are thousands of traits, they tend to cluster into a smaller number of higher order factors, primarily ranging from three to 16 factors (Goldberg, 1993). The most commonly used model related to teacher attributes is the five-factor model (also called the Big 5), developed by Tupes and Christal in the 1960s, whose work was largely unknown but developed and popularised by researchers like Digman (1990) and Costa and McCrae (1992). The five factors are generally labelled openness to experience/ intellect, conscientiousness,

extraversion, agreeableness, and neuroticism/ emotional stability. While the five-factor model certainly does not capture the richness of personality traits, the model has been extensively studied across a variety of contexts, with findings suggesting that personality traits appear to be important influencers of a variety of different outcomes, including health, relationships, and occupation (Roberts, Kuncel, Shiner, Caspi, & Goldberg, 2007).

Studies have linked the Big 5 to a variety of educational outcomes, including measures of teacher quality, finding that personality does correlate to teacher quality outcomes, but only effect sizes are weak. For instance, Poropat (2009) examined associations between personality traits and academic performance, primarily in university level studies but also including studies of k-12 teachers. He found that agreeableness, conscientiousness, and openness all positively predicted higher levels of academic performance. While the results were statistically significant, correlations were small (r = .07, .19, and .10 respectively). Poropat suggested this finding was still practically significant, particularly conscientiousness, when converted to Cohen's d effect size values. Similarly, Klassen and Tze (Klassen & Tze, 2014) meta-analysed studies that related teachers' self-efficacy and personality traits to external measures of teaching. Notably, they were only able to identify twelve such studies that meet their criteria for inclusion, and only one such included an actual measure of teacher effectiveness as value-added to student achievement (Rockoff, Jacob, Kane, & Staiger, 2008), while all others were based on evaluations of actual teaching practice. From those studies, which utilised at least one and in some instances all of the Big Five personality factors, the average correlation between personality and measures of teacher quality was r = .10. One potential problem with Klassen's and Tze's meta-analyses was the combination of all personality factors in representing findings, as they failed to highlight that particular factors may more practically relevant to teaching quality than others.

Two more recent meta-analyses reinforced the broad conclusion that personality traits weakly but still significantly correlate with measures of teacher quality, but present contradictory findings regarding which traits are more or less predictive of teacher quality. Picking up on the limitations of Klassen's and Tze's meta-analysis, Kim, Jorg et al. (2019) sought to update the work of Klassen and Tze in examining personality and teaching effectiveness, by also considering teacher burnout and retention as a valued facet of quality, and to account for the individual relevance of each of the five factors in predicting effectiveness and burnout. Kim, Jorg et al. found clear differences in the associations between measures of particular personality factors and teacher effectiveness. Extraversion had the highest correlation with teacher effectiveness (r = .17), while conscientiousness had the second highest correlation (r = .13), and emotional stability (low neuroticism) and openness were similar (r = .10). Agreeableness did not significantly correlate with teacher effectiveness. Kell (2019) found similarly low but positive associations between most of the Big Five traits and measures of teacher quality, with the exception of agreeableness. While the magnitude of effects may be small, Kell noted that these effects should be viewed as anything but trivial, particularly as such effects may cumulate over time. While personality may not be the definitive factor for teacher quality, it appears to play a valued role in shaping it.

Other non-cognitive traits. Beyond the Big 5, other research has looked at specific teacher traits and non-cognitive characteristics viewed as not wholly intellectual or analytical traits or skills that are nonetheless influential upon behaviour and achievement (Bastian, 2013). Specifically relevant to teacher quality, Duckworth, Quinn et al. (2009a) studied the relationship amongst grit, optimistic explanatory style, and life satisfaction with rankings of teacher effectiveness on a cohort of Teach For America teachers. Using previously validated questionnaires for the three positive traits and teacher effectiveness rankings based on

estimated grade-level gains and/or average student mastery of educational content goals, the authors found that all three traits separately predicted ratings of teacher effectiveness. The authors suggested that grittier individuals tend to work harder and longer in very challenging settings than less gritty peers, and that a teacher's ability to sustain or even increase effort in the face of adversity would positively impact their students' achievement. In spite of optimism independently predicting effectiveness, when modelled simultaneously with grit and life satisfaction, its results were rendered insignificant. The authors speculated that the power of optimism for teachers was potentially lost in the study because the authors studied all three traits independently, suggesting that learned helplessness theory would suggest that grit and life satisfaction may have mediated the effects of optimism on performance, and that further studies of should not rule out the possible relationship between optimism and effective teaching.

A follow up paper by Robertson-Kraft and Duckworth (2014) further investigated the relationship between evaluations of grit, teacher retention and measures of teacher effectiveness with a group off Teach For America teachers in two studies. To address limitations in self-reported questionnaires, particularly when associated with selection, the authors developed a rubric to evaluate candidates' demonstrated grit based on biographical information they provided in their applications to the program. This was compared to their retention through the school year as well as the effectiveness of the teachers based on reports to regional supervisors. Effective teachers were labelled as those whose students made at least one year of growth based on available standardized test data or 70% student mastery of content based on standardized tests or other available classroom data. The authors concluded that grittier teachers outperformed less gritty teachers, with teachers who scored one standard deviation higher in grit 64% more likely to outperform their less gritty peers ($d = .42$ in the first study and $d = .45$ in the second study).

Another study of Teach For America teachers (Bastian, 2013) examined the relationship between eight teacher trait measures taken prior to commencement of training, including leadership, perseverance, motivational ability, organizational ability, respect for low income students and families, and the degree of fit with Teach For America's vision for educational equity. Teacher effectiveness measures included teachers' value-added to student achievement based on standardized assessments in reading and mathematics in elementary and middle school levels, and end of course exams in high school, as well as principal ratings using the McREL teacher evaluation system to score classroom observations. In most instances, these non-cognitive traits predicted better results on value-added models of student achievement gains and/or principal evaluations. In elementary grades (mathematics and reading) teachers' organizational ability most strongly predicted students' achievement gains, while in high school, teachers' respect (academic and behavioural expectations) for students significantly predicted value-added effectiveness. Concerning evaluation ratings, two non-cognitive characteristics, leadership and motivational ability, predicted higher scores for multiple teacher competencies. Furthermore, expected non-cognitive characteristics (e.g., leadership) predicted higher ratings of specific teacher competencies (e.g., teachers demonstrate leadership). There were some surprising findings however, including leadership potential negatively relating to student achievement gains in high school, although this was not true in elementary school results and high scoring principal evaluations had among the highest correlations with leadership. Additionally, perseverance negatively correlated with second year teacher effectiveness, a result inconsistent with Duckworth's aforementioned study. One possible reason for this discrepancy is the difference in measures used in Bastian's study, which measured non-cognitive traits based on the evaluation scores of Teach For America's selectors using rubrics aligned to each trait, while Duckworth relied on self-report questionnaires. These results highlight the need for further research in this area

utilizing valid reliable instruments of both the desired teacher traits as well as multiple measures of effectiveness.

One of the most promising implications from Duckworth et al.'s studies and Bastian's study is that teachers' thoughts and beliefs, core elements of many so called non-cognitive traits, can be operationalized and measured in relation to indicators of effective teaching.

Character strengths. Character strengths are a related but distinct set of personal qualities are character strengths, which have grown out of a larger body of work in the field of positive psychology. Aspects of character strengths were identified alongside teacher beliefs as key factors for inclusion in the conceptual model that framed this dissertation; thus this section highlights relevant research supporting the inclusion of character strengths as an element of teacher quality.

The identification of character strengths as a valid psychological construct was achieved through a multi-year study that sought to identify intrinsically valuable, trait-like, distinct, and cross-culturally relevant character strengths that were nurtured by societal norms and theoretically nested within six classes of virtue (Peterson & Seligman, 2004). The six virtues, made up of 24 character strengths are:

1. *Wisdom and Knowledge*: creativity, curiosity, open-mindedness, love of learning, perspective, innovation
2. *Courage*: bravery, persistence, integrity, vitality, zest
3. *Humanity*: love, kindness, social intelligence
4. *Justice*: citizenship, fairness, leadership
5. *Temperance*: forgiveness and mercy, humility, prudence, self-control
6. *Transcendence*: appreciation of beauty and excellence, gratitude, hope, humour, spirituality

A growing body of research finds that knowledge and use of one's strengths relate to a variety of desirable outcomes for students, including greater school achievement (Duckworth & Seligman, 2005; Park & Peterson, 2009a, 2009b; Wagner & Ruch, 2015). Research on the relationship between teacher character strengths and measures of effective teaching is young and promising, and already beginning to point to evidence that students with teachers who think, feel, and behave in ways consistent with particular strengths are more likely to experience better outcomes than those without. Further research is needed to explore character strengths and teacher impact in larger and more diverse settings. Given the high value that positive psychology and positive education place on the development of both cognitive and non-cognitive skills (Seligman, Ernst, Gillham, Reivich, & Linkins, 2009), it would be beneficial to explore whether teachers with strengths that are predictive of academic success and life satisfaction also nurture key strengths in their students. Teachers' self-perceptions of their character strengths should be tested as a potential teacher beliefs construct and compared with other types of teacher beliefs. Such research would help expand the field of teacher beliefs research. If applied to research on effective teaching, it will help shed light not only on what effective teachers do and what their students achieve, but also who effective teachers are and what they believe.

Rationale for the inclusion of personality characteristics. This thesis proposes that the similarities between the conceptualisation of personality traits, non-cognitive aspects, and character strengths and common definitions of teacher beliefs make a case for positioning teacher self-perception of character strengths as a valid and vital system of teachers' beliefs that moderate their behaviours and impact upon their effectiveness in the classroom. Consider four common understandings of teacher beliefs in contemporary research offered by Skott (2014): (1) beliefs are individual subjective mental constructs, (2) beliefs have both cognitive and affective aspects; (3) beliefs are generally contextually stable and often quite

resistant to change, yet capable of change, and (4) beliefs significantly shape teachers' behaviours. Similarly, personality characteristics are (1) mostly captured through self-reported questionnaires of thoughts, feelings, and actions (reflecting subjective aspects of the constructs), (2) are both cognitive and affective in nature, reflecting a person's unique ways of thinking, feeling, and behaving, (3) contextually stable and resistant to change, but also capable of change, and (4) shape meaningful life outcomes.

The widespread use of self-report inventories of beliefs and behaviours in studies of personality is consistent with common methodology in teacher beliefs research, where questionnaires are the most common assessment data collection strategy used. Take as an example Duckworth's use of scales for grit and optimism, which rely heavily on statements of self-reported beliefs such as "setbacks don't discourage me" and behaviours such as "I finish whatever I begin." Self-efficacy scales such as the Teacher Self-Efficacy Scale (Tschannen-Moran & Hoy, 2001) ask teachers to evaluate statements such as "How much can you do to help your students value learning?" Both scales blend affective and cognitive elements as individuals' responses represent their own subjective truths. Descriptions of character strengths and personality traits as thoughts, feelings and actions align with notions of teachers' beliefs as both cognitive and affective, as well as highly related to behaviour. Further research exploring the relationship between self-perceptions of teachers' character strengths and consistency of application in practice would help validate whether it does operate similarly to other teachers' beliefs systems such as student expectations, beliefs about teaching and learning, self-efficacy beliefs, etc.

Student perceptions of teacher effectiveness. A third approach to considering teacher quality uses student self-reported information. Student perspectives have been heavily utilised by research aiming to identify and distil some of the attributes and behaviours of effective teachers as well as to rate and create inferences regarding quality teaching, albeit

more recently in K-12 settings than in higher education. This section provides an overview of this research, where studies of students' ratings of their teachers can be found stretching back for over 90 years (Remmers & Brandenburg, 1927), and have been extensively studied throughout that period of time, particularly in the context of university level teaching (Clayson, 2009). Although the bulk of K-12 research on student ratings of teachers is far more recent, the validity and benefits of looking to students as key sources of evidence related to teacher quality is well supported by the evidence. The logic of using students as valid sources of feedback on teacher quality is strong. While formal observations of teaching practice may provide a snapshot of particular practices at a given moment, student perceptions of teaching can be drawn from numerous lessons and interactions between teachers and students. The increased contact and experience students have with their teachers, as well as the increased number of raters in the form of students, compared to formal observational systems conducted by trained assessors, can arguably create a more reliable, stable, and accurate overall perspective on teachers' effectiveness, with the MET project finding solid evidence to support this claim (Ferguson, 2012).

While research on student ratings of teaching in higher education has developed a significant evidence base testing its validity and relatedness to outcomes such as student achievement, it has taken many more decades for K-12 focused research on the student perceptions of teaching to emerge and provide a clearer picture regarding its validity and reliability. One early attempt by researchers to determine how K-12 student perceptions of teaching aligned with those of trained observers presented an unclear picture regarding the validity and reliability of student perceptions (Evertson, 1978). Continuous concerns previously raised around student ratings of teachers argued that students were unable to identify and discriminate between important teacher knowledge and skills, and that students may be unduly influenced by teacher influences that might bias their results (Peterson,

Driscoll, & Stevens, 1990). The criticism that student survey results conflate teacher popularity or likeability with their actual quality of practice, and related concerns regarding the potential halo effect (Nisbett & Wilson, 1977) persisted in the absence of a strong body of empirical evidence testing the validity and reliability of students' perceptions of teaching.

Peterson et al. (1990) engaged in a number of earlier studies of student surveys outside of tertiary contexts, building upon his observations of earlier researchers who found promising evidence that student feedback on teaching provided useful information regarding teacher quality and that there were indications that students had demonstrable competence to make valid judgments about teacher behaviour. One such study, focusing on primary students, examined whether students' responses to survey items confirmed underlying factors as well as to test for internal reliability amongst student raters (Peterson et al., 1990). The results challenged assumptions that student perceptions of teaching were inappropriate indicators or measures of teacher quality, suggesting that students (including primary level children) did in fact discriminate amongst practices, with particular distinctions in their perceptions of teachers' instructional delivery skills, their rapport and classroom management, and their ability to create opportunities for work. They also found sufficient variance in results to indicate that there were varied levels of quality perceived amongst groups of teachers, challenging the perception that most students invariably rate most if not all teachers high. Further research also highlighted multiple distinct dimensions of teaching indicated by student survey results, with further evidence that students distinguish between teacher behaviours that promote caring, respectful relationships with the skills that facilitate effective learning through instruction(Peterson, Wahlquist, & Bone, 2000). Findings of this nature did not clarify the extent to which students' perceptions of teaching were related to other valid effectiveness measures, such as value added, but by validating student surveys as indicators of quality teaching, they paved the way for a larger body of research indicating that

such relationships do exist, and that arguably student perceptions of teaching are more reliable indicators of teachers' contributions to student achievement than observations or ratings from any other source.

More recent studies have taken up the question of how predictive student surveys are of teacher value-added to student achievement, and the extent to which they correspond to other possible indicators of teacher quality. Research has also attempted to better explore the dimensions of teaching that student surveys can capture, and the role that popularity plays in shaping students' perceptions of teaching. Fauth, Decristan et al. (2014) reinforced prior conclusions that multiple dimensions of teaching were indicated by factor analysis of survey results. But more notably, the researchers found that teacher popularity, although positively related, was also distinct from students' perceptions of quality teaching. What's more, they found that student perceptions of quality teaching, as well as teacher popularity, positively correlated with classroom achievement.

The positive relationship between student perceptions of teaching and teacher effectiveness was more expansively highlighted by the findings of the MET project. The MET project's authors ultimately advocated in their culminating findings that student surveys should be included as one of the three most valid measures of teachers' effectiveness in the classroom. Specifically, the findings indicated that student survey results positively predicted higher achievement gains as well as higher performance on classroom observation rubrics, and were ultimately more predictive of student achievement gains than any other measure in the project (Cantrell & Kane, 2013). The positive relationship between student achievement gains and ratings of teachers through formalised observation rubrics was replicated in further analyses of MET project data (Ferguson & Danielson, 2015; Kuhfeld, 2017; Wallace, Kelcey, & Ruzek, 2016). Outside of the MET project, additional recent studies have also reflected the recurrent finding that student perception surveys positively predict other measures of

teacher quality, including academic gains (Kyriakides, 2005; Sandilos, Rimm-Kaufman, & Cohen, 2017; van der Scheer, Bijlsma, & Glas, 2019).

Student perceptions of teaching should be viewed as more than a simple stand in or indicator of other measures or dimensions of teacher quality. Instead, the growing body of evidence suggests that students' perceptions of teaching are themselves a unique and distinct dimension of teacher quality that may help elicit a number of positive effects of teaching that are not sufficiently addressed by other more historically utilised measures. Student surveys have provided further insights regarding the influence of particular teaching practices on the development of student agency. This research has indicated, for example, that teachers who engage in practices that focus on increasing challenge and rigour in the classroom have students who demonstrate increases in effort, growth mindset, conscientiousness, and higher future aspirations(Ferguson, Phillips, Rowley, & Friedlander, 2015).

The use of student surveys also validates the importance of students' voices in determining the quality of teaching and learning they are experiencing, and honour the importance of student voice and leadership in the classroom, aligned with growing emphasis globally on the importance of student voice. Hattie (2012) suggested that this notion of teachers shifting from monologue to dialogue is an essential mind frame for effective teaching. One key feature of this suggested dialogue involves "listening to their questions, their ideas, their struggles, their strategies of learning, their successes, their interaction with peers, their outputs, and their views on teaching" (Hattie, 2012, p. 186). Promoting student voice and facilitating students' perceptions that their teachers are actively listening and responding to their students' perspectives are integral to positive student-teacher relationships (Egeberg & McConney, 2018). When schools engage student voice, they create opportunities for students to feel more positive about their school and themselves, to better manage their

own learning, and to realise that they can have an impact on things that matter to them (Fielding & Rudduck, 2002).

Student surveys provide a unique and invaluable mechanism for providing high quality teacher feedback to support their professional learning. Student surveys are attuned to factors less detectable through other measures such as classroom observations or student achievement data, and reveal facets of teaching and its outcomes that may not be evident through other measures. They also consistently relate with observations of higher quality practice and better student achievement gains. They improve the reliability of teacher feedback and are potentially more trustworthy than many if not most alternative sources of feedback. There is significant room to better determine the particulars of what students are able to distinguish about their teachers, and the extent to which particular forms of bias may influence these perceptions, but in a world of imperfect means to identify and measure teacher quality, student perceptions of teaching have helped expand existing knowledge of teacher quality and are likely to remain an integral component of its measurement in many settings for the foreseeable future.

Notably, student perceptions of teaching in primary and secondary classrooms has become increasingly common in teacher evaluation systems in various countries globally. For example, at least seven US states require student perception surveys as part of their teacher evaluation systems, and 25 states and the District of Columbia allow and encourage their use as one of multiple options for their multi-measure evaluation systems(Geiger & Amrein-Beardsley, 2019). Student perception surveys of teaching have also been used at the state level in Australia through Victoria's implementation of the Attitudes to School Survey for students, which includes factors such as effective teaching time, differentiated learning challenges, stimulated learning and effective classroom behaviour (Turner & Pale, 2019). Stimulated learning, which describes the extent to which teachers making students interested

and engaged in learning, is a specific measure in the FISO (Framework for Improving Student Outcomes) model used to evaluate school performance and establish goals and strategies for improvement. The New South Wales Department of Education administers its own survey instrument, the *Tell Them From Me* student survey, which provides schools with data related to multiple aspects of students' experiences, including their perceptions of quality teaching in their classes. Less formally, the increasingly common use of student surveys by schools as a tool for providing teacher feedback and guiding professional learning as well as performance management both overseas in the United States (at least six major survey instruments in wide circulation) and in Australian schools is reflected by the emergence of surveys developed and utilised across thousands of classrooms such as the Pivot Student Survey, the Student Perception of Teaching Questionnaire developed by the Australian Council for Educational Research. Student surveys have become a staple in many schools' and systems' toolkits from gathering and providing feedback on teaching and in some instances shaping approaches to teacher appraisal and performance management (Geiger & Amrein-Beardsley, 2019).

Summary. This section aimed to highlight the progressive movement in research, policy, and practice, towards multi-dimensional conceptions of teacher quality along with efforts to examine if and how multiple facets of teacher quality can be measured and related. This included a more in-depth examination of particular dimensions that have become recurrent in the literature, with particular emphasis on teacher attributes or qualities, teacher practices, and students' perceptions of their teachers (which may be more helpfully viewed as students' experiences of effective teaching and learning). The review of the literature emphasised the role of teacher practices as a central feature of such multi-dimensional models, alongside the growing array of frameworks and measurement approaches designed to capture and illuminate the moves that quality teachers make not only frequently but also to a

high standard of quality. The review illustrated the significant overlap of practices that are consistently highlighted by researchers of quality teaching practice, while also noting a persistent challenge that remains unresolved by a lack of clear and aligning criteria: how to determine what practices are most effective, or most essential, in characterising the repertoire of a quality teacher. The review also noted the various aspects of teachers' attributes that have been named and studied as potential factors of teacher quality. Whether these attributes are considered as broad and far-ranging, or more specifically pegged to constructs such as personality, the research in this review highlighted that there are important non-cognitive features that teachers' bring to their classrooms, and that this factors appear to play a role in shaping their quality and impact. The review also highlighted the growing emphasis on students' perceptions as part of multi-dimensional approaches to conceptualising and measuring teacher quality. The research reviewed indicates that students' experiences of their teachers and classrooms capture facets of teacher quality that may be both distinct from other teacher quality factors, but also related. Expanding conceptions of teacher quality, along with multi-measure approaches to indicate it, will likely persist in policy and practice.

Research Gaps Identified through the Literature Review

Teacher beliefs and teacher quality. Teacher beliefs have been extensively researched for many decades. This review highlighted the growing number of types of beliefs that have been established and garnered additional attention over time. It has also highlighted revised conceptualisations and the growing evidence base of long-established teacher beliefs constructs, such as self-efficacy, alongside more recently established teacher beliefs, such as curriculum and assessment. Ongoing disputes regarding the definition of teachers' beliefs and what distinguishes them from teacher cognition, as well as other psychological constructs, has revealed a gap in the research regarding teachers' beliefs as a system. While researchers have largely isolated particular types of teachers' beliefs in their

studies, teachers are likely to draw upon a complex array of beliefs to guide their thinking processes and shape their behaviours in the classroom.

A key tenant of teacher beliefs research is the proposition that beliefs are important because they play a critical, albeit indirect, role in influencing student learning outcomes. Much of the research presented in this review reflects the perspective by many researchers that teachers' beliefs can serve to both predict and explain teachers' practices, which in turn influence learning outcomes (Fives & Buehl, 2012). While the question of whether beliefs really are congruent with enacted practices remains unresolved in the literature, this review demonstrated the connection between particular types of beliefs and other measures of teacher quality. In some instances, such as teacher expectations or teacher self-efficacy, these connections are more strongly evident than in other types of beliefs that should absolutely relate to how teachers teach and how effective they are in optimising student learning outcomes, such as pedagogical beliefs and purposes for teaching. This is not because the evidence base has demonstrated that these beliefs don't influence teacher behaviour and by extension student outcomes, but rather because of a lack of studies that have sought to explore these links and demonstrate whether or not such a connection exists, and the extent to which it matters.

One key research opportunity is to expand studies that situate teacher beliefs within a teacher quality paradigm. This could be achieved within teacher beliefs research by shifting the emphasis towards more studies that aim to explore the alignment between established or proposed teacher beliefs constructs and established measures of quality teaching. This could be achieved within teacher quality or teacher effectiveness research by pairing the more common measures of teacher quality (namely student achievement gains) with measures of teachers' beliefs. Teacher quality research continues to pursue answers as to what characteristics and qualities most contribute to effective teaching, maintaining emphasis on

factors such as experience, licensure, and initial teacher education, which, at best, have limited predictive power over quality teaching practice and student outcomes. This raises questions regarding whether other factors should be further examined if efforts to raise teacher quality are going to be successful. Perhaps teacher beliefs are an additional critical input that should be more visible and studied within the field of research.

Defining and aligning around Teacher Quality. Another gap in the research lies in the actual conceptualisation of teacher quality. An implicit assumption that can be drawn from the teacher quality research highlighted in this review is that teacher quality is a singular construct (with potentially many aspects or factors). What the research makes less clear is whether or not there may be multiple, potentially non-complimentary ways to conceptualise teacher quality. Researchers are increasingly aware of the expanded societal expectations on teachers (Muijs, 2006), which makes it unclear whether a single profile of teacher qualities, behaviours, and outcomes is an appropriate way to conceptualise and measure teacher quality. Studies of multiple measures of teacher quality, examining their comparability as well as their incongruence with each other, may further insights regarding whether particular models and measures can be used to highlight the compatibility of particular aspects of teacher quality.

This dissertation essentially challenges the notion that teacher quality factors and measures are sides of the same coin, which in turn tests the extent to which common conceptions of teacher quality are clear, consistent and aligned. It aims to address this clarity gap in the research and offer implications for future theorizing and measurement of teacher quality. Finally, through the development of a teacher quality model that attempts to test the notion of "quality" teacher beliefs, this dissertation addresses a research gap in efforts to identify and measure elements of teacher quality. It does so by including and examining multiple constructs and measures of teacher quality that are empirically connected to

improved student learning outcomes with the notable addition of a range of teacher beliefs. This in turn will help address a question that is not sufficiently understood by the extant research: are there particular beliefs and systems of beliefs that teachers may possess which promote higher quality teaching and optimise student learning?

Teacher beliefs as a factor of teacher quality. A key tenant of teacher beliefs research is the proposition that beliefs are important because they play a critical, albeit indirect role in influencing student learning outcomes. Much of the research presented in this review reflects the perspective by many researchers that teachers' beliefs can serve to both predict and explain teachers' practices, which in turn influence learning outcomes (Fives & Buehl, 2012). While the question of whether beliefs really are congruent with enacted practices remains unresolved in the literature, this review demonstrated the connection between particular types of beliefs and other measures of teacher quality. In some instances, such as teacher expectations or teacher self-efficacy, these connections are more strongly evident than in other types of beliefs that should absolutely relate to how teachers teach and how effective they are in optimising student learning outcomes, such as pedagogical beliefs and purposes for teaching. This is not because the evidence base has demonstrated that these beliefs do not influence teacher behaviour and by extension student outcomes, but rather because of a lack of studies that have sought to explore these links and demonstrate whether or not such a connection exists, and the extent to which it matters.

One key research opportunity is to expand studies that situate teacher beliefs within a teacher quality paradigm. This could be achieved within teacher beliefs research by shifting the emphasis towards more studies that aim to explore the alignment between established or proposed teacher beliefs constructs and established measures of quality teaching. This could be achieved within teacher quality or teacher effectiveness research by pairing the more common measures of teacher quality (namely student achievement gains) with measures of

teachers' beliefs. While teacher quality research has offered and continues to pursue answers to what characteristics and qualities most contribute to effective teaching, the current emphasis on factors such as experience, licensure, and teacher education, has largely failed to present a compelling case for focusing on these elements in collective efforts to raise teacher quality. Perhaps teacher beliefs are an additional critical input that should be more visible and studied within the field of research.

Putting multi-dimensionality in teacher quality to the test. A growing emphasis in the research, now largely translated into teacher evaluation in the United States, has been on the design and implementation of multi-dimensional approaches to define and measure teacher quality and its key indicators. By implementing and exploring connections between different facets of teacher quality, opportunities have arisen to highlight the growing complexity of the roles, responsibilities, and expectations places on teachers. The advancement of a number of well-established observation frameworks and tools, students as a viable and valuable source of data on teacher quality, and the use of value-added analysis, among other things, have grown a strong evidence base highlighting their validity on their own, and their connectedness to each other. Research of this nature is still not fully mature, and needs further examination, particularly outside of the MET project. This assertion is particularly relevant considering the recent report on an expansive, nearly $1 billion dollar educational initiative co-sponsored and co-funded by the Gates Foundation to enact professional development and policy largely informed by the findings of the MET (Stecher et al., 2016). The report found that in spite of this massive investment, an emphasis on utilising a multi-dimensional model of teacher quality to inform feedback, professional development, hiring and retention, there was little evidence that teacher quality was improved, not only in terms of improving retention of high quality teachers, but also in terms of improving academic achievement for students, which was largely unaffected by the initiative. Further

research testing multi-dimensional models of teacher quality will support efforts to evolve and improve theoretical understandings that can and currently do have immediate implications for policy and practical decisions undertaken by education systems and the schools within them. Raising teacher quality remains a priority in Australian at the national policy level and across states and territories, and yet little research exists on teacher quality, let alone its multidimensionality, implemented in Australian schools and with Australian teachers.

Conclusion

This chapter aimed to review both seminal and contemporary research on teacher beliefs and teacher quality, to illustrate what is known, what is unknown, and what remains unresolved or in dispute. Furthermore, the chapter provided illustrations of where research within respective fields may already indicate intersections between teacher beliefs and teacher quality, as well as an analysis of where the most salient opportunities for further research exist. The focus and questions that framed this dissertation's studies were created in light of this review.

While the meaning and characteristics of teacher beliefs are not fully resolved by the literature, these beliefs are inarguably an important construct in educational research. Teachers' beliefs form an integral part of who teachers are, and by extension, what they do. While it remains unclear the extent to which we can claim that beliefs predict behaviours (or vice versa), the importance of beliefs, as possible antecedents of behaviour, as possible filters or influencers upon experience, and as potential enablers or disablers of teachers' efforts to continuously improve, is hard to deny. As teacher beliefs research has matured, particular beliefs constructs have emerged, with some beliefs, such as self-efficacy, extensively studied, with other types of beliefs, such as conceptions about assessment, in more nascent stages of understanding and exploration. A greater understanding of teachers' beliefs about various

aspects of pedagogy, of their own motivational factors, and of their students, reflects the complexity of the role of the teacher in modern society, and the potential underlying differences in beliefs that may put teachers on very different pathways of behaviour and response to their experiences, which presumably could impact their efforts to teach effectively and promote the best possible learning outcomes for their students.

Teacher quality, not unlike teacher beliefs, is a construct that suffers from continuous disagreement regarding its meaning and appropriate measurement. Also, like teacher beliefs research, in spite of continued debate around its definition and characteristics, it is far from a nascent field, with decades of research providing significant insights suggesting what can be extrapolated about the characteristics, behaviours, and outcomes that can be attributed to quality teachers. Teacher quality research has not produced any silver bullets regarding what characteristics best reflect or promote teacher quality, with many of its areas of focus (such as experience, credentials, and certification) accounting for only small degrees of difference in teachers' effectiveness. But this finding itself is noteworthy, as it highlights the complex, multifaceted nature of teacher quality, such that it can never be the product of one discrete, high-yield factor, but is more likely the combination of a number of smaller factors that may not always be pre-requisites for quality teaching and learning to occur. Among the critical insights that teacher quality research has provided is the significant and crucial role that teachers play in influencing students' learning outcomes, reflected by the overwhelming body of evidence suggesting that there remains no better predictor of teachers' effectiveness in influencing students' learning gains than the gains of their previous students. In essence, the most important aspect of teacher quality is teachers' value added to their students' learning.

A further critical insight that has emerged from research in this field is an understanding of the complex, hierarchical relationship of factors that can be considered relevant to teacher quality. There is a growing case to be made for studies of teacher quality

to consider it as a multi-step process, and therefore emphasise measurement of relationships that occur as the process moves from the qualities or attributes of the teacher, to whatever antecedents best predict their behaviours, through to their actions, and then to the impact those actions have on students' learning outcomes. Multidimensional approaches to conceptualising and measuring teacher quality provide opportunities to capture not only the various elements that together comprise broader meanings of teacher quality, they also enable the examination of teacher quality as a complex process.

