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TASMANIA

Culturally Responsive Education and its Impact on the Educational Outcomes of Indigenous Australian Children

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Abstract

Throughout the latter decades of the 20th century a concerted effort has been made by successive governments and researchers to improve the educational outcomes of Australia's Aboriginal and Torres-Strait Islander population. At the core of this effort has been the notion that educational outcomes are likely to be improved by the incorporation of Indigenous knowledges, cultures and perspectives into the day to day pedagogy and curriculum of the classroom. Over the years this notion has appeared in various domains of the scholarship under various guises however is best known under the all-encompassing term 'Culturally Responsive Education' (CRE).

At present the core concept of CRE resides in both the Australian Curriculum and the standards governing teacher registration. It also features prominently in political discourse and the curricula of various institutions charged with training the nation's teachers. In essence it has become the principal method for solving the educational disparity experienced by the nation's Aboriginal and Torres-Strait Islander students. This is problematic for two reasons. Firstly, there is theoretical and conceptual contradiction in regard to what exactly it entails and thus the mechanism by which it is hypothesised to improve educational outcomes. Secondly, it has been noted by various scholars that there are questions surrounding whether or not it actually improves educational outcomes for Indigenous students at all. It was these issues this thesis aimed to address.

To achieve this, the study employed Structural Equation Modelling (SEM) to explore whether CRE had both a statistically and practically significant effect on the educational outcomes of Indigenous children and if so, whether this effect was direct or

mediated by the children's engagement with their school and education more broadly. The former suggesting that CRE theory originating from the culturalist tradition was more appropriate, the latter suggesting that theory grounded in a Marxist / Post-Colonial paradigm was a more apt way of envisaging the process by which CRE may have improved educational outcomes.

It began this process by drawing on data regarding the educational experiences of 326 Indigenous 5, 6, 7 & 8 year old children obtained from the Longitudinal Study of Indigenous Children (DSS) to operationalise the following latent variables: PRESENCE (the level to which Indigenous people were present within the school); PRACTICE (the extent to which Indigenous knowledge, practices and perspectives entered the curriculum and practice of the classroom); AFFECTIVE (the strength of student's emotional reactions towards education and the school); BEHAVIOURAL (the extent to which student's paid attention, participated and adhered to the rules of the classroom); LITERACY (the student's proficiency in composition, comprehension, reading and writing); and NUMERACY (the student's proficiency in operations, measurement and geometry). It then specified and tested a SEM model containing a series of relationships between these which represented the core hypotheses of both the culturalist and Marxist/Post-colonial perspectives on the mechanism by which CRE should improve the educational outcomes.

The model was an excellent fit to the data (RMSEA = .06; CFI = .95; TLI = .95). The standardized indirect effect of PRACTICE on LITERACY was .13 ($p < .05$) and the standardized indirect effect of PRACTICE on NUMERACY was .14 ($p < .05$) thus providing evidence that CRE has what may be heuristically considered a 'medium' positive effect on educational outcomes. The model also provided evidence that

relationship between CRE and educational outcomes was mediated by behavioural engagement though the practically and statistically significant paths identified between PRESENCE and PRACTICE; PRACTICE and BEHAVIOURAL; BEHAVIOURAL and LITERACY; and BEHAVIOURAL and NUMERACY.

These results are significant for a number of reasons. Firstly, they constitute the first empirical evidence surrounding the ability of CRE to improve the educational outcomes of Indigenous students in the Australian context – a quality which could not be more timely given the current tensions between neo-liberalism and agendas of social justice in Australian education where Indigenous (and indeed all) students are concerned. Secondly, they call into question the efficacy of the culturalist paradigm and within this, the notion that cognition is inextricably linked to culture – a finding with significant implications not only for policy and practice in Indigenous education but also for our understanding of the learning process itself. Thirdly, they provide important insights into the positive (and perhaps vital) role Indigenous presence and voices play in the provision of CRE – a finding which may help inform a range of stakeholders in the educational process but of significant importance for those whose roles lie in educational leadership and policy. Finally, through the operationalisation of the latent variables described above it provides solid groundwork in regard to the quantitative measurement of CRE – a vital step if the empirical research in Indigenous education is to move forward from its present state.

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Prologue:

A Statement of Standpoint

I am male, middle class and white. I have fought against inequality but through inaction I have also been complicit in its construction. I am a student, a teacher, and a person sitting in a dark room staring at numerical abstractions of reality. I am an academic, or at least someone who is beginning such a journey.

As a student, I have spent much time uncovering how whiteness operates socially and personally. I continue to explore the inherent assumptions which have constructed my past conceptualisations of reality. This process is challenging. Paradigmatic shifts have, and continue to occur. I draw upon theory as both a vehicle for understanding, and as a catalyst for further change. Within this, I aim to understand more deeply the reluctance of non-Indigenous dominant systems, ideologies and bias held institutionally and by people in those systems, to interrogate their cultural assumptions, and how they manifest in education. The perspective that I am developing recognises the need to question the role that non-Indigenous systems play in the 'problems' they define about Indigenous nations, communities and students which they 'other'.

As a teacher, I believe it is time for a theoretical shift in the discourses and ideologies which underlie the process and provision of education to Indigenous Australians, one which interrogates the processes and practices of colonisation, their influences both in the past and the present, and the emergence of new forms of imperial power and hegemony which shape the world that we live in today. I believe it is time to do away with 'quick-fixes' and the notion that simply throwing money at a problem will make it disappear. It is time to listen to Indigenous voices, both in the scholarship and more broadly, regarding the root causes of the current predicament and potential solutions. Most importantly, it is time to acknowledge the role of the past in relation to the present just as Indigenous scholars, activists and commentators have argued for decades. In doing so, I believe in the promotion of strengths as opposed to the re-enforcement of deficit, but only to a point. I refuse to paint pictures through rose tinted glasses for the sake of civility. Nor will I ignore the voices of friends and elders who speak against the politics of power and identity which fragment aboriginal lives.

As an academic, I believe in the power of numbers, for this is the way in which I see the world - as observable, quantifiable, and as a complex machine of cause and effect. I see the patterns in the leaves of the plant that sits on my desk, the intricacy in the wings of the framed insect specimens which sit on my shelf, and I marvel at the fractals which cross my computer screen as it goes to sleep. I see a world that is connected, that is ultimately knowable. In this sense I am a positivist, perhaps even

an empiricist, but simultaneously I recognise the limits of human knowledge and the fragmented and contextualised circumstances within which it is constructed. Consequently, I believe our conception of the world is neither neutral nor objective, but inevitably influenced by the filters and frames of our circumstances. I believe these filters and frames construct our understanding of reality and the world around us. As researchers, they shape “the questions we see, the answers we seek, the way we go about seeking those answers, and the interpretation we make, the theoretical paradigms that make ‘sense’ to us” (Walters, 2009, p. 11). In precis, I believe numbers are objective, but their representations of reality are not. I believe in cause and effect, but question our capacity to truly isolate these relationships within complex systems. And, I believe the world is ultimately knowable, but not in the foreseeable future, or perhaps never by humans. As a consequence of these various roles and the philosophical standpoints which underpin them (or at least the ways in which I interact within them), I see the role of quantitative research where Indigenous issues are concerned in a somewhat different light.

Firstly, I see (at least some of) the damage which has been done by research in the past. I see that research involving Indigenous peoples has been shaped by paradigms and discourses that privileged Western systems of knowledge and knowledge production. Consequently, I see that the Western world defined the rules by which the Indigenous world was theorized and understood, the way these rules shaped interactions,

and the dire consequences this has had. For these insights I thank Linda Tuhiwai Smith. It is your writings which drew me to such conclusions.

Secondly, I see that Western ways of knowing, both in the past and the present, have remained authoritative, universal and often unquestioned. Consequently, I see the assumption that Western understandings can be employed to explain the Indigenous realities present itself time and time again and from this, the development of a discourse bound by Indigenous 'problems' and non-Indigenous 'solutions'. For these insights I thank Marie Battiste and others who have written in this contested space.

Thirdly, I see the way quantitative research plays into these issues through its inherent links to neo-liberal governance and the pride of place it holds within the tool-box of the settler colonial state. I see the way numerical abstractions create truth claims about the other, the way they do this both to the coloniser and at times the colonized themselves, and the deficit constructions of Indigeneity they often create through constant comparison to Western norms. Consequently, I understand why Indigenous scholars are wary of quantitative methods, but I also see the power of such methods to challenge the truth-claims they have previously made. For these insights I thank Maggie Walter, Chris Andersen and Gawaian Bodkin-Andrews. Your work has been invaluable in framing this research and evaluating my methods.

Finally, I see a way forward. I have hope that research of this nature can become a vehicle of emancipation and social justices as opposed to simply another tool of colonisation. To do so, I draw on Martin and Mirraboopu (2003) who argue that research should: recognise Indigenous worldviews, knowledges and realities as distinctive, vital to survival, and as a means from which research should originate; honour Aboriginal social mores as essential processes through which people live, learn and situate themselves as Aboriginal people in their own lands and when in the lands of other Aboriginal peoples; emphasise the social, historical and political contexts which shape Aboriginal experiences, lives, positions and futures; privilege the voices, experiences and lives of Aboriginal people and Aboriginal lands; and, identify and redress issues of importance to Aboriginal people.

Now it may appear odd to begin a thesis in such a manner. It has not escaped my attention that such discussions are normally found within methodologies and methods. Indeed, this is where it was originally presented. However, there is reason behind this. You see, as I sat here at my desk before the simultaneously cathartic and daunting act of submission, I realised the philosophical contradiction that the placement of such a standpoint within my methods posed. If I believe that the filters and frames of our circumstances guide the questions we see and the answers we seek, then I must also believe that they shape the way I frame my research - the traditional function of the thesis introduction; the way I understand the issues that my research seeks to address - the

*traditional role of the literature review and the methods I apply - the
traditional role of the research methodology.*

*It is for these reasons that such a discussion sits exactly where it does
within the thesis, as it is on these terms that I now begin.*

Chapter 1: Introduction

Setting the Scene

In 1967 the Australian public voted in a nationwide referendum, the results of which brought about significant change in the relationship between the Government and the nation's First People. Alongside the federalisation of Indigenous affairs, Indigenous Australians were now to be counted as part of the nation. Whilst prior research had to some extent identified the various forms of disadvantage experienced by Indigenous Australians, in 1971 the first national census to include Indigenous Australians confirmed what had long been assumed. Significant disparities between Indigenous and non-Indigenous Australians were present across a broad range of social indicators. Amongst other alarming statistics, the data identified a 25-year gap in life expectancy between Indigenous and non-Indigenous Australians, an unemployment rate six times higher than the broader population, and a 44-percentage point difference in home ownership¹. In the specific context of education, it also found that a quarter of Australia's Indigenous population had never attended school, and post-secondary qualifications were virtually non-existent (Altman, Biddle, & Hunter, 2008). These figures represented a crisis in Indigenous affairs. What had been assumed for years could no longer be ignored. The Government was forced to act.

¹ Home ownership is a useful proxy for accumulated wealth.

At the time, various manifestations of human capital theory had permeated the global discourse of political economy. As a result, considerable emphasis was placed on education as a means to transform the circumstances of Indigenous Australians. Politicians looked to education as a panacea for progress, whilst research sought to explain the consistent failure of Indigenous students. At the core of this process was an assumption that the problem lay with Indigenous communities and families, as opposed to the various institutions which had been tasked with creating change. In essence, the dire circumstances of Indigenous Australians were largely seen as a product of educational failure, and the educational failure of Indigenous people was conceptualised as a product of culture and environment, not as a consequence of historical marginalization and an educational system which failed to meet their needs. It was from this position that the first² concerted research effort into the education of Indigenous people began.

As the Ivory Tower sought to construct a picture of the Indigenous learner throughout the later decades of the 20th century, its discourse was defined by an uncritical acceptance of assimilation. Much of the early literature was concerned with the barriers posed by the prevalence of non-standard English in Indigenous communities, and the multi-lingual nature of many Indigenous learners. Much of the later literature was concerned with a broader lack of compatibility between the learner and the institution; cultural and social disconnects between the home and the school; and perhaps most damagingly, with the process of learning itself. As a consequence, policy sought to erase difference. Culture and language were traded for conformity and rote learning and forms of 'Indigenous' pedagogies permeated the nation's classrooms.

² In the Australian context.

Fast-forward to the present and relatively little has changed. Despite over half a century of successive policy, there is still not a single socioeconomic indicator where Australia's Indigenous population demonstrates better or equal outcomes compared to the non-Indigenous population. At present, depending on demographic context, the gap in life expectancy stands between 9 and 14 years, Indigenous Australians are between 1.5 and 13³ times more likely to be unemployed, and the gap in home-ownership is steady at 40 percentage points (Australian Bureau of Statistics, 2019). In the context of education, whilst there has been significant improvement in both the number of Indigenous Australians who have attended school and the rate of post-secondary qualifications since 1971, the statistics are still yet to equalise and are unlikely to do so in the foreseeable future (Altman, Biddle, & Hunter, 2009). Furthermore, as a broader picture of Indigenous education has emerged from research and literature, other gaps requiring equal or perhaps greater attention have become apparent. For example, the introduction of nationwide standardised testing in 2008 revealed that Indigenous students are on average two years behind their non-Indigenous counterparts in relation to literacy and numeracy outcomes, and the introduction of electronic record keeping has identified a culture of truancy and ad-hoc attendance (Gillan, Mellor, & Krakouer, 2017a).

However, whilst considerable disparity continues to exist between Indigenous and non-Indigenous Australians, there is perhaps some hope for the future. Although the historical gaps have failed to close and new ones have emerged, the recognition of a connection between Indigenous disadvantage and prior history has entered the conversation, both in the broader context of Indigenous affairs, and in the specific context of Indigenous education. Furthermore, a slow shift in blame from the child to

³ Figures vary based on gender and location.

the institution has emerged both in theory and policy. In essence, present directions in Indigenous affairs show promise. It is this promise that the present study explores.

The Study

The current theoretical trend in Indigenous education broadly argues that the cultural identity and knowledge that Indigenous children bring to the classroom has considerable influence on the way in which they interact and engage with formal education (Gillan et al., 2017a). In particular, it claims that the gap in educational outcomes between Indigenous and non-Indigenous students can be explained through a cultural mismatch between the home, the community, the educational environment and the expectations of the school⁴. As expected, these assumptions have flowed into the educational system creating broad and sweeping reform where Indigenous students and issues are concerned. For example, core policy documents such as the Melbourne Declaration and subsequent National Aboriginal and Torres-Strait Islander Education Action Plan dictate that schools build on local cultural knowledge as a foundation for learning, develop working partnerships with local communities in all aspects of a learning process, and promote high expectations for the learning outcomes of all Indigenous students. Furthermore, in a national first, these lofty goals have been replicated within the documentation that guides the day-to-day practice of Australian classrooms such as the Aboriginal and Torres-Strait Islander Cross Curriculum Priority, nested within the current Australian Curriculum, and the corresponding teacher

⁴ For various reasons, with a range of consequences and potential solutions.

standards that require educators to be proficient and knowledgeable both in the education of Indigenous students and Indigenous perspectives, amongst other things. However, whilst the new policy paradigm is certainly ‘progressive’, unfortunately it suffers from significant shortcomings.

Firstly, the sheer diversity of Indigenous cultures, identities and circumstances that exist across Australia pose questions surrounding which Indigenous cultures should be present in the classroom. Secondly, the lack of teacher knowledge, readiness to engage with these models and lingering forms of prejudice that continue to pervade the system all play a considerable role in shaping potential outcomes. Thirdly, the assumption that Indigenous histories and knowledges can be forced uncritically into a Western framework, despite the obvious epistemological, ontological and cosmological conflicts, has largely been ignored. Fourthly, theoretical confusion exists regarding the mechanism by which the intended process may occur, and consequently strategies ranging from the re-instatement of ‘Indigenous’ pedagogies to the decolonisation of education and in some cases knowledge itself are presented. Finally, and most problematically, there are also serious concerns surrounding the efficacy of the approach as the literature is comprised almost entirely of theory, case studies and the anecdotes of individual educators. Each of these are plagued by shifting and conflicting definitions, a concerning culture of inter-referentiality, a propensity to focus on examples of exemplary classrooms, and a troubling tendency to present opinion as fact⁵.

⁵ See: Apthorp, D'Amato, & Richardson (2002); Byrd (2016); Demmert Jr (2001); Demmert Jr & J. Towner (2003); Howard (2010); Khalifa, Gooden, & Davis (2016); Klump & McNeir (2005); Leonard, Brooks, Barnes-Johnson, & Berry (2010); Leonard et al. (2018); Lipka (2002); Powers (2006); Savage et al. (2011); Sleeter (2012); Yazzie (1999).

In essence, whilst both literature and policy have made a strong case for the incorporation of culture in the educational process under the theoretical and ideological guise of ‘Culturally Responsive Education’, there is little to no evidence that this influences educational outcomes for Indigenous learners in the Australian context⁶. Furthermore, there is confusion and disagreement as to whether the link between culture and educational outcomes is direct, whether it is mediated by various forms of resistance, alienation and engagement, or indeed, whether it is a combination of both. It is the intention of the present study to address these issues to varying degrees through a quantitative evaluation of the efficacy of educational approaches which incorporate aspects of culture in the educational process. At its core, it aims to answer two key questions:

1. Does the incorporation of culture within the learning process influence educational outcomes for Indigenous students and;
2. If this is the case, is this relationship direct or is it mediated by engagement?

It achieves this through the development and evaluation of a structural equation model using data obtained as part of the Longitudinal Study of Indigenous Children (*Footprints in Time*)(see further: Chapter 3 – Data Collection).

⁶ A point which has been articulated in the Australian scholarship at various times however most recently by Burgess et al. (2019) whose systematic review of the Australian literature found that there was “*a disconnect between practice and outcomes where links to improved outcomes are by implication rather than evidence*” (p. 1)

Methods (overview)

Structural Equation Modelling (SEM) refers to a set of statistical techniques that can be broadly described as a combination of Confirmatory Factor Analysis (CFA) and regression (Hox & Bechger, 1998). Within these techniques, latent variables⁷ derived from observed variables represent theoretical constructs (or aspects of theoretical constructs), and regression relationships between latent variables represent causal propositions (Evermann & Tate, 2009). Within the process, model-implied covariances are compared to an empirical or data-based covariance matrix for consistency, with the aim of confirming a plausible set of relationships between measures or good ‘model-fit’ (Kelloway, 1995). This process can be thought of simplistically as ‘Data = Model + Error’, where error determines the nature of ‘model-fit’ and consequently the applicability of the model to the data (Hox & Bechger, 1998). Due to this complexity, structural equation models are usually represented as ‘path-diagrams’. For those unfamiliar with the method, these can generally be thought of as statistical ‘flow-charts’ which identify the observed variables employed to operationalise latent variables and the hypothesised relationships between these.

The structural equation model tested by the thesis (represented conceptually in *Fig. 1*) broadly reflects the central hypothesis’ put forward by current theory and policy in Indigenous education – that educational environments which incorporate culture influence the educational outcomes of Indigenous children. Simultaneously, it broadly

⁷ The terminology of SEM is quite fluid and often changes depending on nationality and discipline within which the research is based. For example, whilst the term ‘latent variable’ is employed in this instance, the terms ‘factor’, ‘latent-factor’, ‘construct’ or ‘latent construct’ (amongst others) would be equally appropriate. Where possible, an attempt has been made to maintain continuity of terminology throughout the thesis by employing either the term ‘construct’ or ‘latent variable’ – the former in more theoretical contexts, the latter in more analytical contexts.

captures the competing mechanisms by which this process is theorised to occur – either directly, indirectly through engagement/disengagement as a consequence of resistance and/or alienation, or potentially a combination of both.

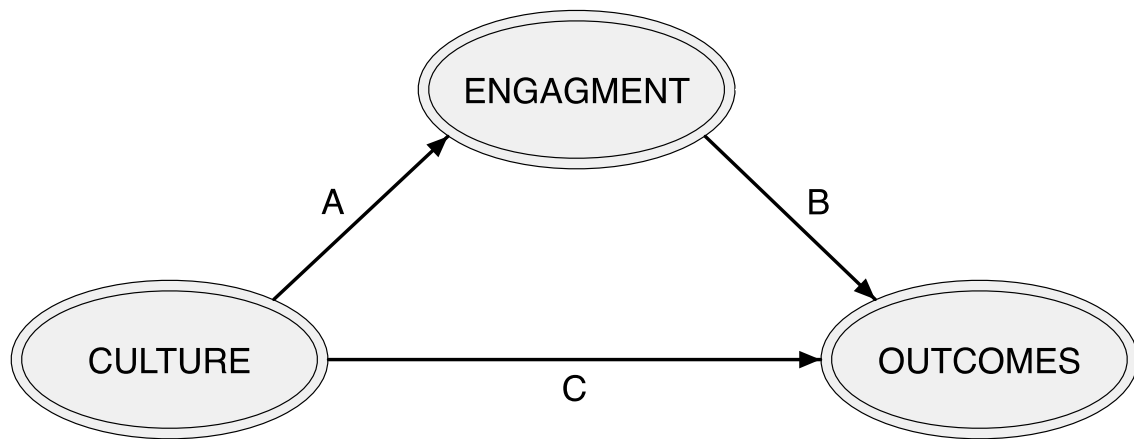


Figure 1: Conceptual Model.

To achieve this, a ‘mediation’ analysis was employed. At the core of this technique is the hypothesis that the relationship between two constructs can be best explained via the influence on and of a third mediatory construct. In the context of the thesis – that the influence of ‘CULTURE’ on ‘OUTCOMES’ can be best explained by the influence of ‘CULTURE’ on ‘ENGAGEMENT’, and consequently, the influence of ‘ENGAGEMENT’ on ‘OUTCOMES’. Mediation can be either partial – e.g. ‘CULTURE’ influences ‘OUTCOMES’ both directly and through its influence on ‘ENGAGEMENT’; or full – e.g. ‘CULTURE’ influences ‘OUTCOMES’ only through its influence on ‘ENGAGEMENT’.

Thesis Structure

Even at this early stage of the thesis, it should be evident that there are considerable tensions and methodological requirements which arise when conducting research of this nature in this space employing these methods. Naturally, these tensions and requirements had considerable influence on the manner in which the thesis tells its story.

Firstly, as outlined before the thesis formally began, the role that quantitative methodologies have played in shaping the lives of Indigenous peoples has made the scholarship wary of their use (and rightly so). Consequently, the vast majority of the literature relating to the topic of the thesis and the research questions to be addressed is theoretical in nature. As a result, a review of the research literature focussing on prior studies would have been either overly brief or generally irrelevant, due to differences in context and research paradigm. For this reason, a traditional literature review does not follow on from this chapter. Instead, an overview of the key theoretical frameworks currently operating in Indigenous education is provided.

Secondly, the nature and context of the research alongside the principles and ethical standpoints upon which it was conducted meant that there was a need to emphasise the social, historical and political contexts of both the research and the researched. For this reason, historical context frames many of the chapters contained within, and discussions of theory often delve into the interplay between the past and the present. Through such an approach, it is hoped that the current study is able to move beyond simple understandings of the issues which Indigenous peoples may face on a daily basis.

Thirdly, as many of the constructs employed by the study had not been previously operationalised; had not been operationalised with the measures available to the present study; had not been operationalised in the context of Indigenous education; or, had not been operationalised within a SEM framework, it was necessary to spend a considerable amount of time to ensure these were reliable, valid and grounded in theory, literature and where possible Indigenous voices. As a consequence, an entire section of the thesis is dedicated to this process.

Fourthly, whilst it is recognised that it is *very* unconventional, some results and implications relating to data selection and preparation are contained within the method chapter of the thesis. This was deemed to be a necessary evil due to the nature of the analysis and subsequent structural demands. The alternative was to either spread these throughout the thesis in a relatively un-coherent manner; present either a contextually devoid or overly repetitive chapter prior to the section of the thesis which deals with operationalising constructs; or, ‘put the cart before the horse’ and discuss these in the results section after the data had already been drawn upon. None of these was deemed to be a particularly sensible option.

Finally, whilst it is perhaps not a structural irregularity, it should be noted that the thesis has been written with multiple audiences in mind, as it is recognised that many of those who may be interested in its content will be unfamiliar with the methodology that has been employed for various reasons. As a result, the thesis seeks to strike a balance between demonstrating the necessary rigour that SEM requires, and conveying this in a manner which is accessible to those unversed in the more technical aspects of quantitative research. This was deemed an ethical necessity on the basis of the discussion presented before the thesis formally began. As a result, the chapter which

deals with methodology and method is considerably longer than what is perhaps deemed to be 'usual' in the field.

Section A:

Theory and Method

This section of the thesis aligns the theoretical perspectives and research methods which were applied by the present study. It is comprised of two distinct but interconnected chapters. The first of these outlines the main theoretical perspectives surrounding the mechanism by which culture translates into improved educational outcomes for Indigenous students. It provides a brief outline of these, both in the broader theoretical context, the educational context and the specific context of Indigenous education. It then concludes by aligning these perspectives with the analysis through an exploration of the different relationships between the constructs outlined in the conceptual model for each.

The second chapter of this section then outlines the methodological approach employed to address the research questions. It begins with a broad overview of SEM as a statistical technique and the various tools on which it relies. This is followed by a discussion of the way in which SEM is commonly conveyed and a brief albeit succinct justification of the appropriateness of the method to address the research questions of interest to the present study. From here, it looks at the key steps involved in the construction and estimation of model employed by the present study. This discussion is divided into four sections: Data Collection; Data Preparation; The Measurement Model; and, the Full Model.

Chapter 2:

Theoretical Frameworks

Introduction:

As outlined within the preceding chapter, whilst recent moves towards a policy paradigm where increasing levels of responsibility are being placed on educational institutions to attend to the needs of Indigenous learners is certainly progressive, there is still a long way to go. Firstly, although the shift has seen the inclusion and legitimisation of Indigenous knowledges and perspectives in the Australian classrooms through various manifestations of Culturally Responsive Education, there is little to no evidence that this is or has been beneficial for Indigenous students in the Australian context. Secondly, whilst Culturally Responsive Education has become the prominent framework in Indigenous education, confusion and conflation has created a situation where two distinct and conflicting theories currently operate regarding the nature of culture, the role of culture in the classroom, and the mechanism by which its incorporation will hypothetically translate into improved outcomes. Drawing on the culturalist tradition, the first is largely a-historical, grounded in notions of cultural discontinuity, and argues for the implementation of pedagogies and practices based on a set of oppositional beliefs about the way Indigenous students learn. Drawing on Marxist and Post-Colonial thought, the second is historically grounded, theorises that Western education creates various forms of Indigenous resistance and alienation, and argues for a pedagogy and curriculum which incorporates Indigenous knowledge and perspectives as

a means to improve engagement and consequently outcomes. The following discussions lay out the literature and assumptions that underpin each of these theories; how they have entered and appear in the policy and discourse of Indigenous education; their merits and critiques; and, the way in which these differing mechanisms of action were captured within the analysis conducted by the thesis.

Culturalism

In the broadest terms, Culturalism refers to the tendency to assume that cultures exist as distinct and identifiable elements of society; that they are composed of people who share the same ways of viewing the world; and, that these are naturally different and consequently preclude the understanding of others who do not share them (Stjernfelt, 2013). Whilst culturalist perspectives have changed over the years, a number of key tenets have remained⁸. Firstly, culture is generally conceptualised in terms of artefacts which embody shared values, habits and worldviews which are passed on to successive generations as traditional knowledge, practice and the underlying core of group identity and belonging. Secondly, each group is conceptualised as an entity unified by culture, and consequently it is theorised that different societies are best conceptualised as distinct cultural entities with unique ways of doing, being and understanding. Finally, it is theorised that individual consciousness is relative to and determined by culture. In essence, the culturalist tradition theorises that reality is seen through the lens of culture

⁸ The following points draw upon the work of Regelski (2002).

and that through socialisation, culture is burnt into the very core of the individual forever distinguishing and separating them (Vertovec, 1996).

From such definitions, various scholars have attempted to construct typologies that could be employed to broadly define the cultural characteristics of a given group. For example, early research such as Benedict (1946) suggested that differences could be found within manifestations of shame or guilt. The role of communication and trust was considered in the work of Hall (1976), which categorised cultures into ‘high context’ and ‘low context’ based on the amount of information required to interpret various cultural messages. The work of Fukuyama (1995) explored the relationship between trust and social structures across various cultures. Conversely, later research has generally attempted to bring such typologies together. For example, Hofstede (2001) argued that cultural differences were best conceptualised in terms of dichotomies between power or distance, uncertainty or avoidance, individualism or collectivism, and long term or short term orientations. The typology has been further refined by House, Hanges, Javidan, Dorfman, and Gupta (2004) who argue that cultures are best categorised as embracing egalitarianism or hierarchical social structures, collectivist or individualist pursuits; are comfortable with or avoid uncertainty; value nurture or power; repress or satisfy desires; and, are orientated to thinking either in the short term or the long term.

In Education

Although its roots in Anthropology date back to at least the turn of the 20th century, the rise of culturalism in education largely began in the late 1970’s as a response to previous theories of ineducability which conceptualised the disparate

outcomes of minority students either in terms of genetic deficiency⁹ or cultural deprivation¹⁰. Drawing on a hypothesis of cultural discontinuity, this new direction broadly theorised that prior socialization (through culture) influences the way in which individuals negotiated, mediated and responded to the various components of formal education such as curriculum, pedagogy, learning tasks and the patterns of communication employed within the classroom. Interestingly, much like the broader work surrounding the nature of culture, culturalist perspectives on education (especially where minority cultures are concerned) have generally focussed on identifying various dichotomies which are theorised to exist in relation to the ways in which individuals from different cultures learn. Consequently, a considerable amount of the research and literature, (and perhaps more importantly in the context of the present study, the vast majority of which deals with minority education) has attempted in some shape or form to align these dichotomies with the concept of ‘learning styles’.

The concept of learning styles arose from the broader socio-cultural perspectives on learning and teaching promoted by many of the key educational theorists such as Dewey. Although the literature is definitely broad, perhaps the most prominent work in the field can be attributed to the work of Kolb in the early 1980’s and his model of ‘experiential learning’. Within this, it was theorised that the learner should be placed somewhere on the following spectrum based on differences in perception and processing (*Fig.2*).