The research reviewed in this chapter reveals an important opportunity for further study that prioritises the intersection between teacher beliefs and teacher quality, with particular emphasis on multidimensional modelling and measurement of key factors. There is no sign that international research, policy, and practice, will deprioritise the improvement of teachers and teaching practice as a central pillar of efforts to enhance educational outcomes for students. This remain as true for Australia as it does overseas. While efforts continue to identify and prioritise leveraging teacher-related factors that promote the best possible outcomes for students, the literature reviewed in this chapter suggests that those efforts will be enhanced by future research that seeks to integrate these areas of study.

Research Aims and Questions

This dissertation responds to a number of key opportunities to address gaps or unresolved questions in the research areas highlighted in this review. First, the dissertation aims to explore the complex and comprehensive interactions between numerous teacher beliefs, with the ultimate aim to reduce these beliefs to higher order factors, thereby examining beliefs as a system. Secondly, the dissertation responds to the opportunity to situate teacher beliefs research within the study of teacher quality, by adding to the base of studies examining teachers' beliefs in relation to commonly utilised constructs and measures of quality teaching. Thirdly, the dissertation explores the congruence and underlying

meaning of multiple measures of teaching. Finally, this dissertation responds to the paucity of Australian-based studies absent from the review. Research of the nature of this dissertation to date has been very limited in the Australian context. The dissertation therefore not only aims to add to the broader evidence base described above, but also aims to test the evidence put forth in overseas studies to determine the extent to which similar conclusions can be drawn about teacher quality in the Australian educational content.

The research questions addressed in this thesis are grouped based around four areas of interest, relating to the relationships and higher order structure of teachers' beliefs, teachers' beliefs as a predictor or indicator of quality teaching, establishing a profile of teacher quality, and the use of composite or multi-measure approaches to identify and measure quality teachers and quality teaching.

Teachers' beliefs as a system. The first research aim is to establish the relationships and systemic nature of teacher beliefs that may influence quality teaching. This section addresses four research questions:

1. What are the individual and unique beliefs that relate to teacher quality that can be identified through a comprehensive teacher beliefs questionnaire?
2. Does a comprehensive teacher beliefs questionnaire capture multiple distinct dimensions of teachers' beliefs?
3. Do teachers generally endorse particular types of beliefs more than others?
4. How do teachers' beliefs relate to each other?

Teachers' beliefs as a predictor or indicator of quality teaching. The second research aim is to determine whether teachers' beliefs predict the quality of their teaching, based on their relationship to additional measures. This section addresses two research questions:

1. Do particular teacher beliefs and characteristics correlate more strongly than others with measures of quality teaching?
2. To what extent do teachers' beliefs influence or impact quality of teaching?

Establishing a profile of teacher quality. The third research aim is to determine whether the measures employed through the studies suggest a particular profile of teacher quality, and if so, what constituent elements such a profile would include. This section addresses three research questions:

1. Does a quality teacher possess a typical set of competencies or attributes as well as "quality" teacher beliefs?
2. Are there a common set of practices that quality teachers employ with particular frequency in the classroom?
3. What perceptions of teaching to students have in a quality teacher's classroom?

Composite or multi-measure approaches to identify and measure quality teachers and quality teaching. The fourth research aim is to explore the underlying constructs of and relatedness between multi-measure approaches that theoretically aim to address the same overarching phenomenon of teacher quality. This section addresses four research questions:

1. Do student perception surveys actually capture distinct dimensions of teaching?
2. Does frequency of the usage of high-quality teaching practices actually reflect quality teaching?
3. Is quality teaching measured through classroom observations congruent with quality teaching measured through student surveying?
4. Are quality teacher "inputs" such as personality traits, beliefs, and non-academic competencies congruent with quality teaching measures such as classroom observations and student perceptions of teaching?

The research for this thesis involved a first study based on the development and validation of a teacher beliefs questionnaire consisting of types of teacher beliefs empirically connected to teacher quality, based on the extant research. The second study built upon the results of the first study and involved the examination of the structure and relationships amongst four key areas of teacher quality. The four areas examined were teachers' non-academic capabilities (measured by their teacher education program selection data), teachers' beliefs (measured by the questionnaire developed through the first study), teachers' observable practices (measured by the Visible Classroom instrument) and students' perceptions of quality teaching (measured by the Tripod student survey). Methodologies for each study are described in depth in the two chapters that follow.

Chapter 3: Examining Multiple Dimensions of Teachers' Beliefs

Grounded in the literature reviewed in the prior chapter, particularly that related to extant teacher beliefs constructs and their possible relationship to measures of teacher quality, this chapter is based on a study conducted as part of this thesis whose overall purpose was to develop a comprehensive model of quality teacher beliefs. Chapter two identified three broad thematic categories within which most teachers' beliefs can be grouped: pedagogical beliefs that relate to teaching and learning and all that underpins it, motivational beliefs that are largely comprised of self-beliefs, and beliefs about students that are presumed to affect interactions between teachers and students. While such categorisations of teacher beliefs may provide a convenient and logical taxonomy, there was limited research to suggest such a taxonomy would reflect the relational structure of different teacher beliefs. Furthermore, the typical focus in the field on studies of specific constructs (e.g. beliefs about teaching vs. beliefs about self-efficacy) in isolation indicates a paucity of evidence to suggest whether and potentially how teachers' beliefs integrate within higher order belief systems.

Informed by this research and its current limitations, the study sought to answer four key questions. Firstly, can a series of teacher beliefs empirically linked to quality teaching be identified through a comprehensive teacher beliefs questionnaire? Secondly, does this questionnaire capture dimensions or higher order factors of teachers' beliefs? Thirdly, do teachers generally endorse particular types of beliefs more than others? And finally, do teachers' pedagogical and motivational beliefs relate to each other?

Method

To answer these questions, a survey instrument was designed, drawn out of the literature review of both teacher beliefs' research and research on teacher quality presented in the second chapter of this thesis. Survey design was informed by first identifying empirical links between particular beliefs and quality teaching measures including teacher impact on student

achievement, based on the extant research. Additionally, workshops and consultations were run with teachers, instructional coaches, academics across multiple universities and educational leaders in complement to the literature review with the aim of identifying a comprehensive list of key teachers' beliefs areas to inform the design of a teacher beliefs questionnaire. These workshops and consultations confirmed a number of teacher beliefs types supported by the literature and highlighted in the prior chapter, of which the following categories were ultimately included:

- Learning (Biggs, 1987a; Brown, 2008a; Entwistle, 1997b; Marton & Säljö, 1976; Purdie & Hattie, 2002)
- Teaching (Gow & Kember, 1993; Kember & Gow, 1994; Pratt, Collins, & Selinger, 2001)
- Epistemology (Schommer-Aikins, 2004; Schraw et al., 2002)
- Curriculum (Brown, 2008b; Cheung, 2000)
- Assessment (Brown, 2008a)
- Self-efficacy (Pajares, 1997; Ross, 1994; Tschannen-Moran et al., 1998; Woolfolk Hoy et al., 2009)
- Personal responsibility (Guskey, 1981; Lauermann & Karabenick, 2013)
- Purposes for teaching (Richardson & Watt, 2014)
- Goal orientation, including growth vs. fixed mindset (Butler, 2014; Dweck, 2000; Eccles & Wigfield, 2002; Lynott & Woolfolk, 1994)
- Students' innate ability and the importance of effort (Blackwell et al., 2007; Schommer, 1990)
- Expectations of students' achievement potential (Brophy, 1983; Jussim & Harber, 2005; Rubie-Davies, 2014)

The various categories and factors of teacher beliefs were organized into the taxonomy illustrated in Figure 2.1, which organised teacher beliefs into three broad categories: pedagogical beliefs, motivational beliefs, and beliefs about students. The survey instrument designed was an anonymous teacher beliefs questionnaire, based primarily on the pre-validated beliefs surveys in which the 11 categories of beliefs in the list above were broken up into 43 specific factors of unique teacher beliefs. The only exception was a generalised teacher expectations scale created by the author. The survey included 170 beliefs items in total. Table 3.1 identifies each belief type, provides a descriptive overview, and the source for survey items adapted or utilized in the study.

Table 3.1. An overview of beliefs included in the study 1 survey, including original sources of survey items.

Belief Area	Belief Construct	Belief	Descriptive overview	Survey
Pedagogical	Teaching	Apprenticeship teaching	Belief that the purpose of teaching is to model, demonstrate, and support students to perform and apply key knowledge and skills.	Teaching Perspectives Inventory (Collins & Pratt, 2010)
		Social reform teaching	Belief that the purpose of teaching is to empower and inspire students to improve society	
		Development teaching	Belief that the purpose of teaching is to challenge students to develop new ways of knowing and thinking.	
		Nurturing teaching	Belief that the purpose of teaching is to nurture students' self-confidence, self-esteem and social and emotional well-being	
		Transmission teaching	Belief that the purpose of teaching is to transmit important and relevant knowledge and expertise to students.	
	Learning	Learning - deep	Belief that learning is building deep knowledge that can be applied to the real world	Approaches and Study Skills Inventory for Students (Entwistle, 1997a), Learning Process Questionnaire (Biggs & Telfer, 1987), and the Conceptions of Learning Inventory (Purdie & Hattie, 2002)
		Learning-surface	Belief that learning is the reproduction of information, memorisation of facts, and achieving of results	
		Learning – strategic and achieving	Belief that learning is about achieving high marks and academic success	Conceptions of Learning Inventory (Purdie & Hattie, 2002)
		Learning – social consciousness	Belief that learning is the development of social skills, caring and the ability to help and care for others	
		Learning – personal change	Belief that learning widens views and changes ways of thinking and viewing the world.	

Belief Area	Belief Construct	Belief	Descriptive overview	Survey
	Epistemology	Epistemology-simple	Conception of knowledge that emphasises its simplicity, certainty, and lack of ambiguity	Epistemic Belief Inventory (Schraw et al., 2002)
		Epistemology – certain	Conception of knowledge that emphasises its certainty	
	Assessment	Assessment-accountability	Belief that assessment holds teachers, students, and systems accountable	Conceptions of Assessment IIIa Inventory (Brown, 2008a)
		Assessment-improvement	Belief that assessment supports and improves teaching and learning	
		Assessment-hindrance	Belief that assessment interferes with and hinders effective teaching and learning	
		Assessment-demonstrates learning	Belief that assessment information is reliable and illustrates what students know and can do	
	Curriculum	Curriculum-social reconstruction	Belief that the purpose of curriculum and education is to focus on highlighting societal problems and empowering students to address them	Conceptions of Curriculum Inventory (Cheung, 2000)
		Curriculum – academic subjects	Belief that the purpose of curriculum is to develop rational thinking and cognitive ability within particular subject areas	
		Curriculum-humanistic	Belief that the purpose of curriculum and education is to provide learning experiences centred around the interests, needs, and goals of individual students	
		Curriculum- technological	Belief that the purpose of curriculum is to utilise technology and to systematically focus on transmitting important information in a systematic and in an efficient way	

Belief Area	Belief Construct	Belief	Descriptive overview	Survey
Motivational	Self-efficacy	Self-efficacy for instructional practice	Positive self-perceptions of ability to effectively use key teaching strategies	Teacher's Sense of Efficacy Scale (Tschannen-Moran & Hoy, 2001)
		Self-efficacy for student engagement	Positive self-perceptions of ability to effectively use strategies to motivate and engage students.	
		Self-efficacy for classroom management	Positive self-perceptions of ability to effectively execute a classroom management system, including managing challenging behaviour and ensuring students follow rules	
	Goal orientation	Ability-approach goal orientation	Orientation towards achievement goals that emphasise demonstrating ability and impressing others with one's performance	Goal Orientations for Teaching Measure (Butler, 2014)
		Relational goal orientation	Orientation towards achievement goals that emphasise building strong relationships with students	
		Mastery-approach goal orientation	Orientation towards achievement goals that emphasise learning and developing as a teacher	
		Work-avoidance goal orientation	Orientation towards achievement goals that emphasise avoiding work	
		Ability-avoidance goal orientation	Orientation towards achievement goals that emphasise masking or avoiding demonstrations of inability as a teacher	
	Purpose	Purpose-personal utility value	Purpose for choosing to teach related to factors such as job security, holidays, and family considerations	FIT Choice Scale (Watt & Richardson, 2007)
		Purpose-professional status (task demand)	Purpose for choosing to teach related to the perceived high demands (challenge, respected career, teachers as knowledge experts, etc.) status of teachers in society and formal qualification and recognition	
		Purpose – task return	Purpose for choosing to teach related to the perceived extrinsic benefits to teachers (e.g. pay, social status of teachers, etc.)	

Belief Area	Belief Construct	Belief	Descriptive overview	Survey
Beliefs About Students		Purpose – self perceptions of teaching	Purpose for choosing to teach related to self-perceived ability to teach effectively	
		Purpose-intrinsic motivation and self-efficacy	Purpose for choosing to teach related to genuine personal interest in teaching and intrinsic value and self-perceived ability to teach effectively	
		Purpose-social utility value	Purpose for choosing to teach related to wanting to contribute to society, support young people, help disadvantaged students, etc.	
		Purpose – fallback	Purpose for choosing to teach related to a fallback career option and not top preference.	
	Responsibility	Responsibility-student achievement	The extent to which a teacher feels personally responsible for student successful or unsuccessful learning and academic achievement	Teacher Responsibility Scale (Lauermann & Karabenick, 2013)
		Responsibility-student motivation	The extent to which a teacher feels personally responsible for engaging and motivating students to value, enjoy, and take interest in subject matter	
		Responsibility-relationships	The extent to which a teacher feels personally responsible for earning trust and showing students they care about them	
		Responsibility-teaching	The extent to which a teacher feels personally responsible for the effectiveness of their teaching	
	Expectations	General expectations for achievement	Endorsement of high or low overall expectations for academic engagement and achievement of students	Created by author
	Effort	Effort	Belief that effort drives ability and achievement	Effort Beliefs Subscale (Blackwell et al., 2007)
	Innate Ability	Innate ability	Belief that intellectual potential and ability is fixed at birth	Epistemic Belief Inventory (Schraw et al., 2002)

For each item on the survey, respondents were asked to rate their level of agreement on a six-point scale of 1 (*strongly disagree)*, 2 (*mostly disagree)*, 3 (*moderately disagree)*, 4 (*moderately agree)*, 5 (*mostly agree)* and 6 (*strongly agree)*.

Principals throughout Victorian government primary and secondary government schools were contacted via email and provided with information regarding the study, and asked to provide permission to invite teachers in their schools to participate. Of the 500 primary and 103 secondary schools who were contacted, those principals who provided consent forwarded a survey link to teachers in their schools. Ultimately, 663 teachers consented to participate, of whom 446 were primary teachers and 167 were secondary teachers (50 teachers did not specify). These teachers were sampled from 182 primary, 27 secondary and 3 K-12 government (i.e., public) schools in Victoria, Australia. 41 teachers opted not to specify a gender, but of the 602 who did, 81% identified as female (502 participants), and 19% identified as male (122 participants). The participants had a range of experience levels, with 29% having taught 1-5 years (split equally between teachers in their first two years and teachers between their third and fifth year), 19% having taught for 6-10 years, and 52% of teachers having more than ten years of experience. The majority of teachers, 54%, had at least a Bachelor's Degree qualification, while 27% and 16% held post-graduate diplomas and master's degrees, respectively. The remaining 3% held additional or other qualifications. In terms of discipline areas, 62% of the total participant group were generalist primary teachers, while an additional 10% identified as specialist area primary teachers. 8% of participants identified as teachers of social studies or humanities, 16% identified as English, 10% identified as mathematics, and 7% identified as science. 18% of respondents identified additional areas of teaching, including but not limited to subjects such as physical education, health, technology, music, visual arts, and languages other

than English. Between 584 and 620 of the original group completed some or all of the demographic questions. The participation rate then dropped and stabilised within the first ten teacher beliefs questions, with ultimately 514 of the teachers responding to items throughout the entire length of the survey. There were no discernible differences between the teachers who completed items across the survey from those who only completed demographic information.

Exploratory and confirmatory factor analysis was used to identity and distinguish between multiple types of teacher beliefs, and to test the relationships between teachers' pedagogical and motivational beliefs. In all cases, factor analysis was conducted using maximum likelihood estimation and promax rotation at a kappa of 4.

For each beliefs construct and its accompanying scale, factor analysis was applied by isolating the pre-set survey items for that particular belief (e.g. teaching, learning, epistemology, etc.) The factor structure within each beliefs construct was not assumed, even based on prior research, so that initial tests did not fix the number of factors within a particular type of belief, but instead included the results for all factors with Eigenvalues above 1. Given the large number of items in the questionnaire and the pre-existing validation of nearly all scales and items, confirmatory factor analysis was conducted separately for each of the beliefs types described in Table 3.1 to determine if scales would replicate previous results and to identify a factor structure within each type of belief construct, with the intent that each factor within a construct could be identified as a unique type of teacher belief. Reliability of factors was tested through calculating Cronbach's Alpha. A target of alpha = .7 was set for reliability, although in instances in which this figure fell between .6 and.7, the factor was still put forth, although flagged to be interpreted with caution and requiring further study.

The tables presented in the results section highlight the factor structures and loadings within each of the key beliefs areas in the study: teaching, learning, knowledge, assessment, curriculum, self-efficacy, goal orientation, purpose, responsibility, expectations for students, and theories of intelligence and effort regarding students. Descriptive statistics were calculated to examine how prominent particular beliefs were amongst the sample, and t-tests, MANOVA (multivariate analysis of variance) and correlation analysis were used to examine whether or not there were statistically significant differences in the beliefs of teachers based on experience, subject area, gender and whether they taught in primary vs. secondary classrooms. All statistical calculations and analyses were conducted with the Statistical Package for the Social Sciences (SPSS).

Testing the Factor Structure of Teacher Belief Types

Factor analysis identified 32 distinct types (or scales) of teacher beliefs, drawn out of the original 12 beliefs constructs (and within these, 42 pre-validated scales). Factors with Eigenvalues greater than 1.0 were accepted provided that there were sufficient unique loadings (>.30) that were interpretable. The following sections describe the factor structure and loadings for each teacher belief type investigated in the study. This includes the basis for each item utilised in the questionnaire, the factor loadings for each questionnaire item and the Cronbach's alpha results used to estimate the reliability of each factor.

Perspectives on teaching. Analysis of items drawn across the full five factors of beliefs about teaching, from the Teaching Perspectives Inventory (TPI; Pratt, 2001), indicated two instead of five factors of beliefs about teaching. The only distinct factor from the original TPI that was confirmed by this study was social reform teaching. Exploratory analyses indicated that a select group of items drawn across the other four factors from the TPI– apprenticeship, development, nurturing, and transmission – loaded into a single remaining factor, reflecting *teaching for deep learning*. There were two identifiable factors (Table 3.2), labelled *Teaching for Deep Learning* (α = .79 and *Social Reform* (α = .68).

Table 3.2. Factor structure and loadings for perspectives on teaching.

	Teaching for Deep Learning	Social Reform
My intent is to build students' self-confidence and self-esteem as learners.	**0.90**	-0.20
I make it very clear to students what they are to learn.	**0.69**	-0.07
My intent is to help students develop more complex ways of reasoning.	**0.63**	0.07
I encourage expressions of feeling and emotion.	**0.56**	0.12
My intent is to demonstrate how to perform or work in real situations.	**0.46**	0.20
I expect students to be committed to changing our society.	0.03	**0.86**

	Teaching for Deep Learning	Social Reform
I help students see the need for changes in society.	0.15	**0.65**
Individual learning without social change is not enough.	-0.14	**0.44**
Correlations between factors		
Teaching for Deep Learning	1.00	0.61
Social Reform	0.61	1.00

Self-efficacy. There were 12 items taken from the *Teachers' Sense of Efficacy Scale* (Tschannen-Moran & Hoy, 2001). Of the three self-efficacy factors initially tested in the study, there were two identifiable factors (Table 3.3): *Efficacy for Instructional Practice and Student Engagement* (α = .83), and *Efficacy for Classroom Management* (α =.86). That engagement and instructional practice loaded together suggested a high degree of relatedness between these practices for teachers in the study, as well that classroom management is a more distinct aspect of teaching practice to teachers than other skills.

Table 3.3. Factor structure and loadings for self-efficacy beliefs.

	Efficacy for instructional practice and student engagement	Efficacy for Classroom Management
I am able to get students to believe they can do well in school.	**0.84**	-0.11
I am able to help my students value learning.	**0.65**	0.07
I am able to motivate students who show low interest in school.	**0.64**	0.13
I am able to craft good questions for my students.	**0.59**	-0.02
I am able to use a variety of assessment strategies.	**0.58**	0.05
I am able to assist families in helping their children do well in school.	**0.49**	0.17
I am able to provide alternative explanations or examples when my students get confused.	**0.37**	0.16
I am able to control disruptive behaviour in the classroom.	0.01	**0.81**
I am able to get students to follow classroom rules.	-0.05	**0.81**
I am able to establish a classroom management system with each group of my students.	0.05	**0.73**
I am able to calm a student who is disruptive or noisy.	0.11	**0.70**

	Efficacy for instructional practice and student engagement	Efficacy for Classroom Management
Correlations between factors		
Efficacy for instructional practice and student engagement	1.00	0.70
Efficacy for Classroom Management	0.70	1.00

Goal orientation. There were 20 items taken from the *Goal Orientations for Teaching* measure (Butler, 2012), with alternative items to the original measure provided for the ability-avoidance factor (2017, provided via correspondence from the author.) There were five identifiable factors related to goal orientation (Table 3.4), labelled *ability-approach* (α = .77), *relational* (α = .78), *mastery-approach* (α =.73), *work-avoidance* (α = .63), and *ability-avoidance* (α = .67).

Table 3.4. Factor structure and loadings for teacher's goal orientation beliefs.

	Ability-approach	**Relational**	**Mastery-approach**	**Work-avoidance**	**Ability-avoidance**
I'd feel I had a particularly successful day if the principal singled me out as one of the best teachers in the school.	**0.77**	0.000	0.05	-0.05	-0.11
I'd feel I had a successful day in school if I was praised for showing high teaching ability relative to my colleagues.	**0.72**	0.01	0.01	-0.06	-0.03
I'd feel I had a particularly successful day if in a staff meeting my lesson plans were better than those of the other teachers.	**0.68**	0.03	0.00	0.02	0.07
I'd feel I had a successful day in school if my classes scored higher on an exam than those of other teachers.	**0.59**	-0.02	0.06	0.07	0.09
More than anything, I invest in creating and maintaining deep personal relationships with students.	-0.08	**0.76**	0.04	0.08	0.04
My main goal as a teacher is to show students that I care about them.	0.00	**0.71**	-0.02	-0.07	0.04
I'd feel that I have succeeded as a teacher if I saw that I was developing closer and better relationships with students and classes.	0.11	**0.57**	0.05	-0.01	-0.10
I'd feel I had a successful day in school if something that happened in class inspired me to deepen my professional knowledge.	-0.02	-0.06	**0.80**	0.05	0.07

	Ability-approach	Relational	Mastery-approach	Work-avoidance	Ability-avoidance
I'd feel I had a successful day if a student asked a question that made me think differently about the topic I was teaching.	0.00	-0.01	**0.74**	0.11	-0.02
I'd feel I had a successful day if I learned something new about myself as a teacher.	0.05	0.02	**0.56**	-0.02	-0.07
I feel I had a successful day in school when I see that I am developing professionally and teaching more effectively than before.	0.11	0.09	**0.42**	-0.17	0.02
I feel I had a good day when I don't have any tests or homework to mark.	-0.12	0.05	0.14	**0.75**	-0.01
I'd feel I had a successful day if I didn't have to spend much time preparing lessons.	0.00	0.06	-0.03	**0.68**	0.05
I'd feel I had a successful day if I got by without having to work too hard.	0.11	-0.09	-0.11	**0.54**	0.04
I'd feel I had a successful day if some of my classes were cancelled.	0.23	-0.05	-0.08	**0.33**	0.03
I try to avoid teaching topics that might reveal some lack of ability on my part.	-0.13	0.01	0.06	-0.05	**0.82**
It's important to me that students don't notice if I make a mistake in class.	0.07	-0.2	-0.01	-0.04	**0.53**
I'd feel that I had a successful day if students didn't embarrass me by asking questions I didn't know how to answer.	0.05	-0.2	-0.04	0.05	**0.44**
It's important to me that others don't notice if I am less successful than other teachers in some aspect of teaching.	0.23	0.05	-0.07	0.03	**0.40**
Correlations between factors					
Ability-approach	1.00	0.03	-0.04	0.42	0.46
Relational	0.03	1.00	0.52	-0.08	-0.05
Mastery	-0.04	0.52	1.0	-0.24	-0.37
Work-avoidance	0.42	-0.08	-0.24	1.0	0.46
Ability-avoidance	0.46	-0.05	-0.37	0.46	1.0

Innate ability. There were 6 items taken from the *Epistemic Belief Inventory* (Schraw et al., 2002) items related to innate ability beliefs. While this factor is drawn from an epistemological scale, it has been categorised as a belief about students in this study. This was informed by earlier critiques of epistemological constructs arguing that this particular type of belief relates more to students' ability to learn than conceptions of knowledge (DeBacker et al., 2008). A single factor was confirmed (α = .74; Table 3.5).

Table 3.5. Factor loadings for innate beliefs.

	Innate Beliefs
Smart people are born that way.	**0.76**
How well you do in school depends on how smart you are.	**0.60**
Students' intellectual potential is fixed at birth.	**0.57**
Some people just have a knack for learning and others don't.	**0.55**
Really smart students don't have to work as hard to do well in school.	**0.51**
Some people are born with special gifts.	**0.48**

Beliefs about learning. There were 15 items taken directly or adapted from multiple pre-existing from the *Approaches and Study Skills Inventory for Students* (Entwistle, 1997a), The *Learning Process Questionnaire* (Biggs & Telfer, 1987), and the *Conceptions of Learning Inventory* (Purdie, Hattie, & Douglas, 1996). Of the original five factors tested as learning beliefs, EFA suggested three identifiable factors that described beliefs about learning (Table 3.6): *deep learning as widening understanding and application to the world* (α =.84), *surface learning as reproducing information and achieving results* (α = .74), and *deep learning as relational* (α = .76). An achieving/strategic beliefs factor, previously established in the literature, was not confirmed, with achieving/strategic beliefs items loading with surface items. For this reason, the surface factor was characterized as being about reproducing information as well as achieving results. This was notable in that Biggs (Biggs et al., 2001) himself concluded that his three-factor model of learning beliefs – surface, achieving, deep – should be adjusted to just surface and deep.

Table 3.6. Factor structure and loadings for teacher beliefs about learning.

	Deep – widen understanding and application to world	Surface – reproducing information and achieving results	Deep – relational
Learning is being able to use information in other situations.	**0.83**	0.02	-0.08
Learning is applying new material to real life.	**0.76**	-0.01	-0.01
Learning helps us to widen our views about life.	**0.70**	0.00	-0.02
Learning is seeing things in a more meaningful way.	**0.69**	0.02	0.07
Learning changes our ways of thinking.	**0.67**	-0.05	0.01
Learning is being able to relate what is learned in one subject to what is known in other subjects.	**0.44**	0.05	0.12
Learning is memorizing the facts and details in subjects.	-0.04	**0.70**	-0.05
Learning is knowing the material that will be covered on exams.	-0.01	**0.61**	-0.03
Learning is building up knowledge by acquiring facts and information.	0.15	**0.56**	-0.01
Learning is being able to remember things well	-0.10	**0.54**	-0.04
Learning is about working for the best marks in a subject whether or not you like it.	-0.03	**0.54**	0.05
Learning is about working solidly throughout the term and revising regularly when exams are close.	0.05	**0.51**	0.10
Learning is not only studying at school but knowing how to be considerate to others.	0.05	-0.01	**0.75**
Learning is knowing how to get on with different kinds of people.	0.11	0.01	**0.71**
Learning is developing good relationships.	-0.03	0.02	**0.62**
Correlations between factors			
Teaching for Deep Learning	1.00	-0.11	0.66
Social Reform	-0.11	1.00	0.00
Deep-relational	0.66	0.00	1.00

Effort beliefs. There were 3 items, taken from the effort beliefs subscale developed by Blackwell and used by Blackwell, Trzesniewski, and Dweck (2007). Factor analysis supported the single factor (Table 3.7), though the items were less reliable than other factors (α = .63).

Table 3.7. Factor loadings for effort beliefs.

	Student Effort
If you're not good at a subject, working hard won't make you good at it.	**0.71**
It doesn't matter how hard you work - - if you're not smart, you won't do well.	**0.59**
If you're not doing well at something, it's better to try something easier.	**0.54**

Epistemological beliefs. There were eight items, taken from the *Epistemic Belief Inventory* (Schraw et al., 2002). Reliability supported the *simple, certain knowledge* factor (α = .67), but not the ambiguous, complex knowledge factor (α = .48; Table 3.8).

Table 3.8. Factor loadings for teacher epistemological beliefs.

	Simple, certain knowledge	Complex, ambiguous knowledge
Too many theories just complicate things.	**0.66**	0.08
Teachers should focus on facts instead of theories.	**0.65**	-0.14
If a person tries too hard to understand a problem, they will most likely end up being confused.	**0.64**	0.14
Most things worth knowing are easy to understand.	**0.54**	-0.07
What is true today will be true tomorrow.	**0.36**	-0.19
Sometimes there are no right answers to life's big problems.	-0.09	**0.64**
What is true is a matter of opinion.	-0.09	**0.48**
The best ideas are often the most simple.	0.30	**0.37**
Correlations between factors		
Simple, certain knowledge	1.00	0.17
Complex, ambiguous knowledge	0.17	1.00

Assessment beliefs. There were 14 items taken from the *Conceptions of Assessment (COA) IIIa* inventory (Brown, 2008a). There were four identifiable factors (Table 3.9): *assessment as a positive accountability tool* (α = .81), *assessment supporting teaching and learning* (α = .69), *assessment hindering teaching and lea*rning (α = .65), and *assessment demonstrating learning* (α = .73).

Table 3.9. Factor structure and loadings for teacher beliefs about assessment.

	Assessment as positive accountability tool	Assessment supporting teaching and learning	Assessment hindering teaching and learning	Assessment demonstrating learning
Assessment is a good way to evaluate a school.	**0.92**	-0.03	0.03	-0.04
Assessment is an accurate indicator of a school's quality.	**0.91**	-0.03	0.00	-0.09
Assessment provides information on how well schools are doing.	**0.68**	-0.03	0.02	0.16
Assessment determines if students meet qualifications or standards.	**0.30**	0.13	0.15	0.21
Assessment is integrated with teaching practice.	0.04	**0.83**	0.17	-0.04
Assessment information modifies ongoing teaching of students.	-0.13	**0.65**	0.13	0.18
Assessment helps students to improve their learning.	0.19	**0.43**	-0.10	0.09
Assessment forces teachers to teach in a way against their beliefs.	-0.01	-0.08	**0.62**	0.03
Assessment results should be treated cautiously because of measurement error.	-0.04	0.28	**0.57**	-0.02
Assessment interferes with teaching.	0.01	-0.44	**0.56**	0.15
Assessment places students into categories.	0.13	0.10	**0.56**	-0.12
Assessment establishes what students have learned.	-0.01	-0.02	-0.13	**0.77**
Assessment is a way to determine how much students have learned from teaching.	0.03	0.11	0.06	**0.60**
Assessment results are trustworthy.	0.28	0.03	-0.22	**0.34**
Correlations between factors				
Assessment as positive accountability tool	1.00	0.53	-0.48	0.60
Assessment supporting teaching and learning	0.53	1.00	-0.60	0.48
Assessment hindering teaching and learning	-0.48	-0.60	1.00	-0.36
Assessment demonstrating learning	0.60	0.48	-0.36	1.00

Curriculum beliefs. There were 14 items taken from the *Conceptions of Curriculum Inventory (Cheung, 2000).* The four original factors tested (academic subjects, humanistic, social reconstruction, and technological orientations) were not confirmed, but rather four different factors emerging from the items (Table 3.10): *assessment as a positive accountability tool* (α = .81), *assessment supporting teaching and learning* (α = .69), *assessment hindering teaching and learning* (α = .65), and *assessment demonstrating learning* (α = .73).