⁹ The ‘genetic deficiency’ hypothesis proposed that disparities in minority education could be explained by differences in IQ. This hypothesis is largely implicated in the educational discrimination experienced by Indigenous Australians, especially in the early half of the 20th century (Beresford, 2003).

¹⁰ Theories of cultural deprivation posit that children from ethnic minorities are ‘retarded’ in their social and psychological development, since the stimulation for normal development is not present (Rothson, 2005). Subsequently, such theories usually manifest within educational systems as the notion that education fundamentally conflicts with the value systems of ethnic minorities. In essence, parents do not value education hence children do not want to learn.

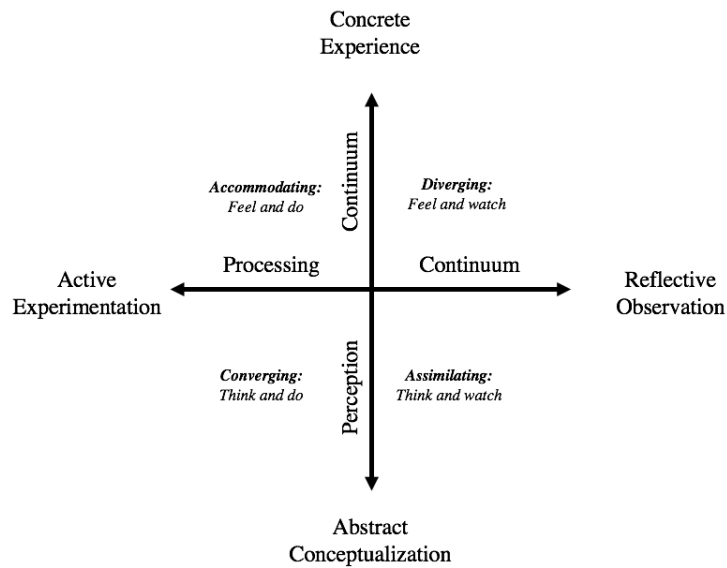


Figure 2: Kolb's Dimensions of Learning.

Within this model, it is assumed that those who prefer Concrete Experience are intuitive, make feeling based judgements concerned with the present, and rely on contact with people throughout the learning process. Whereas, those who lean towards Abstract Conceptualisation seek theories and generalizations, are logical, learn through compartmentalisation, and have less reliance on people in order to learn (Joy & Kolb, 2009). In respect to the second continuum, it is assumed that those who prefer Reflective Observation wait and watch before acting, whereas those who prefer Active Experimentation are practically orientated, willing to 'try things out' and take risks (Joy & Kolb, 2009).

Since the emergence of such theorisation, there has been a concerted effort to align various cultures with the various learning styles which have been proposed. For example, Auyeung and Sands (1996) have explored differences between Australian students, students from Hong Kong and students from Taiwan. Barmeyer (2004)

explored differences between students from France, Germany and Canada. Others such as Yuen and Lee (1994) and McMurray (1998) looked at within group variations in Japan and Singapore. Alongside this, various scholars have proposed a range of pedagogical techniques that should be employed. For example, Sims and Sims (1995) argue that where African American students are concerned, learning should focus on storytelling, trust, dialogue and clear expectations. Sit (2013) notes that Chinese students often rely on rote learning, are silent and conscientious, and thus pedagogy and practice should be adapted to suit.

The Indigenous Context

In the context of Indigenous education, advocates of culturalist perspectives tend to emphasise the notion that educational disparity should be conceived as a function of differing micro-level cultural elements. In essence, it is argued that the poor performance of minority cultures can be explained as a product of cultural incompatibility with formal education (Huffman, 2001). As a consequence, such theorization often translates into the contention that in the realm of the school, the cultural differences between Indigenous peoples and mainstream education are fundamentally at odds (Partington & Beresford, 2012). Consequently, deviation from non-Indigenous norms is identified as the underlying issue, and disparate outcomes are ‘explained’ through the identification of what Indigenous students ‘lack’ (Nakata, 2007).

In the Australian context, much of the theorisation which has linked culture to learning has drawn on the work of Scribner and Cole (1973) and the concept of ‘functional learning styles’. Within this, it is theorised that whilst all cultures nurture the

same psychological and cognitive capacities, there are distinct differences in the way in which these capacities are employed in various ‘problem-solving situations’ that do not ‘match’ with the way formal learning is conducted in Western society. Within the nation, perhaps the most recognisable manifestation of culturalist theorization began in the 1980’s with the publication of *Culture and Learning* by Stephen Harris, and the subsequent adoption of ‘Aboriginal Learning Styles’ as a guiding theory and framework for policy and practice in Indigenous education. Such theorization hypothesised that significant differences exist in the ways Aboriginal children learn, based on the assumed presence of a homogeneous set of oppositional belief systems. In precis, it was theorised that Indigenous people were religious as opposed to positivistic; viewed the world as related as opposed to compartmentalised; maintained an open as opposed to a closed society; saw time as cyclic as opposed to linear; and, had contrasting views of work, economics and authority. Consequently, overcoming educational disparity was simply a matter of applying a ‘checklist’ of Indigenous specific pedagogies based upon the principles that Indigenous people learnt through¹¹ observation and imitation as opposed to verbal instruction; trial and error as opposed to demonstration; by wholes as opposed to by sequenced parts; ‘real-life’ as opposed to artificial settings; and, context specific instruction as opposed to generalizable principles.

As with other theories of the time based on the cultural-discontinuity hypothesis, Aboriginal Learning Styles was immensely successful in terms of its take up by the teaching community and broader educational system, and consequently underwent a number of revisions, a useful summary of which is provided by Hughes and Moore (1997). They advance the argument that Indigenous people also learn through imagery

¹¹ The following points are drawn from the summary provided by Nichols, Crowley, & Watt (1996).

and spontaneity; are passive as opposed to active participants in the classroom; and, are often slow to respond in the classroom due to fear of embarrassment, or may make random guessing attempts at answers in a process of trial and feedback.

Whilst the concept of distinct and knowable Aboriginal Learning Styles fell out of favour around the turn of the century¹², with theory and policy subsequently shifting to a more post-colonial paradigm, the recent rise of ‘8-ways pedagogy’ has in many ways seen a resurgence of culturalist principles in Indigenous education. Based upon the work of Yunkaporta (2009), this pedagogy proposes that Indigenous people:

“Connect through the stories they share; picture their pathways of knowledge; see, think, act, make and share without words; keep and share knowledge with art and objects; work with lessons from land and nature; put different ideas together and create new knowledge; work from wholes to parts, watching then doing; and bring new knowledge home to help our mob.”

Consequently, Indigenous perspectives, and by implication Indigenous students¹³, should be taught under the assumption that they learn through culture, narrative, visually, non-verbally, and through imitation (amongst other things) – a remarkably similar suggestion to the earlier work of Indigenous learning styles.

¹² Possibly due to a lack of success and evidence surrounding its efficacy.

¹³ The following is not intended to be an ‘attack’ on the work of Yunkaporta. Rather, it should be interpreted as a concern surrounding its un-critical adoption in curriculum, policy and teacher-education as a demonstration of ‘best-practice’. To this end, it is worth noting that the original research by Yunkaporta (2009) made limited reference to its potential use as an ‘Indigenous pedagogy’. Furthermore, it explicitly cautions against its uncritical adoption in various places – e.g. it is stressed that *“the 8ways framework is not a collection of arbitrary learning styles to be assigned to students like astrology signs.”* (Yunkaporta, 2009, p. 47).

Critique

Although (almost) all of the key scholars¹⁴ working within the theoretical confines of the culturalist paradigm have stressed the importance of steering away from broad generalisations, and the wholesale applicability of their frameworks to Indigenous learners, these caveats have rarely (if ever) been fully recognised in policy and practice. Instead, such frameworks have largely been presented as both widely applicable and ‘best-practice’ in Indigenous education. For example, at the present time, the current standards for teacher registration in Australia require that teachers are able to:

*“Demonstrate broad knowledge and understanding of the **impact of culture**, cultural identity and linguistic background on the education of students from Aboriginal and Torres Strait Islander backgrounds”* (Australian Institute for Teaching and School Leadership, 2011). Furthermore, the Australian Curriculum and key teacher education texts such as Perso and Hayward (2015) have advocated for the widespread adoption of ‘8 ways pedagogy’. This is generally considered problematic as these theories have a tendency to render the Indigenous subject as a passive object, frozen in time and ‘traditional’ culture. As Nakata argues in the following passage¹⁵, Indigenous realities are anything but:

... we are all also grounded in Western epistemology, through historical experience, through Christianisation, through the English language,

¹⁴ In this respect, much of the literature on and developed by 8-ways is very confusing. On the one hand, it makes broad generalisations and essentialist claims about Indigenous learners, such as the quotation provided above. On the other, it makes numerous disclaimers surrounding the need to tailor approaches to specific contexts. Arguably it is not possible to have it both ways.

¹⁵ It is important to note here that AnyonWoolfe speaks of a Cultural Interface; both a lived location and a theoretical space where experience is constituted in a complex nexus between ‘lived experience’ and discursive constructions that play out in many shifting intersections that are never reducible to any one intersection, the reader is directed to Nakata (2002) for an overview of this theoretical standpoint.

through interventions of and interactions with colonial and contemporary institutions ... we may accept it, refuse it, assimilate it, domesticate it, use it, subvert it, but nevertheless are constantly engaged with it” (Nakata, 2007, p. 10)

Furthermore, such frameworks are often criticised as reductionist in nature, with considerable consequences in terms of how human conceptions of diversity and pluralism are conceived, often leading to the construction of racial binaries where ‘other’ cultures tend to be positioned in opposition as inferior to dominant white, middle class norms (McConaghy, 2000). Furthermore, it is argued that such binaries often manifest in the classroom as differential treatment, based upon non-Indigenous notions of Aboriginal culture, in essence embodying ‘racism by cotton wool’¹⁶ (Partington & Beresford 2012). However, perhaps most problematically (in my own eyes), the a-historical nature of culturalist frameworks fails to take into account past and present manifestations of colonialism, thus rendering the issue of Indigenous disadvantage outside the forces of history, politics and power. In essence, in the context of the nation, the frameworks suggest that the impact of over two centuries of cultural repression, marginalisation and destruction can be ignored in favour of reducing Indigenous students to fundamentally different but ultimately knowable entities whose assumed deficits lie in the way they learn.

¹⁶ For an overview of this position see Nichols et al. (1996).

Conceptual Model

As addressed earlier in the discussion, there are three fundamental assumptions of the culturalist tradition. Firstly, that culture is best understood as a set of shared values, habits and worldviews which are transmitted through successive generations. Secondly, culture is a unifying force which binds groups together as distinct entities with unique ways of doing, being and understanding. And finally, that individual consciousness is relative to and determined by culture.

Translating these assumptions and tendencies into analysis is relatively simple. Whilst the intricacies of the various culturalist frameworks currently operating in the nation's classroom cannot be captured, a limitation of the present study which is acknowledged in various places throughout the remainder of the thesis, the central thrust of the culturalist tradition as it applies to education can be, namely, the assumption that the process of learning is culturally situated. Consequently, if the assumptions of the culturalist tradition surrounding the nature of the learning process and Indigenous learners are correct, we would expect to see the incorporation of culture directly influence the educational outcomes of Indigenous students, regardless of engagement (and indeed other potential factors). In more empirical terms, we would expect to see only direct effects between CULTURE, ENGAGEMENT, and OUTCOMES. Returning to the Conceptual Model presented in the preceding chapter (*Fig. 1*), we would expect to see both practical and statistical significance in paths C and B (assuming of course that engagement influences educational outcomes) and a lack thereof in path A., This is demonstrated in *Fig. 3*.

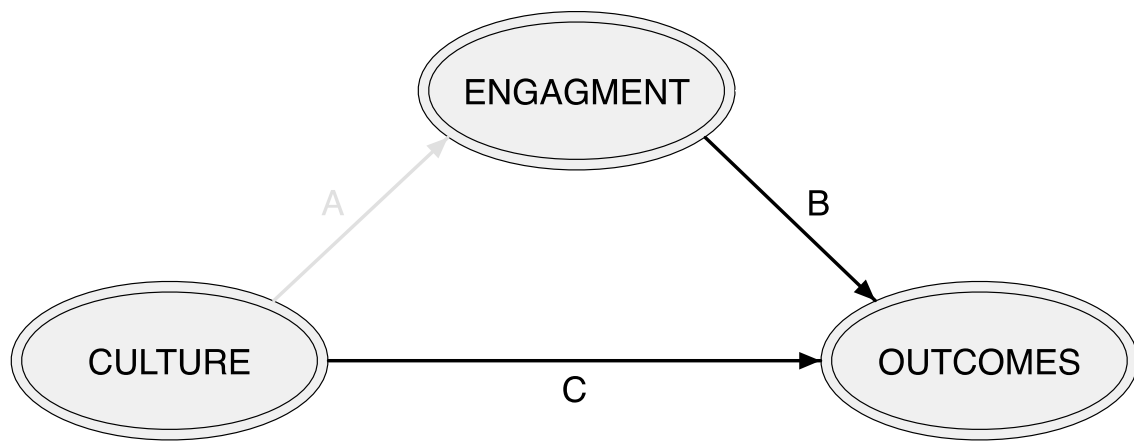


Figure 3: Conceptual Model for Culturalist Hypothesis (non-significant paths in grey).

Resistance

At the core of Resistance theory is the notion that students may actively resist formal education as a process of power relationships (Gray & Beresford, 2008). This concept is not new. Theories of resistance have been a cornerstone of Marxist thought in education since the birth of critical theory in the mid 1920's, and even earlier if the philosophical underpinnings from which they were born are taken into account. This said, Marxist thought did not in fact enter the broader educational discourse until the later decades of the 20th century, when social movements pushed challenges to the structural-functionalist approach into the public spotlight, and the role of education in the reproduction of inequality came under interrogation.

Throughout this period, whilst the scholarship bound in liberal thought continued to regurgitate the notion that education was a tool for the underprivileged enabling them to become upwardly mobile, scholars such as Althusser argued that we could no longer

consider education as neutral, but rather as a means for the nation state to exert its multiple ideological apparatuses, which at their core reproduce and reinforce power and privilege¹⁷. This was later built upon by scholars such as Giroux, who broadly argued that education, and consequently schools, were best seen as agencies of the dominant culture¹⁸, main role being to reinforce the existing power relations, behaviours, and patterns which serve the ideological and economic interests of people in power (Demaine, 2003). From this, resistance theory was born as a means to explain the inherent tensions in the educational process, and the underpinnings of oppositional behaviours which ultimately led to educational failure. At its core, it saw such behaviours from working class students as a political stance envisaged as a means to contest class subordination. Although, in an act of cruel irony, it also theorised that such behaviours were the very means for reaffirming social class, and condemned the same students to a life of subordination. Naturally however, this earlier work was largely concerned with the reproduction of class inequality, due in no small part to its Marxist beginnings. It was not until later that resistance theory was blended with cultural theory and found its way into the domain of minority education.