Table 3.10. Factor structure and loadings for teacher beliefs about curriculum.

	Social reconstruction	Individualization	Cross-curricular skills	Systematic/ explicit
Curriculum contents should focus on societal problems such as pollution, racial discrimination, corruption and crime.	**0.83**	0.00	-0.10	0.02
Existing problems in our society should be the organising centre of curriculum.	**0.83**	0.08	-0.14	0.06
Curriculum should let students understand societal problems and take action to establish a new society.	**0.69**	-0.01	0.15	-0.04
The most important goal of school curriculum is to foster students' ability to critically analyse societal problems.	**0.59**	-0.11	0.20	-0.08
Students' interests and needs should be the organising centre of the curriculum.	-0.03	**0.84**	-0.01	-0.08
Teachers should select curriculum contents based on students' interests and needs.	0.02	**0.76**	-0.07	0.02
Curriculum should try to provide satisfactory experience related to each student's own goals.	-0.02	**0.42**	0.29	0.05
The basic goal of curriculum should be the development of cognitive skills that can be applied to learning virtually anything.	-0.05	-0.07	**0.73**	-0.10
The ultimate goal of school curriculum should be to help students to achieve self-actualization.	0.12	0.04	**0.46**	0.07

	Social reconstruction	Individualization	Cross-curricular skills	Systematic/ explicit
School curriculum should aim at developing students' rational thinking.	0.06	0.08	**0.46**	0.09
Curriculum and instruction should focus on finding efficient means to a set of predetermined learning objectives.	-0.08	0.00	0.00	**0.67**
Learning should occur in certain systematic ways.	0.00	-0.06	-0.07	**0.53**
Curriculum should require teachers to transmit the best and the most important subject contents to students.	0.04	0.01	-0.04	**0.42**
Curriculum should stress refinement of intellectual abilities.	0.05	-0.02	0.16	**0.41**
Correlations between factors				
Social reconstruction	1.00	0.47	0.58	0.30
Individualization	0.47	1.00	0.49	0.14
Cross-curricular skills	0.58	0.49	1.00	0.44
Systematic/explicit	0.30	0.14	0.44	1.00

Expectations for students. The author created 6 items to test generalized teacher expectations for student academic potential. Factor analysis confirmed the single factor (α = .63; Table 3.11) but the results should be interpreted with caution, as the alpha was towards the minimum acceptable level.

Table 3.11. Factor loadings for teacher expectations for students.

	Teacher Expectations
All of my students are capable of engaging in high level thinking about the content in my class.	**0.79**
I expect all of my students to succeed in meeting the class learning goals.	**0.61**
I expect all of my students to complete their work to a high standard.	**0.46**
All of my students are capable of learning.	**0.40**
Not all students are as able as others to learn (reverse coded).	**0.36**
My students are capable of performing much better than their prior achievement would suggest.	**0.35**

Teachers' purposes for teaching. There were 29 items from the *FIT-Choice Scale* (Watt & Richardson, 2007) focusing on teachers' purposes for teaching, divided amongst 7 factors: demand, social status/salary, self-perceptions of ability, intrinsic value, personal utility value, social utility value, and fallback career. 23 items loaded across five factors (Table 3.12): *personal utility value* (α = .81), *professional status and recognition* (α = .84), *intrinsic motivation and self-perceptions of ability* (α = .67), *social utility value* (α = .72), and *fallback career* (α = .62).

Table 3.12. Factor structure and loadings for purposes of choosing to teach.

	Personal utility value	Professional status and recognition	Intrinsic motivation and self-perceptions of ability	Social utility value	Fallback career
I am a teacher because teaching is a secure job.	**0.88**	-0.06	0.02	-0.05	-0.02
I am a teacher because teaching provides a reliable income.	**0.77**	-0.03	0.03	-0.02	-0.01
I am a teacher because teaching offers a steady career path.	**0.73**	0.05	0.09	-0.01	-0.01
I am a teacher because I get to have lengthy holidays.	**0.52**	0.07	-0.12	-0.03	-0.02
I am a teacher because teaching hours fit with the responsibilities of having a family.	**0.51**	0.00	-0.06	0.05	0.04
I am a teacher because teachers feel valued by society.	-0.08	**0.87**	0.00	-0.06	-0.03
I am a teacher because teaching is a well-respected career.	-0.02	**0.84**	0.02	-0.05	-0.03
I am a teacher because teaching is a high-status occupation.	-0.01	**0.77**	-0.02	0.03	-0.02
I am a teacher because teachers are perceived as professionals.	0.15	**0.59**	0.09	0.07	0.06
I am a teacher because teaching is well paid.	0.30	**0.37**	-0.06	0.00	-0.05
I am a teacher because a teaching qualification is recognised everywhere.	0.26	**0.34**	-0.03	0.13	0.13
I am a teacher because I have good teaching skills.	-0.03	0.02	**0.81**	-0.17	0.12
I am a teacher because I have the qualities of a good teacher.	0.02	-0.01	**0.72**	0.04	0.04
I am a teacher because I like teaching.	-0.09	0.04	**0.45**	0.01	-0.17

	Personal utility value	Professional status and recognition	Intrinsic motivation and self-perceptions of ability	Social utility value	Fallback career
I am a teacher because teaching is suited to my abilities.	0.16	-0.01	**0.41**	0.10	0.01
I am a teacher because I am interested in teaching.	-0.08	0.04	**0.34**	0.08	-0.08
I am a teacher because teaching allows me to have an impact on children/adolescents.	-0.04	-0.07	0.32	**0.27**	-0.14
I am a teacher because teaching allows me to benefit the socially disadvantaged.	-0.04	0.00	0.01	**0.90**	0.06
I am a teacher because teaching allows me to raise the ambitions of underprivileged youth.	-0.08	0.03	-0.03	**0.83**	0.01
I am a teacher because teachers make a worthwhile social contribution.	0.24	-0.07	0.07	**0.37**	-0.08
I am a teacher because I chose teaching as a last-resort career.	-0.07	-0.04	0.04	-0.02	**0.89**
I am a teacher because I was unsure of what career I wanted.	0.07	0.00	-0.09	0.06	**0.60**
I am a teacher because I was not accepted into my first-choice career.	0.00	0.02	0.01	0.00	**0.48**
Correlations between factors					
Personal utility value	1.00	0.59	0.09	0.10	0.31
Professional status and recognition	0.59	1.00	0.14	0.13	0.15
Intrinsic motivation and self-perceptions of ability	0.09	0.14	1.00	0.28	-0.36
Social utility value	0.10	0.13	0.28	1.00	-0.07
Fallback career	0.31	0.15	-0.36	-0.07	1.00

Teacher beliefs about personal responsibility. There were 14 items, taken from the *Teacher Responsibility Scale* (Lauermann & Karabenick, 2013), focusing on teachers' sense of internal obligation and commitment to particular outcomes, with all original items loading into the original four factors (Table 3.13): *personal responsibility for student achievement* (α = .90), *student motivation* (α = .80), *relationships with students* (α = .80), and *teaching* (α = .77).

Table 3.13. Factor structure and loadings for responsibility beliefs.

	Student achievement	Student motivation	Relationships with students	Teaching
I would feel personally responsible if a student of mine had very low achievement.	**0.88**	0.04	-0.02	-0.06
I would feel personally responsible if a student of mine failed my class.	**0.87**	0.01	0.01	-0.01
I would feel personally responsible if a student of mine failed to learn the required material.	**0.80**	0.00	0.00	0.09
I would feel personally responsible if a student of mine failed to make excellent progress throughout the school year.	**0.46**	0.30	0.11	-0.02
I would feel personally responsible if a student of mine was not interested in the subject I teach.	-0.01	**0.92**	-0.02	0.03
I would feel personally responsible if a student of mine did not value learning the subject I teach.	0.01	**0.86**	0.05	-0.06
I would feel personally responsible if a student of mine disliked the subject I teach.	0.33	**0.54**	-0.06	0.06
I would feel personally responsible if a student of mine did not believe that I truly cared about him/her.	0.03	-0.09	**0.79**	0.13
I would feel personally responsible if a student of mine thought he/she could not count on me when he/she needed help with something.	-0.14	0.21	**0.78**	-0.10
I would feel personally responsible if a student of mine did not think that he/she can trust me with his/her problems in or outside of school.	0.15	-0.11	**0.70**	0.02
I would feel personally responsible if a lesson I taught was not as effective for student learning as I could have possibly made it.	-0.01	-0.03	-0.01	**0.93**
I would feel personally responsible if a lesson I taught was not as engaging for students as I could have possibly made it.	0.01	0.06	0.06	**0.74**
I would feel personally responsible if a lesson I taught failed to reflect my highest ability as a teacher.	0.03	0.34	-0.02	**0.34**
Correlations between factors				
Student achievement	1.00	0.73	0.56	0.68
Student motivation	0.73	1.00	0.49	0.58

	Student achievement	Student motivation	Relationships with students	Teaching
Relationships with students	0.56	0.49	1.00	0.60
Teaching	0.68	0.58	0.60	1.00

Higher Order Structures of Teacher Beliefs

Confirming existing and identifying new found factor structures of beliefs.

Of the 42 teacher beliefs factors examined in the study, 28 of these factors were confirmed by the analysis conducted, based on clear indication of items loading appropriately onto these factors, and with sufficiently high reliability statistics. Of the 14 factors that could not be confirmed, five loaded more appropriately onto other factors. As a reminder, the teacher expectations factor and its suggested items were the only ones created for this study and not already previously validated through prior research. Under self-efficacy, instructional practice and student engagement loaded onto a single factor that encompassed both. Under teachers' purposes, intrinsic motivation and self-efficacy loaded onto the same single factor, as did the original task return and personal utility value factors. Under beliefs about learning, personal change items remained together but loaded more appropriately as part of the deep learning factor, and the achieving/strategic items loaded within the surface learning factor. The eight factors that could not be confirmed fell under three beliefs constructs: curriculum, teaching, and epistemology, all notably types of pedagogical belief. Four of the five pre-validated teacher beliefs factors and three of the four curriculum beliefs factors could not be confirmed, either by appropriate factor loadings or reliability statistics.

There were six new beliefs factors identified through that included reconstituted items from multiple pre-validated scales. The majority of the factors that were not confirmed were those originally categorised as pedagogical. Rather than the five distinct factors indicated from

the *Teaching Perspectives Inventory* (Pratt et al., 2001), only two distinct factors emerged, one focusing on teaching as social reform and the other focusing on teaching as building deep learning. Similarly, of the five distinct epistemological factors previously validated by research and development of the *Epistemic Beliefs Inventory* (Schraw et al., 2002), only two beliefs about innate ability and simple knowledge were confirmed.

The factor structures for motivational beliefs constructs such as such as goal orientation, personal responsibility, and purposes for teaching more clearly aligned with the expected factor structures than belief constructs labelled as pedagogical. This may be because motivational constructs and measures are less sensitive to contextual factors than pedagogical beliefs (although this would need to be tested with further research). It may also be because teachers' pedagogical beliefs are relatively commonly aligned around an orientation towards promoting deep and active learning and that most teachers agree that effective teaching draws from a wide range of strategies that are almost all valuable and important to meet the needs of all learners.

It is also possible that some teachers internalized the pedagogical items as statements of efficacy as opposed to conceptions of pedagogy or pedagogical effectiveness. For example, there was a significant and moderate correlation between *self-efficacy for instruction* and *teaching for deep learning* ($r = .42$). Furthermore, items ultimately characterised as *teaching for deep learning* may have been read as self-efficacy statements, as opposed to presumed beliefs about what constituted good teaching. To illustrate this point, consider three items included in the *Teaching Perspectives Inventory* that all loaded into this factor, yet were originally categorised as types of beliefs about good teaching within three distinct factors: "I make it very clear to students what they are to learn" (transmission), "My intent is to help students develop more complex ways of reasoning" (development), and "I encourage expressions of feeling and

emotion" (nurturing.) Asking teachers what they do may unintentionally blur the lines between elucidating teachers' beliefs about teaching with their beliefs regarding their ability to do those very things.

Alternatively, this may reflect that the items included in the scales are not sufficient for adequately replicating the structures across different samples. With limited numbers of items for some of these factors, in some instances only three or four, it is possible that an insufficient number of survey items were included to replicate the factor structure from prior surveys.

Strength of teacher beliefs. Table 3.14 summarises descriptive information for the 32 beliefs factors. To compare the prevalence of these factors, responses were grouped into disagreement with belief (score of 1 or 2, strongly or mostly disagree), neutral (score of 3 or 4, slightly disagree or slightly agree), and agreement with belief (score of 5 or 6, mostly or strongly agree). Considering 65% agreement as a belief being highly prevalent, ten types of beliefs were identified as highly prevalent. The most strongly endorsed beliefs were *deep learning*, *mastery approach goal orientation*, *effort as determinant of achievement*, *intrinsic motivation* and *self-efficacy* as motivations for teaching, *responsibility for relationship*, *relational learning*, *self-efficacy for classroom managemen*t, and *conceptions of teaching* as targeting deep learning outcomes.

Table 3.14. Descriptive statistics for individual teacher beliefs.

Belief Type	N	Mean	SD	% disagree	% agree
Learning-deep (widening understanding and real world application)	486	5.52	0.59	11.5	88.5
Mastery-Approach goal orientation	486	5.43	0.66	18.7	81.3
Effort	486	5.41	0.56	11.7	88.3
Purpose-intrinsic motivation and self-efficacy	486	5.33	0.58	21.0	79.0
Responsibility-relationships	486	5.27	0.89	23.7	76.3

Belief Type	N	Mean	SD	% disagree	% agree
Learning – deep (relational)	486	5.22	0.82	26.5	73.5
Self-efficacy for classroom management	486	5.20	0.68	22	78.0
Teaching for Deep Learning	486	5.15	0.87	25.7	74.3
Self-efficacy for instructional practice and student engagement	486	5.10	0.61	33.7	66.3
Relational goal orientation	486	5.06	0.86	35.0	65.0
Curriculum-cross curricular skills	486	4.98	0.78	35.4	64.6
Responsibility-teaching	486	4.84	1.00	42.4	57.6
Assessment-improvement	486	4.84	0.89	44.7	55.3
Curriculum-individualisation	486	4.74	0.90	49.2	50.8
Purpose-social utility value	486	4.72	0.92	52.1	47.9
General expectations for achievement	486	4.66	0.73	59.9	40.1
Social Reform Teaching	486	4.25	1.01	70.0	30.0
Responsibility-student achievement	486	4.25	1.16	66.3	33.7
Responsibility-student motivation	486	4.00	1.29	68.5	31.5
Assessment-demonstrates learning	486	3.97	0.93	80.5	19.5
Curriculum-social reconstruction	486	3.80	1.05	83.1	16.9
Curriculum-systematic	486	3.70	0.90	88.5	11.5
Assessment-accountability	486	3.29	1.02	93.6	6.4
Assessment-hindrance	486	3.09	1.00	94.2	5.8
Learning-surface	486	2.92	0.88	98.8	1.2
Ability-Approach Goal Orientation	486	2.77	1.14	95.7	4.3
Innate ability	486	2.53	0.78	100.0	0
Purpose-personal utility value and professional status	486	2.37	0.88	99.6	0.4
Epistemology-simple	486	2.23	0.75	99.8	0.2
Work-avoidance goal orientation	486	2.03	0.83	99.6	0.4
Ability-avoidance goal orientation	486	1.67	0.62	100.0	0
Purpose-fallback career	486	1.26	0.51	100.0	0

A few observations are evident. Efficacy was a particularly strong belief, both in reflecting on their capabilities in the classroom, but also as a motivational factor for choosing to teach. The dominant perspective of relationships as central to teachers' beliefs emerged as a theme as well. Teachers' goal orientation towards building strong relationships, beliefs that a significant aspect of learning is the development of effective relational skills, and sense of responsibility for relationships with their students, were all highly prevalent amongst those

sampled. A theme addressing constructs related to growth vs. fixed mindset also emerged. Teachers in the study largely endorsed a mastery orientation towards personal goals, meaning a focus on learning and improvement (growth mindset) vs. demonstration of ability or aversion to demonstrating inability (fixed mindset.) A related type of belief focused on effort was also highly endorsed. Effort beliefs suggest that achievement and ability are driven more by effort than by innate ability (the group largely rejected innate ability beliefs as well.)

A subset of almost uniformly rejected beliefs also emerged from this study. Ten such beliefs scales carried a mean below 3.5 on the 6 point scale of the survey and had fewer than 6% of all surveyed mostly or strongly endorsing the belief. Many of these scales appeared dichotomous with many of the most highly endorsed beliefs that arguably served as a counterpart (and in certain instances, were significantly negatively correlated). Beliefs that broadly sit under the umbrella of "fixed" or "entity" mindset were largely rejected by the teachers in this study, which included an ability approach (goals focusing on demonstrating ability), work avoidance, avoidance of demonstrating ability or lack thereof, and a belief that ability and intelligence is innate as opposed to malleable and changeable through effort and growth. This finding is unsurprising given how highly endorsed growth mindset related beliefs were by the vast majority of the teachers in this study. Another overarching theme in highly rejected beliefs related to learning and knowledge, and included a belief that viewed learning primarily in terms of surface elements such as memorising and reproducing information, and an epistemological view that favoured knowledge that is concrete, easy and quick to grasp. This is unsurprising given how highly teachers endorsed beliefs of teaching and learning in deep vs. surface terms. Teachers also largely rejected two types of beliefs about assessment, one which endorses assessment as an accountability tool, and another in which assessment is considered to be a hindrance to good

teaching and learning. The remaining rejected beliefs all related to teachers' purposes for teaching, where an inability to successfully pursue an alternative career, and personal utility/professional status factors such as career stability, additional holiday time, and recognition of the status of teachers were reasons for choosing to teach. Notably almost no teachers mostly or strongly endorsed these beliefs.

A third subset of beliefs were neither strongly endorsed nor were they rejected by the teachers in this study. These beliefs carried a mean between 3.5 and 5 on the 6 point scale with greater than 6% and less than 65% of the overall sample mostly or strongly endorsing. These could be broadly categorised as teachers' beliefs about curriculum, assessment, class expectations, social responsibility as a purpose for teaching, and their sense of responsibility in the classroom. Curricular beliefs represent perceived purposes of curriculum but also more broadly reflect underlying values about what is most important in education (Cheung, 2000). The cross-curricular and individualization factors were the most popular of the four, with significantly fewer teachers strongly endorsing the social reconstructivist factor or the systematic factor. However, all four of the curriculum beliefs significantly correlated with each other, meaning that teachers more likely to endorse one particular belief were also likely to endorse each of the others. This suggests that teachers' beliefs about curriculum, and more broadly what is important in education, are pluralistic, and that there is no dominant or consistent paradigm amongst the sample of teachers in this study, a finding that is consistent with Cheung's prior research. While teachers' sense of responsibility for relationships was strongly endorsed, the other three factors of teacher responsibility - for motivating students, for their teaching effectiveness, and for student achievement – were not. Teachers did feel more personally responsible for their teaching than their students' motivation and achievement, which would be

consistent with a perspective that shares attribution of student motivation and achievement with factors beyond just the teacher, such as the influence of other school factors (peers, school climate, other teachers, etc.) or student factors (family influence, student attitude or characteristics, student prior achievement, etc.). Teacher expectations, the only scale created for the purposes of this study, merits some further examination, particularly given that overall the scale was strongly endorsed. A more careful examination of each item suggests that teachers hold high expectations in some but not all ways. The following table looks at each of the items related to teacher expectations and includes the mean score as well as the percentage who mostly or strongly agreed with each item:

Table 3.15. Descriptive statistics for teacher expectation beliefs survey items.

Item	N	Mean (out of 6)	% Who Mostly or Strongly Agreed
All of my students are capable of learning	512	5.73	94.9
I expect all of my students to complete their work to a high standard.	514	5.17	81.0
I expect all of my students to succeed in meeting the class learning goals.	511	4.77	70.6
All of my students are capable of engaging in high level thinking about the content in my class.	511	4.44	57.3
Not all students are as able as others to learn (reverse coded)	510	3.63	29.2 (mostly or strongly disagreed)
My students are capable of performing much better than their prior achievement would suggest.	507	4.14	44.2

The results highlight how strongly teachers endorsed some types of expectations of all students (particularly the first two items), and how more divided they were with regards to considerations such as whether all students are capable of engaging in high level thinking, whether students are equally capable of learning, and whether students can outperform prior achievement.

Teachers' beliefs about the value and utility of assessment varied when taken as a whole. Less than 20% of teachers mostly or strongly endorsed assessment as a way to demonstrate learning (with a mean of 3.97) and just over 50% mostly or strongly endorsed assessment as something that helps to improve teaching and learning (with a mean of 4.84.) It is unclear the extent to which teachers may have internalised these statements as relating to external assessment systems and processes such as standardized tests, versus teacher-driven assessment practice. However, given the value placed on assessment as a systemic tool as well as a crucial aspect of teacher practice, the relatively low level of endorsement should be further investigated. The final area included in this grouping related to a social utility value purpose for choosing to be a teacher. Although nearly half of teachers did mostly or strongly endorse this factor (with a mean of 4.72), it did not emerge as a dominant purpose for most teachers choosing to teach, which is noteworthy given that all teachers in this study worked in the government system. The thematic foci of Victoria's Education State Agenda are learning for life, building happy, healthy and resilient students, breaking the link between outcomes and disadvantage, making sure every community has access to excellence in every school and classroom. These foundations align strongly with a social utility purpose for teaching and would be well served by increasing teachers' commitment to positively impacting their students, to benefitting the disadvantaged, and making a strong social contribution through their work.

Moderator analyses. An additional element of analysis focused on differences in beliefs between different demographic groups in the study. MANOVA (multivariate analysis of variance) were used to determine whether there were statistically significant differences in any of the types of beliefs endorsed by teachers based on their gender, level of education, years of experience, subject area and whether or not they were a primary vs. secondary teacher.

Multivariate analysis found no significant action between different levels of education and teachers' beliefs, and limited but in some cases very large differences in the beliefs of teachers based on subject area and years of experience. The most substantial differences in sheer number of beliefs, but also in the size of those differences, was observed between primary and secondary teachers and between male and female teachers in the study.

With regards, to subject area, there were no overall statistically significant differences found between the beliefs of English and science teachers. English and mathematics teachers also did not differ significantly in their beliefs, with three exceptions: mathematics teachers more strongly endorsed simple epistemological views ($d = .41$, $p < 0.05$), and English teachers more strongly endorsed social reconstructivist ($d = .39$, $p < 0.05$) and individualization ($d = .46$, $p < 0.05$) views of curriculum and education. To determine specifically which beliefs contributed most to these overall differences, univariate F-ratios were calculated. The results are illustrated in table 3.16.

Table 3.16. Significant interactions between teacher experience and particular beliefs.*

Belief factor	Type III Sum of Squares	df	Mean Square	F
Self-efficacy for instructional practice and student engagement	3.22	3.00	1.07	3.38
Self-efficacy for classroom management	3.53	3.00	1.18	2.85
Relational goal orientation	6.94	3.00	2.31	3.49
General expectations for achievement	5.01	3.00	1.67	3.28
Purpose – personal utility value	6.69	3.00	2.23	2.96
Deep–relational (higher order factor)	2.83	3.00	0.94	3.50

* All interactions between beliefs and experience were significant at $p<0.05$ level.

Essentially, teachers with more experience held more efficacious beliefs, a finding consistent with prior research linking more experience to stronger self-efficacy beliefs(Tschannen-Moran & Hoy, 2007). Teachers with 10 or more years of experience had significantly stronger self-efficacy for instruction ($d = .41$, $p = <.001$) and student engagement ($d = .46$, $p < .001$) than teachers with only 1-2 years' experience. However, there were no significant differences in the efficacy beliefs of teachers with 3-5 years' experience vs. those with more than 10, suggesting that the first two years have the greatest impact on self-efficacy.

Additionally, more experienced teachers on average had a lower relational goal orientation (for teachers with 10 or more years' experience vs. those with 1-2, $d = -.38$, $p < .01$), lower general expectations for achievement (for teachers with 10 or more years' experience vs. those with 1-2, $d = -.36$, $p < 0.01$), and higher personal utility purposes for teaching (for teachers with 10 or more years' experience vs. those with 1-2, $d = .23$, $p < 0.05$). On the higher order factor deep-relational factor, those with more experience on average were lower than less experienced teachers (for teachers with 10 or more years' experience vs. those with 1-2, $d = -.34$, $p < 0.05$). Further differences were observed in comparing the most and least experienced teachers in this study. Compared to teachers with more than 10 years' experience, teachers with 1-2 years' experience more strongly endorsed social reform teaching ($d = .27$, $p < 0.05$), mastery approach goal orientation ($d = .34$, $p < 0.01$), effort beliefs about students ($d = .28$, $p < 0.05$), social reconstructivist curricular beliefs ($d = .50$, $p < 0.001$), high expectations for student achievement ($d = .36$, $p <0.01$), social utility value purposes for teaching ($d = .38$, $p < 0.05$), and personal responsibility for relationships ($d = .37$, $p < 0.001$) and had a lower ability approach goal orientation ($d = -.31$, $p < 0.05$). These results suggest that over time, while teachers' confidence in their abilities increases, their connectedness to students dissipates somewhat.

Initially higher expectations of students, effort based beliefs, a social reconstructivist orientation, and social utility purposes for teaching would all be consistent with the more idealistic views one might expect of new teachers. Also, for teachers still in the early stages of their career, a mastery orientation would reflect an expectation that they are still learning and developing, while more experienced teachers unsurprisingly may be more likely to hold fixed views of their ability.

There were numerous significant interactions between teachers' beliefs and whether they taught in primary or secondary classrooms, with significant differences in 17 of the 32 identified beliefs factors, as well as in four of the six higher order beliefs factors. These results are illustrated in table 3.17.

Table 3.17. Significant differences between primary and secondary teachers' beliefs.

Belief factor	Type III Sum of Squares	Df	Mean Square	F	Sig.
Self-efficacy for instructional practice and student engagement	10.27	1.00	10.27	***32.37	0.00
Self-efficacy for classroom management	9.04	1.00	9.04	***21.89	0.00
Teaching for deep learning	5.54	1.00	5.54	*7.65	0.01
Ability approach goal orientation	8.04	1.00	8.04	*6.40	0.01
Relational goal orientation	3.04	1.00	3.04	*4.60	0.03
Mastery approach goal orientation	2.61	1.00	2.61	*6.42	0.01
Ability avoidance goal orientation	2.00	1.00	2.00	*5.24	0.02

Learning-deep (widening understanding and real world application)	2.58	1.00	2.58	***8.30	0.00
Learning – surface	9.74	1.00	9.74	***13.10	0.00
Curriculum – individualization	5.36	1.00	5.36	*7.03	0.01
Curriculum – cross curricular skills	4.95	1.00	4.95	***8.28	0.00
Purpose – personal utility value	4.59	1.00	4.59	*4.32	0.04
Purpose – intrinsic motivation and self-efficacy	1.74	1.00	1.74	*5.52	0.02
Responsibility – Achievement	16.78	1.00	16.78	***12.92	0.00
Responsibility – Motivation	16.80	1.00	16.80	***10.21	0.00
Responsibility-Relationships	11.90	1.00	11.90	***17.53	0.00
Responsibility-Teaching	6.72	1.00	6.72	*7.06	0.01
Surface/fixed (higher order factor)	1.44	1.00	1.44	*6.88	0.01
Responsibility (higher order factor)	12.67	1.00	12.67	***16.63	0.00
Efficacy (higher order factor)	6.11	1.00	6.11	***27.52	0.00
Deep-Relational (higher order factor)	2.63	1.00	2.63	***9.76	0.00

*p<0.05; ***p<0.001

The largest effect sizes observed between primary and secondary teachers related to self-efficacy for instruction and student engagement ($d = .75$, $p < 0.001$), self-efficacy for classroom management ($d = .46$, $p < 0.001$), relational goal orientation ($d = .43$, $p < 0.001$), deep conceptions of learning ($d = .47$, $p < 0.001$), relational conceptions of learning ($d = .36$, $p < 0.001$), views of curriculum and purpose of education as focusing on individualisation ($d = .53$, $p < 0.001$), intrinsic and efficacy driven purposes for teaching ($d = .35$, $p < 0.001$),and personal responsibility for achievement ($d=.45$, $p < 0.001$), motivation ($d = .34$, $p < 0.001$), relationships ($d = .58$, $p < 0.001$) and teaching ($d=.37$, $p < 0.001$). They also had significantly lower endorsement of an ability-approach goal orientation ($d=.26$, $p < 0.05$), ability-avoidance goal orientation ($d= .23$, $p < 0.05$), surface-based conceptions of learning ($d=.45$, $p < 0.001$), personal utility purposes for teaching ($d=.25$, $p < 0.05$) and fallback career as a purpose for teaching ($d= .25$, $p < 0.05$). These differences, many of which are quite large, raise substantive questions as to what may be influencing so much variance between these two types of teachers. It may be that the primary teaching model, in which the teachers spends significantly more time with overall fewer students than a typical secondary teacher may promote higher self-efficacy and responsibility (as the influence on achievement is less shared than in secondary contexts). A stronger relational orientation would also be logical in primary settings as more time with fewer students promotes closer relationships, as well as more opportunities to individualise instruction.

Teacher gender accounted for far more differences in teachers' beliefs than their subject areas, years of teaching experience, or level of education. There was initial speculation that these gender differences may been influenced by the primary vs. secondary teachers' differences, given that the overwhelming majority of the primary teachers in this study were female. However, multivariate analysis found no interaction between the two demographic groups,

meaning that the differences in beliefs along gender lines occurred whether the teachers were based in primary or secondary schools. Ultimately, there were significant interactions between gender and 12 of the beliefs factors as well as 3 of the 6 higher order beliefs identified by the study. Table 3.18 illustrates the gender-based differences observed in teachers' beliefs in the study.

Table 3.18. Significant differences in beliefs of male vs. female teachers.

Belief factor	Type III Sum of Squares	Df	Mean Square	F	Sig.
Self-efficacy for instructional practice and student engagement	1.44	1.00	1.44	4.55	<0.05
Social reform teaching	9.73	1.00	9.73	9.80	<0.001
Relational goal orientation	11.49	1.00	11.49	17.35	<0.001
Mastery Approach Goal Orientation	2.98	1.00	2.98	7.33	<0.01
Learning - Relational	3.29	1.00	3.29	5.09	<0.05
Assessment - Hindrance	4.92	1.00	4.92	4.98	<0.05
Expectations	4.00	1.00	4.00	7.84	<0.01
Purpose – intrinsic motivation and self-efficacy	1.67	1.00	1.67	5.28	<0.05
Purpose- fallback	1.07	1.00	1.07	4.47	<0.05
Responsibility - student achievement	5.79	1.00	5.79	4.46	<0.05
Responsibility - Relationships	6.97	1.00	6.97	10.27	<0.001
Responsibility - Teaching	3.70	1.00	3.70	3.89	<0.05
Responsibility (higher order factor)	4.83	1.00	4.83	6.34	<0.01
Efficacy/Intrinsic Motivation (higher order factor)	1.28	1.00	1.28	5.75	<0.05
Deep/Relational (higher order factor)	3.94	1.00	3.94	14.65	<0.001

Female teachers on average held stronger beliefs related to self-efficacy for instruction and engagement ($d = .39$, $p < 0.05$), relational goal orientation ($d = .65$, $p < 0.001$), mastery goal orientation ($d = .41$, $p < 0.05$), learning as relational ($d = .50$, $p < 0.05$), expectations for student achievement ($d = .37$, $p < 0.05$), and personal responsibility for relationships ($d = .51$, $p < 0.001$). Overall, as measured by the higher order factors, female teachers held stronger personal responsibility ($d = .33$, $p < 0.05$), self-efficacy and intrinsic motivation ($d = .42$, $p < 0.05$), and deep/relational beliefs ($d = .62$, $p < 0.001$). These findings are consistent with past research indicating female teacher on average have higher self-efficacy beliefs, greater tendencies towards nurturing and focusing on students' needs, and are more likely to accept responsibility for their students (Ross, Cousins, & Gadalla, 1996). This prior research bore a striking resemblance to the three higher order factors where there were significant interactions, suggesting that female teachers overall had higher self-efficacy, personal responsibility, and deep/relational beliefs (both in terms of their goal orientation but also in their conceptions of learning.)

***Teacher beliefs as a system: relationships between teachers' beliefs*.** After identifying the 32 distinct teacher beliefs factors, exploratory factor analysis was conducted on these 32 factors to determine whether any higher order factors (or "systems") of teacher beliefs emerged. Six higher order factors or systems of integrated beliefs were identified. Fallback career as a purpose for teaching did not load adequately into any of the six higher order factors, and therefore was not included in this model. Additionally, two of the purpose related factors, personal utility value and professional status and recognition, were so highly related that they were combined into a single factor for the higher order analysis.

The first higher order factor, societal improvement/individualisation, reflected a set of beliefs focused on education for the purpose of improving society and/or addressing the needs

and actualisation of individual students. The second, surface/fixed, reflected a set of beliefs that broadly combined fixed mindset characteristics with surface-type beliefs about both learning and teaching, as well as personal utility purposes for teaching. Additionally, the surface/fixed system included a negatively correlated expectations belief, indicating generally lower expectations of students' academic potential. The third system, personal responsibility, included each of the four types of teacher responsibility adapted from Lauermann and Karabenick's (2013) pre-existing scale. Assessment beliefs all grouped into the fourth system of beliefs. The fifth system of beliefs, efficacy and intrinsic motivation, included teacher self-efficacy beliefs but also included their purposes for teaching that reflected a belief in personal ability to teach and genuine intrinsic value in being a teacher. The sixth system, deep/relational, included four types of beliefs related to teachers' achievement goal motivation, as well as their beliefs about learning, highlighting a congruence between teachers' mastery orientation (growth mindset) and belief in deep learning, but also a relationship between these factors and goals to build strong relationships with students and to see learning as partly about the development of relational skills. The full higher order structure and its constituent types of teacher beliefs is provided in table 3.19.

Table 3.19. Higher order structure (systems) of teacher beliefs and factor loadings.

	Societal improvement/ individualisation	Surface/ fixed	Personal responsibility	Assessment	Efficacy and Intrinsic Motivation	Deep/ Relational
Social reconstructivist curriculum	**0.97**	0.03	-0.01	-0.09	-0.19	-0.12
Social reform teaching	**0.67**	-0.01	-0.03	-0.06	0.16	-0.06
Social utility value purposes	**0.52**	-0.02	-0.04	0.04	0.01	0.17
Cross-curricular	**0.51**	0.01	-0.05	0.07	-0.04	0.25
Individualized curriculum	**0.44**	-0.04	0.00	-0.06	0.10	0.05

	Societal improvement/ individualisation	Surface/ fixed	Personal responsibility	Assessment	Efficacy and Intrinsic Motivation	Deep/ Relational
Innate ability	-0.02	**0.64**	0.05	-0.07	0.09	0.06
Surface learning	0.02	**0.55**	-0.05	0.29	-0.02	0.01
Ability-avoidance goal orientation	-0.02	**0.55**	0.12	-0.11	-0.18	-0.01
Effort beliefs	0.01	**-0.54**	0.00	0.14	0.05	0.11
Simple epistemological beliefs	-0.04	**0.51**	0.04	-0.02	0.09	-0.12
Work-avoidance goal orientation	0.05	**0.50**	-0.15	-0.25	-0.01	0.09
Personal utility value and professional status purposes for teaching	0.10	**0.50**	-0.08	0.14	0.01	-0.03
Ability-approach goal orientation	0.02	**0.49**	0.10	0.10	-0.02	0.03
Systematic curriculum	0.22	**0.40**	0.04	0.31	0.10	-0.06
(High) expectations for students	0.34	**-0.36**	0.22	0.07	0.00	-0.05
Responsibility for student achievement	-0.03	-0.02	**0.94**	0.01	-0.06	-0.08
Responsibility for student motivation	0.05	0.08	**0.86**	-0.01	0.01	-0.12
Responsibility for teaching	-0.10	0.01	**0.76**	0.06	-0.07	0.12
Responsibility for relationships with students	0.02	0.02	**0.53**	-0.10	0.11	0.20

	Societal improvement/ individualisation	Surface/ fixed	Personal responsibility	Assessment	Efficacy and Intrinsic Motivation	Deep/ Relational
Assessment as positive accountability tool	0.05	0.22	-0.02	**0.76**	-0.02	-0.03
Assessment demonstrating learning	0.00	0.10	0.05	**0.70**	-0.07	0.10
Assessment supporting teaching and learning	-0.01	-0.10	0.05	**0.65**	0.12	0.00
Assessment hindering teaching and learning	0.21	0.22	0.08	**-0.64**	0.07	0.05
Self-efficacy for instruction	0.03	-0.02	0.07	0.04	**0.88**	-0.11
Self-efficacy for classroom management	-0.07	-0.01	-0.02	-0.05	**0.84**	-0.11
Purpose – intrinsic motivation	0.11	0.09	-0.15	0.01	**0.44**	0.24
Efficacy for deep teaching	0.24	-0.07	-0.08	-0.03	**0.37**	0.09
Deep learning	0.19	-0.09	-0.01	0.07	-0.05	**0.72**
Relational learning	0.26	0.01	0.00	-0.07	-0.08	**0.54**
Mastery goal orientation	0.27	-0.10	0.10	0.04	0.11	**0.35**
Relational goal orientation	0.17	0.13	0.21	-0.09	0.21	**0.25**

Correlations between the factors

	Social/ Individualisation	Surface/ fixed	Personal responsibility	Assessment	Efficacy	Deep/ Relational
Correlations between factors						
Societal improvement/ Individualisation	1.00	-0.05	0.41**	0.18	0.36**	0.48**

Surface/fixed	-0.05	1.00	-0.17**	0.02	0.31**	-0.19**
Personal responsibility	0.41**	-0.17**	1.00	0.36**	0.43**	0.38**
Assessment	0.18	0.02	0.36**	1.00	0.28**	0.18**
Efficacy	0.36**	-0.31**	0.43**	0.28**	1.00	0.56**
Deep/Relational	0.48**	-0.19**	0.38**	0.18**	0.56**	1.00

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

The correlations between the six higher factors reflect at a higher level what the relationships were between the 32 identified factors of teacher beliefs. There were significant moderate positive relationships between social/individualisation and personal responsibility, self-efficacy/intrinsic motivation, and deep/relational beliefs. There were significant negative but small correlations between surface/fixed beliefs and personal responsibility and deep/relational beliefs, and a significant negative and moderate correlation with self-efficacy/intrinsic motivational beliefs. Personal responsibility significantly correlated positively and moderately with social/individualisation beliefs, assessment beliefs, self-efficacy/intrinsic motivational beliefs, and deep/relational beliefs, and negatively and weakly with surface/fixed beliefs. Assessment beliefs significantly correlated with personal responsibility (moderately) as well as with self-efficacy/intrinsic motivational beliefs and deep/relational beliefs (weakly). Self-efficacy/intrinsic motivational beliefs significantly correlated positively with social/individualisation (moderately), personal responsibility (moderately), deep/relational (moderately), and assessment (weakly), and negatively with surface/fixed. Deep/relational beliefs significantly correlated positively with social/individualisation beliefs (moderately), personal responsibility (moderately), assessment (weakly), and efficacy (moderately.)

A third-order factor analysis was conducted with the six second order factors, to determine if they would load into even fewer factors, illustrated in table 3.20. All but one of the beliefs systems, assessment beliefs, loaded into a single overall factor.

Table 3.20. Factor analysis of higher order factors structure.

	Internalized teacher beliefs	Assessment Beliefs
Deep/Relational	**0.84**	-0.20
Social/Individualistic	**0.70**	-0.08
Efficacy/Intrinsic Motivation	**0.60**	0.03
Personal Responsibility	**0.49**	0.19
Surface/Fixed	**-0.23**	0.12
Assessment	-0.03	**1.01**
Correlations between factors	Deep	Social
Internalized teacher beliefs	1.00	0.22
Assessment beliefs	0.22	1.00

That assessment beliefs remained a separate factor and overall so much less related than all other beliefs factors was an unanticipated finding. One possible implication is that all other beliefs factors (and their higher order categories) represent a set of internalized but multifaceted set of teacher beliefs. It seems that teachers can hold various views of assessment that fail to predict beliefs amongst the five higher order factors. Teachers' beliefs about assessment may be distinct in that they focus on an external, systemic factor that mediates teachers' actions (or choices) but does not itself strongly influence their internalized beliefs about themselves, their students, or pedagogical practices.

Three of the six third order factors identified in this study suggest that there are beliefs systems that blend teachers' personal motivations with their pedagogical beliefs and beliefs about students. For example, while past research may have parsed teachers' beliefs about learning within a broader system of beliefs about content, knowledge, or pedagogy, this study

found that surface learning beliefs nested within a broader system of beliefs that also included work avoidance, ability-approach goal orientation and a rejection of higher academic expectations and belief that effort is more important than innate ability. In another example, while goal orientation or growth vs. fixed mindset are more typically examined as part of a theory of motivation, this study found that mastery or growth mindset sat within a broader system of beliefs that also included relational goals and deep notions of learning. The beliefs system labelled "social/individualistic" was a novel finding in that it captured an orientation towards social improvement, realised through social reconstructivist or reform beliefs about curriculum and teaching, endorsement of teaching and curriculum approaches that emphasise the needs and interests of individuals and the development of cognitive skills that can be applied across contexts, and personal purpose factors rooted in contributing to society and making a difference in the lives of students.

The higher order naming and underlying meaning of these overarching factors are one of if not the most critical finding in this study. While teachers' beliefs are multifaceted and complex, the higher order factors suggest that when a teacher enters in the classroom and engages with their classes, they most critically access systems of beliefs factors that cluster around deep/relational learning, social purpose, intrinsic motivation and self-efficacy, personal responsibility, and extrinsic/surface/fixed attitudes that they draw upon in acting and reacting to their classroom contexts, while assessment remains a puzzling additional but less related unique factor in teachers' beliefs systems.

The surface/fixed beliefs system was unanticipated, as it encompassed beliefs across nearly all broad areas investigated in this study: purpose, goal orientation (fixed mindset), teaching, learning, and (low) expectations for student achievement. It also captured an array of

beliefs that would generally be considered undesirable in teachers. This included innate ability beliefs, lower expectations for students, a belief that effort does not influence achievement, and goal orientations focused on demonstrating ability or avoiding demonstrating inability (synonymous with the fixed mindset label), and work avoidance. Furthermore, surface/fixed beliefs included surface-focused beliefs about learning, and simplistic epistemological views about knowledge, all of which have been aligned to less effective teaching practices (Askew et al., 1997; Kember & Gow, 1994; Muijs & Reynolds, 2001; Schommer, 1990; Staub & Stern, 2002b). Further research should be undertaken to determine whether or not these beliefs are truly less desirable or truly dichotomous with their theoretical counterparts (deep learning and deep teaching), something that will require more explicit measures of teacher effectiveness against these particular beliefs. Nevertheless, the relatedness of these beliefs supports a position that they both inform and are informed by each other. It was reaffirming that for the most part only a small proportion of the teachers in this study endorsed beliefs within this broader system, but further study of this profile of teaching would be beneficial.

Discussion

The results of this study highlight the complexity of beliefs that likely influence teachers' behaviours and potentially their impact on students. Overall, these results confirmed most of the first-order beliefs constructs and measures that informed the study design, in particular validating previous research on motivational constructs and related scales for self-efficacy, purposes for teaching, goal orientation, and teacher responsibility. The results also suggest that pedagogical beliefs, about curriculum, teaching, learning, epistemology, and assessment are distinct, multifaceted and complex. While teachers largely endorsed and rejected a common set of beliefs, the study also indicated areas where teachers' beliefs were less consistent. This included beliefs about assessment, personal responsibility, and conceptions of curriculum. There are a number of potential reasons why teachers' beliefs tended to vary more in these areas than others. The scope of the study did not explicitly test these theoretical explanations and so they are presented for consideration and recommended as potential areas for further research. The first is the role of contextual factors in particular mediating these types of beliefs. Arguably, the school context plays a more critical role in influencing teachers' beliefs in these areas than in others. For example, teachers may feel more constrained around what curriculum requirements they must meet and how they must go about meeting them. Their beliefs about what they are responsible versus what students, other staff, or the broader community is responsible for, may also be heavily conditioned by how these issues play out within their school, and what beliefs persist amongst fellow staff. Similarly, their views on the value and importance of assessment, as both a tool for improving teaching and learning as well as an important means for creating student and school accountability, are likely to be heavily influenced by the way in which assessment matters transpire in their school context.

By seeking to integrate a comprehensive set of teachers' beliefs, new understandings of the relationships between beliefs have emerged, including the existence of higher order beliefs systems that cut across constructs research typically parses into its own distinct systems. It has been argued and established in the research literature that teachers' beliefs function within integrated, interactive and complex systems (Pajares, 1992). The results of the higher order factor analysis provide new insights into these potential beliefs systems and support existing claims that multiple and varied types of beliefs come together to guide, filter, and frame teaching behaviours (Fives & Buehl, 2012). It could be argued based on these results that in addition to beliefs such as efficacy, responsibility, purpose, and goal orientation, beliefs about teaching, curriculum, assessment, and learning and even beliefs about students are as much "motivational" or "self" beliefs as they are pedagogical beliefs, and that these labels may not effectively represent the beliefs systems of teachers, which are more integrated. The exclusion of assessment in this grouping was surprising and raises some questions. Is it possible that teachers view assessment as a phenomenon that is done to them, that mediates their actions, while all other beliefs can be "owned" by the teacher his/herself? Or is it perhaps that assessment beliefs are more about what teachers *do* to students and less about what they believe about themselves? There is more work to be done in this area to ascertain how assessment beliefs sit within broader teacher beliefs systems.

The results also shed some light on the popularity (or lack thereof) of particular beliefs in the context in which this study was conducted. While particular beliefs were often universally endorsed (often motivational beliefs such as ability-approach goal orientation), or nearly

universally rejected (such as innate ability beliefs), a large proportion of beliefs related to pedagogy, in particular beliefs around the purposes of curriculum and education, fell in the middle, taking into account that teacher subject area had little to no impact on curricular beliefs. A lack of consistency or agreement amongst teachers about the purposes of curriculum and education could be a strong impediment to collaboration and collective efficacy.

It is also noteworthy that, when considering the various demographics examined in this study, that overall, teachers across subject areas have far more in common with each other than not, and the same is largely true when various levels of experience are considered. The large degrees of difference in beliefs of primary vs. secondary teachers and male vs. female teachers draw greater attention to these factors. Ross et al. (1996) reported a general trend across numerous studies suggesting that female teachers typically report higher degrees of self-efficacy, consistent with the results of this study. Why female teachers generally reported higher self-efficacy and more strongly endorsed an array of theoretically desirable teacher beliefs is up for speculation and further study.

With regards to primary vs. secondary teacher differences, the implication that primary teachers have higher self-efficacy, greater sense of personal responsibility, more focus on relationships, and greater deep-leaning orientations towards teaching and learning is a crucial finding. The causes for these differences are purely speculative and require further investigation. One possible factor may be who teaches in primary and secondary classrooms (noting that in the context of this study, primary teaching positions are more competitive and secondary, and thus may attract more qualified candidates than secondary schools.) Another factor may be the construct of the primary teacher's programme: spending greater time with fewer overall students may reinforce pro-relational beliefs and enable teachers to focus more on depth over breadth

with their students (with more time to delve into the content vs. feel pressed to "cover" as much of the curriculum as they can in limited time.) If structural factors are at play in influencing potentially beneficial vs. counterproductive teacher beliefs, it may have important implications in how secondary schools structure their teaching and learning programs.

This study's results suggest numerous potential recommendations and directions for research in practice, five of which stand out as particularly worth noting. First, a more comprehensive set of teachers' beliefs could be measured in future research. Currently, at a systemic level, there is more focus on measuring teachers' beliefs about the strength of school-wide factors such as school climate, school leadership and professional learning, or on self-reporting of a list of teaching behaviours. There is little systematic gathering of information in the areas of belief included in this project. A key limitation of this study was potential bias in the form of schools and teacher who chose to participate versus those who did not. Consequently, it remains unclear whether the beliefs of teachers can be generalised beyond the participants who volunteered for the study. With very limited research upon which to compare this study's results, there is a need for future studies that seek to examine not only the structure and strength of a wide range of teachers' beliefs, but also the relationships between teachers' beliefs and normative outcomes such as academic achievement, sense of belonging, and student attitudes and dispositions.

Second, teacher beliefs should be more explicitly embedded in future professional development efforts and initiatives. One of the key reasons that efforts to change teacher practice fail is that they conflict with teachers implicit and explicit beliefs. Deepening teachers' awareness of their existing beliefs and encouraging them to examine these in relation to the beliefs that underpin professional development efforts may be a crucial precursor to facilitating

long term changes in practice. Additionally, by presenting the evidence base not only for specific practices, but also the beliefs that underpin these, we will be more likely to persuade teachers to consider and adopt not just new ways of working, but also new ways of thinking. Finally, given the strong degree of endorsement of many beliefs areas, teachers' beliefs have the power to serve as anchors to underpin professional development efforts. For example, teachers were quite uniform in their endorsement of relational goals and responsibility for relationships with students, strengths that could be used as the basis for a school-wide behaviour plan that seeks to use student-teacher relationships to improve student behaviour.

Third, further investigation is needed into of the differing levels of beliefs endorsement between primary and secondary teachers and males and females in the system. With statistically significant differences in the means these teachers' beliefs between 2/3 of the beliefs identified in the study, it can be argued that there are some substantially different beliefs between these types of teachers. Primary teachers had significantly stronger beliefs in conceptions of teaching and learning as deep, and an orientation towards individualisation of curriculum and education. It also stood out in the results how much stronger primary teachers' self-beliefs were, particularly in the areas of self-efficacy, personal responsibility, goal orientation, and purposes for teaching. These effects were also similarly higher for female teachers over their male counterparts. Surely it would be desirable to see equally highly endorsed beliefs like this in the classrooms of both primary and secondary students, and in the classrooms of both male and female teachers, and greater continuity in the beliefs of teachers across classrooms from the start to finish of school, and between teacher genders.

Fourth, teacher beliefs need to be more clearly examined in relation to measures of teacher quality and impact. It remains largely unknown in this context whether or how much

particular teacher beliefs may influence teacher behaviours that optimise student learning. There is a body of research to point to the positive benefits on student learning and outcomes of some of the beliefs examined in this study, but further contextualised data should be gathered. Further studies of the relationships between teacher beliefs and normative outcomes such as students' achievement, belonging, attitudes and dispositions, and other outcomes, would be greatly beneficial.

Given the variability between primary and secondary teachers' beliefs evidenced by this first study, it is also critical for future research to independently examine these two different types of teachers, particularly given the distinct and differential roles and responsibilities of primary and secondary school teachers, and the potential influence these unique factors may have on their beliefs, behaviours, and impact. As a follow up study to this project, the author will conducted a second study examining the relationship between particular teacher beliefs, student ratings of their teacher through the Tripod student perception survey, and teachers' objective performance across a variety of high impact teaching areas utilising the Visible Classroom observation tool. It was anticipated that the results of this study (the focus of the next chapter) would shed further light on the question of which beliefs may be most instrumental in shaping quality teaching and learning in the classroom, noting that the beliefs that matter most may be distinct between primary and secondary teachers. Additionally, this second study, which was conducted with a targeted group of high school teachers, provided the opportunity to explore the connection between beliefs and measures of teacher quality particular to secondary teachers, given that an arguably disproportionate amount of teacher quality research is done in primary and middle school classrooms vs. secondary classrooms.

Fifth, a number of unresolved remaining questions should be studied in future research. While this study identified a large number of distinct beliefs, it did not determine whether particular beliefs were more dominant than others in shaping teachers' thinking and behaviour. It also did not address other longstanding and continuously debated questions in teacher beliefs research, such as how congruent teachers' beliefs are with their behaviour, and how stable teachers' beliefs are. These are unresolved debates within the field, which has amassed evidence both supporting and contradicting the consistency between beliefs and behaviours in the classroom as well as their stability (Fives & Buehl, 2012). To strengthen future survey-based research of this nature, it would be beneficial to collect survey data from participants at multiple points in time, as this would make it possible to control for unobserved differences among participants at the time of the administration of the first survey. The second study of this dissertation incorporated a low-inference observational measure of teaching practices, which yielded findings related to the relationship between beliefs and behaviours. This topic is discussed at length in chapter 4 of this dissertation.

Chapter 4: Multiple Measures of Teacher Quality

Definitions and measurement of teacher quality tend to be multi-faceted, and may include everything from qualifications and personal attributes to pedagogical skills and actual effectiveness in raising student achievement (Strong, 2011). Two conclusions are consistently drawn in the literature: teachers are a major factor influencing students' learning outcomes, probably the largest school-based factor there is (Hattie, 2003); and the quality of teachers and their teaching must increase if schools and systems wish to improve, remain competitive, meet the demands of its current and future economy, reduce inequity, and achieve holistic learning goals for all students. There are many seminal studies that have demonstrated the strong influence of teacher quality on student achievement (Kane & Staiger, 2008; Sanders & Horn, 1998).

Researchers continue to struggle to identify the factors or attributes that drive teacher quality, and there is limited evidence to support characteristics such as experience, teacher education, and certification as indicators of teacher quality (Rice, 2003; Wayne & Youngs, 2003). Decades ago, Fenstermacher (1978) suggested that future teacher effectiveness research and policy should also include a focus on teachers' beliefs, but over the past 40 years research on teacher quality and teacher beliefs have crossed paths rarely.

Consider as one recent example, the MET (Measures of Effective Teaching) study. This study approached the challenge of measuring effective teaching by studying multiple potential measures of teaching, seeking "to improve the quality of information about teaching effectiveness, to help build fair and reliable systems for teacher observation and feedback (Cantrell & Kane, 2013). The culminating findings of the MET study suggested that a composite of multiple measures offered numerous benefits over a single source (e.g., teacher value added to

student ratings of quality of their learning, and student achievement.) A composite approach, that is, one drawing together multiple aspects of effective teaching, increased the consistency and reliability of measures used, and demonstrated greater year-to-year stability in teacher evaluation. But the study neglected to include any measures of teachers' beliefs, which may have increased the explained variance relating to effective teaching.

This study sought to bring together these two areas of research and explore the interaction between multiple potential factors of teacher quality, including beliefs. The primary purpose of this study was to test a multidimensional model of teacher quality and the relationships between its factors. Drawing from four distinct measures, the aim was to reduce the many potential beliefs to a smaller set of higher order factors that could be utilised to address these specific questions posed at the conclusion of the literature review. The first purpose of this study was to determine whether teachers' beliefs were a valid and reliable predictor or indicator of quality teaching. The specific questions tested were as follows:

1) Do particular teacher beliefs and characteristics correlate more strongly than others with measures of quality teaching?
2) To what extent do teachers' beliefs influence or impact quality of teaching?

The second purpose of this study was to determine whether a profile of teacher quality could be validated based on teacher "inputs" such as beliefs and characteristics and "processes" related to quality teaching behaviours, as well as "outcomes" such as students' perceptions of teacher effectiveness. The specific questions tested were as follows:

3) Does a quality teacher possess a typical set of competencies or attributes as well as "quality" teacher beliefs?

4) Are there a common set of practices that quality teachers employ with particular frequency in the classroom?
5) What perceptions of teaching to students have in a quality teacher's classroom?

The third purpose of this study was to explore the underlying constructs of and relatedness between multi-measure approaches that theoretically aim to address the same overarching phenomenon of teacher quality. The specific questions tested were as follows:

6) Do student perception surveys actually capture distinct dimensions of teaching?
7) Does frequency of the usage of high quality teaching practices actually reflect quality teaching?
8) Is quality teaching measured through classroom observations congruent with quality teaching measured through student surveying?
9) Are quality teacher "inputs" such as personality traits, beliefs, and non-academic competencies congruent with quality teaching measures such as classroom observations and student perceptions of teaching?

A composite model of teacher quality was built based on four empirically supported elements. The first element focused on teachers' beliefs commonly considered strongly related to planning, instructional decisions, and classroom practices (Ashton, 2015; Pajares, 1992). The second element was non-academic capabilities, such as resilience, organisation, and problem solving ability, which have been correlated with higher quality observed teaching practice as well as measures of student achievement gains (Duckworth et al., 2009b; Klassen & Tze, 2014; Robertson-Kraft & Duckworth, 2014). The third element was student perceptions of teaching, noted for its reliability and correlation with other teacher quality factors including student achievement gains (Cantrell & Kane, 2013; Ferguson, 2012). The fourth element was observable

teaching practice, as measured through the Visible Classroom program, which highlights sixteen key practices supported by meta-analytic research on effective instructional practices(Hattie, 2008).

Method

Participants. Participants were recruited from the *Teach For Australia* program (www.teachforaustralia.org). All current and former program participants who were teaching in government schools across the four states and territories that provided departmental approval for the study (Victoria, Australia Capital Territory, Western Australia, Northern Territory) were invited to participate. Of these 340 invited participants, 123 (36%) initially volunteered for the study. After withdrawals, primarily based on limited availability, there were ultimately 68 participants (20% of those eligible, 32 male, and 36 female) who volunteered for the study Nearly all teachers had 1-5 years of experience (with just four having six or more years of experience.) All participants were high school teachers (grades 7-12) who taught across multiple subjects and year levels, including English, Social Studies/Humanities, science, mathematics and additional subject areas.

***Measures*.** Four measures were utilised to capture the four distinct factors of teacher quality utilised in the study. Data from these measures was collected between April and August of 2017.

Teacher beliefs. The first dimension measured was teacher beliefs through a comprehensive survey instrument with 139 items organised into 31 beliefs factors, validated through study one. With the exception of the items related to teachers' expectations for students, all items were drawn from pre-existing, validated survey instruments utilised in study one. For further information on the sources of these factors and items, refer to study one. The survey also

included demographic characteristics such as name, gender, years of teaching experience, level of education, subject area and year level(s). Participants were provided with an electronic link to the survey and given the option to complete it within the data collection period for the study.

Non-academic capabilities (teacher selection criteria). A second dimension of effectiveness related to non-academic capabilities, which included a variety of personality traits and characteristics, measured based on participants' performance against a set of selection criteria for entry into the Teach For Australia program. All Associates selected into the Teach For Australia program undergo three stages in the selection process. They first submit an initial online application, which is reviewed by Teach For Australia staff, who screen candidates and pass those deemed qualified to proceed to a second stage, consisting of a phone interview. Those who pass through the phone interview stage are invited to participate in a selection day, which consists of a number of activities, which are designed to evaluate candidates based on 8 key competency areas. The titles of these competency areas and a brief description are noted in Table 4.1. A brief description of the activities that candidates to the program perform as part of the selection process and the related competencies are illustrated in table 4.2.

Table 4.1. Teach For Australia selection competencies.

Competency	Description
Leadership	▪ History of achieving ambitious, measureable results ▪ Able to take initiative and assume personal responsibility
Resilience[1]	▪ Able to work through obstacles, and adapt behaviour as required, to pursue goals purposefully and rigorously ▪ Maintains a positive outlook when faced with a challenge or uncertain environment
Planning and Organisation	▪ Able to plan and prioritise effectively, meet deadlines, and work efficiently
Interaction	▪ Able to communicate clearly and confidently using a range of techniques, is engaging, socially aware, and can earn the attention of others and compel them to take action ▪ Actively listens and responds effectively
Commitment to Mission	▪ Believes in the importance of focusing on raising, and measuring student achievement for those in areas of educational disadvantage ▪ Expresses a deep desire to take on this challenge
Problem Solving	▪ Demonstrates logic and is able to quickly analyse and synthesise data to draw accurate conclusions
Humility, Respect and Empathy[2]	▪ Sees intrinsic value in, and remains open minded about the views, experiences, opinions and methods of others ▪ Focuses on the strengths of others and recognises positive opportunities in every situation
Learning and Self-Evaluation[3]	▪ Places high value on learning from others, and actively seeks out opportunities to do so ▪ Can take ownership for self-improvement

[1] For the first two cohorts of the program, the term "perseverance" was used instead of resilience.
[2] For the first two cohorts of the program, "empathy" was not included within the assessment criteria.
[3] This measure was introduced during selection for cohorts 3 through 7.

Table 4.2. Teach For Australia selection activities and capabilities measured.

Activity	Brief Description	Capabilities Measured
Interview(s)	A 30-60 minute interview consisting primarily of pre-planned questions relating to past personal experiences that align with key competencies. Conducted and evaluated by trained Teach For Australia evaluators.	Leadership Resilience Planning and Organization Interaction Commitment to Mission Problem Solving Humility, Respect and Empathy Learning and Self-Evaluation
Sample Teaching Lesson	Candidates prepare and deliver a 7 minute demonstration lesson for a small group (generally consisting of other candidates, guest observers, and/or evaluators).	Leadership[4] Planning and Organization Interaction Learning and Self-Evaluation
Group Activity	A group of candidates is given a school-related challenge and asked to brainstorm and create an effective solution collaboratively.	Leadership Interaction Problem Solving Humility, Respect and Empathy Learning and Self-Evaluation
Problem Solving Test	The candidate takes a 15 question multiple choice test designed to measure problem solving ability.	Problem Solving

For each activity in the selection process, where a particular competency is evaluated, the candidate was given a score on a five point scale (poor, below average, average, good, excellent) by trained assessors from Teach For Australia. Scores against each competency and task were collected from participants' original selection data, which was provided by Teach For Australia.

Student perceptions of teaching. The third dimension of teacher quality, student perceptions of teaching, was measured through a student perception survey. The 35 item Tripod Student Perception survey was devised by Ferguson(Ferguson & Danielson, 2015; LaFee, 2014) and widely utilised in the Measures of Effective Teaching Project (Kane & Staiger, 2012). Each participant selected one class of their choosing to undertake the survey, within the period in which other measures were collected. The rationale for choice was to optimise participation,

because prior research suggested that student perceptions of classes tended to be favourable across different groups of students (Kane & Cantrell, 2010).

Each participant was provided with a link to an online survey to be administered to their individual class. To preserve anonymity, teachers provided the link to their students, who used classroom computers during a regular teaching session to complete the survey online, with results sent direct to the researchers.

The 35 items in the Tripod Survey are organised around seven elements of effective classroom teaching, dubbed the seven Cs. Care describes practices that create emotionally safe and supportive learning environments. Control pertains to classroom management. Clarify relates to practices the promote understanding by clearing up confusion and conveying ideas and concepts clearly. Challenge describes teacher behaviours that press students to not only work hard, but think in academically rigorous ways. Captivate pertains to practices that make instruction engaging and stimulating. Confer describes behaviours that seek out students' points of view, and provide opportunities for students to express themselves. Finally, consolidate concerns how teachers check for understanding, review and summarise important material.