In Education

Perhaps the most prominent thought in this area comes from the work of sociologist John Ogbu and his seminal work in the context of the American educational system. Although it is not specifically framed within Indigenous contexts, it may be argued that it has strong relevance in terms of conceptualisations of structural power and

¹⁷ See Althusser (1971)

¹⁸ See Giroux (1983)

individual agency. In the case of his later work, in particular the development of what has come to be known as the ‘Cultural Ecological Model’¹⁹, it is argued that resistance to formal education can be understood as a process of macro-structural power relations. At the centre of such theorization is the notion that resistance can be conceptualised as a product of environmental forces. In essence, Ogbu saw minorities not simply as structural victims, but as actors within a structure who possessed certain forms of agency. For example, Ogbu posits that, minorities who occupy their social position as a result of conquest, forced migration or enslavement, a categorisation he termed ‘involuntary minorities’, develop oppositional identities and responses to dominant power structures (Foster, 2004). In addition, involuntary minorities maintain identity affirming norms and values as a means by which to distinguish themselves from the dominant culture (Ogbu, 1990).

The Indigenous Context

Resistance theory in the Indigenous context, whilst keeping its broad Marxist origins, is generally influenced by Post-Colonial thought and Settler-Colonial Theory as a means to identify the often-silent discourses that operate within global educational systems; the colonial assumptions that pervade classrooms, shape curricula and exclude the ‘other’ from academic success; and, as a means to situate the act of resistance as a form of individual and collective agency.

¹⁹ See Ogbu (1990)

To achieve this, it is generally argued that the process of colonisation where Indigenous peoples are concerned (both in the Australian context and more broadly) took a specific form with a number of key qualities. Firstly, in contrast to other forms of colonisation²⁰, the primary object of desire was land itself rather than the surplus value to be derived from mixing Indigenous labour with it²¹. Secondly, that to settle one must build, and to build one must replace, thus Indigenous peoples stood in the way of colonial enterprise practically, economically and symbolically²². Thirdly, the process of colonisation is ongoing. It is persistent in its drive for replacement, and furthermore, it is persistent in its coloniality. Fourthly, although the process of colonisation is ongoing, it pursues a specific endpoint. It seeks to eliminate difference and Indigenous challenges to settler sovereignty. Finally, education (both for and about Indigenous people) is employed as means by which to exclude or assimilate the Indigenous other into the settler state. In essence, it is a tool of cultural destruction²³.

Naturally, these qualities provoke specific responses. For example, as Veracini (2011b) argues, if the demand is for labour, the response of the colonised must centre on the agency to withhold it. In context, this often manifests as a multiplicity of residential strategies: attack; sabotage; self-mutilation; and, evasion amongst others. If on the other hand, the demand is to disappear, as is largely the case where Indigenous peoples are concerned, then the response takes the form of persistence and survivance (Veracini,

²⁰ For example, colonies of exploitation such as India, Indonesia, and much of what occurred across Africa and South-east Asia.

²¹ Whilst it cannot be suggested that Indigenous labour was (and is) indispensable to the settler-coloniser, the structure of settler-colonisation is, as Wolfe (1999, p.169) describes it, 'at base a winner-take-all project whose dominant feature is not exploitation but replacement' (p.169).

²² See Veracini (2010).

²³ Such practices are easily evidenced from the historical record. For example, in the Australian context, the first colonial foray into Indigenous education came in the form of the 'Native Institution'. Children were taken from their families to learn reading, writing and arithmetic. Children were denied access to their families and cultural practices were forbidden. This is largely seen as the first of many attempts to destroy Indigenous culture through forced assimilation (Burridge & Chodkiewicz, 2012).

2011a). Transferring this into the context of education, this would suggest that overt efforts to support dominant values and beliefs, may be seen as acts of symbolic violence from which arises a sense of unity born out of oppression and suppression (Budby, 1994; Gray & Partington, 2003; Hughes & Moore, 1997; Matiasz, 1989). In essence, resistance can become a means by which to invert the colonial discourses that run through the institution, turning them into forms of agency and cultural solidarity (Hollinsworth, 1992). In light of earlier qualitative work (although not interpreted through such a lens at the time), such theorisation is compelling. For example, Keefe states in the context of constructions of Aboriginal identities:

“A few of the students also spoke to each other, and to sympathetic adults, about the attitudes of teachers towards them and about what they regarded as the humiliating content of school lessons, particularly in Australian history ... Aboriginal students now have the language of response ... they can invert the negative message of teachers and the curriculum and turn it into a positive message about their own collective identity. Resistance takes specific oppositional form in the school lives of students. White authority, personified in teachers, is actively resisted with a range of responses that include ‘cheeky behaviour’, sullen withdrawal, inattention and absenteeism” (Keefe, 1988, pp. 56-57).

There is also support in later work operating from a more Marxist orientation such as the work of Groome and Hamilton (1995) and Purdie, Tripcony, Boulton-Lewis, Fanshawe, and Gunstone (2000), who identify climates of ‘anti-intellectualism’, where

achievement is conceptualised as of ‘little value’ or a ‘shame job’, and even students who are academically gifted do not always feel good about themselves as students.

In terms of pedagogical and curricular propositions, it is generally argued that to overcome resistance, a pedagogy of ‘decolonisation’ must be employed where Indigenous knowledges, cultures and perspectives are both legitimised as valid modes of instruction and actively encouraged within the classroom. This means that firstly, curricula and rigid disciplines that privilege Eurocentric knowledge systems must be challenged and ultimately superseded by modes of instruction that function within a cultural interface (Hingangaroa Smith, 2000; Nakata, 2008). Secondly, the hegemonic master narratives of historical account which function within the discourses of legitimised national history, must also be confronted (Hickling-Hudson & Ahlquist, 2003). Thirdly, alongside Indigenous knowledges there is the need for the legitimisation of Indigenous languages, where possible²⁴, as official means of instruction²⁵. And lastly, institutions must recognise the elders who keep these languages and knowledges as living educational treasures, as individuals who comprise a functioning ‘Aboriginal university’ based upon Indigenous knowledge and pedagogy (Battiste, 2002). These principles are by no means dissimilar to the more critically orientated theories of Culturally Responsive Pedagogy, such as those described by Ladson-Billings (2014) and

²⁴ It is noted that Indigenous languages have been subjected to the oppressive and destructive effects of colonisation and assimilation policies of successive governments. Of the estimated 250 languages in use prior to invasion only an estimated 145 remain spoken to some degree, an estimated 20 languages being considered ‘strong’ in the sense that they are still spoken by all generations (Australian Bureau of Statistics, 2010). It is also recognised that students within any one class may represent a range of language backgrounds which may pose issues in terms of selecting which language to incorporate.

²⁵ As Battiste (2002, p.17) argues, “Indigenous languages and their symbolic, verbal and unconscious orders structure Indigenous knowledge; therefore educators cannot stand outside of Indigenous languages to understand Indigenous knowledges”. Furthermore, for those whose language has survived the successive onslaught of government sanctioned destruction, it becomes increasingly difficult to maintain culture and identity within the classroom if schools continue this process from the invalidation of Indigenous languages (Hickling-Hudson & Ahlquist, 2003).

Paris (2012). Hence the deployment of such a term in both policy and practice, and its conflation with more culturalist understandings.

Critique

Much of the critique surrounding Resistance Theory lies not in the theory itself, but rather within the recommendations for pedagogy and curricula it proposes. In this respect, perhaps the most prominent critique surrounds the emphasis placed upon progressive and political educational goals, supposedly to the detriment of conveying subject knowledge and developing basic skills. Generally, such arguments regard multicultural curricula and various forms of pedagogy grounded in culture as condescending, divisive, anti-intellectual and designed to make students ‘feel good’, rather than improve educational outcomes (Ayers, Quinn, & Stovall, 2009). In the United States, these arguments gained considerable traction from conservative commentators as the educational reforms of the late 20th century failed in spectacular fashion. In the absence of measureable improvement, ‘progressive education’ became a scape-goat for deeper systemic issues and chronic underfunding. In a similar manner, the lack of improvement in Indigenous outcomes since the introduction of various cultural recognition policies has seen similar critiques arise from conservative commentators, politicians and educators alike. Perhaps the most pressing of these come from the self-described ‘radical centre’, which argues for a ‘direct instruction’ approach derived from 1950’s behavioural science, on the basis that progressive educational currents serve only to reproduce illiterate underclasses instead of critical thinkers (Pearson, 2009). Drawing upon the notion that Indigenous children lack implicit literacy as a result of growing up in families defined by educational disadvantage, ‘direct

instruction' applies a behaviourist approach through a scripted curriculum which assumes that learning occurs in sequences with only one logical interpretation (Dow, 2011). Such methods have had mixed success. Some areas where they have been implemented have reported gains in literacy and numeracy and others have regressed.(Carden, 2017).

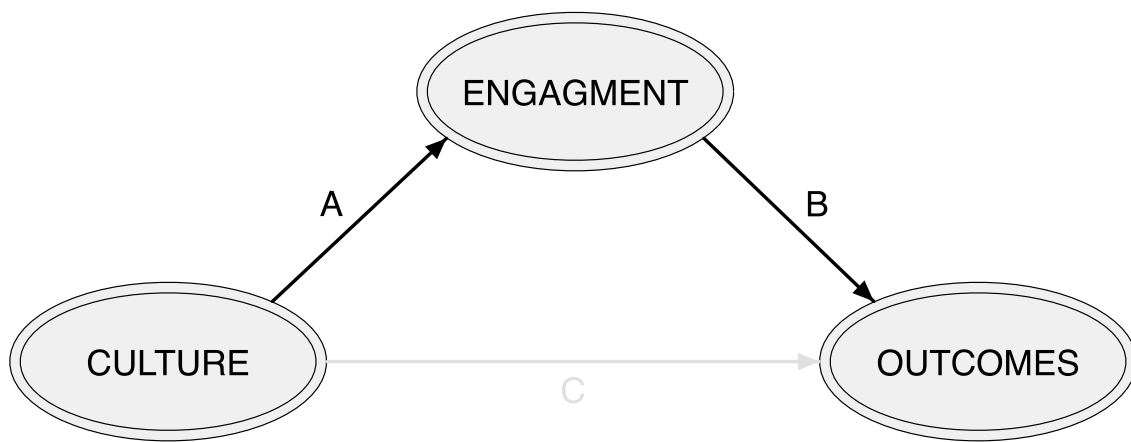
Conceptual Model

Whilst the thesis cannot capture the intricacies of these processes due to limitations of data, and to some extent the confines of the quantitative paradigm, it can infer their presence through proxy²⁶. This is because, regardless of whether the act of resistance is conceptualised through Marxist or Post-Colonial theory, both cause and effect remain very similar. In essence, formal education does not respond to the cultural needs of students, and consequently students disengage with formal education. Furthermore, both the issues underlying the cause and the nature of the disengagement expounded by the various theories contain a striking number of commonalities. In almost all cases, formal education is unable (or perhaps to put it more aptly, unwilling) to respond to students due to the inherent norms, values and discourses of the dominant culture upon which it is based. Consequently, it is theorised that students disengage either passively through actions such as inattention or non-attendance, actively through various forms of behaviours which challenge the assumed role and authority of the

²⁶ And also to some extent whether this proxy points to mechanisms of resistance or alienation, based on the nature of the proxy variable employed, and its relationships between other variables in the model, a point which is discussed at a later juncture in the thesis.

institution, or a combination of the two. In essence, the viability of Resistance theory can be inferred by student engagement (or lack thereof).

Translating this into analysis is again relatively simple. If the assumptions that Resistance theory makes surrounding the nature of the learning process and Indigenous learners correct, we would expect to see a two-step process. The incorporation of culture should influence student engagement, and student engagement should influence educational outcomes. In more empirical terms, we would expect to see the relationship between CULTURE and OUTCOMES fully mediated by ENGAGEMENT. Returning again to our conceptual model, we would expect to see both practical and statistical significance in paths A and B and a lack thereof in path C, this is demonstrated in *Fig. 4*.



*Figure 4: Conceptual Model for Resistance/Alienation Hypothesis
(non-significant paths in grey).*

Chapter 3:

Methodology and Method

Introduction

To some extent, the thesis has already touched upon what SEM is, what it entails, and the way it was employed as a method of analysis by the present study. However, what has been said is both brief and loaded with terminology. Whilst care has been taken to expand on the points made where possible, it has not gone unnoticed that the reader unfamiliar with quantitative methodologies²⁷ may be somewhat at a loss as to how the present study moves from the conceptual model to an analysis with enough nuance to at least begin to address the complexity of the research questions at hand. This is the purpose of the present chapter. To provide an overview of SEM, its relevance to the research questions, and the series of steps which were taken to address them.

Before the chapter begins in full, it is important to note that a somewhat novel approach has been adopted to the way in which the information is presented. As the scholarship presents a strong case for the harm that quantitative methodologies have caused Indigenous populations, it was deemed an ethical necessity to present the approach that was taken by the present study in the most accessible manner possible. This decision was taken so that the choices which were made can be interrogated on the reader's own terms, regardless of their familiarity with research paradigms or the nuances of the methods employed. Consequently, where SEM is discussed, it is broken

²⁷ And perhaps even to those who work with statistics but in different fields and disciplines.

into its component parts with a distinct emphasis on their mechanics, the means by which they fit into the broader SEM framework, and the ability of the method to address the complexity of the research questions. Where method is discussed, a strong emphasis has been placed upon the explanation of what particular steps and statistical techniques are, what they aim to achieve, and how they aim to achieve this alongside the provision of various examples and footnotes. As a consequence, this chapter is considerably more lengthy than normal, and for the reader familiar with SEM, much of the information provided will be surplus to conventional requirements – I make no apologies for this.

SEM

When explaining SEM in the thesis, it is often found positioned as a means by which we can begin to bridge qualitative and quantitative research. For example, in discourse analysis we are often interested in how the author, the receiver and the mode of communication influence the way information is interpreted. Conversely, in phenomenological research, whilst we are largely interested in lived experience, we are often also interested in the ways phenomena came to be, and thus the various components which construct the whole. In this respect, SEM is no different. We are interested in the broad interactions between the components of a phenomenon and in most instances, how these interactions influence an outcome of interest. In essence, we are interested in either testing theory, or creating theory. Where the key difference lies (beyond the obvious philosophical underpinnings), is in the tools that are at our disposal to achieve this. Whilst the qualitative researcher may apply various linguistic, structural and other methods to explore these connections, SEM employs an array of statistics to

understand what we are observing. Consequently, it seems logical to begin any formal explanation of the technique with an overview of these. From here, we look at the way in which SEM is conveyed, and conclude the section with a rationale for its use within the present study.

Tools of SEM

Regression

Regression is at the core of any SEM analysis. It is the underlying method by which the relationships between many of the variables are estimated. Surprisingly, given the complexity of SEM, it is a relatively simple and commonly employed method of statistical analysis. Overall, its goal is to examine two things: how well does one variable predict another; and, in the case of multiple regression, how well does a set of variables predict another, and which variables are best at doing this? To help contextualise this with an example, regression would be an appropriate technique if we wished to ascertain the relationship between height and weight for a population. It would also be an appropriate technique if we wanted to ascertain whether height or diet (e.g. sugar intake) was a better predictor of this.