Observable teaching practice. Observable teacher practice was captured using the Visible Classroom program to identify the use of 16 specific teaching practices supported by meta-analytic research as promoting higher levels of academic achievement (Hattie, 2008; Skipp & Tanner, 2015). One group of practices relates to the promotion of critical analysis and thinking and includes connecting to prior knowledge, use of divergent and convergent questioning, reviewing important information, and promoting a positive classroom environment. Another group of practices relate to engaging and understanding, and include provision of clear instructions, the use of prompting or probing statements, summarising key points, and setting

clear behaviour expectations and prompting behaviour reminders. The last group of practices relate to feedback and instruction, and include introducing and explaining new concepts and vocabulary, utilising a variety of resources to support learning, emphasising important points, providing immediate and specific feedback to individuals and groups of students, and effectively using goals and success criteria within instruction.

Participants in the study audio recorded themselves delivering 3-5 full lessons with the same class. Participants were able to select the lessons they wished to record, and were not required to record the lessons sequentially. They were encouraged to limit the time between recordings to 1-3 lessons. Recordings were then uploaded through a Visible Classroom mobile phone-based app, which then auto-transcribed and anonymised the lessons before they were shared with coders. Lesson transcripts were then coded by trained assessors from the University of Melbourne's Centre for Program Evaluation, which operates Visible Classroom, and also provides the training for these assessors. As part of their training, coders work with practice transcripts to analyse with other coders until they reach an agreement level of 80% or above before proceeding to formally code actual transcripts.

After receiving the anonymised transcripts, coders conducted frequency counts of the 16 practices previously highlighted. Those results were then aggregated across all lessons and averaged for each of the 16 practices. Additionally, teachers' average words per minute, percentage of the lesson they spoke, the number of questions they asked and the number of questions students asked were collected.

Analytical Approach

To build and test the composite model of quality teaching, three key steps were planned. The first step was to reduce the number of factors in the study (using factor modelling) in order

to distil quality teaching beliefs, behaviours, non-academic capabilities and student perception factors into a more discrete set of key higher order factors.

The 31 factor structure for the teacher beliefs measure was accepted as pre-validated on the basis of the results from study one (Chapter 3), which itself was supported by previously validated factors and survey items. These factors were reduced to a set of higher order teacher beliefs exploratory factor analysis (EFA) with correlated rotation (Oblimin). Similarly, the average scores for each of the eight assessed Teach For Australia selection non-academic capabilities were analysed through exploratory factor analysis to determine whether the factors could be reduced to a higher order structure. The validity of the seven factor model established by Ferguson was tested first via confirmatory factory analysis of the seven factors as well as via exploratory factor analysis, to determine whether or not "7Cs" structure of the Tripod would replicate in an Australian secondary school context.. Finally, the average frequency counts against each of the 16 measured Visible Classroom teaching practices underwent exploratory factor analysis to determine whether a higher order structure of those practices could be identified on the basis of how strongly related particular factors were to each other, with an ultimate aim of reducing the 16 factors.

Second, a series of correlational analyses was conducted. This included an analysis of bivariate correlations between the 31 factors derived from the teacher beliefs scales, the seven pre-determined student perception scales, the eight pre-set Teach For Australia non-academic competencies, and 16 Visible Classroom teaching practices. Following factor analysis to determine higher order factors in the first part of the analytical approach, bivariate correlation of the higher order factors was also conducted, followed by the development of a structural equation model. The structural equation model was planned on the basis of the higher order

factors reduced for each of the four measures, and a preliminary indication of correlations between these factors.

Third, hierarchical cluster modelling was then utilised to determine whether particular profiles of teacher types could be identified based on their results across the measures. Hierarchical cluster modelling was used with between groups linkage as well as k means cluster analysis to identify a number of clusters with sufficiently distinct characteristics so as to highlight multiple distinct profiles of teachers on the basis of their beliefs, non-academic competencies, behaviours and their students' perceptions of teaching.

Results

Teacher beliefs. Study 1 yielded a validated set of 31 teacher beliefs factors with sufficiently high reliability drawn from the 139 item teacher beliefs scale to accept these factors and their items as reliable for study 2, which had a comparatively lower number of participants. In order to determine whether these 31 factors could be reduced into a smaller set of overarching higher order beliefs, study one employed exploratory factor analysis and identified a six-factor higher order beliefs model. Study 2 sought to replicate this higher order beliefs model, and attempted to do so by using maximum likelihood confirmatory factor analysis (CFA) through SPSS (Statistical Package for the Social Sciences), using an oblique (Promax) rotation.

With the results from study two participants, the majority of the factors loaded similarly onto the six-factor higher order model identified in study one. However, not all factor loadings were sufficiently high to confirm the original model structure, nor were reliability estimates sufficiently high to have confidence in the structure. For that reason, exploratory factor analysis was used for total scores across the 31 factors in both study 1 and study 2 to determine whether a

higher order beliefs structure could be identified that fit the datasets from both studies. In both studies, a five factor higher order beliefs model provided reasonable fit for both data sets.

The revised five-factor model was created which fit both datasets with no differences in the original surface/fixed, personal responsibility and assessment higher order factors. A new factor, termed "social/deep" included all societal improvement and individualised factors from study 1, as well as all deep/relational and deep/teaching related factors. The higher order efficacy and intrinsic motivation factor remained the same across both studies, with the exception of one factor, teaching for deep learning, which was a stronger fit within the social/deep factor described in table 21. Table 4.3 highlights the differences between the higher order factor structure originally suggested by study 1 and the revised factor structure based on analysis of both studies. The revised factor loadings for study 1 based on the updated higher order structure is illustrated in table 4.4.

Table 4.3. Comparison of higher order factor structure between study 1 and study 2.

Original Higher Order Factor Study 1	Study 1 Higher Order Teacher Beliefs Factor Structure	Study 2 Revised Higher Order Teacher Beliefs Factor Structure
Societal improvement and individualisation	Beliefs focused on education for the purpose of improving society and/or addressing the needs and actualisation of individual students	New higher order factor "social/deep" which included all factors from study 1 as well as all deep/relational factors from study 1 as well as teaching for deep learning factor (originally part of higher order factor efficacy/intrinsic motivation.)
Surface/fixed	A set of beliefs that broadly combined fixed mindset characteristics with surface-type beliefs about both learning and teaching, as well as personal utility purposes for teaching	Overall factor structure was consistent between studies
Personal responsibility	Beliefs reflecting the teachers' sense that they are responsible for classroom management, teaching, relationships and achievement of their students	Overall factor structure was consistent between studies
Efficacy and intrinsic motivation	Beliefs related to teacher self-efficacy as well as motivations to teach based on perceived ability and intrinsic interest in teaching	One item removed (teaching for deep learning) and placed within higher order factor social/deep
Pro-assessment	Beliefs that endorsed the validity and benefit of assessment for improving teaching and learning and promoting accountability for students and schools.	Overall factor structure was consistent between studies

Table 4.4. Study 1 revised factor structure and loadings

	Social/Deep	Surface/Fixed	Responsibility	Pro-Assessment	Efficacy/Intrinsic Motivation
Curriculum-Social Reconstruct	**0.85**	0.06	0.01	-0.09	-0.32
Curriculum – Cross Curricular	**0.68**	0.00	-0.06	0.06	-0.04
Teach- Social Reform	**0.66**	0.01	-0.03	-0.06	0.03
Purpose – Social Utility Value	**0.65**	-0.01	-0.04	0.04	-0.02
Learning – Deep	**0.57**	-0.12	-0.02	0.06	0.14
Learning – Relational	**0.56**	-0.02	-0.01	-0.06	0.05
Curriculum - Individualization	**0.51**	-0.03	0.00	-0.06	0.04
Goal Orientation – Mastery Approach	**0.50**	0.12	0.08	0.04	0.17
Goal Orientation – Relational	**0.35**	0.12	0.20	-0.08	0.25
Innate Ability	-0.19	**0.64**	0.04	-0.07	0.17
Learning -_Surface	0.02	**0.56**	-0.05	0.29	-0.01
Goal Orientation-Ability Avoid	-0.03	**0.55**	0.12	-0.11	-0.17
Effort	0.08	**-0.54**	-0.01	0.14	0.06
Epistemology – Simple	-0.10	**0.52**	0.04	-0.02	0.06

Purpose - Personal Utility Value and Professional Status	0.10	**0.50**	-0.08	0.15	-0.01
Goal Orientation – Work Avoidance	0.12	**0.50**	-0.15	-0.25	0.01
Goal Orientation – Ability Approach	0.05	**0.49**	0.11	0.10	-0.01
Curriculum - Systematic Responsibility	0.20	**0.41**	0.04	0.31	0.05
Expectations(reverse coding)	0.34	**-0.35**	0.22	0.07	-0.08
Responsibility for Achievement	-0.07	-0.02	**0.95**	0.01	-0.08
Responsibility for Motivation	-0.02	0.09	**0.86**	-0.01	-0.03
Responsibility for Teaching	-0.02	0.01	**0.74**	0.06	-0.01
Responsibility for Relationships	0.15	0.01	**0.52**	-0.09	0.18
Assessment – Accountability for Students and Schools	0.04	0.23	-0.01	**0.76**	-0.05
Assessment – Demonstration of Learning	0.06	0.10	0.04	**0.70**	-0.04
Assessment – Improvement	0.01	-0.010	0.04	**0.65**	0.10
Assessment - Hindrance (reverse coded)	0.27	0.22	0.07	**-0.64**	0.05
Self-Efficacy-Classroom Management	-0.11	0.02	-0.01	-0.05	**0.83**

Teaching and Learning Self-Efficacy - Instruction	0.02	-0.01	0.08	0.05	**0.79**
Purpose – Intrinsic Motivation and Self-Efficacy	0.27	0.09	-0.15	0.01	**0.49**
Teaching – Deep	**0.33**	-0.06	-0.08	-0.03	0.33

Study 1 Higher Order Factor Correlation Matrix

	Social/Deep	Surface/Fixed	Responsibility	Pro-Assessment	Efficacy/Intrinsic Motivation
Social/Deep	1.00				
Surface/Fixed	-0.14	1.00			
Responsibility	0.43	-0.11	1.00		
Pro-Assessment	0.10	0.11	0.28	1.00	
Efficacy/Intrinsic Motivation	0.44	-0.15	0.32	0.18	1.00

The correlations between these factors show that each factor contributed sufficient unique variance, and certainly the correlations are not so high as to suggest redundancy. Estimates of reliability were sufficiently high to have confidence in the total scores within each of the five identified factors (social/deep alpha = .84, surface/fixed alpha = .72, responsibility alpha = .84, pro assessment alpha = .81, efficacy and intrinsic motivation alpha = .74). Table 4.5 illustrates the factor structure and loadings based on the revised model.

Table 4.5. Study 2 factor structure and loadings.

	Social/Deep	Responsibility	Surface/ Fixed	Efficacy/ Intrinsic Motivation	Pro-Assessment
Curriculum-Social Reconstruct	**0.95**	-0.03	0.04	-0.23	0.06
Curriculum – Individualization	**0.79**	-0.08	0.02	-0.13	-0.15
Teach- Social Reform	**0.67**	0.00	0.04	0.13	0.11
Curriculum – Cross Curricular	**0.65**	-0.03	0.09	-0.01	0.01
Learning – Deep	**0.53**	0.10	0.00	0.19	0.19
Goal Orientation - Relational	**0.52**	0.25	-0.09	-0.04	-0.15
Learning – Relational	**0.43**	0.15	-0.10	0.26	0.31
Purpose – Social Utility Value	**0.39**	-0.07	0.05	0.17	-0.10
Goal Orientation – Mastery Approach	**0.37**	0.15	-0.19	**0.39**	-0.14
Responsibility for Motivation	-0.04	**0.91**	0.12	-0.22	-0.01
Responsibility for Achievement	-0.04	**0.87**	0.01	-0.02	-0.18
Responsibility for Teaching	-0.08	**0.81**	-0.02	0.12	0.05
Responsibility Relationships	0.30	**0.72**	0.05	-0.18	0.02
Teaching – Deep	0.14	**0.35**	0.14	0.19	0.13
Learning -_Surface	0.03	0.05	**0.67**	0.25	0.10
Curriculum - Systematic	0.23	-0.15	**0.62**	0.23	-0.09

Goal Orientation – Ability Approach	0.22	0.09	**0.55**	-0.28	-0.16
Innate Ability	-0.17	-0.02	**0.46**	-0.10	0.03
Goal Orientation- Ability Avoid	-0.06	0.18	**0.41**	-0.33	0.17
Epistemology – Simple	-0.47	-0.01	**0.40**	0.10	0.12
Purpose - Personal Utility Value and Professional Status	0.27	-0.23	**0.38**	0.14	0.10
Effort	-0.19	-0.06	**0.35**	0.03	0.02
Expectations(reverse coding)	-0.05	0.54	**-0.34**	0.23	0.13
Goal Orientation – Work Avoidance	-0.08	0.05	**0.32**	-0.06	0.81
Self-Efficacy- Classroom Management	-0.06	-0.08	0.07	**0.86**	-0.03
Self-Efficacy - Instruction	-0.10	0.10	0.04	**0.79**	-0.12
Purpose – Intrinsic Motivation and Self-Efficacy	0.13	-0.16	0.23	**0.41**	-0.12
Assessment - Hindrance (reverse coded)	0.01	0.01	-0.09	-0.11	**0.73**
Assessment – Demonstration of Learning	-0.20	0.19	0.28	0.18	**-0.41**
Assessment – Improvement	0.10	0.16	0.25	0.16	**-0.28**
Assessment – Accountability for Students and Schools	-0.13	0.19	0.52	0.17	**-0.05**

Study 2 factor correlations.

	Social/Deep	Responsibility	Surface/Fixed	Efficacy/Intrinsic Motivation	Pro Assessment
Social/Deep	1.00				
Responsibility	0.46	1.00			
Surface/Fixed	-0.08	-0.09	1.00		
Efficacy/Intrinsic Motivation	0.30	0.16	0.17	1.00	
Pro Assessment	0.05	0.27	0.22	0.28	1.00

Estimates of reliability were sufficiently high to have confidence in the total scores within each of the five identified factors (social/deep alpha = .86, responsibility alpha = .73, efficacy and intrinsic motivation alpha = .72, pro-assessment alpha =.73). Caution is needed for surface/fixed as this estimate of reliability (alpha = .57) is below acceptable levels. However, the larger sample size and estimates of reliability for study 1 are sufficiently high across all five factors, providing additional empirical support for the factor structure fit to the two separate studies.

Teach For Australia non-academic capabilities. A maximum likelihood exploratory factor analysis (EFA) with correlated rotation (Promax) was used to identify the factors underlying the eight capabilities used as part of the selection criteria for TFA. One of the eight competencies, problem solving, did not produce a factor loading to fit appropriately into a factor with other competencies. Factor analysis with the seven remaining competency areas produced two factors, which explained 42% of the total variance and could be interpreted. The correlation between the two factors was .25 again, showing that each factor provided sufficient unique variance to be considered similarly important. Table 4.6 illustrates the factor loadings for the

two higher order factors. The two higher order factors, personality and persistence, were significantly and positively correlated at r = .25.

Table 4.6. Factor structure and loadings for higher order TFA selection competencies.

	Personality	Persistence
Interaction	**0.83**	-0.07
Personal Organisation	**0.62**	0.17
Leadership	**0.48**	0.14
Learning and Self-Evaluation	**0.45**	-0.12
Humility, Respect and Empathy	**0.40**	0.06
Resilience	-0.07	**1.01**
Commitment to Mission	0.13	**0.32**

While personal organisation, interaction, leadership, and learning and self-evaluation loaded into a single factor, estimates of reliability were not sufficiently high to have confidence in the total scores within the two identified factors (personality alpha = .68, persistence alpha = .51.) Because of their low reliability, it was deemed best to not attempt to incorporate these measures into the structural equation model.

Tripod student perception surveys. Confirmatory factor analysis of *each* of the seven Cs of teaching demonstrated acceptable loadings of each factor with the items that had been pre-determined to fit and high estimates of reliability. However, as table 4.7 illustrates, the correlations between each of the seven C factors was alarmingly high (aside from the control

factor), suggesting that the factors may not actually indicate distinct facets of teaching as perceived by students. All correlations were significant at the p<.01 level.

Table 4.7. Correlations between the Seven Cs of Tripod surveys.

	Challenge	Consolidate	Clarify	Confer	Care	Captivate	Control
Challenge	1.0	92	..90	.90	.84	.86	.65
Consolidate	.92	1.0	.90	.89	.90	.85	.61
Clarify	.90	.90	1.0	.89	.84	.90	.63
Confer	.90	.89	.89	1.0	.87	.88	.66
Care	.84	.90	.84	.87	1.0	.83	.52
Captivate	.86	.85	.90	.88	.83	1.0	.65
Control	.65	.61	.63	.66	.52	.65	1.0

Consequently, maximum likelihood exploratory factor analysis of the 35 item survey was used to determine whether the seven factor model could be replicated as distinct elements of student perceived quality teaching behaviours. The analysis suggested that there were only two distinct facets of teaching captured by the survey, highlighted in table 4.8. The correlation between the two factors was r = .60., indicating that the two factors are strongly related but also sufficiently distinct. The two-factor model produced a strong fit with estimates of reliability that were sufficiently high to have confidence in the total scores within each of the two identified factors (general instructional practices alpha = .97, classroom management alpha = .82.)

Table 4.8. Revised Tripod survey factor structure and loadings

	Original Tripod Survey Classification	General instructional practices factor	Classroom Management factor
My teacher really tries to understand how students feel about things.	Care	**0.85**	-0.03
My teacher explains difficult things clearly.	Clarify	**0.83**	-0.00
My teacher checks to make sure we understand when s/he is talking.	Consolidate	**0.83**	-0.03
My teacher gives us time to explain our ideas.	Confer	**0.82**	-0.02
My teacher has several good ways to explain each topic that we cover in this class.	Clarify	**0.81**	-0.01
If I don't understand something, my teacher explains it another way.	Clarify	**0.80**	0.01
My teacher respects my ideas and suggestions.	Confer	**0.80**	0.01
In this class, we learn to correct our mistakes.	Consolidate	**0.79**	0.02
My teacher makes lessons interesting.	Captivate	**0.79**	0.00
My teacher knows when the class understands, and when we do not.	Clarify	**0.79**	-0.06
My teacher doesn't let people give up when the work gets hard.	Challenge	**0.78**	-0.00
I like the ways we learn in this class.	Captivate	**0.78**	0.00
My teacher makes learning enjoyable.	Captivate	**0.77**	0.05
In this class, we learn a lot almost every day.	Challenge	**0.77**	0.03
My teacher in this class makes me feel that s/he really cares about me.	Care	**0.77**	0.02
My teacher wants me to explain my answers – why I think what I think.	Challenge	**0.76**	-0.02
We get helpful comments to let us know what we did wrong on assignments.	Consolidate	**0.73**	0.04

My teacher asks questions to be sure we are following along when s/he is teaching.	Challenge	**0.73**	-0.02
The comments that I get on my work in this class help me understand how to improve.	Consolidate	**0.71**	0.04
My teacher seems to know if something is bothering me.	Care	**0.71**	-0.10
In this class, my teacher accepts nothing less than our full effort.	Challenge	**0.70**	-0.03
My teacher asks students to explain more about the answers they give.	Challenge	**0.70**	-0.06
My teacher takes the time to summarize what we learn each day.	Consolidate	**0.68**	-0.04
My teacher wants us to share our thoughts.	Confer	**0.66**	0.04
Students speak up and share their ideas about class work.	Confer	**0.60**	0.08
Students get to decide how activities are done in this class.	Confer	**0.47**	0.07
This class does not keep my attention – I get bored.	Captivate	**-0.28**	-0.27
Student behaviour in this class is a problem.	Control	0.22	**-0.87**
I hate the way that students behave in class.	Control	0.24	**-0.77**
Student behaviour in this class makes the teacher angry.	Control	0.09	**-0.71**
My classmates behave the way my teacher wants them to.	Control	0.28	**0.52**
Student behaviour in this class is under control.	Control	0.24	**0.45**
Students in this class treat the teacher with respect.	Control	0.33	**0.45**
Our class stays busy and doesn't waste time.	Control	0.35	**0.42**
When s/he is teaching us, my teacher thinks we understand when we don't.	Clarify	-0.07	**-0.41**

***Visible Classroom*.** Based on the frequency counts from each recorded Visible Classroom lesson, an overall average was calculated for each of the sixteen coded teaching practices. An exploratory factor analysis was conducted to determine the higher order structure of these practices. A two factor model, illustrated in table 4.9, was identified that excluded two of the original sixteen teaching practices (goals/success criteria and connections) because neither scale contributed to either factor. The correlation between the two factors was r = .27.

The first factor described teaching practices related to explicit instructional techniques, while the second factor described teaching practices related to providing both instructional and behavioural directions and corrections to students. Estimates of reliability were sufficiently high to support these two factors (explicit instruction alpha = .71, directions and corrections alpha =.69).

Table 4.9. Factor structure and loadings of Visible Classroom practices.

Practice	Overview of practice	Explicit Instruction	Directions and Corrections
Repeats Comment	Repeats comment or question from student before answering in order to encourage and reinforce correct answers.	**0.99**	-0.11
Convergent Questioning	Checks fact recall by asking closed questions (characterised by YES/NO questions/ quizzes), or questions which have one correct answer or a designated set of possible answers.	**0.68**	0.12
Prompting	Teacher uses prompting or probing (a question or statement used to elicit an appropriate student response).	**0.62**	0.04
Positive Environment	Creates a classroom environment in which students have an opportunity to freely/spontaneously ask/provide task related questions/feedback that is content specific.	**0.51**	0.12
Deepen Understanding	Provides student with opportunity to deepen understanding and make connections between ideas and build on prior knowledge through sustained context-specific dialogue and open-ended or divergent questions, to which there is no one correct answer.	**0.50**	-0.13
Introduces Explains	Introduces and explains new/complicated vocabulary/ terminology, simplifies concepts by breaking into different levels or elaborates on abstract concepts using concrete, developmentally appropriate and high quality examples.	**0.33**	-0.06
Important Information	Emphasises important points.	**0.27**	-0.20
Summarise	Concludes the lesson by recapitulating/summarising key points, AND provides opportunity for follow up/future engagement.	**0.21**	-0.30
Review	Reviews previously learned concepts at the beginning of and/or throughout the lesson, or builds upon prior/assumed knowledge.	**0.13**	0.06

Instructions	Provides step by step instructions on completing tasks/activities.	-0.03	**0.88**
Behaviour	Sets clear behaviour expectations and prompts behaviour reminders during the lesson.	0.16	**0.65**
Resources	Reviews previously learned concepts at the beginning of and/or throughout the lesson, or builds upon prior/assumed knowledge	-0.15	**0.64**
Scaffolded activities and collaboration	Provides opportunities for collaborative, scaffolded activities with their peers in order to actively engage in learning	0.07	**0.58**
Feedback	Teacher provides immediate, specific and corrective feedback to individual students/student group.	0.23	**0.28**

Exploring the relationships between factors of teacher quality

This section explores the results of analysis examining the relationships amongst the various teacher quality factors from the study. It begins with the initial attempts to identify correlations between teacher inputs (beliefs and non-academic competencies) and measures of quality teaching, both at the lower order or scale level of teacher beliefs and non-academic competencies, and then utilising the higher order factors identified in the prior section of this dissertation. Then, this section will describe the creation of a structural equation model to describe the relationships between higher order factors of teacher quality.

Correlations between individual beliefs and competencies with measures of quality teaching. Initially, bivariate correlation analysis was conducted to determine whether teacher inputs (beliefs and non-academic competencies) directly related to the two primary measures of quality teaching examined in this study: frequency of quality teaching practice measured by Visible Classroom and student perceptions of teaching measured by the Tripod survey. There was limited evidence that individual teacher beliefs and particular non-academic competencies strongly related to measures of quality teaching. Of the 32 beliefs scales examined in this study, only one belief scale significantly correlated with stronger student perceptions of general instructional effectiveness (mastery goal orientation, $r = .28$), and none of the beliefs scales correlated with stronger perceptions of effective classroom management. Additionally, there were no correlations between non-academic competencies and students' perceptions of teaching. The only teacher beliefs scale of the 32 examined in this study that correlated with student perceptions of general instructional effectiveness was personal utility and professional status as purposes for teaching, which significantly correlated (negatively) with the more frequent use of explicit instructional practices as measured by Visible Classroom ($r = -.26$). Notably, there were

three teacher beliefs scales that significantly correlated with the use of directing and correcting teaching practices measured by Visible Classroom, all of which correlated negatively with the practices (self-efficacy for general instruction r = -.33, ability approach goal orientation r = -.29, innate ability beliefs r = -.31).

Higher Order Factor Correlations. From the above analysis it was possible to identify and defend 9 higher order factors. There were five teacher belief factors (Social/deep, responsibility, surface/fixed, efficacy/intrinsic motivation, and pro-assessment), two Tripod Student perception factors (General instructional practices, Classroom Management), and two Classroom Practice factors drawn from Visible Classroom (Explicit instruction and Directions and corrections). The correlations between these higher order factors are presented in Table 28. The correlations are not so high as so suggest redundancy in these factors.

Table 4.10. Higher order factor correlations.

	Self-Efficacy and Intrinsic Motivation Beliefs	Social/Deep Beliefs	Surface/Fixed Beliefs	Pro-Assessment Beliefs	Responsibility Beliefs	Visible Classroom Directions and Corrections	Visible Classroom Explicit Instructional Practices	Tripod Student Survey – General Instructional Practices	Tripod Student Survey – Class Control
Self-Efficacy and Intrinsic Motivation Beliefs	1	.30*	0.17	.28*	0.16	-.28*	0.00	0.19	0.14
Social/Deep Beliefs	.30*	1	-0.08	0.05	.46**	-0.04	-0.07	0.22	0.11
Surface/Fixed Beliefs	0.17	-0.07	1	0.22	-0.09	-.28*	-.28*	-0.03	-0.07
Pro-Assessment Beliefs	.28*	0.05	0.22	1	.27*	-0.05	-0.03	0.16	-0.02
Responsibility Beliefs	0.16	.46**	-0.09	.27*	1	-0.05	0.01	0.02	-0.08
Visible Classroom Directions and Corrections	-.28*	-0.04	-.28*	-0.05	-0.05	1	.27*	-0.22	-.49**
Visible Classroom	0.00	-0.07	-.28*	-0.03	0.01	.27*	1	0.11	0.18

	Self-Efficacy and Intrinsic Motivation Beliefs	Social/Deep Beliefs	Surface/Fixed Beliefs	Pro-Assessment Beliefs	Responsibility Beliefs	Visible Classroom Directions and Corrections	Visible Classroom Explicit Instructional Practices	Tripod Student Survey – General Instructional Practices	Tripod Student Survey – Class Control
Explicit Instructional Practices									
Tripod Student Survey – General Instructional Practices	0.19	0.22	-0.03	0.16	0.02	-0.22	0.11	1	.60**
Tripod Student Survey – Class Control	0.14	-0.11	-0.07	-0.02	-0.08	-.49**	0.18	.60**	1

*significant at p<.05 level

**significant at p<.01 level

***A Structural Equation Model of Teacher Quality Factors*.** Structural equation modelling (SEM) was utilised to measure the fit of pre-specified directional relationships between these higher order factors. The initial structural equation model hypothesised that non-academic competencies measured through Teach For Australia's selection process were antecedents to beliefs that, in turn were antecedents to behaviours as measured by Visible Classroom practices, and that these in turn would influence student perceptions of teaching. The hypothesis was that candidates' non-academic attributes on admission to the program would predict beliefs that would influence their practices, and as a consequence their students' experience of these teachers and their perceptions of teaching quality. From the fit to this first model, it became clear that the non-academic capabilities contributed very little to no influence on any of the other higher order factors. Coupled with the low reliability estimates that occurred in attempting to distil higher order competency factors, this aspect of teacher quality was omitted from the structural equation model.

A revised structural equation model was tested with the omission of non-academic competencies. Figure 9 provides the standardized loading from this SEM model, and table 4.9 provides the fit statistics for the model. There were several non-significant interactions between higher order factors in the SEM. The higher order beliefs factors that contributed most to frequency of teaching practices measured by Visible Classroom were the surface/fixed, pro-assessment and efficacy/intrinsic motivational factors. Within the higher order Visible Classroom measured explicit instructional practices factor, there were several practices with notably low regression weights, suggesting they may not contribute as significantly to the factor as the majority of the other practices with regression weights in excess of .3 (important information, summarising, and reviewing.) The revised model suggested that of the original

practices measured from Visible Classroom, seven in particular related together most into the explicit instructional factors. These practices emphasised broader skills such as questioning and discussion (represented through convergent and divergent questioning, prompting, and repeating key comments) and instructional delivery (introducing and explaining content and strategies, highlighting important information, etc.) The five practices nested within the higher order Visible Classroom measured directing and correcting factor all had regression weights that suggested a good fit for the factor.

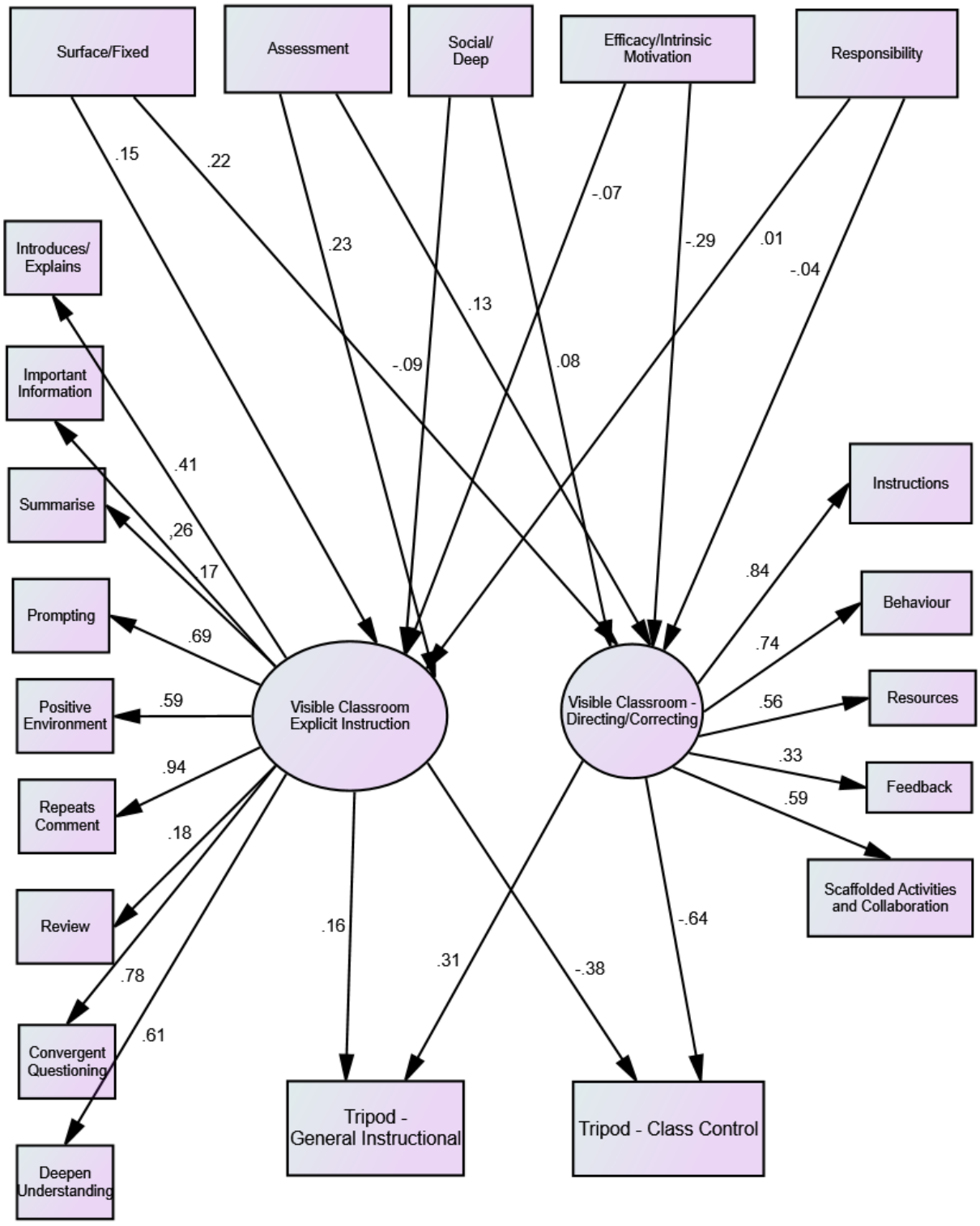

Figure 4.1. Structural equation model of teacher beliefs, teacher practices, and student perceptions of teaching.

Table 4.11. Fit statistics for Preliminary SEM

Chi Square	Df	P	RMSEA
395.36	**184**	**<.001**	.13

In an attempt to improve the SEM, all non-significant paths were omitted and the structural model rerun. Figure 10 illustrates the revised SEM. The estimates and fit statistics (captured in table 4.12) are a significant improvement over the full model. The revised model suggests that pro-assessment beliefs positively correlate (although not within the .05 significance threshold) with the more frequent use of explicit instructional practices. Surface/fixed beliefs appear to negatively influence the use of both explicit instructional practices and directing and correcting practices, while higher levels of efficacy and intrinsic motivation to teach negatively contribute to the use of directing and correcting strategies (although not within the .05 significance threshold. Notably, in the model, the more frequent use of explicit instructional strategies predicted higher ratings of student perception of teaching in terms of general instructional practices and classroom management, while the more frequent use of directing and correcting strategies predicted lower perceptions of general instructional capability and classroom control. Nearly all paths in the revised SEM were significant.

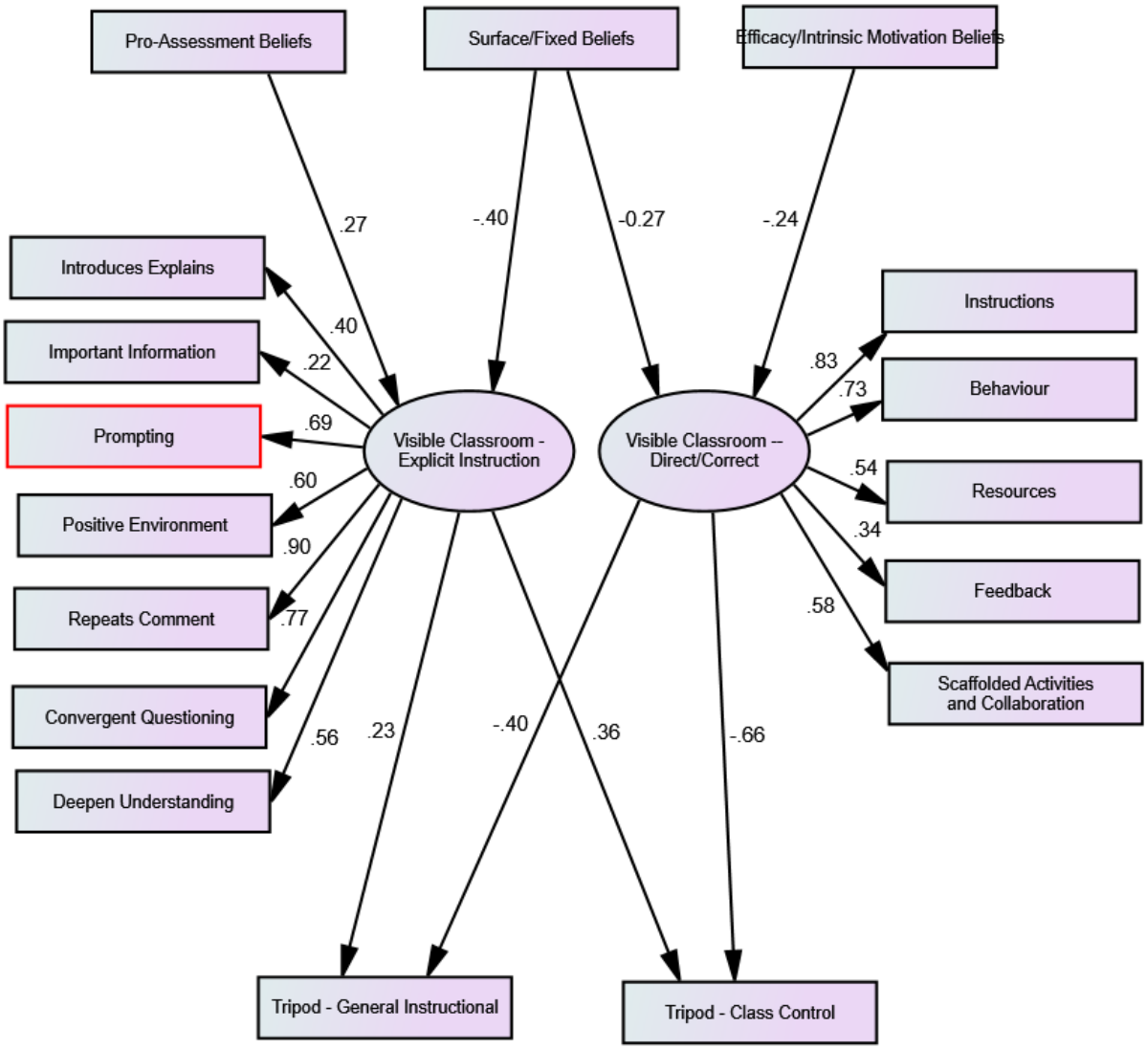

Figure 4.2. Revised structural equation model of teacher beliefs, practices and student perceptions of teaching.

Table 4.12. Fit statistics for revised SEM.

Chi Square	Df	P	RMSEA
228.00	**117**	**<.001**	.12

The model in figure 10 provides statistically a better fit than the model in figure 9, as illustrated by the difference in chi square test (Δ chi square = 167.36, df = 67, $p < .001$.) It should be noted that the RMSEA falls outside of the .08 threshold suggested for an acceptable fit(MacCallum, Browne, & Sugawara, 1996). The relatively low sample size for this model (n = 68) is an important factor affecting the model fit, and for this reason the results should be interpreted with some degree of caution. Further testing with larger participant sizes would provide greater confidence in the results.

Hierarchical Cluster Analysis. Hierarchical cluster analysis was utilised to determine whether there were particular groups of teachers whose qualities demonstrably set them apart from other groups of teachers. A k-means cluster hierarchical analysis using Ward's method was used. This method minimizes the distance between subjects within the cluster (it reduces the variance within the group) and avoids "long chaining" (Aldenderfer & Blashfield, 1984). The Euclidean distance was used as a similarity measure across the five higher order teacher beliefs factors, the two higher order Visible Classroom teaching factors, and the two higher order student perceptions of teaching factors. The dendrogram suggested five clusters as the most convenient. The major dimensions that discriminated amongst the five clusters were frequency of use of explicit instructional practice and directing and correcting practices, as well as the ratio between the two types of practices. While teachers' beliefs were distinct across factors, the most

significant dimension of difference appeared to be endorsement of pro-assessment beliefs. Table 32 provides a set of descriptive statistics for each of the five clusters for each of the higher order factors that were ultimately included in the structural equation model, including mean and standard deviation. An effect size for each cluster's results against each of the higher order factors is also included, expressed as Cohen's D. The Cohen's D statistic provides an indication for each cluster regarding how small or large their results were as compared to the overall study population of all five clusters. This provided further insight regarding the ways in which particular clusters stood apart from each other, and the magnitude of those differences.

In the first group, students typically found teachers to be less effective than teachers in other clusters, particularly in terms of their general instructional capability. Yet, these teachers, compared to the average across clusters, much more frequently utilised both explicit instructional practices as well as directing and correcting strategies than the average across clusters. They maintained a relatively balanced ratio between the two types of practices, suggesting that a balanced ratio leads to average or weaker perceptions of teaching. The results of the fifth cluster further illustrate this.

The second group stood apart most from the other clusters in their comparatively lower endorsement of all higher order beliefs outside of surface fixed. They were comparatively higher than the average in this belief alone. They were average in terms of their directing and correcting and above average in their use of explicit instructional practices though, and were slightly above average in terms of students perceptions of their quality of general instructional practice and well above average in terms of students' perceptions of their classroom control.

The third group was unique in that, unlike the other clusters, they received above average feedback from student perception surveys on their general instructional practice and below

average feedback on their class control. What distinguished them in terms of their teaching practice was that they were below average in their use of both types of Visible Classroom practices. The teachers in this group were the most passive, which potentially mediated slightly lower perceptions of effective classroom control.

The fourth group was relatively average in terms of students' perceptions of their effectiveness. However, they had below average frequency of both explicit instructional and directing and correcting practices. This cluster was also average in terms of their beliefs. The difference, expressed as Cohen's d between their use of explicit instructional practices and directing and connecting was d = -.36, indicating that this group far less frequently utilised directing and correcting practices in proportion to their use of explicit instructional practices. The lower ratio of directing and correcting practices compared to explicit instructional practices may have contributed to higher perceptions of quality from students, given the previous analysis on the potentially adverse effect that directing and correcting practices (when all else is equal) appeared to have on students' perceptions of quality.

The fifth group was not particularly distinct from others in terms of their social/deep beliefs or sense of responsibility compared to the broader sample of teachers, but were well above average in their endorsement of pro-assessment beliefs and their rejection of surface fixed beliefs. However, they stood out in particular with regards to their feedback from students on both general instructional practice and classroom control, as well as their frequency of use of both types of Visible Classroom practices, all of which were the highest averages across all five clusters. which was the highest across all clusters for both Visible Classroom factors, as well as their use of

Cluster analysis provided a helpful complement to the structural equation model. Cluster analysis confirmed that pro-assessment beliefs tended to predict greater frequency of use of Visible Classroom measured practices, but also suggested that, contrary to the structural equation model, more frequent use of explicit instructional practices and directing and correcting techniques did not necessarily lead to poorer student perceptions of teachings. The contrary findings of the hierarchical cluster model indicated that the ratio of explicit instructional practices to directing and correcting practices may be important in shaping students' perceptions of teaching. The fifth group not only had the most frequent use of both types of practices, but perhaps more importantly, they used explicit instructional techniques 2.31 times more frequently than directing and correcting practices. Notably, the second group had the second highest average ratings from their students, and the second highest ratio of explicit instructional practices to directing and correcting practices (1.88:1). An additional observation for these two clusters was that they held comparatively the highest pro-assessment beliefs across the five clusters.

Table 4.13. Higher order factor descriptive statistics for five clusters, including effect size

Group 1

Factors	Cluster Mean	N	SD	D
Efficacy/Intrinsic Motivation	4.7	9	0.57	0.31
Social/Deep	5.1	9	0.6	0.13
Surface/Fixed	2.03	9	0.3	-0.56
Pro Assessment	4.16	9	0.54	0.21
Responsibility	4.76	9	0.71	0.33
Tripod-General Instructional	3.71	9	0.43	-0.25
Tripod - Class Control	3.38	9	0.44	-0.07
Visible Classroom – Explicit Instruction	10.1	9	0.71	0.60
Visible Classroom – Directing and Correcting	6.09	9	2.16	0.44

Group 2

Factors	Cluster Mean	N	SD	D
Efficacy/Intrinsic Motivation	4.29	12	0.57	-0.36
Social/Deep	4.65	12	0.53	-0.76
Surface/Fixed	2.35	12	0.33	0.34
Pro Assessment	3.70	12	0.54	-0.60
Responsibility	4.17	12	0.76	-0.42
Tripod-General Instructional	3.86	12	0.33	0.10
Tripod - Class Control	3.56	12	0.50	0.33
Visible Classroom - Explicit Instruction	9.43	12	0.92	0.35
Visible Classroom - Directing and Correcting	5.18	12	1.64	-0.05

Group 3

Factors	Cluster Mean	N	SD	D
Efficacy/Intrinsic Motivation	4.71	13	0.60	0.32
Social/Deep	5.15	13	0.33	0.24
Surface/Fixed	2.3	13	0.30	0.21
Pro Assessment	4.28	13	0.51	0.40
Responsibility	4.55	13	0.65	0.06

Tripod-General Instructional	3.89	13	0.40	0.17
Tripod - Class Control	3.30	13	0.56	-0.23
Visible Classroom - Explicit Instruction	5.04	13	0.36	-1.29
Visible Classroom - Directing and Correcting	4.88	13	1.49	-0.22

Group 4

Factors	Cluster Mean	N	SD	D
Efficacy/Intrinsic Motivation	4.35	17	0.67	-0.26
Social/Deep	5.20	17	0.47	0.34
Surface/Fixed	2.25	17	0.37	0.06
Pro Assessment	3.95	17	0.67	-0.16
Responsibility	4.53	17	0.91	0.04
Tripod-General Instructional	3.72	17	0.46	-0.24
Tripod - Class Control	3.37	17	0.36	-0.10
Visible Classroom - Explicit Instruction	7.25	17	1.50	-0.46
Visible Classroom - Directing and Correcting	4.86	17	1.73	-0.23

Group 5

Factors	Cluster Mean	N	SD	D
Efficacy/Intrinsic Motivation	4.66	7	0.51	0.25
Social/Deep	4.99	7	0.36	-0.10
Surface/Fixed	2.08	7	0.54	-0.38
Pro Assessment	4.29	7	0.43	0.42
Responsibility	4.57	7	0.92	0.09
Tripod-General Instructional	3.99	7	0.36	0.45
Tripod - Class Control	3.50	7	0.46	0.19
Visible Classroom - Explicit Instruction	14.08	7	0.96	2.00
Visible Classroom - Directing and Correcting	6.10	7	2.34	0.44

Discussion: Implications, Limitations and Future Research

The results suggest that teachers' beliefs play an important role in shaping teachers use of a variety of effective teaching practices and that teachers' particular use of these practices in turn effects their students' perceptions of teacher quality. The results point in particular to the importance of three higher order beliefs, comprised of multiple types of teacher beliefs structures or systems, which were identified as higher order factors of teacher beliefs. These are pro-assessment, surface/fixed, and self-efficacy/intrinsic motivation beliefs. The study failed to support the argument that personality traits and general competencies such as organisation, resilience, and interpersonal skills, are important and valid factors in teacher quality. The results illustrated some incongruences between theoretically related aspects of teacher quality, suggesting that some teacher quality factors should be viewed as compatible. Yet, the lack of compatibility between certain factors may be an indication of competing implicit conceptualisations of teacher quality. While the measures in this study were able to draw out a potential profile of quality teaching, the profile did so at the exclusion of numerous aspects of quality that could not be identified as key factors of teacher quality based on the results of this research. This section will explore each of these key results in turn, discussing their implications, as well as limitations and opportunities for further research.

That there was a stronger correlation between beliefs and practices than between beliefs and student perceptions of teacher quality should be expected, given the greater proximity between teacher beliefs and behaviours. This does not diminish the importance of teachers' beliefs but highlights the need for more sophisticated models of teacher quality as a complex, multi-stage process through which teachers' beliefs may play an important role in shaping particular student outcomes. Studies examining teachers' beliefs in relation to more distal

measures, such as student outcomes, may have failed to identify important beliefs factors by ignoring the connection between beliefs and particular practices, which in turn mediate student outcomes. The same implication applies to teacher beliefs research that focuses on the connection between beliefs and behaviours, without further examining how those behaviours ultimately lead (or do not lead) to improved student outcomes. That said, this research did not examine other potential aspects of the process and multiple dimensions of teacher quality, including additional mediating factors that could illuminate a more complete picture of how teacher qualities eventuate in teaching quality and then in teaching effectiveness. However, its results suggest that conceptualisations of teacher quality, as well as future studies, will benefit from examining teacher quality as a multi-step process or model, where beliefs, behaviours, and outcomes all feature prominently. Although student perception surveys provided a type of outcome measure for this study, and one that was empirically linked to both improved academic achievement as well as non-cognitive gains (Ferguson et al., 2015), further research of this nature would greatly benefit from the inclusion of learning gains measures or other non-cognitive student outcomes measures to strengthen understanding of what particular teacher characteristics and practices function most critically together to produce quality teaching outcomes for students. This was a significant limitation in the study, and remains one particularly concerning for Australian educational research.

As previously noted, there were particular types of beliefs that better predicted the frequency of quality teaching practices as measured by Visible Classroom. Self-efficacy and intrinsic motivation, pro-assessment beliefs, and surface/fixed beliefs all predicted to some extent how frequently teachers utilised general instructional practices as well as particular directing and correcting techniques. Self-efficacy is a well-established and researched teacher

belief, and as the literature review indicated, has been linked across numerous studies to measures of teacher quality, including improved student outcomes. While this study could not definitively claim that self-efficacy predicted quality teaching, it nevertheless highlighted the importance of self-efficacy in predicting teacher quality, albeit in a complex manner. Self-efficacy was not a clear and unambiguous indicator of more frequent use of quality teaching practices measured by Visible Classroom or higher student perceptions of teacher quality. Higher self-efficacy did not appear to predict more frequent use of the general instructional practices measured by Visible Classroom, but did predict less frequent use of directing and correcting techniques. The latter is logical, as it would be reasonable to expect that teachers more confident in their abilities, would need to engage less frequently in practices aimed to triage or correct issues with engagement directions. This hypothesis would explain why teachers who used directing and correcting practices more frequently ended up with lower student perceptions of class control. The hierarchical cluster modelling conducted in this study may also shed some light on how and why self-efficacy does not always translate to better teaching. Of the five groups, only one group performed well above average in both factors from the student perception survey as well as in their frequency of Visible Classroom practices. This group did not have the highest self-efficacy, but were above average, and were also the only group that had well above average pro-assessment beliefs complementing their above average self-efficacy. This raises the possibility that beliefs such as self-efficacy and pro-assessment work in tandem to drive teachers towards behaviours and outcomes with students that lead to higher quality teaching. While the construct of assessment beliefs is relatively newer and less researched than some of the other types of beliefs examined in this study, it appears to be a promising new addition to both teacher beliefs research and research on the factors that matter when considering

teacher quality. It could be speculated that teachers who more strongly endorse pro-assessment beliefs are focused on evidence of learning and impact, and this in turn may steer them towards using a variety of high leverage practices that have the largest positive influence on student learning gains (Hattie & Zierer, 2017).

The discovery of a surface/fixed factor in study 1 was novel in that it appeared to cluster together a diverse range of beliefs whose primary connection was that the research suggested they were not conducive to quality teaching or learning. Study 2 tested the hypothesis that the higher order factor was a negative or undesirable belief, and the structural equation model confirmed this hypothesis. Surface/fixed beliefs predicted lower levels of both explicit instructional practices captured by Visible Classroom as well as less frequent use of directing and correcting practices, suggesting that these beliefs led to a more passive and less active approach to teaching. While the negative relationship between surface/fixed beliefs and explicit instructional practices appeared to put these teachers on a path to lower perceptions of effectiveness across both higher order student perception factors, the results are less clear regarding how surface/fixed beliefs affected the use of directing and correcting techniques, which were lowered, and in turn affected students' perceptions (noting that lower directing and connecting predicted higher quality student perceptions.) The hierarchical cluster modelling provided some helpful insights in this regard, as teachers who were more passive and/or had lower ratios of explicit instructional practices to directing and connecting ended up with below average student perceptions of teaching.

There were equally a number of beliefs, organised into two of the five higher order factors in this study, that were not strong markers of quality teaching. Teacher responsibility, for their teaching, their relationships with students, and for student achievement, was not a strong

marker of quality as measured by Visible Classroom or the Tripod student survey. Teacher Responsibility is not an entirely new construct, but has been far less studied than many of the other types of beliefs that were examined in this study. Given its historical overlap with self-efficacy research, alongside more recent efforts to establish it as a distinct type of teacher belief, it may be the case that the construct itself, as well as its measures, require further refinement. This was, to my knowledge, the first attempt to apply Lauermann's model and measure to the study of teacher quality, so although the results do not provide evidence to support their importance as a determinant of teacher quality, more research will need to be undertaken to definitively rule this belief in or out as a quality teacher belief. It was similarly notable that the social/deep factor was not a strong predictor or quality teaching practice or positive student perceptions of teaching. Many expected congruencies between beliefs and behaviours would have produced stronger correlations between social/deep beliefs and teaching practices, yet, even when each individual type of belief was examined, there were virtually no correlations with measures of quality teaching. One notable exception was mastery goal orientation, which did not predict any higher frequency use of Visible Classroom practices, but did significantly correlate to higher student perceptions of quality (r = .28.) The other was a combination of social/deep teacher beliefs that correlated with lower frequency of feedback during instruction (individualisation conception of curriculum r = .-34, learning as relational r = -.34, relational goal orientation = -.40.) It is possible that teachers more strongly oriented towards positive relationships with their students and individualising their teaching are less likely to provide feedback, potentially from fear that feedback may diminish said relationship or cause students' undue harm (in the case of negative or critical feedback.) Yet, aside from this specific instance, there were few other correlates found between the higher order factor and its specific beliefs

scales, and the measures of teacher quality. There was no significant correlation between conceptions of learning or teaching as deep and the use of questioning to deepen understanding, nor was there any significant correlation between relational goals or views of curriculum as individualising and interactions that promoted a positive classroom environment, and no significant correlations, for example. While the research suggested that some beliefs appeared to predict and/or potentially lead to particular teacher quality outcomes, the study could not support the popular view that largely prevails in definitions of teacher beliefs that they are reliably congruent with teachers' practices.

The non-academic competencies, measured through Teach For Australia selection, had a low predictive value for practices (as measured by Visible Classroom), students' perceptions of teaching (as measured by the Tripod survey) and all higher order beliefs factors besides assessment beliefs. One possible explanation for this is the distance between when this measure was taken (which for more experienced participants could have been more than five years) and when all other measures were taken. It is reasonable to assume that the effect of this characteristics would be more visible for more recent recruits. However, no significant interactions were observed between selection scores and classroom practices or student perceptions of teaching. This finding is consistent with the broader body of research on teacher quality which indicates that personal characteristics offer little to no predictive value to more proximal measures of teacher quality (such as student learning gains). While these findings do not support a strong case for the particular characteristics as indicators of teacher quality, it also does not rule these out. One important finding these study supports is that the interaction between factors that ultimately result in "better" teaching is complex, not likely linear, and also laden with possible interactions that the study did not attempt to measure. Other studies have

indicated that many of the characteristics Teach For Australia utilises in its selection model, including motivation to teach, communication skills, openness to learning, resilience, conscientiousness and organisational and planning skills, have been supported as important capabilities for teachers entering into the profession (Barber & Mourshed, 2007; Bastian, 2013; Rockoff, Jacob, Kane, & Staiger, 2011; Watt et al., 2012). As such, it is possible that certain characteristics should be featured in more complex models of teacher quality, and therefore more attention needs to be paid to how these characteristics interact with other latent factors to promote more effective teaching and learning. The fact that these characteristics are less proximal to actual teaching and learning outcomes (and therefore less easily detectible) should not lead to the assumption that they are not important to teacher quality.

An assumption going into this study was that quality teaching could be presented as a singular overall construct with a number of constituents that were related and integrated into a more coherent whole, highlighting the multidimensional nature of teacher quality. Instead, this study found a mixture of positive, negative and non-existent correlations amongst theoretically related factors, suggesting that various measures of teacher quality may not only indicate unique dimensions of teacher quality, but they may in fact indicate contradictory conceptions of teacher quality. For example, while two higher order factors of effective classroom practices were identified, explicit instruction and directions and corrections, the more frequent use of directions and corrections significantly predicted lower quality of student feedback on both tripod factors. Thus, teachers who performed higher in a particular measure of quality were in turn more likely to perform worse in another. The same issue was observed between certain teacher beliefs, practices, and student perceptions of quality teaching. For example, teachers who more strongly endorsed surface/fixed beliefs were less likely to use explicit instructional techniques and more

likely to use directing and correcting techniques. When all techniques are assumed to be markers of quality teaching, it creates a confusing picture of teacher quality when the same belief predicts less frequent use of some practices and more frequent use of others. The findings could indicate that more theoretically desirable teaching beliefs (based on supporting empirical evidence) may be oppositional to desirable teaching practices, or potentially incongruent. Further research exploring this discrepancy would be highly beneficial.

The results of the study contribute to a broader debate within teacher beliefs research related to the congruence between beliefs and practices. Several beliefs examined in this study had theoretical near equivalents measured by Visible Classroom. For example, deep learning beliefs could be seen as theoretically congruous with deepen understanding practices or relational goal orientation or relational learning beliefs could be seen as congruous with positive environment practices. Yet, the relative lack of congruence between particular beliefs and behaviours highlights the complex and often unidentified factors that mediate and moderate the relationship between beliefs and practices. The need for sensitivity to context is therefore an important consideration in utilising a composite approach such as the one tested in this study.

For pg. 222, an additional paragraph will be added to the bottom of the page, stating the following:

Another context-sensitive feature meriting further exploration is whether or not the results of study 2 would be consistent in a study focusing on primary school teachers. Study 1 illustrated numerous differences in the beliefs of primary and secondary teachers (much greater than the differences in beliefs between high school teachers across disciplines). As study 2 was conducted exclusively on secondary teachers, it would be problematic to assume that its findings would replicate in primary classrooms without further research testing whether or not the

variation indicated in study 1 applies further to the relationship between primary teachers' beliefs, behaviours and impact.

The relationship between particular "quality" teaching practices and students' perceptions of teacher quality was a key finding in this study. In essence, this study found that the more frequent use of practices measured by Visible Classroom led to poorer perceptions of quality teaching on the part of students. This was a contrary finding to prior research highlighted in the literature review that had found numerous parallels between higher performance on observational measures and student perception surveys (including the Tripod survey that was used for this study.) It may be the case that a low-inference approach to measuring teaching practices, while having the benefit of added reliability, failed to capture the quality of interactions between teachers and their students, and their moment by moment impact on students' perception of the classroom experience were less detectable. Another possible implication is that students' perception of teachers' practices are not just that, but rather an altogether different dimension of teaching that is unique by virtue of it being filtered through the eyes of students. This study confirmed a finding from another recent study that utilised Tripod survey data from the MET project and determined that the proposed Seven Cs model was a poor fit based on the evidence obtained through exploratory factor analysis (Kuhfeld, 2017). This study essentially replicated Kuhfeld's finding that suggested the best fit for the Tripod survey data was a two-factor model that included a distinct factor related to classroom management (or control) and a second composite factor that included nearly all other items from across the other six Cs. Kuhfeld suggested that this composite factor could be described as teacher support. It could be extrapolated that student perception surveys highlight a dimension of quality teaching that is distinct from effective teaching practices. Ferguson himself noted that the Tripod survey

design was influenced in part by a desire to provide a voice for students experiences of and with their teacher that reflect the quality of life in the classroom (Ferguson & Ramsdell, 2011). Students' perceptions of the quality of life in the classroom and the role their teacher plays in supporting and directing this classroom experience can and should be seen as distinct from simply a students' view of practices that might otherwise be measured by a trained observer.

Efforts to synthesise profiles of effective teachers, their qualities, behaviours, and outcomes, are a kind of Holy Grail in teacher quality research. While this study cannot lay claim to uncovering a clear and indefensible profile of teacher quality, the results support a profile of teacher quality that showcases the interplay between a set of critical beliefs, behaviours, and student outcomes. This profile, illustrated by a small subset of teachers, suggested that above average pro-assessment above average self-efficacy beliefs and below average surface/fixed beliefs work in tandem to promote extensive use of explicit instructional practices and directing and correcting practices, although at a ratio in which the former is undertaken far more frequently than the latter. Although the model could not causally connect these beliefs and behaviours to student outcomes, it was notable that the students of these teachers on average rated them most favourably as well. The notion of quality teaching as "active" vs. passive is strongly supported by the findings, and affirmed by student perceptions of teachers, particularly those who emphasise practices that are rooted in high leverage explicit instructional practices. The use of directing and correcting approaches emerged as a problematic finding that may be explained by the possibility that teachers who more frequently engaged in corrective practices were responding to issues such as increased classroom behavioural problems, making their occurrence less of an indication of effective teaching than ineffective teaching. Classroom observational measures more focused on quality over quantity would be likely to better detect the

proactive and responsive strategies used be effective classroom managers than the instrument used in this study.

This study provides clear and coherent evidence of three important realities affecting current and future research on teacher quality: it is complex, multidimensional, and has multiple steps or stages. Future attempts to model and measure it must take into consideration and act upon Goe's assertion that teacher quality involves inputs, processes and outcomes. To ignore any one of those three elements will at best provide an incomplete picture of teacher quality. The study also indicates a need to ensure that such models clarify what they uniquely value and implicitly or explicitly privilege as factors of teacher quality and how these constituent elements are compatible with a larger, broader notion of teacher quality.

Chapter 5: Discussion

This thesis aimed to contribute new knowledge about teacher quality and its constituent elements, in particular to test the role that teacher beliefs play in models of teacher quality and the extent to which multiple dimensions of teacher quality can be seen as coherent elements of a broader conceptualisation of quality. This chapter first provides a summary of the results of the two studies presented, followed by a series of conclusions drawn around four thematic areas:

(1) The relationships and higher order structure of teachers' beliefs and core belief systems of teachers.

(2) Teachers' beliefs as an indicator of practice and outcomes.

(3) A multidimensional profile of teacher quality

(4) The use of composite models to shape new meaning of teacher quality

Summary of Findings of this Thesis

The major question that drove this thesis was whether a more complete and coherent picture of teacher quality could be illustrated through a composite model informed by four key dimensions: teachers' attributes and capabilities, their beliefs, their use of empirically-supported effective teaching practices, and their students' perceptions of teacher effectiveness. Prior research suggested that each of these four dimensions were antecedents or direct indicators of quality teaching. This research aimed to situate teacher beliefs within a broader composite model of teacher quality to determine how strongly teachers' beliefs predicted other theoretical indicators of effectiveness, and to test the cohesion between all indicators. The results suggest that while teachers' beliefs may be an important construct in education research, it is difficult to tie most beliefs to practices and outcomes, making them a somewhat weak marker of quality teaching. Furthermore, while a profile of effective teaching was distilled from some of the

measures in this study, it was not possible to build the profile across all measures due to challenges with identifying positive relationships across factors and measures. The results highlighted some of the potential incongruences between theoretically established indicators of teacher quality. This may problematize the use of multidimensional models or highlight the need to set clearer parameters regarding how much value is placed over particular measures in comparison to others. That said, there are some potential insights regarding profiles of quality teaching practice that can be surmised from the results of this research.

The relationships and higher order structure of teachers' beliefs and core belief systems of teachers. Studies 1 and 2 sought to establish a higher order structure of beliefs that *should* relate to teaching quality, aiming to determine whether the myriad of beliefs teachers bring to the classroom could be reduced to a few key areas. Particular types of beliefs studied were drawn from prior research offering an empirical link between said beliefs and teacher quality, and whenever possible the research used or adapted pre-validated measures. It was hypothesised that a higher order structure of beliefs would parallel the way in which the literature has tended to parse the study of teachers' beliefs (e.g., beliefs about teaching and learning, motivational beliefs, beliefs about students, etc.)