In its most simplistic form, where we are only interested in predicting the outcome of one variable on another, the mathematics behind the technique is not particularly difficult. At its core is the equation $Y = \alpha + \beta x + e$ where Y is the value of the variable we are trying to predict, x is the value of the variable we are using to try and predict it, α is a constant (the value of Y when $x = 0$), β is the slope of the

regression line (how much Y changes as x increases) and e is an error term (in essence, the value by which our prediction missed its mark). As, we use regression in the SEM framework largely to determine the influence of one variable on another, we are mostly interested in the values for β and e – how much one variable changes in response to another, and how reliably we can predict this change.

Confirmatory Factor Analysis

Perhaps one of the most powerful features of SEM surrounds the ability to employ a unique type of variable to measure constructs or dimensions thereof – a Latent Variable. A latent variable is a variable that is not directly observed or measured, rather it is inferred from the influence it has on a set of observed variables. For example, if we wished to quantitatively measure happiness²⁸ there are a number of ways that we could approach this. At the most simplistic level, we could ask someone to rate their happiness. This would certainly provide results. But it is questionable how reliable and useful these would be when we consider the contextual and multidimensional nature of the construct²⁹. At the next level, we could ask people to rate their happiness across a number of different dimensions (e.g. job satisfaction, relationships, health, etc), then sum up these ratings to arrive at an overall measure of happiness. Yet again, this would certainly provide results. However, their accuracy would be questionable, as we cannot address the fact that the various dimensions of happiness are likely to contribute differently to an individual's overall level of happiness³⁰. Finally, if we were to employ

²⁸ Although not directly related to the analysis conducted within the thesis. This concept has been chosen as an example, as it is hoped that most readers will be at least familiar with it.

²⁹ For example, people are likely to define happiness differently depending on their social context.

³⁰ For example, it has been noted by Vinson and Ericson (2014) that high-income countries such as Australia tend to place a stronger emphasis on health as opposed to job satisfaction when assessing overall happiness and life-satisfaction.

a latent variable to measure happiness, we could use these ratings, but instead of simply summing them, we could assess how much they were influenced by an unobserved phenomenon, then use this information to predict an overall level of happiness. To achieve this, SEM employs Confirmatory Factor Analysis (CFA).

CFA is yet again, a relatively simple statistical technique. At its core, it is based on the assumption that if a set of variables correlate or ‘move together’ then it is possible to employ the values of these variables to infer the presence of and thus measure something we have not been able to directly observe. In essence, rather than assuming that what we have observed causes a phenomenon, we assume that a phenomenon causes what we observe. In SEM, CFA has two distinct roles: to provide evidence in regard to whether the latent variables we have constructed accurately reflect the constructs we intend (a point discussed at a later juncture in the present chapter); and, to provide values which can be employed by path analysis to estimate the statistical relationships between these. Within SEM, the portion of the analysis which employs this technique is commonly referred to as the ‘measurement model’

Path Analysis

Path analysis is a special case of regression analysis. At its core, it involves solving a set of simultaneous regression equations as a means to establish/test the causal order between variables. In essence, it is about the analysis of ‘chains of influence’ (Streiner, 2005). From this we are able to derive the direct, indirect and total effect of one variable upon another. In essence, the influence of one variable on another through its ‘chain of influence’ on the variables that fall in-between.

When conducting path analysis within a SEM framework it is possible to use both latent variables and observed variables. It is this tool which is at the heart of the mediation analysis conducted by the present study. It is this tool that enables the potential relationships between the incorporation of culture in the classroom, student engagement and educational outcomes to be explored. In essence, we can employ sets of latent variables to measure the various dimensions of the key constructs – *CULTURE*, *ENGAGEMENT*, and *OUTCOMES*. We can then employ path analysis to estimate the statistical relationships between these to determine direct effects (i.e. whether there is a statistical relationship between the incorporation of culture in the classroom and the educational outcomes of Indigenous students); indirect effects, (i.e. whether this relationship flows through engagement and if so, the degree to which this occurs); and, total effects, (i.e. the total influence that the incorporation of culture in the classroom has on the educational outcomes of Indigenous students regardless of the mechanism by which this occurs). Within SEM, the portion of the analysis which employs this tool is commonly referred to as the ‘Structural Model’, or if combined with the ‘Measurement Model’, the ‘Full Model’.

Fit Indices

As has been addressed previously (albeit briefly within the introductory chapter), within a SEM framework we have the ability to assess not only the strength and significance of relationships between variables, but also the overall ‘logic’ of these relationships. This is because the overall goal of any SEM analysis is to determine the extent to which the hypothesised model is supported or ‘fits’ with what we observe in the data. Once the ‘Full Model’ has been estimated, there are a number of ways that this

can be assessed, each with their own strengths and weaknesses³¹. However, in general, measures of model-fit are calculated on the basis of a saturated model, an independence model, and the respective chi-square values. In general, there are three broad types of these: ‘Absolute’ fit indices which aim to assess the amount of difference between the observed and implied variance-covariance matrices; ‘Incremental’ fit indices which aim to compare the specified model to a ‘null’ or independence³² model; and finally (although more rarely employed), ‘Parsimonious’ fit indices which aim to ascertain whether the model may be better estimated if it was simpler (i.e. with fewer paths between variables). However, the last of these are of little use to the present study, as they can only be interpreted in situations where the researcher wishes to compare the relative fit of two different models.

Conveying SEM

Due to the complexity of the method, it is common practice to convey both the hypothesis and results of SEM via path diagrams. To some extent, these have already been encountered in the form of the conceptual model and variants thereof which have been presented throughout the first two chapters of the thesis. However, it would seem to be of some importance at this juncture to provide an explanation of how these should be interpreted. A path diagram similar to the Full Model which was tested by the thesis is presented in *Fig. 5* to aid in this process.

³¹ Unlike other statistical techniques, determining how well the model fits the data is not entirely straightforward (Schumacker & Lomax, 2010). The various approaches employed by the present study alongside their limitations are discussed at a later juncture in the present chapter.

³² A null or independence model assumes that there are no relationships between variables.

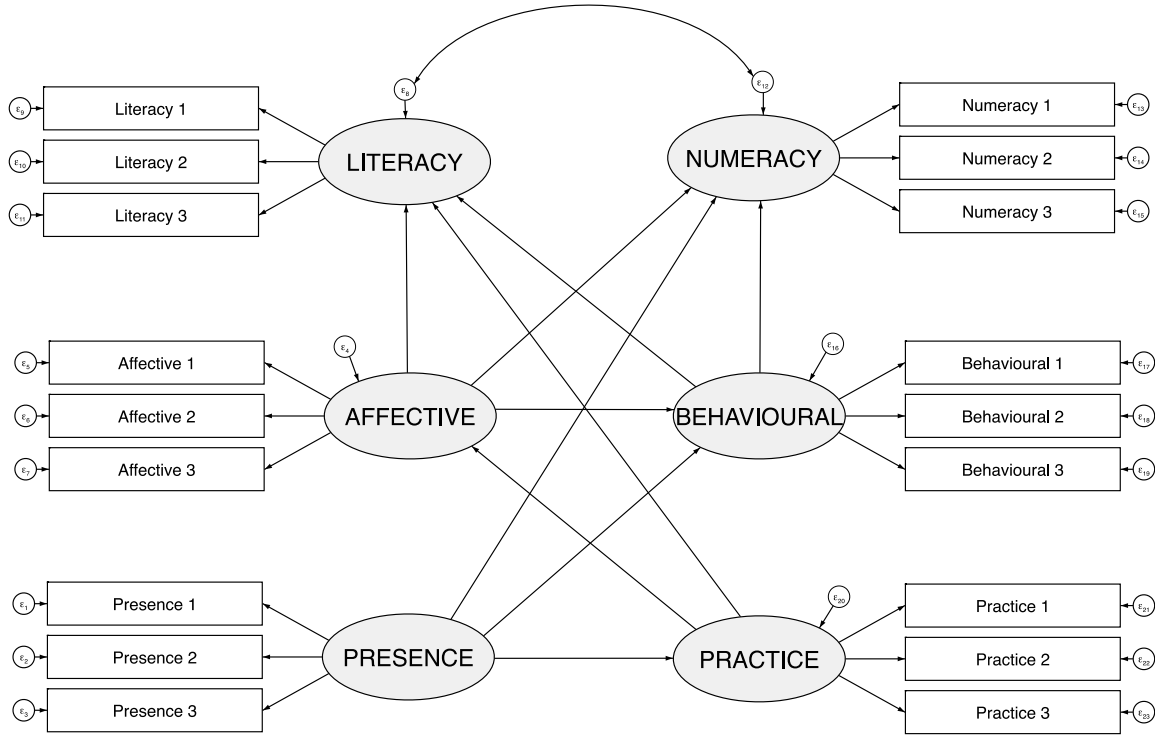


Figure 5: Simplified Path Diagram of Full SEM Model (for demonstration purposes).

As has been stated before, path-diagrams can be thought of as statistically measurable ‘flow-charts’. This statement still holds true, even though we have now added more complexity. However, it is important to note that the shapes and symbols employed within these have specific meanings. Firstly, latent variables are represented by ellipses (drawing on the example provided, these are PRACTICE, PRESENCE, AFFECTIVE, BEHAVIOURAL, LITERACY and NUMERACY). Observed variables are represented as rectangles (for example Presence 1, Presence 2 and Presence 3³³). Error terms are represented by circles. In the example, these can be seen as influencing both the observed variables and the latent variables. Secondly, directional relationships

³³ In the actual model tested by the thesis, the majority of latent variables are operationalized with more than three observed variables. However, in the interests of reducing complexity, and saving some space on the page, it appeared to be more appropriate to exclude these from the example.

are represented by single headed Arrows; and non-directional relationships are represented by double headed arrows. For example, in *Fig. 5*, the relationship between the latent variables PRACTICE and PRESENCE is hypothesised to be directional (i.e. presence influences practice). However, the relationships between the error terms of LITERACY and NUMERACY are hypothesised to be correlated (i.e. they ‘move together’. However, we are not assuming that one has influence over the other).

Why SEM?

As may be evident at this juncture in the discussion, SEM has a number of unique properties that made it a particularly suitable method with which to interrogate the complexity of Indigenous education and in doing so, the main research questions addressed by the thesis. Firstly, as discussed previously, perhaps one of the most powerful aspects of SEM is its ability to quantify the seemingly ‘unquantifiable’ in a theoretically rigorous and statistically robust manner through the use of latent variables. In essence, we do not need to directly observe complex phenomena, instead we can statistically infer their presence through their influence on what we observe. Secondly, as we can employ latent variables, we have the ability to account for measurement error across the various sub-dimensions of a phenomenon – something other techniques such as item parcelling cannot achieve³⁴. Thirdly, SEM has the ability to simultaneously test multiple relationships between constructs; the observed variables these are hypothesised to influence; observed variables in their own right; and, various combinations of the above. This means that we can delve beyond the analysis of simple relationships and

³⁴ Item parcelling refers to the practice of constructing composite measures by summing the values of observed variables.

begin to explore why such relationships may exist. Furthermore, we can begin to explore aspects of directionality, and consequently begin to address questions of causality. Finally, SEM can provide insights into the precision by which constructs have been measured; the strength of relationships between constructs; the overall plausibility of these relationships; and, through various tests³⁵, suggest potential relationships that the researcher may not have originally conceived, or relationships which have been hypothesised, but make little sense in relation to the data. Consequently, it can be used for exploratory research; explanatory research employing inductive reasoning; deductive reasoning, or a combination of both. To achieve this, studies which employ SEM follow a process of analysis which can be broadly divided into four distinct parts which follow on from what the thesis has already covered in relation to the development of research questions, relevant theory and the subsequent specification of a conceptual model. These are: data collection; data preparation; development of the measurement model; and finally, development and subsequent estimation of the Full Model. These are now discussed alongside any requirements that must be met.

Data Collection

The first step of any SEM analysis is data collection. There are various approaches which can be taken throughout this step, each with their own advantages and disadvantages. However, as the present study has drawn upon already established data

³⁵ Reference is made here to either, the Lagrange Multiplier Test (commonly referred to as Modification Indices) which can be employed to determine whether model fit would be improved if additional parameters were estimated, or the Wald Test which can be employed to determine whether model fit would be impacted by the deletion of a parameter. These are discussed at a later juncture in the present chapter.

collected as part of ‘Footprints in Time’, an in-depth discussion of these is of relatively little use in the context of the thesis³⁶. Consequently, the following discussion is more concerned with outlining the approach that was adopted by the designers of ‘Footprints in Time’, and the manner in which this has influenced the analysis, as opposed to justifying the efficacy of the approach. For such a discussion, the reader is directed to Department of Social Services (2015); Department of Social Services (2016); or Department of Social Services (2017).

Structure and sampling

‘Footprints in Time’ is a longitudinal data set containing information on 4620 variables pertaining to 1680 Indigenous children, their parents/primary carers and teachers. It currently has over eight waves and employs an accelerated cross-sequential design. Hence, variables pertaining to two distinct cohorts are available: K cohort (children born between December 2003 and November 2004) and B cohort (children born between December 2006 and November 2007). Data is collected on an annual basis regarding³⁷:

- Participants’ physical and mental health, their social and cognitive development, family and community, and significant events in their life.
- The participant’s family and household health, work, lifestyle and connectedness.

³⁶ For the interested reader, Schumacker and Lomax (2004) provide a comprehensive discussion of various approaches which can be employed in the quantitative paradigm.

³⁷ The information within the following passage has been drawn from a range of resources published by the developers such as Department of Social Services (2015, 2016, 2017).

- Community facilities, services and social and community issues.
- Child-care, education, health and other services used by the participant and the participant's family.

Participants were recruited by non-random purposive sampling across eleven research sites, chosen to cover a diverse range of socioeconomic and community conditions where Aboriginal and Torres-Strait Islander children live. As the developers note, the data, whilst not nationally representative, reflects the distribution of Aboriginal and Torres Strait Islander children across the nation (with the exception of the Australian Capital Territory and Tasmania).

Variables³⁸

As the literature identified that each construct employed by the study was multidimensional in nature, it was necessary to develop latent variables which reflected this quality. Consequently, '*CULTURE*' was operationalised by the latent variable PRACTICE, which broadly represented aspects of curriculum and pedagogy; and, the latent variable PRESENCE, which represented the degree to which Indigenous people were present within the educational environment or involved within the educational process. '*ENGAGEMENT*' was operationalised by AFFECTIVE, which measured emotional responses to school and education; and, '*BEHAVIOURAL*', which assessed the degree to which students demonstrated effort, concentration and attention, alongside their ability to conform to classroom norms and participate in the educational process.

³⁸ The following is provided as context for the remainder of the chapter. As outlined in the introductory chapter of the thesis, an extended discussion of the operationalization of constructs and latent variables is provided in section C of the thesis.

Finally, ‘*OUTCOMES*’ was operationalised by ‘*LITERACY*’, which measured ability in English communication, reading, writing and comprehension; and ‘*NUMERACY*’, which assessed children’s proficiency in relation to procedural numeracy, measurement and geometry.

To operationalise these latent variables, the study drew on a number of observed variables contained within the data. Whilst this process is described in considerably more detail within the subsequent section of the thesis, the following table may be of some use at this juncture in terms of providing context to the remainder of the current discussion. Contained within this table are the constructs, the latent variables which represented these, the observed variables which were employed to operationalize them³⁹, and the scales which were used to measure these⁴⁰.