A common set of higher order beliefs was identified across the two studies that could be distilled to five key areas: social/deep orientation, self-efficacy/intrinsic motivation to teach, personal responsibility, surface/fixed orientation, and pro-assessment. Notably, three of these five beliefs areas took a structure that drew across unexpected areas. The social/deep orientation drew together beliefs about teaching, learning, curriculum along with goal orientation and motivation to teach, unified by a focus on societal improvement. Notably, another goal area brought together self-efficacy beliefs alongside intrinsic motivation to teach, suggesting a strong

connection between choosing to teach and a belief in one's capabilities as a teacher. The surface/fixed orientation was perhaps the most unique and complicated area in which a diverse and surprising array of beliefs clustered. This category suggested that teachers' beliefs about students, teaching, learning, curriculum, knowledge, and self could fall together under a banner of what could arguably be an almost utilitarian orientation towards teaching. This particular beliefs system could be viewed as one that privileges more simplistic or surface views of learning and knowledge, generally lower expectations for students alongside assumptions that capabilities are more likely to be innate than supported by effort and malleability.

Teacher beliefs as an indicator of practice and outcomes. Having established a structure of teachers' beliefs, study 2 aimed to situate teachers' beliefs within a broader composite model of teacher quality. Based on prior research indicating that teachers' beliefs are important predictors and correlates teachers' practices (Kagan, 1992; Pajares, 1992), it was theorised that particular beliefs would by extension support higher quality teaching and learning. Study 2 hypothesised that particular beliefs would predict higher performance on measures of effective teaching. One of these measures, the Tripod student perception survey, was selected on the basis of its endorsement as a strong measure of teacher effectiveness (Kane & Staiger, 2012). The other measure, the Visible Classroom program, was selected on the basis of its explicit identification of effective teaching practices distilled from meta-analytic research related to improvements in student learning (Hattie, 2008, 2012).

One of the most significant findings was the relative lack of predictive value that many types of teachers' beliefs had on other measures of quality teaching, and the notable finding that there were particular beliefs that related more than others to teacher quality. Beliefs about personal responsibility and social/deep orientation, which included conceptions of learning,

teaching, curriculum, and motivations to teach, amongst other things, failed to positively or negatively predict better results on the quality teaching measures in the study. Self-efficacy and intrinsic motivation did not significantly predict better or worse results on student perception surveys, but did predict the ways in which teachers attempted to direct and correct their students. Pro-assessment beliefs emerged as an important beliefs factor, and given the construct's comparatively smaller research base, it appears to be a promising consideration for future research relating to teacher quality. While this research identified correlations between beliefs and behaviours, it failed to provide strong evidence that particular beliefs predicted theoretical congruent behaviours, essentially challenging research suggesting congruence between beliefs and behaviours.

A multidimensional profile of teacher quality. Study 2 sought to utilise multiple dimensions of teacher quality, indicated through multiple measures, to create a profile or profiles of higher quality teachers and teaching. It was hypothesised that teachers with measurably higher non-academic capabilities and stronger endorsement of beliefs previously validated by research as predictive of higher performance, would demonstrably engage more frequently in effective teaching practices, and consequently receive more positive feedback from their students on their quality of teaching. The lack of congruence amongst these dimensions limited the potential to distil a profile of teacher quality across all dimensions. Intuitively and empirically, it may have seemed true that the "quality" teaching beliefs ought to have predicted the research-supported practices that in turn ought to have predicted higher quality of student feedback. Yet, there were enough instances of either unidentifiable or negative relationships between these factors to question the coherence of an overall conception of teacher quality that assumed a connection between these measures.

Still, hierarchical cluster analysis helped to identify multiple profiles of teachers, including one teacher quality profile that emerged, drawn out of Visible Classroom practices and student perception survey results. A small group of teachers stood apart from others in study 2, because they not only received the strongest average feedback from their students on the Tripod survey, they also engaged across the board in more frequent use of both categories of Visible Classroom practices. While overall, the use of directing and correcting practices negatively correlated with student perceptions of quality teaching, this group was notable for its comparatively high use of both directing and correcting practices along with explicit instructional practices. This group demonstrated that the use of directing and corrective practices in and of itself does adversely impact students' experiences of the classroom, when the ratio of explicit practices is high.

The use of composite or multidimensional models to shape new understandings of teacher quality. The research in this dissertation aimed to validate the use of a multidimensional or composite approach to conceptualise and measure teacher quality, and determine how teachers' beliefs functioned within such a model, along with other indicators. A composite or multidimensional approach assumes that an overall notion of teacher quality can be expressed, broken into coherent components, and measured by examining these components. Central to the thinking behind such approaches is that these dimensions cohere and form part of a broader whole. For example, the MET study suggested that teachers' value added to student achievement gains on standardised tests, their performance against particular classroom observation rubrics, and their students' perceptions of teaching, were three reliable and coherent indicators that together can be used to identify teachers who ultimately help their students learn more (Cantrell & Kane, 2013). The research that shaped this dissertation began with a similar

assumption, that the various dimensions within the teacher quality model formed part of a broader whole that would indicate which teachers were ultimately most greatly impacting their students' learning outcomes. The prior research would have suggested that teachers' results across the dimensions examined in this dissertation's research should ideally have related and at minimum not contraindicated each other. Yet, the outcomes of the research suggested that dimensions of attributes of teacher quality (such as beliefs) and dimensions of effective teaching (frequent use of effective practices, students' perceptions of quality) might not just fail to relate, they may oppose each other. There were a number of key examples of this illustrated by the research in this dissertation. Of particular note were the incongruence between some Visible Classroom measures of effective teaching and the Tripod student perception survey results, the failure to replicate the 7Cs factor structure of the Tripod, the lack of compatibility between many teachers' beliefs and their use of effective practices and their students' perceptions of quality, and the evidence that suggested surface/fixed beliefs, which the research points to as contraindicators of teacher quality, in some instances actually predicted more frequent use of quality teaching practices measured by Visible Classroom, and did not appear to directly relate to lower student perceptions of quality.

The Visible Classroom system enabled the measurement of a set of 14 empirically supported effective teaching practices, which study 2 found could be broadly grouped into two categories, "directing and correcting," and "explicit instructional practices." A clear outcome of study 2 was the observed negative relationship between "directing and correcting" practices and students' perceptions of teacher effectiveness. If the frequency with which teachers' engaged in these practices is consistent with research on improved learning outcomes, and the same is said to be true with the Tripod survey, then it should have been the case that more frequent use of

these practices would predict higher quality perceptions of teaching, but in reality, the opposite was true. SEM analysis indicated how teachers more frequently using directing and correcting practices were more likely to receive negative feedback from their students. It may be the case that the practices resulted in a lower perceived quality of teaching, or that the use of directing and corrective practices was driven by particular instructional challenges the teachers were experiencing, such as weaker classroom management, but regardless of the causes, the results of study 2 support the argument that teachers' use of effective practices and students' perceptions of teacher effectiveness may not entirely be two sides of the same coin of teacher quality. It is more likely the case that the two measures represent conceptualisations of teacher quality that are at least partially distinct and not completely compatible.

The factor structure of the Tripod survey identified in study 2 raised important questions regarding what it could actually tell us about quality teaching and the validity of students' perceptions of teaching. The purported structure of the Tripod survey highlights seven critical dimensions of teacher practice, 7Cs, which developers and advocates of the instrument suggest students are able to distinctly and reliably rate their teachers on (Ferguson, 2012; Kane & Staiger, 2012). The research in this dissertation found this seven factor model problematic, as confirmatory factor analysis found very high correlations between each of the seven factors, suggesting the seven could not be distinguished from each other. Exploratory factor analysis found only two distinct factors, one of which was largely consistent with the seven items under the "Control" factor and one item categorised as "clarify" related to teachers' ability to recognise when the class does not understand. The other factor consisted of the remaining 27 items drawn across the other six "Cs" and therefore labelled as general instructional practices. These results were consistent with previous research suggesting that students' perceptions of quality teaching

are largely the product of student-teacher interactions that are dyadic in nature and best captured by the construct of responsivity (Hamre, Hatfield, Pianta, & Jamil, 2014; Wallace et al., 2016). Wallace et al. suggested that the results of student surveys such as the Tripod do not support their theoretical bases for quality teaching. It thus remains unclear exactly what these surveys can be said to measure. Given the lack of congruence between some of the Visible Classroom practices and survey factors from the Tripod, I speculate that a) the underlying theory of effective teaching in Tripod surveying is based on the quality of student-teacher interactions and that b) this theory may not be fully compatible with the implicit theory of teacher quality that Visible Classroom represented. This was most clearly indicated by the incongruence between more frequent use of theoretically directing and correcting practices like feedback, behavioural correction, and provision of scaffolded learning, and student perceptions of quality.

The research in this dissertation has highlighted a challenge in constructing multidimensional and composite approaches to measuring teacher quality. Such models may be predicated on a basic assumption that teacher characteristics or inputs, behaviours, and outcomes cohere together and should generally correlate. Yet, each component of a particular multidimensional model and its measurement rest on an implicit or explicit theory of effective teaching and its outcomes. The lack of compatibility or stronger correlations between the measures used in this dissertation's research suggests that there may be conflicts or inconsistencies between components of more complex models of teacher quality. In essence, the elements of such models may not be coherent parts of a broader whole, but instead point to different and potentially incompatible overall conceptualisations of teacher quality.

Conclusions

Advocates of multidimensional models of teacher effectiveness might suggest that such approaches increase reliability, capture multiple dimensions of teacher quality, and provide more sources of insight that can be utilised to inform policy decisions, shape teacher education, support school effectiveness efforts, and strengthen sources of valid feedback to help teachers continue to improve, among other things. The results of this dissertation's studies largely support these arguments. Having situated and tested teacher beliefs as a teacher quality component, the case can be made that there are particular beliefs that appear to support and hinder teacher quality, and that some types of beliefs are more important and relevant than others. The results suggest that models of teacher quality should consider and account for beliefs, and further research on teacher quality should aim to clarify which beliefs are most critical, and how these function in relation to other important indicators such as teacher practices and student outcomes.

The results of this dissertation have also provided new insights regarding the multidimensionality of teacher quality, and how these dimensions manifest in particular, within an Australian context. The varied results of participants across multiple measures can be viewed as important evidence that any model focusing on a limited number of indicators of teacher quality is likely to provide a different picture of quality than a more multifaceted approach will yield. Multidimensional models and measures of teacher quality will help curtail potentially narrow or distorted views of teacher quality. The use of multiple distinct dimensions provides a more in-depth and complex view of teacher quality, considering beliefs and attributes alongside practices, and highlighting how measures of quality teaching can also be distinct when teachers' practices are measured alongside students' perceptions of teacher effectiveness.

This dissertation's research also presents findings that question the implicit assumptions that underpin teacher quality and more complex approaches to its identification and measurement. Chief amongst these assumptions is that there is a clear, consistent theory of effective teaching that underpins the suggested dimensions and measures within multidimensional models, and that this theory aligns with a clear and consistent definition what constitutes quality student outcomes, teacher practices that most strongly and routinely promote those outcomes, and what teacher "inputs," including beliefs, are critical determinants of effective practice.

The research presented, therefore, has implications for:

-our understanding of the higher order nature or systems of beliefs that shape teacher cognition.

-our understanding of the role and importance that teachers' beliefs and characteristics play in teacher quality and impact.

-the use of student perception surveys in teacher evaluation and teacher effectiveness

-the case for low-inference measurement of quality teaching practice such as Visible Classroom (

-identifying and describing a profile of a quality teacher.

-the use of multidimensional or composite approaches to conceptualising, measuring, and identifying quality teachers and quality teaching.

The focus of this section is to identify how the results of the research conducted can contribute to new ways of thinking about teacher quality, particularly its meaning and measurement. The implications of the research presented is relevant and applicable to the shaping of educational policy, as well as efforts to target practice in classrooms, schools, and the broader sector, including the use of evaluative measures for teacher feedback and professional learning. This section also addresses some of the conceptual pitfalls in teacher quality research

and practice, including its intersection with teachers' beliefs research, and offers specific consideration regarding how to strengthen definitional clarity and account for the role teachers' beliefs should play in teacher quality. Finally, this section considers how improvements in conceptualising and measuring teacher quality can be used to raise the bar for teaching and learning outcomes in Australia.

Examining Teacher Beliefs as a System. Teachers' beliefs are one of the most studied constructs in educational research. A central goal of teacher beliefs research is to better predict and explain the practices of teachers (Fives & Buehl, 2012). To shift teachers towards more effective practice, underlying beliefs must be understood and attended to (Fenstermacher, 1978; Richardson, 1998). The results of this dissertation's research suggest that efforts to positively understand and affect teachers' beliefs will be more effective when considering the connectedness between teacher beliefs, and how these "systems" of beliefs may or may not impact practice. In spite of seminal reviews of the literature suggesting that teachers' beliefs are best understood as integrated systems (Fives & Buehl, 2012; Pajares, 1992), and in spite of at least hundreds of studies on teacher beliefs conducted to date, very few studies have examined teachers' beliefs as complex systems (Fives & Buehl, 2012). By examining a large array of teacher beliefs' areas and factors within them, this thesis has provided new insights regarding how these beliefs integrate into larger systems. The results of this study have further validated a number of beliefs established in prior research, but has added significantly to existing research by positing a number of "new" higher order beliefs constructs. This new knowledge may prove valuable in efforts to attend to teachers' beliefs as part of teacher education and professional development.

One example from this dissertation was a higher order factor or system identified in both studies which integrated self-efficacy beliefs with intrinsic purposes for choosing to teach as a career. The results of this research provide evidence that intrinsic motivation to teach (e.g., a genuine interest in the activities of teaching) and self-efficacy beliefs either operate in a reciprocal manner or are mutually nurtured through similar means. Thus, efforts to raise teachers' intrinsic motivation to teach may be supported by strengthening their efficacy in the classroom, and vice versa. Further to this, in efforts to address teachers' self-efficacy or intrinsic motivation to teach, it may be necessary to attend to both factors in our efforts to address either area.

Another notable "new" beliefs construct (or system) identified was the social/deep factor. Together, multiple beliefs about the purposes of the curriculum, teaching, and learning coupled with teachers' own goals and purposes for teaching worked in tandem to reflect an orientation that demonstrates the interconnectedness between teachers' desires to improve society, nurture critical thinking, foster positive relationships with and between students, and meet the needs of individual learners. While prior research has demonstrated that many if not most teachers pursue teaching out of a genuine desire to contribute to society by making a positive impact on their students (Watt et al., 2012), this broader belief system may be an important one to leverage in our efforts to promote practices that encourage deep thinking and learning in the classroom, particularly given the proven benefits when teachers effectively utilise both deep and surface learning strategies for their students (Hattie & Donoghue, 2016). The role that relationships play in this construct is also notable and presents a potentially important lever for raising classroom rigour. There is a growing understanding of the importance of social supports as key facets of quality teaching (Allen et al., 2013) and this research suggests that strengthening teachers' focus

on positive relationships (as both a goal for their practice and as a learning outcome for their students) may reinforce and strengthen their belief in and use of pedagogical approaches that nurture deep thinking.

Potentially the most significant higher order factor belief or system identified in this research was the "surface/fixed" factor. It was unexpected and surprising to see this factor comprised of beliefs drawn across such a wide range of areas that are typically parsed out separately in teacher beliefs research. The results illustrated how within this factor, teachers' beliefs about their students' abilities intersected with their beliefs about curriculum, learning and epistemology, along with personal motivational factors such teachers' goals and purposes for teaching. Notably, nearly all if not all of the beliefs factors in this category were empirically linked with less effective teaching practices and/or lower levels of student academic progress. Given the relatedness amongst the beliefs demonstrated in this research, and prior research suggesting that related beliefs often work in a reciprocal manner, there is a strong implication that negative teacher beliefs across multiple areas are mutually reinforcing. It should be noted that, by and large, the beliefs that fit within the surface/fixed factor were overwhelmingly rejected by the vast majority of teachers across both studies in this thesis, which supports an argument that teachers generally reject the most counterproductive beliefs. If we are to accept the proposition that teachers' beliefs are stable and very difficult to change, then this knowledge is helpful in considering efforts to attract, retain and remove teachers. If we are to accept the proposition that teachers' beliefs are more fluid and subject to change, this would be a crucial area to explore in future research, policy and practice concerned with the process of improving teacher quality, and the role that beliefs play in this process.

The intersection between teachers' beliefs and other characteristics and teacher quality. After over sixty years of research, while a common and consistent definition of teacher beliefs remains elusive (Fives & Buehl, 2012), there is a clear consensus amongst researchers in the field that teacher beliefs are important. Teacher beliefs are suggested to be filters, frames, and guides for teachers' behaviours (Fives & Buehl, 2012), and therefore largely congruent with their methods of teaching (Kagan, 1992). Proponents of the importance of teacher beliefs research suggest that understanding beliefs is essential to improving teacher preparation and teaching practices (Pajares, 1992), with some suggesting clear connections between particular teacher beliefs and student learning outcomes (Ashton & Webb, 1986; Muijs & Reynolds, 2001). Fenstermacher (1978) suggested that efforts to raise teaching quality required attending to teachers' beliefs, as the adoption of more effective practices requires teachers to reconcile new ways of teaching with their pre-existing, "subjectively reasonable" beliefs. The research in this thesis sought to situate teacher beliefs within a teacher quality context, effectively putting to the test the value and importance of teachers' beliefs. While this research does not categorically reject the importance of teachers' beliefs as a construct in educational research, it raises questions regarding the degree of importance that beliefs appear to play in predicting or explaining quality teaching and its outcomes. It would seem that some beliefs do in fact make a difference, and some more so than others.

The argument that teachers' beliefs are an important determinant or indicator of teacher quality relies on the assumption that teachers' beliefs and behaviours are largely congruent, and that practices offer a more visible indicator of particular beliefs. In light of the beliefs/behaviours congruency argument, the research in this study would have predicted some positive correlations between particular beliefs and frequency of practices measured by Visible

Classroom or students' perceptions measured by the Tripod Survey. There were in fact some correlations found, yet, in many instances where there should have theoretically been correlations between particular beliefs and indicators of their corresponding teaching practices, the results failed to indicate any such relationships. This was particularly evident in the analysis of correlations between beliefs relating to teachers' relationships with their students, deep vs. surface beliefs about teaching and learning, beliefs about the value of assessment and expectations for students, and their connectedness to behaviours and feedback from students that should have indicated corresponding practices. Instead, positive correlations were not observed between these beliefs and corresponding practices.

This lack of congruence was also illustrated by results suggesting that teachers who saw themselves as more oriented towards building positive relationships with their students were no more likely to engage in behaviours to establish a positive classroom environment in their interactions with students, nor were they any more likely to receive significantly better feedback from their students related to "care" factors in the Tripod survey or receive overall better survey results from their students. The only significant correlation found was a negative correlation between teachers who saw themselves as more responsible for building positive relationships with students, and the frequency with which they engaged in practices to build a more positive classroom environment.

There was also a lack of congruence between particular beliefs about teaching and learning and some theoretically corresponding practices. Teachers who more strongly endorsed deep conceptions of teaching and learning did not significantly engage more frequently in questioning and discussion techniques that promote deep learning than their counterparts who less strongly endorsed deep conceptions of teaching and learning. These teachers were also not

significantly more likely to less frequently utilise questioning and discussion techniques that supported surface learning. Similarly, no significant relationships were found between stronger endorsement of surface views of learning and frequency of questioning and discussion techniques that promoted surface or deep learning.

Feedback practice and corresponding beliefs were yet another area of incongruence identified in study 2. Feedback is a commonly espoused high quality teaching practice which can have a notably large effect on student achievement (Hattie & Timperley, 2007; Marzano, 1998). Feedback and assessment are inextricably linked, such that formative assessment can be viewed as the context in which most classroom feedback is provided (Brookhart, 2011). It therefore stands to reason that teachers who engage more frequently in providing feedback would support the idea that assessment practice helps improve learning. Yet, in study 2, teachers who more strongly endorsed assessment as an important way to improve learning were not found to engage more frequently in the provision of feedback using assessment information within lessons, nor were their students more likely to suggest that their teachers were more effective at gathering and sharing assessment information with students.

There were a number of other observations of incongruent beliefs in behaviours or between particular practices and what should have been corresponding student perceptions of effectiveness in the practice area. For example, there were no significant relationships detected between higher expectations for students and the use of goal setting or specific student feedback related to challenging students in the classroom or overall Tripod survey results. Additionally, teachers who engaged more frequently in effective teaching practices and received more generally positive feedback from their students did not appear to follow a distinct pattern of beliefs that differentiated them from teachers who engaged less frequently in these practices

and/or received less positive feedback from their students. The hierarchical cluster modelling conducted within the second study provided the most visible evidence of this phenomenon. The two clusters of teachers who had the most similar overall beliefs also had the largest differences in student perception data, and notable key differences in the frequency with which the two groups engaged in particular teaching practices measured by Visible Classroom. Although it was noted earlier in this dissertation that, while the highest performing cluster of teachers were not unique from other clusters in their above average self-efficacy and pro-assessment beliefs, as well as their rejection of surface/fixed beliefs, they were unique in that they were the only group for whom this proved to be the case against those three higher order beliefs areas. This dissertation's results suggest that teachers' beliefs may be important, but appear to play a less directly critical role in significantly shaping quality teaching and teacher effectiveness. It may be the case that this research supports those who argue that there is a large discrepancy between what teachers say versus what they do. Equally, it may be the case that there is a true and important relationship between teachers' beliefs and teaching quality, in which case the findings of the second study would suggest that such a relationship is mediated by factors outside the scope of this research. This could include the varying effects that the school environment has as a mediating factor between beliefs, behaviours, and outcomes, the influence of additional beliefs that went untested in this research, or other important teacher-related factors.

The findings from this research reflect a persistent challenge facing teacher quality research. In this field's efforts to identify the attributes or characteristics of teachers that appear to predict or explain their effectiveness in the classroom, teacher beliefs join the list of other factors that tend to at worst inconsistently or not at all predict effective teaching, and at best account for a very small amount of the variance in measures of effective teaching. This includes

characteristics such as experience, content knowledge, prior coursework or professional learning, among others. It is possible, and this dissertation's results suggest that, beliefs are an important component of teacher quality, but not all beliefs are equally important or relevant to teacher quality. And while beliefs may contribute to other teacher quality factors, the lack of consistency between beliefs and behaviours as well as beliefs and students' perceptions of teachers suggests that the moderating factors that influence the relationship between multiple elements of teacher quality are not sufficiently understood or accounted for in the research, and therefore require further consideration and research.

If the overall objective of teacher quality research is to identify factors that can be used within the broader education system to raise teacher quality, whether by shaping policy, teacher education, teacher evaluation and feedback, and professional development, the findings of this study suggest that focusing on teachers' beliefs as indicators of teacher quality may have limited benefits, but should still be far more deeply considered and tested moving forward. It should be noted though that attempts to situate teacher beliefs within models and measures of teacher quality will benefit from ensuring that, as much as possible, there are components and measures within such models that examine quality teaching behaviours, which are more proximal to teachers' beliefs than student achievement outcomes, and which are at least relational step removed.

Another potential way forward is to begin to make the critical distinction between the study of beliefs as important predictors or explainers of practice (and by extension effectiveness), which this thesis examined, versus the study of beliefs change as an element or requirement for improving teacher practice, which this thesis did not explore. Teacher beliefs literature has focused much more of its energy on establishing beliefs as a construct and exploring the various

types of beliefs, as well as their role in shaping teachers' work. The results of this research suggest that more impact on teacher quality may be achieved by shifting the focus to understanding the beliefs change work that occurs or is required in efforts to improve quality teaching. This paradigm puts us closer to Fenstermacher's proposition that the intersection between quality teaching and teacher beliefs occurs in the improvement arena. Instead of overemphasising attributes in teacher quality research that have limited predictive power of teaching quality and effectiveness, a stronger emphasis on the study of and application of beliefs change as a critical component of raising teacher quality may prove to be a more fruitful focus in teacher quality and teacher beliefs research, teacher education, and interventions designed to address teacher quality by raising quality of practice.

Student Perception Surveys and Frequency Observations in Teacher Evaluation and Professional Improvement. Student perception surveys are an increasingly popular form of teacher feedback. After findings suggesting student surveys were predictive of other established measures of teacher effectiveness, including teacher value-added (Cantrell & Kane, 2013), student surveys have rapidly become more prevalent in classrooms and schools in the United States, as well as teacher evaluation systems, many of which include student perception surveys as a measure of instructional quality (Wallace et al., 2016). Student surveys have also become an increasingly common feature in Australian Schools, with multiple independent providers now offering student perception surveys to schools as a tool for providing reliable feedback on instructional quality, which are now regularly being used at the classroom, school, and departmental level. The increasing popularity and use of student surveys has signalled a need for greater scrutiny of these instruments.

The use of student perception surveys rests on a number of assumptions that have been insufficiently tested in the Australian context, and also are more broadly beginning to be questioned by academic researchers internationally. One key assumption is that these surveys are built around a clear and valid theory or framework of quality teaching within which the survey questions provide accurate data. A second key assumption is that the way in which students' rate their teachers on this survey conforms to said theory or framework of quality teaching, and thus that students are able to distinctly evaluate their teachers' instructional abilities in alignment with this theory. The third key assumption is that the results of student perception surveys will cohere with other measures of effectiveness, which is to say that if students' perceptions of effective teaching are high, then teachers' results utilising other measures of effectiveness should be comparably high. The results of this research have provided evidence challenging each of these assumptions.

The assumed theory or framework of effective teaching the Tripod survey (arguably the most widely known and empirically supported student perception survey of effective teaching), which this dissertation used, is one that highlights seven "Cs" of effective teaching. The results of this research were unable to support the seven Cs model upon which the survey is constructed and suggest an alternative theory of effective instruction indicated by the results in the survey. The way in which students' rated their teachers on this survey only pointed to two distinct facets of effective teaching: one that focused on the teachers' classroom management (or control), and another that essentially grouped all items under a general instructional banner. Given the wide range of what survey items actually addressed regarding instructional practices and yet the still very high correlation between students' ratings of teachers, the results raised important questions regarding how well students are able to distinguish between the various instructional abilities of

their teachers, versus how strongly they are impacted overall by the quality of their interactions with their teacher. Significantly, these findings largely mirrored those of a recent study that similarly failed to replicate the seven Cs structure of Tripod and supported the same two factor model identified in this research (Wallace et al., 2016).

This finding does not dismiss the future role that student surveys can and should play in teacher appraisal and professional development, but suggests a need to better define what these surveys measure and by extension their use. Trained assessors look very differently at teachers' distinct instructional practices than their untrained students, who are assumed to evaluate them more on the basis of their lived experience in the classroom and who not play a participatory role in the classroom (Wallace et al., 2016). Student perception surveys highlight a particular and more general dimension of teacher quality that should not be confused with specific instructional skills that are trained evaluators may be more capable of disguising when observing teachers in action. The unique dimension captured relates to the quality of student-teacher interactions, and the extent to which teachers create a through those interactions an environment of instructional and emotional supports that promote engagement, motivation, and student efficacy.

By further highlighting the distinction that exists between student surveys and other measures of instructional effectiveness, we are also better equipped to explain the incongruences that may occur between students' perceptions of the classroom, and other measures of teacher effectiveness, including value-added to academic achievement, which may not capture other valuable elements of social-emotional learning that students' perceptions of teaching may help to indicate. While this research did not utilise learning gains measures, it did utilise a more objective tool for identifying and measuring quality teaching through the frequency of practices empirically supported as consistent with improved learning outcomes. There were a number of

areas in which the frequency within which teachers engaged in “effective” practices appeared to have little bearing on students’ perceptions of effectiveness, and some areas in which particular practices offered more predictive value. Of the specific practices measured by Visible Classroom, only the frequency of giving instructions significantly correlated with the general factor of instruction captured by Tripod, and the correlation was actually negative, although weak. Only a few measures of teaching practice significantly correlated with Tripod results in the control area, but even more surprisingly, the measures that most strongly correlated with Tripod results were negatively correlated and specifically practices that should indicate teachers engaging in effective classroom control practices, namely correcting behavioural issues in the classroom and directing students to resources for activities. The higher order factor measured by Visible Classroom, Directing and Correcting, also significantly negatively correlated with students’ perceptions of classroom control, a finding that is significant in that it illustrates how the two measures provided contradicting evaluations of teachers’ classroom management.

As student perception surveys continue to be used as a source of feedback and possible appraisal of teachers and schools, further steps can be taken in framing the interpretation of the results of these surveys that are informed by the outcomes of this research. One step is to establish a clear distinction between student perception surveys as a measure of specific instructional practices or practice areas (which these surveys do not appear to effectively do) vs. as a measure of the general quality of student-teacher interactions in the classroom. Making this distinction clearer will help teachers consider which elements of their planning, teaching, and professional development may best support stronger teacher-student interactions, which in turn will promote higher quality learning outcomes for students. Another step is to exercise greater caution and care for teachers and teacher evaluators as they interpret the results of student

perception survey data as an indicator of quality teaching. Given the potential that these results may not parallel other indicators of quality teaching and may in fact contradict such indicators, it is important to recognise the limitations of student perception surveys on their own. Further to this point and in light of the results of this research, student perception surveys should continue to be used in tandem with other valid measures of teacher effectiveness that illustrate other distinct dimensions. A key finding of the Measures of Effective Teaching (MET) Project was that student perception surveys, when used in conjunction with other measures such as teacher value added and classroom observations by trained assessors, increased reliability of teacher appraisal (Kane & Staiger, 2012). To ensure the reliability of evaluations of teaching using student surveys, additional measures will prove vital in our efforts to paint a more accurate and complete picture of effective teaching in the classroom.

A novel feature of this thesis was the inclusion of a low-inference classroom observation measure, Visible Classroom, in tandem with additional theoretical markers of teacher quality. The outcomes of the research have indicated some of the benefits and potential limitations of such tools. Classroom observation is a pervasive feature of both formal and informal teacher appraisal and feedback, yet in spite of this, there is a paucity of commonality and consistency in frameworks, approaches, and tools used for the purpose of evaluating and/or providing feedback to teachers on the effectiveness of their practice. In Australia, systemic approaches utilising classroom observation have done little to differentiate degrees of effectiveness amongst teachers (Jensen, 2011) and there is little evidence to suggest that this will change. The use of a low-inference observational measure like Visible Classroom may offer a potential way forward in efforts to strengthen the quality, consistency and impact of classroom observation as a tool for improving quality teaching. The benefits of low-inference observational measures are well-

established. They rely much less on observer judgement, tend to have higher inter-rater reliabilities, and may be less resource intensive compared to the level of training required to administer high-inference observational measures with fidelity (Muijs, 2006). By focusing on frequency counts of particular practices, these tools provide a valuable springboard for dialogue on teacher practice, whereby teachers and those supporting them can interrogate and explore the reasons, potential impact, and future implications for their use of particular practices.

As a measure of teaching, Visible Classroom made it possible to distinguish between individuals and groups of teachers based on how frequently they employed particular practices. While the research in this thesis cannot confirm the implicit assumption the Visible Classroom approach makes, that more frequent use of practices that are empirically linked to improved academic growth can be used as a proxy for more or less effective teaching practice, this research has indicated how low-inference observations can be used to identify, provide feedback, and orient teachers, schools and the system around more effective practice. The results in this research highlight two broad domains of practice within which the specific Visible Classroom strategies cluster that are important to distinguish. The first domain, directing and correcting practices, are a related group of strategies that teachers employ to manage their classrooms, provide instructions, and direct students to resources, and convey expectations. The second domain, labelled explicit instruction, encompassed the teacher-led high leverage practices that include explanations of content and vocabulary, questioning and discussion techniques, and reviewing and summarising key ideas, among other things. With ongoing recent efforts in place to promote specific high leverage practices in classrooms these results offer two key broad areas of practice that are distinct and discernible, and may help cohere efforts to strengthen classroom practice.

The two areas of teaching practice identified by this research also provide greater insights regarding the relationship between particular teaching practices and students' classroom experiences. One notable and important finding was that, when isolating the directing and correcting practices of teachers and exploring their relationship to students' perceptions of the classroom, there was a clear indication that more frequent use of particular directing and correcting practices related negatively to students' perceptions of quality teaching. SEM analysis supported a hypothetically causal relationship between frequency of these behaviours and negative perceptions of teaching (in particular, classroom management or control.)