Table 1:

Constructs, Latent Variables, Observed Variables, their Scales, and whether or not they were employed in the Final Analysis.

Construct.	Lat. Variable	Obsv. Variable	Scale	Employed
CULTURE	PRACTICE	Activities conducted in an Indigenous language	1-4	✓
		Typically do Indigenous singing/storytelling	1-4	✓
		Typically do Indigenous arts or practices	1-4	✓
		Typically do child-initiated activities	1-4	×
	PRESENCE	Elders visit/teach	1-4	✓

³⁹ Although a number of observed variables were initially identified as being representative of constructs/latent variables, not all of these were employed in the final analysis due to issues surrounding reliability and validity. Variables which were not employed in the final analysis are represented by a ‘×’ in the appropriate column of the table.

⁴⁰ All variables employed by the study were measured on various likert scales.

ENGAGEMENT	AFFECTIVE	Indigenous education workers	1-4	×
		Indigenous teachers/staff	1-4	✓
		Involved with the Indigenous community	1-4	✓
		Finds school fun	1-3	✓
		Feels happy about going to school	1-3	✓
		Wishes they didn't have to go to school (reverse coded)	1-3	✓
		Asks to stay home from school	1-3	×
		Teacher is nice to child	1-3	×
	BEHAVIOURAL	Children are nice to child	1-3	×
		Children pick on child (reverse coded)	1-3	×
		Keeps belongings organised	1-4	✓
		Shows eagerness to learn new things	1-4	✓
		Works independently	1-4	×
		Easily adapts to changes in routine	1-4	✓
		Persists in completing tasks	1-4	✓
		Pays attention well	1-4	✓
OUTCOMES	LITERACY	Contributes relevant information to classroom discussions	1-5	×
		Understands and interprets a story or other text read to him/her	1-5	×
		Reads words with regular vowel sounds	1-5	✓
		Reads words with irregular vowel sounds	1-5	×
		Reads age appropriate books independently with comprehension	1-5	✓
		Reads age appropriate books fluently	1-5	×
		Able to write sentences with more than one clause	1-5	✓
		Composes a story with a clear beginning, middle and end	1-5	×

NUMERACY	Demonstrates an understanding of some of the conventions of print	1-5	×
	Can continue a pattern using three items	1-5	×
	Demonstrates an understanding of place value	1-5	×
	Models, reads, writes and compares whole numbers	1-5	✓
	Counts change with two different types of coins	1-5	×
	Surveys, collects and organises data into simple graphs	1-5	✓
	Makes reasonable estimates of quantities	1-5	✓
	Measures to the nearest whole number using common instruments	1-5	×
	Uses a variety of strategies to solve maths problems	1-5	×

Delimitation

Unfortunately, although Footprints in Time was designed with longitudinal methods in mind, it was not possible to conduct a longitudinal analysis as a result of various irregularities in survey design and data collection. Perhaps the most pressing (and by far the most impactful) of these issues surrounded a tendency for variables to be added, removed, and in some instances modified between waves and cohorts⁴¹. This issue was further exacerbated by discrepancies in survey timing; question order; a continual process of respondents entering and exiting the study; and, low response rates to certain survey items⁴². Consequently, it was necessary to adopt a cross-sectional

⁴¹ See Appendix A for an example.

⁴² Attempts were made to run a longitudinal analysis across waves 5, 6 and 7 in the early stages of the present study. Employing a significantly simplified model, there were less than 30 complete cases which could be drawn on. Whilst SEM can accommodate missing data (as discussed shortly), the sheer amount of incomplete cases made even the most robust practices highly questionable.

approach to analysis. The present study chose to delimit the data to the 7th wave of Footprints in Time as this provided the largest possible sample size.

Sample Size

As SEM is a complex multivariate technique, it relies on large sample sizes in order to produce statistically robust and reliable results. There are a number of heuristic rules regarding required sample sizes for SEM. More broadly, a sample size of between 100 and 150 is considered to be the minimum for conducting simple SEM analysis - e.g. Ding, Velicer, and Harlow (1995); Tinsley and Tinsley (1987). However, it is more common for the literature to consider sample size in relation to the number of observed variables in the model. In this respect, the absolute minimum is considered to be 5 cases per variable when dealing with normally distributed data (Chou & Bentler, 1990), with 10 cases per variable being the most widely applied heuristic for adequate sample size.

As only 445 teachers agreed to participate in Footprints in Time, and many of the variables employed to operationalise the key constructs drew on information collected from them, sample size was a concern for the present study as information was only available for 549 participants (326 in B cohort, 223 in K cohort). Applying the heuristic rules defined above, the sample size for K cohort fell considerably short of the recommendation of 10 cases per observed variable. Conversely, the sample size for B

cohort was within acceptable bounds⁴³ with roughly 9.8 cases. Consequently, the decision was made to draw only upon data pertaining to B cohort⁴⁴.

Impact on Demographics

The decision made on data delimitation and selection to draw only on B-Cohort had an impact on the sample demographics. It is important to discuss this as it naturally has impacts in terms of the generalizability of the present study to the broader population of Indigenous Australians. Consequently, the present study calculated minimums, maximums and medians for three key demographic criteria: participant age; level of relative isolation (remoteness); and, socioeconomic status.

Firstly, in relation to age, the spread of ages within the sample employed by the study closely approximated a normal distribution⁴⁵. This can be seen graphically in *Fig.6*. Within this, the minimum age was 70 months, the maximum age was 99 months, and the mean age was 84 months. In regard to the shape of the distribution, this was broadly reflective of the larger B cohort sample collected by Footprints in Time. However, as can be seen in *Fig. 7* there was a slight difference. The larger sample contains participants who were aged between 100 and 105 months, whereas the sample employed by the present study did not. It should also be noted that the larger sample more closely approximated a normal distribution.

⁴³ I am being somewhat pragmatic here as I do not see an issue with 9.8 cases per observed variable, given the variation in recommendations posed by different scholars.

⁴⁴ It is worth noting that it was not possible to combine B and K cohort to increase sample size. This is because both ENGAGEMENT and OUTCOMES are constructs which measure aspects of human development (either directly or indirectly) and would thus create issues surrounding data normality – i.e. combining data from two age groups at different developmental levels would create bi-modal distributions and thus violate the fundamental statistical assumptions on which SEM relies.

⁴⁵ Normality is discussed at a later juncture of the present chapter.

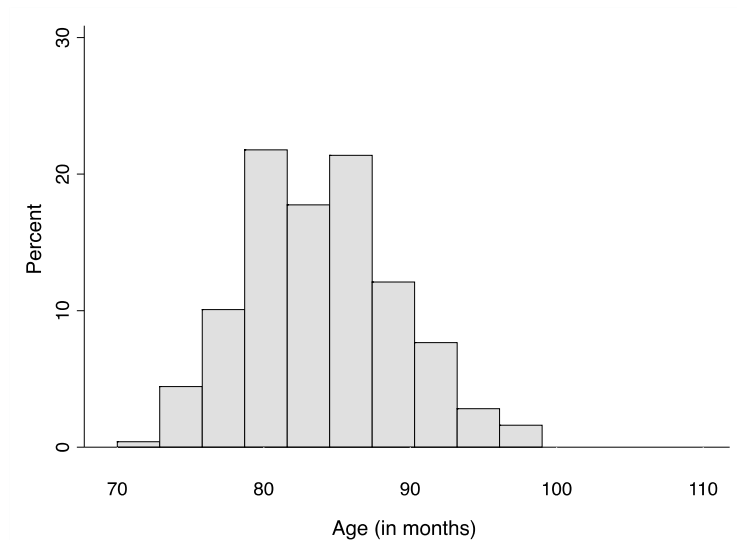


Figure 6: Ages (in months) of Participants in Sample (present study).

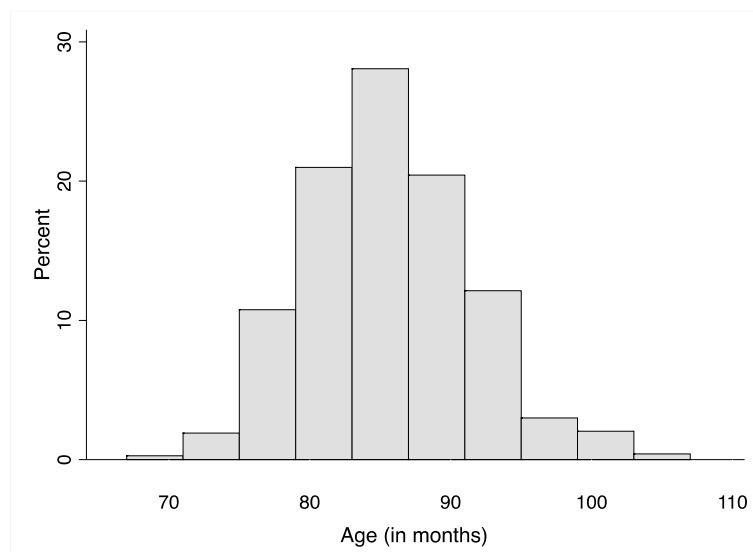


Figure 7: Ages (in months) of Participants Footprints in Time B cohort.

Level of relative isolation (LORI) was employed as a means to assess demographic characteristics of the sample in relation to remoteness. Level of relative isolation is a means of measuring remoteness in relation to the relative distance of a

participant's location from population centres of various sizes. The measure has five categories: None (urban), low, moderate, high and extreme, with the last two measures being combined within Footprints in Time due to low numbers. As noted by Department of Social Services (2017), whilst other more common means of assessing remoteness are available (e.g. ARIA+), level of relative isolation is a more appropriate measure for Indigenous people, as it has been designed to take into account Indigenous languages and other culturally specific geographic characteristics. In relation to the characteristics of the sample, 70 participants demonstrated no isolation; 127 participants demonstrated low isolation; 42 participants moderate isolation; and, 9 participants fell into the high/extreme category of isolation. This is shown graphically in Fig. 8. This was broadly reflective of the full sample collected for Footprints in Time as evidenced in Table 2.

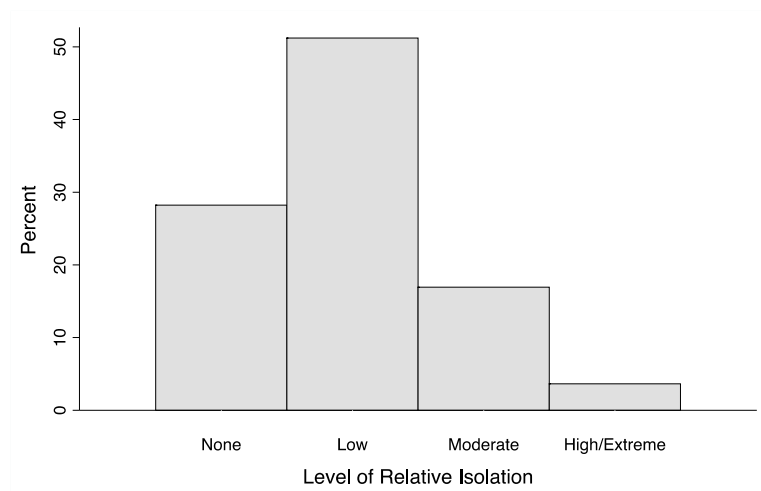


Figure 8: Level of Relative Isolation of Participants in Sample (present study).

Table 2:
Comparison of Level of Relative Isolation of Participant between the Sample and Footprints in Time.

Level of Relative Isolation	Footprints in Time		Present Study %	
	N	%	N	%
None	346	27.61	70	28.23
Low	617	49.24	127	51.21
Moderate	181	14.45	42	16.94
High/Extreme	109	8.70	9	3.63

The SEIFA Decile of Education and Occupation was employed as a means to assess the demographic characteristics of the sample in relation to socioeconomic status. This is a summary score of the educational and occupational characteristics of the usual residents which reside in the area of the participant. It is calculated in deciles at the smallest geographical area (SA1). In relation to the sample employed by the present study, as can be seen in *Fig 9* the vast majority of participants fell within the lowest two deciles of the index. With regard to the coherence of this sample with the broader sample collected by Footprints in Time, as with Level of Relative Isolation, this was broadly comparative as can be seen in *Table 3*.

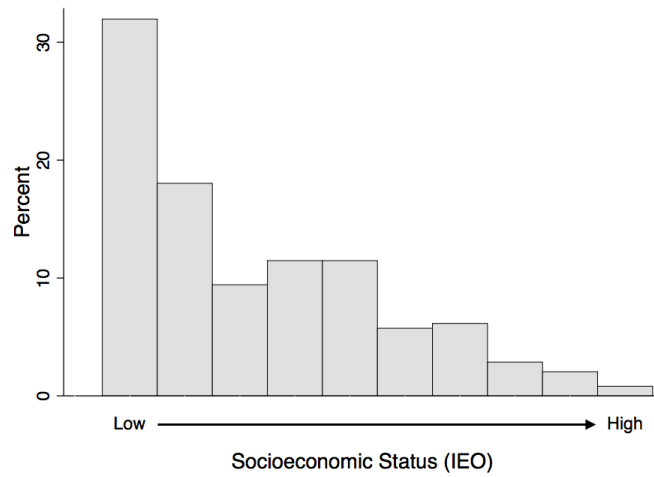


Figure 9: Socioeconomic Status of Participants in Sample.

Table 3:

Comparison of Socioeconomic Status (ieo) of Participant between the Sample and Footprints in Time.

SES	IEO (Decile)	Footprints in Time		Present Study %	
		N	%	N	%
Low ↓ ↓ High	1	408	33.80	78	31.97
	2	221	18.31	44	18.03
	3	128	10.60	23	9.43
	4	127	10.52	28	11.48
	5	111	9.20	28	11.48
	6	91	7.54	14	5.74
	7	62	5.14	15	6.15
	8	38	3.15	7	2.87
	9	16	1.33	5	2.05
	10	5	0.41	2	0.82

Data Preparation

In a similar manner to other parametric techniques, SEM requires that a number of statistical assumptions about the data are met in order to ensure that the results accurately reflect the magnitude and statistical significance of both the specified relationships and measures of model fit. Firstly, the presence of potential outliers in the data must be assessed, and if these exist, they must be dealt with appropriately. Secondly, like all quantitative methods, missing data must be investigated and dealt with in appropriate ways. Finally, like other forms of parametric statistics, SEM requires that data follow a normal distribution (or close thereto) and if this is not the case, the application of methods to minimize the impact of this on the analysis is required.

The following discussion covers these requirements, and the means by which they were assessed and achieved by the present study. As noted in the introduction to the thesis, whilst unconventional, some results are presented within this section although tables and figures have been relegated to appendices. This is largely because these results have considerable implications on the methods applied by the thesis.⁴⁶

Outliers

‘Outliers’ are cases (or observations within these) that have values which lie an abnormal distance from other values. In essence, they are ‘distinct’ from the rest of the data. There are two main types of outliers: univariate and multivariate. A univariate

⁴⁶ For example, approaches to handling missing data must be informed by the type of missing data that is present. In order to justify these approaches, results relating to both the presence and nature of missing data must be revealed.

outlier refers to the presence of a case with an extreme value on a single variable.

Conversely, a multivariate outlier is a case with a combination of unusual values across two or more variables. It is important to note that the presence of a univariate outlier does not necessarily suggest the presence of a multivariate outlier and vice versa.

The presence of outliers often suggests variability in measurement, experimental error, or error during the process of data entry. They also have the potential to produce biased estimates. For example, in SEM they have been demonstrated to influence both parameter estimates and measures of model fit (Kline, 2015). As a consequence, detecting and handling the presence of outliers is vital in terms of the ability for SEM to produce robust and valid results. However, as the variables employed by the study were measured by likert scales, the presence of true outliers is highly unlikely (with the exception of those caused by errors during data entry), as likert scales contain a ‘built-in’ floor and ceiling which prevents their presence. However, in the interests of scholarly rigour, the study engaged in the following process to identify potential outliers in the data.

To detect univariate outliers, z-scores (standard deviations) for each observation were calculated and the results searched for values that fell outside either -3 or 3. This is a common heuristic method based on the empirical rule (i.e. 99.7% of values should fall within three standard deviations of the mean), and has been proposed by various scholars. To detect multivariate outliers the study adopted the process proposed by Billor, Hadi, and Velleman (2000) through the approach developed by Weber (2010). This approach was chosen largely due to its ease of implementation and lower computational intensity. This is a three-step process⁴⁷.

⁴⁷ The following draws heavily on Billor et al. (2000).

In the first step, an initial subset of outlier-free observations were identified through the following algorithm proposed by Billor et al. (2000). Where the initial subset is chosen based on the smallest values of $d_i(\bar{x}, S)$, x is a $n \times p$ matrix of the data, and \bar{x} and S are the mean and covariance matrix of the n observations of the data. This algorithm was chosen over others due to its scale-invariant properties⁴⁸.

$$d_i(\bar{x}, S) = \sqrt{(x_i - \bar{x})^T S^{-1} (x_i - \bar{x})} \quad i = 1, \dots, n,$$

In the second step, the discrepancies between the subset and the remaining data are calculated using the following algorithm, where \bar{x}_b and S_b are the mean and covariance matrix of the observations of the subset.

$$d_i(\bar{x}_b, S_b) = \sqrt{(x_i - \bar{x}_b)^T S_b^{-1} (x_i - \bar{x}_b)}, \quad i = 1, \dots, n,$$

In the third step, observations are added to the subset if they demonstrate a distance smaller than $c_{npr} \chi_{p, \alpha/n}$, where c_{npr} is a correction factor; $\chi_{p, \alpha}$ is the $1 - \alpha$ percentile of the chi square distribution with p degrees of freedom (selected by the researcher); and $c_{npr} = c_{np} + c_{hr}$ where $c_{np} = 1 + \frac{p+1}{n-3} + \frac{1}{n-h-p} = 1 + \frac{p+1}{n-p} + \frac{2}{n-1-3p}$; and, $c_{hr} = \max\{0, (h-r)/(h+r)\}$ where $h = [(n+p+1)/2]$ and r = the size of the subset.

In relation to univariate outliers, no z-scores outside the parameters identified were detected, thus suggesting their absence. In relation to multivariate outliers, when the method proposed by Billor et al. (2000) was applied, all observations were added to

⁴⁸ As many of the key constructs employed variables measured on different likert scales, scale-invariance was vital.

the subset when specifying 0.15 as the percentile of the chi square distribution⁴⁹, suggesting the absence of multivariate outliers. As a consequence, there was no need to develop methods for handling outliers due to their absence in the data.

Missing Data

Tabulation (Appendix B) revealed that missing data was a significant issue for the present study, with values for some variables approaching and in one case exceeding 10%. As a consequence, despite a relatively large sample size after delimitation, only 248 complete cases were available for analysis. Whilst missing data is an unfortunate reality of most quantitative research⁵⁰, and the rate of missingness observed by the present study is not uncommon in the field⁵¹, the presence of missing data posed implications for the validity of the research, and the conclusions which could be drawn from it if it was not properly dealt with. Consequently, it was deemed necessary to formally investigate the nature of the missing data in order to adopt appropriate strategies to minimise potential bias in estimates⁵².

Since the seminal work of Rubin (1976) on the appropriateness of sampling distribution inference in the presence of missing data, the literature has generally reflected the argument that there are three broad types of missing data⁵³: Missing

⁴⁹ This is somewhat pragmatic. However, it has been suggested by Weber (2010) that this is like to produce 'sensible' results.

⁵⁰ For example, Peng, Harwell, Liou, and Ehman (2006) in their review of the literature found that 36% of studies had no missing data, 48% had missing data, and 16% could not be determined.

⁵¹ Enders (2003) notes that a missing rate of 15% to 20% is common in educational and psychological studies.

⁵² As Bennett (2001) notes, whilst the presence of some missing data is unlikely to be problematic, once the amount approaches or exceeds 10%, then there are very real implications for the validity of statistical estimates if appropriate procedures are not implemented.

⁵³ A slightly different (and less common) interpretation has been proposed by Gelman and Hill (2006).

completely at random (MCAR); Missing at random (MAR); and, Missing not at random (MNAR). The first of these (MCAR) refers to a condition where cases with complete data cannot be statistically distinguished from cases with incomplete data, as missing data points are not statistically related to either the values or missingness of other variables within the data set. In essence, missing data is simply a random subset of the data. If it can be established that the nature of missing values meets these conditions, then the presence of missing data can be largely ignored and various techniques for handling it can be applied. The second of these (MAR) refers to a condition where one aspect of MCAR is satisfied but the other is not. In particular, where the presence of a missing data point is related to another variable within the data set, but not to other missing values. For example, in the context of the present study, this may manifest if teachers were less likely to provide data for educational outcomes if participants demonstrated lower levels of engagement⁵⁴. If it can be established that the nature of missingness meets these conditions, then yet again, it is acceptable practice to ignore the presence of missing data as long as the variables with which it is correlated remain in the model/analysis. Finally, MNAR means that the presence of missing data either depends on information that has not been recorded, or depends on the missing value itself. For example (yet again using the present study as context), in the first instance, perhaps teachers who are less experienced may be less willing to record data on student engagement, as they do not wish to reveal a perceived lack of skill, a variable that is not captured by the present study. In the second instance, perhaps teachers are less likely to record data for students who are ‘below-average’ as this may imply the same thing⁵⁵.

⁵⁴ Perhaps a more relatable example for some would be NAPLAN. For example, Goss and Sonnemann (2016) note that correlations exist between student absence (missing data) and disability, language barriers, parental education and grade level.

⁵⁵ This process is generally referred to as ‘censoring’. It is a subset of desirability bias.

Unfortunately, the ability to detect the mechanism of missingness largely depends on the nature of the mechanism. For example, in instances of MAR, whilst there may be variables present within the data with which the presence of missing values correlate, it is impossible to be entirely sure that data is truly missing at random, as there is always the possibility that unobserved variables better predict the missingness. In instances of MNAR, these issues are further compounded, as it is often impossible to differentiate the form it takes, as the information required to ascertain this is in itself missing from the data set. However, MCAR is a somewhat different scenario in that we can formally test whether the nature of missing values meets the required assumptions.

To ascertain the mechanism of missingness, the present study began by subjecting the data to Little's MCAR test, both as the constructs/latent variable were operationalised, and prior to estimating the full model. Little's MCAR test is a χ^2 statistic which can be employed to ascertain whether significant differences exist between the means of different missing-value patterns with the null hypothesis that these do not exist – i.e. there are no differences between the means of missing value patterns. Consequently, rejection of the null hypothesis (i.e. the test returns a non-significant p value) is generally argued to provide sufficient evidence that missing data are MCAR. Somewhat surprisingly⁵⁶, all tests returned insignificant results (See Appendix C).

Normality

The term 'normality' refers to whether or not the sampling distribution of the data conforms to a normal probability distribution. In essence, it is the assumption that

⁵⁶ It is somewhat uncommon for data displaying large amounts of missing values to be MCAR.

if we were to take infinite independent samples from the same population, the means of each variable for each sample would create a perfect normal distribution curve or ‘bell-curve’ (*Fig. 10*) where 68% fell within 1 standard deviation of the overall mean, 27% fell within two standard deviations, and roughly 5% fell within 3.

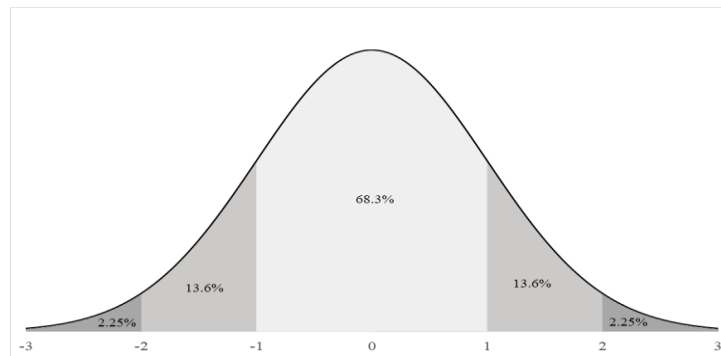


Figure 10: Normal Distribution Curve (Bell Curve).

Many parametric statistics require that data demonstrate normality and SEM is no different. Left uncontrolled for, violation of normality has the potential to introduce bias into parameter estimates, standard errors and consequently, various measures of model fit which rely on analysis of the chi-square distribution (Evermann & Tate, 2009). However, there is contention within the literature as to the impact of non-normal data, with some of the more widely cited literature such as Stevens (2012)⁵⁷ suggesting that this is negligible once sample sizes begin to exceed 50 cases. Regardless, the present study saw fit to assess whether the variables it employed demonstrated normal distributions.

⁵⁷ On the basis of Google Scholar metrics, this publication has been cited over twenty thousand times.

Probably one of the more common approaches for assessing whether data demonstrates normality is by the visual analysis of histograms or normal probability plots for each variable in the analysis (Cleveland, 1984). In both instances, the observed data values are plotted against a theoretical normal distribution, and it is up to the researcher's judgement as to whether the assumption of normality is accepted or rejected. Whilst such approaches have merit, there are also mathematical approaches such as the Pearson Skewness and Kurtosis Coefficients, which to some extent remove the requirement for researchers to rely on their intuition, and instead employ a number of heuristic rules to determine the shape of the data. In addition, it is also possible to assess normality through various formal tests such as the popular Shapiro-Wilk or Kolmogorov-Smirnov tests.

With regard to the present study, both mathematical and statistical approaches to assessing the normality of the data were adopted. In the first instance, the Pearson Skewness and Kurtosis Coefficients were calculated for each variable. Values for skewness that fall outside the range of -1 to +1 are considered to demonstrate skewness. Conversely, for kurtosis, values that fall outside the range of 2 to 4 are considered to provide evidence that the data demonstrates kurtotic distributions. A more formal statistical approach to assessing the normality of the data was also adopted through the implementation of the test outlined by D'Agostino, Belanger, and D'Agostino (1990), with the χ^2 and subsequent p value adjustment proposed by Royston (1992) to correct for issues identified in relation to null distribution. This decision was made based on its ease of application within STATA (the general statistical software package employed for the analysis conducted by the thesis), and its robustness to variations in sample size. This approach tests the null hypothesis that the data are normally distributed thus non-

significant p -values ($p > .05$) suggest normal distributions. These tests revealed considerable issues surrounding the normality of the data, with most variables demonstrating skewed and/or kurtotic distributions (See Appendix D), and thus methods for managing this were implemented.

Finally, the approaches for handling the presence of non-normal data in SEM generally fall into one of two categories⁵⁸, transformations or corrections. In the first category, mathematical functions are applied to each of the values in the data as a means to transform the distribution⁵⁹. In the second category, the goal is to correct for the inefficiency of the chosen method of estimation. Taking the latter approach, the present study employed the adjustments proposed by Satorra and Bentler (1994) and Satorra and Bentler (2001). This method has been shown by various simulation studies⁶⁰ and ‘real-world’ examples to be largely robust to the influence of non-normal distributions with regard to parameter estimates, standard errors, and various fit-indices which draw on the χ^2 statistic.

Developing the Measurement Model

As previously discussed, unlike other techniques⁶¹, rather than hypothesising that what we observe causes a construct, SEM hypothesises that a construct causes what we

⁵⁸ It should be noted that there are more than two categories. For example, non-parametric approaches to SEM are currently being developed. However, these are novel and difficult to implement in many circumstances. There are also more obscure approaches such as Gunver, Senocak, and Vehid (2018).

⁵⁹ Of these transformations, logarithmic functions are by far the most popular and are generally appropriate if the data follow a log-normal distribution. However, they are often subject to misuse and come with a significant ‘trade-off’ as interpretation can become significantly more complex (Feng et al., 2014).

⁶⁰ For example: Asparouhov & Muthen, (2006); Chou, Bentler, & Satorra, (1991); Lei, (2009); Maydeu-Olivares, (2017).

⁶¹ With the exception of Confirmatory Factor Analysis on which this aspect of SEM is based.

observe – this is the role of the measurement model. As may be evident from such a statement, the measurement model is effectively a Confirmatory Factor Analysis which contains all of the latent variables employed by a given analysis.

As noted earlier in the thesis, many of the constructs employed by the study had not been previously operationalised with the measures available within the data set, nor in the context of Indigenous education or within a SEM framework. As a consequence, the thesis took a more rigorous approach to the development of this process than is often seen in the research regarding Indigenous education, research which employs quantitative methodologies and perhaps more concerningly, research which employs SEM as a method of analysis⁶². At the centre of this was the requirement to establish reliability, content validity and construct validity. The following discussion describes the steps which were taken.

Reliability

The term ‘reliability’ refers to the consistency with which a latent variable (or set of latent variables) is able to measure its intended construct. As Heale and Twycross (2015) note, whilst it is not possible to calculate the reliability of a latent variable exactly, estimates are possible through a variety of methods which fall into three broad categories: those which aim to estimate homogeneity/internal consistency; those which aim to assess stability; and, those which aim to assess equivalence. The first of these

⁶² As Kember and Ginns (2012) note, it is common for quantitative research which deals with questionnaires and subsequently the operationalisation of constructs, to either claim validity if the wording of an item simply makes some reference to what is being measured, or fail to mention validity at all. In regard to the limited quantitative research in the field of Indigenous education, with the exception of a few notable scholars, the literature generally ignores not only validity but reliability, and more concerningly often fails to test whether the nature of the data meets the basic assumptions of the statistical techniques being employed.

aims to assess the extent to which the observed variables employed to operationalise the latent variable produce similar scores⁶³, the second aims to assess whether consistency occurs under test-retest conditions⁶⁴, and the third looks at inter-rater consistency⁶⁵. As should be evident from the examples provided in the footnotes, the nature of the study and the data on which it drew meant that only aspects of reliability in regard to internal consistency were able to be assessed.

The first way that reliability was assessed by the present study was through the calculation of Chronbach's Alpha (Cronbach, 1951) for each latent variable.