On the basis of these results, it would be an unfair conclusion to suggest that more teacher-centred, or teacher-led classrooms correspond with negative student perceptions of teaching. In fact, quite to the contrary, more careful examination of the relationships between teacher practices and student perceptions suggested that the teachers who engage the most frequently in practices across both domains captured by Visible Classroom receive the most positive feedback from their students, in terms of both their general instructional practices as well as their classroom management. Hierarchical cluster modelling helped to illustrate an important nuance in how teaching practices relate to students' perceptions of quality teaching. Thus, it is not that students universally respond negatively to teachers who more frequently utilise directing and corrective practices, but rather, when teachers who frequently utilise these practices, and at an even higher ratio, utilise explicit instructional practices captured by VC, they receive the highest ratings from their students. When teachers leverage a similar frequency of directing and corrective practices, but a comparably lower ratio of explicit instructional practices, they receive the lowest ratings from their students. Research tends to identify effective teaching practices in isolation from other practices. The evidence in this research suggests that the

effectiveness of particular practices may depend on their use in tandem with other practices, and that frequency of practice and ratio of practice compared to other strategies is important in determining teacher quality.

A possible profile to characterise effective teaching emerged from this research, which notably corresponds to profiles of effective teaching that have been long established in the literature. The term "active teaching" is well-established as an overarching principle of effective teaching (Brophy, 1986). While not explicitly stated as such, many if not most of the classroom specific interventions indicated by meta-analysis as yielding the highest effect sizes are active teaching practices (Hattie, 2008; Muijs, 2006). Central to this theory is the notion that whether leading whole-group instruction, monitoring individual or small group work, or providing feedback within instruction, effective teachers are constantly at work throughout their lessons, making numerous teacher moves to ensure that their classrooms move at a brisk pace and that time on task is maximised so that students spend as much time as possible engaged in learning experiences. The outcomes of this research provide a profile of effective teaching largely consistent with active teaching, noting that a particular group of teachers in the study were identified who were the most active of all teachers in study 2. One significant extension study 2 made to prior research highlighted the positive relationship between active teaching students' perceptions of effective teaching. Thus, active teaching, which this research reflected in the frequent use of both directing and corrective and explicit instructional practices, as an underlying theory of effective teaching is supported both empirically but also by students' perceptions of effective teaching.

The use of composite approaches to conceptualising, identifying, measuring, increasing quality teachers and quality teaching. This research attempted to situate teacher

beliefs and characteristics assessed as part of selection into an alternative pathway to teaching program within a composite approach to conceptualising and measuring teacher quality. Consistent with much of current policy and practice in Australia, which strongly emphasises the characteristics of teachers as critical levers for raising teacher quality (AITSL, 2015) this study aimed to establish such factors as a key influence on effective teaching practices and outcomes, but largely failed to support such an argument. While this thesis does not categorically dismiss the importance of considering teacher selection factors in teacher education, the results make the case for deemphasising this as a policy lever for raising the quality of teaching in Australia. While Teach For Australia employs a robust process based on selecting candidates for entry into its program that are largely aligned with research highlighting several critical areas for teacher selection into education courses, this research did not indicate that once in the classroom, or after years of teaching, that the effects of these characteristics were visible in teachers' use of effective practices or their students' perceptions of quality teaching. It is similarly difficult to suggest that teacher beliefs should be highly privileged in thinking about teacher effectiveness, and that, along with other characteristics that lack a cogent evidence base linking them in the Australian context to student academic growth, a focus on beliefs and non-academic competencies at the selection stage may have a limited positive effect on teacher quality.

Much of the effort in teacher beliefs research has gone into what continues to be an ongoing struggle to establish a clear and consistent definition for the construct (Ashton, 2015; Fives & Buehl, 2012; Pajares, 1992). Other common areas of research consider the stability of teachers' beliefs, their congruence with practices, further identification of beliefs areas, and the contexts of teachers' beliefs. It is with a greater focus in this latter area where the role of beliefs in improving the effectiveness of teachers can be better understood and ultimately leveraged in

service of teacher quality. A potential blind spot in this research was its emphasis in seeking out relationships between beliefs and other accepted indicators of quality teaching. While teachers' beliefs offered little insight into their use of empirically supported quality teaching practices or their students' perceptions of quality in the classroom, this research did not consider or examine the role that beliefs play in teacher change. If efforts to improve quality of teaching assume that to get better, teachers must make some changes in their practices, then beliefs are likely to be a critical factor determining the extent to which teachers are able to successfully transform their practice towards increased effectiveness (Fenstermacher, 1978; Richardson, 1998). Fenstermacher described this process as one in which teacher change would be conditional upon reconciling new ways of thinking about teaching with pre-existing, "subjectively reasonable" beliefs, and adopting new beliefs as an antecedent to sustainably shifting to higher quality practice. This thesis suggests a more fruitful focus would be for research and practical efforts to utilise teacher beliefs in service of teacher quality is to shift the focus from promoting particular beliefs to promoting the conditions that enable teaching beliefs to facilitate the adoption of more effective practices.

Building on this last point, beliefs may still play a viable role in a composite or multidimensional approach to identifying teacher quality. Yet, the viability of the measures used in this dissertation as part of such a composite approach depends entirely on its purpose and function. For the purposes of formal teacher appraisal or evaluation, the measures used in this dissertation would be problematic to use for the purposes of teacher appraisal. This is due to a few key concerns stemming from the results of the research. The first concern is, as previously mentioned, is the generally weak direct relationships between many beliefs and practices as well as students' perceptions of teaching. The second concern is the potentially conflicting picture of

effectiveness that appears from looking at frequency of particular practices or practice areas as indicators of effectiveness next to students' perceptions of effectiveness. A more nuanced understanding of the quality of practice along with frequency is essential for providing performance based appraisal based on observations of teaching. The third concern in this model is the lack of a learning gains measure. While student academic growth may only indicate one facet of quality teaching, it remains an essential component of any composite approach to evaluating teacher quality. Thus, for these measures to be taken forward for the purposes of teacher evaluation, they would at minimum require the addition of a learning gains measure, at which point the validity of the model may prove to be strong or not.

While the measures utilised in this thesis may not on their own service future teacher evaluation, there remains a very strong and viable use for them as a multidimensional approach to providing feedback data to teachers on different aspects of quality. Although none of these measures individually or collectively can tell teachers how effective or ineffective they are (if learning gains are viewed as the ultimate effectiveness measure), they do provide a compelling, reliable, and multifaceted evidence base upon which teachers can explore and answer that effectiveness question for themselves, using proxies that centre on their attributes and actions. Low inference classroom observational feedback enables teachers to consider the implication and impact of their high or low implementation of particular practices on learners and their impact on learning. It provides invaluable, objective insights on the moves teachers make, and open up a range of highly beneficial reflective questions that could all be strong drivers for personal improvement. For example, a teacher's awareness of the relative lack of questions that promote critical thinking could lead to the future implementation of a better balance of questions that elicit surface and deep responses from students. Another teacher might be better able to

identify a connection between their more frequent recent use of clearer directions of independent activities and improvements in student work completion. Or another teacher may find a relationship between challenges they are experiencing in classroom management and their use of statements that support a positive environment. Student perception data can be equally powerful for teachers to provide invaluable insights from the lenses of their students. Noting that this thesis found that student surveys may not help teachers discern which practices they are particularly exceling in or struggling with, these surveys still shed light on the quality of student-teacher interactions, and the classroom climate, at minimum. Teachers with particularly strong results on such surveys may thus find evidence that they are nurturing supportive connections with students, and promoting greater engagement, while teachers with less strong results can reflect on how their interactions with students may be shaping these results and consider the extent to which students' perceptions of the classroom are affecting their academic progress as well as their social-emotional learning.

The use of teacher beliefs surveys also has positive potential as a source of feedback for teachers, particularly in light of other sources of data. By raising teachers' awareness of beliefs about themselves, their students, and various aspects of pedagogy, particularly in light of other sources of feedback on their teaching, teachers can consider for themselves whether their choices in the classroom are connected to particular beliefs that are helping or hindering their effectiveness. Likewise, they may also benefit from identifying for themselves any incongruences between beliefs and practice, and consider for themselves what factors are preventing them from teaching in a more idealised manner, and identify potential actions to bring their teaching more in alignment with their beliefs.

The final and most important implication for further and future use of composite approaches to identifying and measuring teacher quality, such as the approach used in this thesis, is the need to make implicit theories of quality teachers, their teaching and its outcomes more explicit and clearer. The research has highlighted the criticality of taking notions of teacher quality beyond the implicit and simplistic view that teacher quality describes the attributes and actions of teachers who most help students learn. How we define and measure learning and classroom success, including who we make the arbiter of those judgments reflects our implicit theories of effective teaching. This research highlighted how multiple measures may surface potentially conflicting implicit theories of effective teaching, or how students' perceptions of teaching may indicate a conflicting implicit view of effective teaching to other measures. Furthermore, once simplistic notions of effective teaching, largely shaped out of process-product research methods from decades earlier, must be updated to reflect the more complex and multifaceted societal demands placed on teachers (Muijs, 2006), which are shaping ever more convoluted implicit theories of effective teaching. A critical step to improving teacher quality and quality teaching is shaping a more explicit theory of effective teaching that has a clear definition of the learning outcomes that society now values, reflects contemporary expectations on teachers, and draws from multiple, cohering sources of data to create a new composite approach to identifying, measuring, and ultimately driving quality teaching.

Opportunities for Future Research

This section aims to critically evaluate the research undertaken in this thesis and recommend beneficial areas for further study. This section will also discuss the limitations of the research conducted and potential approaches to overcome them in future research. This section is presented in five parts, the first addressing teacher beliefs as a system, the second discussing

teacher attributes as a lever for raising teacher quality, the third considering beliefs as related to teacher quality, the fourth addressing student perception surveys and classroom observations as measures of teacher quality, and the fifth discussing the use of learning gains measures in teacher quality research both broadly and particularly in Australia.

Teacher beliefs as systems. As previously noted, teacher beliefs studies have more traditionally focused on isolating specific beliefs or beliefs areas, with comparatively far fewer studies attempting to examining teacher beliefs as part of a system. Together, the two studies in this thesis have examined the connectedness and higher order structure between dozens of different teacher beliefs, taking a systemic view of beliefs which has illustrated new beliefs constructs, such as surface/fixed and social/deep. While in most instances reliability was sufficiently high to have confidence in the total scores for specific beliefs factors, alphas often ranged between .7 and .9, which ranges from acceptable to excellent. However, there were a number of beliefs factors that fell below the .7 range, including some of the higher order beliefs constructs. Further research will help strengthen the reliability of this thesis' findings and support the identification of higher order beliefs constructs. A significant conclusion this study offers is that teachers' beliefs come together across pedagogy, students, and personal motivation. Such research will better reflect the complexity within which multiple beliefs interact to influence teacher behaviour.

Teacher attributes in selection as a lever for raising teacher quality. While this study failed to make a strong case for teacher attributes at selection as a key indicator of quality teaching, there is a strong need for further research in this area. It is particularly relevant in the context of selection into initial teacher education in Australia, where the identification and selection of entrants with particular non-academic capabilities has been put forth by

policymakers as a key lever for raising teacher quality in Australia. Among the most strongly endorsed characteristics are motivation to teach, strong interpersonal skills, openness to learning, organisational and planning skills, and resiliency among others (Barber & Mourshed, 2007; Howard & Johnson, 2004; Richardson, Karabenick, & Watt, 2014; Rockoff et al., 2011). These capabilities were all assessed as part of the selection criteria that gained the second study's participants entry into teaching, but there was little to no observed interaction between these attributes and future indicators of effectiveness measured by Visible Classroom or the Tripod survey. As long as these characteristics remain an important feature in policy and discourse around teacher quality both locally and internationally, there is a critical need to put these specific attributes to the test, as well as establish a more general understanding of the importance and impact of non-academic capabilities at selection as a teacher quality factor.

It should be reiterated that the participants of study two were all current or past members of the Teach for Australia program. Some diversity was achieved with the participant group, who taught across a range of schools (including metropolitan, regional, and rural) across four states and territories, and whose teaching experience ranged from less than one year and up to eight, their unique characteristics may have limited findings. Given that these teachers are recruited into the program for their combined competencies in areas such as communication and organisation, alongside their commitment to addressing educational equity, and they experience arguably more similar training and support than a broader sample of teachers, it is possible that the commonalities between the teachers made it more difficult to detect unique relationships amongst the variables studied.

Further to this point, one of the factors essentially dismissed from this study, a set of non-academic competency areas assessed as part of selection into Teach For Australia, may have

proven to be a positive indicator of other measures in the study, with a larger and broader participant group. Given that all Teach For Australia participants met a selection bar that requires higher than average results across all selection areas, there may have been limited opportunity to see greater levels of variance within the measure, which in turn may have indicated a relationship between this factor and other elements of teacher quality that was not as easy to detect in this research. A common current feature of teacher education programs in Australia is the requirement to select participants based on qualities such as those previously described. This creates a unique opportunity for future research to explore at a potentially large scale the impact that non-academic capabilities at selection has on the ultimate effectiveness of teachers in Australian schools.

Beliefs as a predictor of behaviours and quality teaching. The existing research base on teacher beliefs provides an uncertain picture of how aligned beliefs are with practices. Fives and Buehl's (2012) review of teacher beliefs highlighted the lack of consensus in the research, noting that for nearly every study suggesting congruence between beliefs and behaviours, there is a study suggesting the opposite. The issue of beliefs/practice congruence is important if beliefs are to be accepted as a first "port of call" on the pathway to teacher effectiveness. Fives and Buehl suggested that proving congruence is a not prerequisite to arguing for the importance of teachers' beliefs. They note that regardless, beliefs matter because they are precursors for action, and that the change towards more effective practice requires change in beliefs, an argument established earlier by Fenstermacher (1978).

Most research on beliefs/behaviour congruence has utilised teacher-self reporting of both beliefs and behaviours (Fives & Buehl, 2012). The research conducted in this thesis was novel in that it explored beliefs/behavioural congruence utilising a low-inference measure of teacher

behaviours (Visible Classroom) and also sought student perceptions of teachers' behaviours. Future research examining the congruence or incongruence between teachers' beliefs and behaviours will benefit from utilising measures that seek to identify and measure behaviours enacted (vs. indirectly reported), and examine behaviours through multiple perspectives (e.g., a trained evaluator as well as students), and through multiple measures.

Fives and Buehl also raised a valid point in suggesting that research on teachers' beliefs and their relationship to teaching practices should concern itself less with whether congruence actually exists, and more in exploring the potential reasons why teachers struggle or fail to enact their beliefs. The contextual factors that mediate teachers' beliefs and behaviours are a particularly important area of consideration for research on teacher quality, as the same factors impacting teachers' translation of beliefs into teaching practice could be viewed as additional aspects of teacher quality.

Student perception surveys and classroom observation as measures of teacher quality. This research has replicated results of more recent research challenging the assumptions around what student perception surveys of teacher effectiveness actually measure. The research in this thesis demonstrated that students evaluate their teachers in ways that do not suggest they can identify and distinctly differentiate between their teachers' capabilities across a number of discrete, high leverage practices, or even broader areas of teaching such as the seven Cs the Tripod creators suggest as the factor structure of the survey. I hypothesise that the surveys do provide some reflection of students' perceptions of the quality of interaction they have with their teachers and may reflect positively on the quality of relationships between teachers and students, more so than the surveys provide valid and reliable feedback on more specific and isolated aspects of teaching, such as those posited by the 7C model around which the Tripod survey is

organised. However, I would stop short of saying this contention was clearly provable by the results of the study and thus, the questions of what these surveys actually measure, and what facet of teacher quality the surveys actually measure, remains for future research.

Wallace (2016) argued that, as a measure of quality teaching, instruments such as the Tripod require an underlying theory of effective teaching, which presumably the measure will reflect. Given the results of both Wallace's research and the second study, further attention is needed to determine whether a theory of quality teaching (or facet of it) is in fact reflected in student perception surveys, or if alternative surveys can be constructed and tested which provide a clearer and more reliable indication of the practices in which students can distinctly evaluate their teachers. The use of student perception surveys in current research does not make the distinction between whether quality relationships and interactions between students and teachers is the defining principle of effective teaching, or if these relationships and interactions are to be viewed as a facet of a larger organising theory of effective teaching. If it is the former, then future research will need to develop and test more appropriately aligned measures of teacher-attributable learning, as well as observational measures and other possible quality indicators. If it is the latter, then research on composites will need to develop and test a more thorough and coherent definition of effective teaching that takes into account potential teacher attributes, behaviours, and outcomes that should be included and excluded.

Ferguson (2011) discovered that classrooms in which students rated their classrooms more emotionally supportive and their teachers are more caring, that not only were students more likely to perceive less learning occurring in class, but the value-added gains on standardised tests also went down. Ferguson himself suggested that educators should avoid drawing conclusions about whether learning is occurring on the basis of student's happiness or perceptions of the

emotional climate. This distinction is important for future research that includes the use of student perception surveys. The research in this thesis presented an unclear and conflicting impression of the relationships between effective teaching behaviours and students' perceptions of teaching that require further study. Future research should continue to explore both the congruencies and incongruences between classroom observational measures of effective teaching practice and students' perceptions of teaching.

Unlike the MET project, this thesis made use of a low-inference observational tool based on the coding of auto-transcribed recordings of classroom observations by trained evaluators. Low-inference observational measures are noted both for their benefits, which include a generally higher degree of reliability and greater removal of subjectivity on the part of the observer, but also noted for their limitations, which include an inability to take into account the context in which teaching occurs, and an inability to distinguish between quantity of practices vs. quality (Muijs, 2006). In study two for example, this meant that while the frequency with which teachers provided feedback, a generally accepted high-leverage teaching practice, could be measured, the quality and effectiveness of that feedback could not. While student perception surveys provide a helpful additional measure to test observations such as those measured through Visible Classroom, future research may address the limitations of this study by also utilising observational measures that address quality. Research combining low and high inference measures through classroom observation may help to address the limitations of both types of observation and may prove highly beneficial in composite approaches to identifying and measuring quality teaching.

The role of learning gains measures in multidimensional, multi-measure approaches. The exclusion of a learning gains measure in this thesis' teacher quality model and

measures was one of, if not its most significant, limitations. The results of study 2 highlighted the criticality of including learning gains measures in such models. In considerations of teacher quality and quality teaching, learning gains provide a North Star of sorts, a clear compass against which to orient our thinking about the attributes and actions of teachers by testing connections to students' outcomes.

In the absence of a learning gains measure against which to compare the teacher quality factors examined in this research, it was not possible to conclude that teachers rating higher against any of the measures were more "effective" or higher quality than their colleagues, if effectiveness is defined as how well their teaching enabled students to learn. This limitation was further reflected in the somewhat conflicting results observed through both bivariate correlation analysis and the more complex structural equation model created within study two. For example, given the lack of an anchoring learning gains measure and potential incompatibilities between teachers' use of practices measured by Visible Classroom and student perception survey results, it could not be argued that frequency of practices better indicate teacher quality or alternatively that student perception surveys do. This finding reflected a specific need for further research in an Australian context that examines the relationship between teacher attributable learning gains and other possible measures of quality, as well as a broader need for further value-added research studies of Australian teachers.

This research did not test the validity or reliability of teachers' value-added results, but may offer some directions forward for future research that does. To address the simple fact that standardised tests are not specifically designed to evaluate whether what teachers' have taught has successfully been learnt, future research should invest in the development of assessments that do just that. By developing learning gains measures that are more closely aligned to the focus of

teachers' instruction, future research may be in a better position to gather more meaningful evidence of effectiveness. While the overwhelming majority of teacher effectiveness research focuses on subjects like reading and mathematics, this type of research would be of particular value in other learning areas that are largely ignored or poorly attended to in comparison. In Australia, standardised test do exist, but to a far lesser extent and with far lower stakes than many of its counterparts (most notably the U.S.). While standardised tests in Australia are very difficult to use as a measure of teacher effectiveness, the climate may be right for researchers to push for alternative learning gains measures of this nature. It is noteworthy that Hill, Rowe and Smith (1996) were successfully able to utilise an approach to identifying teacher and classroom attributable achievement growth by devising a set of subject profiles within learning areas that had ordered sets of indicators describing observable learning behaviours. Teachers were trained to ensure their formal and informal evidence base accurately informed their evaluation of each students' progress along a developmental continuum within their learning area. The researchers found that teachers were highly reliable ratings and that their interrater reliability with other staff in schools was satisfactory. Their study is one of only a handful that have provided local evidence of the importance and effect of quality teaching in Australian schools. More than twenty years later, it may be worth revisiting and extending upon their approach or attempting alternative ways in which to evaluate learning gains within standardised achievement tests.

The prior paragraph's recommendation to explore new ways of considering and measuring learning gains as part of multidimensional approaches should not be viewed as a rejection of the use of value-added modelling in the study of teacher quality, in Australia or anywhere else. In fact, the difficulties in utilising value-added measures of teacher effectiveness for this thesis should be viewed as a limitation of the research and reflect a genuine need for

further use of value-added research in Australia. There have been virtually no studies in Australia using value-added. One notable exception is Leigh (2010) who was able to measure teacher value-added by studying the two-year changes in students' test scores. He was able to complement and enhance prior research on teacher effectiveness, primarily based in the U.S., and situate within an Australian context, determining that teacher effects played an important role in students' achievement gains. What's more, Leigh noted that a 75th percentile teacher would achieve in three quarters of a year what a 25th percentile teacher would require a full year to achieve, and suggested that if all indigenous children had access to 75th percentile teachers, the black-white test score gap in Australia could be closed in seven years. While Leigh did not test other measures of quality teaching that might belong within a composite model, he did test other factors often studied in teacher quality research that could be put forth as composite elements, although his findings suggested that these factors, including experience and level of education, accounted for a very small degree of the variance in student achievement gains. Leigh noted at the time of this study that he was unaware of any other prior attempts in Australia to use value-added analysis to study teacher effectiveness, and as of this thesis' completion, I am unaware that any studies have been published since. Moving forward, it is difficult to expect significant positive progress to be made to understand, measure, and ultimately grow teacher effectiveness in Australia in the absence of robust methods of determining the extent to which teachers are contributing to their students' academic growth. Value-added research is not the sole means to address this gap, but should be considered along with other possible approaches to measuring learning gains as part of any future approaches to identifying and measuring teacher quality.

Establishing Profiles of Quality Teachers and Teaching

An aim of this thesis was to utilise a multidimensional model to identify a profile or profiles of quality teachers and their teaching, drawn across the multiple measures utilised in the studies. It was hypothesised that teachers with particular non-academic qualities (measured as Teach For Australia's selection competencies) and beliefs (measured by the Teacher Beliefs survey) would more frequently utilise high leverage practices (as measured by Visible Classroom) and receive more positive feedback from their students (as measured by the Tripod Survey). A complete profile drawn across these four measures and their multiple indicators was not identifiable, and whether such a profile could be remains an area for further research.

Study 2 did produce a profile of teacher quality drawn from some of the observable practices and student perceptions measured by Visible Classroom and the Pivot survey instrument, consistent with the notion of "active teaching" described in the prior chapter. This profile suggests that quality teachers are constantly engaged in high-leverage practices, whether instructing the whole group, working with individuals or small groups, or monitoring instruction and giving feedback. They engage actively in the management of the classroom, but even more frequently focus their energy on engaging students in learning, whether through modelling and explaining concepts, using questioning and discussion techniques, or highlighting and reviewing important ideas. The results of this dissertation suggest that active teaching resonates strongly with their students, who appear to view their teachers as more effective, on the basis of survey feedback. Arguably, and supported by the findings of this thesis, the teaching profile just described is not necessarily underpinned by particular beliefs and qualities that set these teachers apart from others who were less actively engaged in Visible Classroom measured practices and who received poorer feedback from students. This should not be taken as an indication that

beliefs have little to offer in attempting to profile effective teachers. It does suggest caution in overstating the importance of particular beliefs. It also suggests that further research that situates teacher beliefs within studies of teacher quality will help us to understand the complex internal processes in which different beliefs interact with each other and other potential mediators that ultimately lead teachers to enact particular practices and achieve particular outcomes for their students.

While the results of this dissertation's research provide a strong affirmation of particular practices and their relationship to students' positive experiences in the classroom (and their perceptions of their teachers' effectiveness), additional consideration must be given to a few key limitations from the research conducted. Firstly, hierarchical cluster modelling was used to establish this profile, but with an overall small sample size of fewer than sixty participants and five distinct groups identified, much larger sample sizes are required to support a conclusion that this profile is both valid and reliable. Furthermore, while this profile highlighted the potential connection between quality teaching practice and student perceptions, it remains unclear if teachers who fit this profile are also responsible for higher gains in student achievement than teachers who engage less frequently in these practices or receive comparatively weaker student feedback. Lastly, while this profile excluded teacher characteristics and beliefs, it would be pre-emptive and potentially unwise to exclude either aspect of teacher quality from future research. It may very well be the case that teachers who fit the profile established in study two also have unique beliefs and attributes that set them apart from other colleagues, and that there are additional factors that work in tandem with these beliefs and attributes to make them more effective than their peers. These effects could be better understood through future research utilising a mixture of both qualitative and quantitative methodologies. This can support efforts

to continue to make the results of teacher quality research generalizable while simultaneously allowing researchers to consider context more closely and gain a deeper perspective on teachers and teaching than quantitative research alone will permit (Muijs, 2006).

Composite or Multidimensional Approaches to Identifying and Measuring Teacher Quality

To the best of my knowledge, this thesis was the first attempt in an Australian context to establish and test a multidimensional model of teacher quality, including one that took into account a comprehensive set of teacher beliefs in relation to other teacher quality factors. The MET project played a pivotal role in promoting the use of a composite model of teacher effectiveness and in particular the promotion of value-added, formal classroom observation, and student perception surveys as valid, reliable, and related indicators of teacher effectiveness (Cantrell & Kane, 2013). The research conducted in this thesis attempted to replicate elements of the MET with Australian teachers, including one of its specific measures (the Tripod survey). Further studies of such approaches to identifying and measuring teacher quality may serve to further clarify findings in this research that were less conclusive and questions the research was unable to address.

The most important issue that further research could address in this regard is the compatibility or congruence between beliefs, behaviours, and indicators of effective teaching outcomes in schools. The second study in this thesis utilised structural equation modelling (SEM) to attempt to identify the interplay between multiple factors in a composite model of teacher effectiveness. The relatively low sample size of the study hindered the reliability of the results of SEM. The use of SEM is particularly useful in studies of teacher effectiveness utilising a composite approach, as it allows researchers to model and test the relationships

between all of the factors in the proposed model (Muijs, 2006). Muijs and Reynolds (2001) successfully used SEM to establish a composite model of teacher effectiveness that encompassed a number of beliefs factors, teaching approaches, and greater academic gains on standardised tests. Further studies with larger sample sizes using SEM will greatly benefit this nascent area of research in Australian classrooms and schools, where there is still an overreliance on studies conducted overseas on teacher effectiveness and the multiple components and measures that can be brought together as part of a composite model. The key findings of this research, including some of the incompatibilities or non-existing relationships between theoretically linked factors of teacher quality, are unique and significant in that they have been situated in an Australian context. This research has established a base upon which further and deeper exploration of a number of questions can proceed, such as how important teachers' beliefs are as determinants of their effectiveness in the classroom, whether particular teaching practices correspond with other important indicators of effectiveness, how valid student perception surveys are as a measure of teacher effectiveness in Australian schools, how related multiple measures of teacher effectiveness are, and whether a particular profile or profiles of effective teachers and effective teaching can be put forth based on empirical findings.

Beyond studies utilising larger participant groups, further research on multidimensional and composite models of teacher quality in Australia will benefit from examining more diverse groups of teachers. The participants of this study were all current or past participants of the Teach for Australia program. Although some diversity was achieved with the participant group, who taught across a range of schools (including metropolitan, regional, and rural) across four states and territories, and whose teaching experience ranged from less than one year and up to eight, their unique characteristics may have limited findings. Given that these teachers are

recruited into the program for their combined competencies in areas such as communication and organisation, alongside their commitment to addressing educational equity, and they experience arguably more similar training and support than would be the case in a sample of teachers from outside the program, it is possible that the commonalities between the teachers made it more difficult to detect unique relationships amongst the variables studied. Further to this point, one of the factors essentially dismissed from this study, a set of non-academic competency areas assessed as part of selection into Teach For Australia, may have proven to be a positive indicator of other measures in the study, with a larger and broader participant group. Given that all Teach For Australia participants met a selection bar that requires higher than average results across all selection areas, there may have been limited opportunities to identify greater levels of variance within the measure.

Concluding Remarks

The major objective of this thesis was to contribute new knowledge about the structures and relatedness of multiple dimensions and measures of teacher quality within an Australian educational context. It sought to provide new knowledge regarding teacher quality, and in particular the relationship between elements that included teacher inputs (attributes and beliefs), processes (quality teaching), and outcomes (effective teaching.) The findings presented here demonstrate the importance of considering all three broad elements of teacher quality, given the complex, relational nature between who teachers are, what they do, and their impact upon students. Efforts to understand and ultimately improve teacher quality will be more fruitful and complete when we can understand the interrelationships between these elements.

This thesis sought to situate teacher beliefs within teacher quality research. In doing so, this thesis attempted the novel goal to not only investigate and contribute new knowledge across a comprehensive range of critical teaching beliefs that were theoretically linked to quality teaching and by extension, student achievement, but also attempted to distil this wide array of beliefs into a small number of critical higher order beliefs. The findings here have provided a number of insights regarding the complex ways in which teachers' beliefs function as a system, including how pedagogical beliefs, motivational beliefs, and beliefs about students integrate to form higher order beliefs structures that have not been commonly identified in prior research. It stands to reason that one particular belief does not function in isolation of others. This thesis would suggest even further that the function of teachers' beliefs largely draws together beliefs that are typically not parsed or studied together. While the results of this dissertation do not indicate strong and obvious connections between most teachers' beliefs and other measures of teacher quality, they nevertheless highlight that particular beliefs do appear to influence

particular practices that in turn promote higher quality learning outcomes for students. Our understanding of this relationship and the practices that appear to most strongly mediate effective teaching practice is essential to the ultimate aim of both teacher quality and teacher beliefs research: the optimisation of teaching and learning for all students.

While few people would debate the importance of teacher quality in education, there remains a lack of clarity and consensus regarding its definition, its key elements, and its optimal measures. This issue is compounded by the increasingly complex and varied societal expectations placed upon teachers. The findings highlight the need for greater alignment around the meaning and measure of teacher quality, and the potentially problematic nature of research in this field that has been arguably driven more by advances in measures and tools first and theory second, when the opposite should be true. Researchers, policy makers, schools and teachers all continue to prioritise and invest in efforts to raise teacher quality, buoyed by a strong and common understanding of the simple truth that teachers can and do make a difference for their students. The focus on teacher quality is a noble effort and one that should be supported by a strong body of evidence to hasten the continuous improvement of teaching in service of excellence and equity for all students. The evidence this thesis has drawn from and extended upon calls for an understanding of teacher quality based on its multiple dimensions and the important and complex relationships between these dimensions.

There remains little doubt how important teachers are, but the usefulness of this conclusion is limited in the absence of knowing how and why they are important. In contribution to this how and why question, this thesis argues that particular beliefs and particular practices matter, and the interaction between those beliefs and practices lead to better or worse educational outcomes for students, of which one important facet is the perception of students

themselves. Efforts to improve teacher quality must embrace and address the complexity and connectedness between these factors. Doing so will better service efforts to address the looming concerns regarding the plateauing academic results and equity gaps in Australian classrooms, and more broadly service efforts in any country that aims to improve educational outcomes by raising teacher quality.

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