Chronbach's Alpha is a measure which aims to assess the internal consistency of a set of observed variables by calculating the pairwise correlations between them. It provides a score which ranges from negative infinity to 1 with values exceeding 0.7 generally considered to be indicative of acceptable reliability. However, as McNeish (2018) notes, whilst this is by far the most popular way of assessing this aspect of reliability, it raises a number of issues. Firstly, it is generally a poor way of assessing the reliability of latent variables which aim to measure multi-dimensional constructs due to the statistical assumption of uni-dimensionality on which the test is built. Secondly, it is widely known that the values obtained change based upon the number of observed variables employed to operationalise the latent variable, with more narrowly defined constructs often demonstrating artificially low levels of reliability. Finally, it assumes that errors

⁶³ For example, if a latent variable has one observed variable which aims to assess whether a child enjoys school, and another observed variable which aims to assess whether a child dislikes school, then we would expect to see similar relationships between the values of these variables across all children. In essence, the values of the observed variables should 'move-together'.

⁶⁴ For example, if a latent variable constructed on the same observed variables was measured consecutively on the same set of study participants, the observed variables should demonstrate approximately the same set of responses, and subsequently, so should the means and variance of the latent variable.

⁶⁵ For example, if a child's ability in literacy was assessed using the same set of observed variables entered by two different teachers, then the values should be roughly the same.

between observed variables are uncorrelated, which is likely to be problematic in some contexts.

As a result of the limitations of Chronbach's Alpha, a decision was made to calculate a secondary measure of reliability - Composite Construct Reliability⁶⁶ (CCR). In a similar manner to Chronbach's Alpha, CCR looks at the relationships between variables, but rather than exploring these through correlation, it looks at the variance shared between them. Consequently, it is well suited to situations where the values of observed variables may vary in how strongly related they are to the construct being measured. Furthermore, whilst the presence of correlated errors can be problematic, and in some instances⁶⁷ will lead to an overestimation of reliability, it is far less susceptible to these issues if these are due to what McNeish (2018, p. 17) terms 'additional minor dimensions'⁶⁸.

Content Validity

Content validity refers to the extent to which a latent variable (or set of latent variables) accurately measures key aspects of the construct it purports to measure. For example, if an instrument claims to measure well-being, but fails to measure key aspects of the construct such as relationships, accomplishment and sense of purpose⁶⁹, then it cannot be considered valid. As should be evident even at this early stage of the discussion, content validity can often be difficult to establish, especially in studies such

⁶⁶ This is sometimes referred to as the Omega or McDonald's Coefficient in the literature – See McDonald (1999).

⁶⁷ Generally, it is only problematic if errors are strongly and positively correlated.

⁶⁸ For example, when measuring literacy, we may see minor (or sub) dimensions such as comprehension, reading, writing, etc.

⁶⁹ The dimensions of well-being employed within this example are drawn from Seligman (2012).

as the present which aim to measure relationships between theoretically similar and often multi-faceted constructs.

Unlike other forms of validity, content validity is usually assessed either via non-statistical methods⁷⁰, by far the most common of these being the use of expert-panels. In essence, this approach involves subject matter experts evaluating the items which are used to measure a latent variable (or set thereof) with regard to whether they accurately reflect the construct one is attempting to measure. However, whilst commonly employed, the use of expert-panels has considerable limitations. For example, Kember and Ginns (2012) note that there is a tendency for researchers to pick colleagues with similar beliefs to their own, precluding the ability to uncover alternative views. Conversely, when dealing with constructs which are both multidimensional and theoretically contested, like many that are employed within the present study, we are likely to encounter the opposite⁷¹. For these reasons, alongside logistical issues, whilst experts in the field were conferred with, expert-panels were not convened, instead an approach grounded in the relevant literature alongside advice from experts was adopted.

As it has been outlined at various points throughout the thesis, there is a considerable amount of theoretical literature regarding the constructs that the present study employed in its analysis. Indeed, the overly theoretical nature of one of these lies at the core of the present study, and is clearly reflected within the research questions. This is where the study began its method for establishing content validity – with a

⁷⁰ Or at least via methods which do not involve analysis of the data upon which the latent variables draw.

⁷¹ For example, if we take engagement, drawing upon only the literature that can be considered seminal (i.e. 500+ citations), it is argued that it can be broken down into anywhere between 2 and 12 dimensions which are theorised to operate on either a continuum, a continua or discretely (i.e. a quality is either present or it is not). As a consequence, attempting to achieve a consensus on the nature of engagement from a truly ‘expert’ panel would most likely be an exercise in sheer futility.

review of the literature pertaining to each construct. The aim of this being to derive from theory (and where possible prior research) the proposed dimensionality of constructs and the types of variables which reflect these. Throughout this process (where possible) an attempt was made to draw upon the work of Indigenous scholars. From this juncture, latent variables representing the dimensions of each construct were hypothesised, and the data was searched for relevant observed variables that reflected them. Where possible, observed variables from already established instruments included in the data were selected. This was possible for the latent variables AFFECTIVE, LITERACY and NUMERACY. Following the identification of latent variables and their corresponding observed variables, advice was sought from the supervisory team alongside a number of scholars working within a range of relevant disciplines, as to whether these accurately represented the intended constructs and where relevant, potential limitations.

Construct Validity

Construct validity is largely concerned with whether inferences can legitimately be made from operationalised constructs, contained within a particular study, to the theoretical constructs they aim to measure. In essence, it examines the extent to which the operationalised constructs are measuring what they are intended to measure. For example, if an instrument claims to measure happiness, but actually measures enthusiasm, or perhaps aspects of both, then it would not be considered valid. However, this is where the scholarly consensus surrounding the nature of construct validity ends. Even the most cursory review of the literature surrounding construct validity will quickly reveal to even those unfamiliar with the concept, that depending on the discipline of

scholarship and the method of analysis, there are a range of competing and sometimes contradictory definitions of what exactly construct validity entails, the qualities a construct should possess in order to be considered valid, and the methods for assessing this. For example, Trochim and Donnelly (2001) argue that construct validity can be achieved through precise definition and consequently, straightforward operationalisation, and thus we should be concerned with things such as creating semantic nets and the provision of evidence that allows us as researchers to effectively control the manner in which we operationalise the construct. Conversely Heale and Twycross (2015) argue that to demonstrate construct validity, an instrument should be highly correlated with instruments measuring similar variables, poorly correlated with instruments designed to measure different variables, and have high correlations with future criteria⁷². To add further to the issue, it is also common in the scholarship to see construct validity as an overarching form of validity, and thus subsume aspects of content validity and criterion validity within this.

As a result of this scholarly confusion, the present study adopted the approach to construct validity proposed by Fornell and Larcker (1981). This approach to assessing content validity is widely employed⁷³ in the SEM literature, and thus appeared to be an appropriate choice for the present study. In general, it proposes that latent variables must demonstrate uni-dimensionality, discriminant validity and convergent validity if they are to demonstrate construct validity. In essence, they must measure the same phenomena, be statistically distinct from other latent variables contained within the model, and the observed variables that are employed to operationalise them must share a

⁷² For example, an instrument designed to measure self-efficacy in performing a task should predict the likelihood of someone completing the task.

⁷³ The original paper by Fornell and Larcker (1981) has over 62,000 citations.

high portion of variance in common. These requirements and the means by which they were assessed are now discussed.

Uni-dimensionality

To assess uni-dimensionality, Exploratory Factor Analysis was conducted on the sets of observed variables which had been identified within the data as being potentially representative of each dimension of the constructs. Exploratory Factor Analysis is a multivariate statistical technique which can be employed to identify patterns within the data through the analysis of correlations between observed variables. Its goal is to identify unobserved ‘factors’ which explain the variance observed in the data⁷⁴. At its core, it is an exploratory technique with little influence from the researcher beyond the interpretation of results. As a consequence of this quality, when placed alongside further steps, it was deemed a particularly suitable method of analysis to assess this aspect of content validity.

Prior to conducting Exploratory Factor Analysis, it is vital to assess the suitability of the data for this method of analysis, both in terms of sample size, and the nature of the variables and subsequent data points within these. To assess whether the data possessed the required qualities, Kaiser-Meyer-Olkin tests of sampling adequacy were performed on each set of variables to determine whether the proportion of variance

⁷⁴ In many ways the term ‘factor’ and ‘latent-variable’ are synonymous. The difference lies largely in the terminology employed by the method of analysis – i.e. in factor analysis we call them ‘factors’, in SEM we call them ‘latent-variables’. That said, it is common to employ both terms in SEM. For example, it would be entirely appropriate to say that *“the combination of observed variables represented a strong factor and therefore the latent variable was included in the measurement model”*. To the reader less acquainted with the statistical methods employed in the present study, I offer an apology. I have sought throughout the thesis to strike a balance between employing the appropriate terminology and avoiding unnecessary confusion, but this is one instance where the balance must swing towards terminology.

was likely to have been caused by the presence of underlying factors. Following this, Bartlett's test of sphericity was performed as a means to ascertain whether the correlation matrix was an identity matrix (i.e. that variables are unrelated), and thus unsuitable for structure detection.

The next step of Exploratory Factor Analysis is factor extraction. This process aims to determine both the number of dimensions, and the ways in which the observed variables are related to or 'load' onto these. There are various methods by which factor extraction can be approached. However, Principle Component Analysis and Principle Axis Factoring are by far the most common in the published literature (Williams, Onsman, & Brown, 2010). Whilst there is fierce debate in the literature in terms of which of the methods to employ. However, it has been noted by Thompson (2004) amongst other scholars, that the practical differences are largely insignificant if the sets of variables demonstrate high reliability. Consequently, the present study employed Principle Axis Factoring as the method of extraction, and employed the Kaiser Criterion to determine the number of factors to be retained⁷⁵. This involves retaining only the factors which demonstrate an eigenvalue greater than 1. It is by far the most popular method for determining the number of factors present.

The final step of Exploratory Factor Analysis is rotation. The goal of this step is to maximise high item loadings and minimise low item loadings as a means to make the pattern of factor loadings⁷⁶ easier to interpret. There are two common rotation

⁷⁵ In factor analysis, Eigenvalues are employed as a measure of the amount of variance of a set of observed variables that can be explained by a factor. Any factor with an Eigenvalue greater than 1 is able to explain more variance than any of the observed variables within the factor analysis. Another way of saying this would be to suggest that the higher the Eigenvalue, the better the factor is at measuring an underlying phenomena/construct.

⁷⁶ Factor loadings can be thought of as a measure of 'how well' an observed variable explains a construct.

techniques (orthogonal and oblique), and various methods by which this process can be undertaken (varimax, quartimax, oblimin, promax). In regard to techniques, orthogonal rotation of the factor loadings assumes potential factors are uncorrelated, oblique rotation assumes that they are. With regard to methods, these are simply different ways in which the rotation can be performed⁷⁷. For the present study Oblique Varimax Rotation was chosen, as it was assumed that if the variables employed to operationalize the latent variables were not unidimensional, then the dimensions were likely to be correlated.

Convergent Validity

To assess convergent validity, Confirmatory Factor Analysis was conducted on each set of observed variables. Unlike Exploratory Factor Analysis within which all observed variables are hypothesised to be related to all factors in some manner, Confirmatory Factor Analysis requires the researcher to specify a-priori both the number of factors and the relationships between these and the observed variables. In essence, Confirmatory Factor Analysis is a statistical method which can be employed within a SEM framework to both ‘confirm’ the number of latent variables, and the observed variables these are hypothesized to reflect. Conversely, in a similar manner to Exploratory Factor Analysis, Confirmatory Factor Analysis produces measures of both the amount of variance in the observed variables that can be explained by the factors (Average Variance Extracted), and the amount of variance within factors which can be

⁷⁷ For example, Varimax aims to maximize the variance of the squared loadings in each factor, whereas Quartimax works by maximizing the sum of all loadings to the power of 4. Interestingly, although there is considerable debate, similar to that concerning the choice of method for factor extraction, there is some evidence to suggest that the results of these methods actually converge.

explained by specific observed variables (Standardized Factor Loadings). It is these measures which are employed to establish convergent validity under the Fornell and Larcker (1981) method.

With regard to the first set of measures, it is assumed that a latent variable demonstrates convergent validity if each of the standardized factor loadings for the observed variables exceeds 0.4. Although it is also suggested that these should generally exceed 0.6 for most observed variables (Thompson, 2004). Translating this into a percentage variance⁷⁸, this means that each observed variable must at minimum explain 16% of the of the variance in the latent variable, but ideally 36% or more.

With regard to the second set of measures, it is assumed that a latent variable demonstrates convergent validity if it is able to explain more than fifty percent of the variance in the observed variables (Fornell & Larcker, 1981). To ascertain whether this has been achieved, the Average Variance Extracted (AVE) is assessed. AVE is calculated summing the squared factor loadings then dividing these by themselves plus the sum of the error variances. For example, the AVE for the hypothetical ‘Latent Variable X’ in *Fig.11* would be: $\frac{0.9^2+0.7^2+0.8^2}{(0.9^2+0.7^2+0.8^2) + (0.19+0.51+0.36)} = 0.65$. Thus, we could claim that Latent Variable X was able to explain 59% of the variance in Observed Variables 1, 2 & 3 and as a consequence, the second requirement of Convergent Validity has been achieved.

⁷⁸ This is achieved by squaring the factor loading – i.e $0.4^2 = 0.16 = 16\%$.

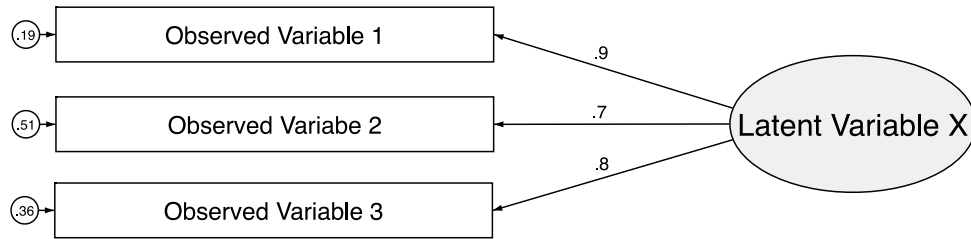


Figure 11: Latent Variable X with Standardized Factor Loadings Displayed.

As may be evident from the above equation, it is possible to improve the AVE of a latent variable, and thus its convergent validity by removing (or in some cases adding) observed variables. For example, if we were to remove the observed variable with the lowest loading⁷⁹ from our example above (Observed variable 2), then the AVE for Latent Variable X would be : $\frac{0.9^2 + 0.8^2}{(0.9^2 + 0.8^2) + (0.19 + 0.36)} = 0.76$. Finally, it is worth noting that there are some exceptions to this rule which can be applied with caution when working with novel constructs and their operationalizations. For example, it has been suggested by Fornell and Larcker (1981) and more recently by Cheung and Wang (2017), that this aspect of Convergent Validity can still be achieved as long as AVE is not significantly smaller than 0.5; no loadings are considerably less than .05, and the value for composite construct reliability exceeds 0.6. Both the removal of observed variables and this caveat had to be applied to some latent variables employed by the present study to establish convergent validity.

⁷⁹ Generally it is bad practice to estimate a latent variable with only two observed variables. This has been done here purely for the purpose of providing an example.

Discriminant Validity

To assess Discriminant Validity, the present study also employed Confirmatory Factor Analysis. However, in this instance, rather than testing each latent variable/construct in isolation, a full Confirmatory Factor Analysis containing all latent variables employed by the study was specified and the correlations between these assessed. The goal of this process was to ascertain whether the latent variables represented statistically (and thus theoretically) distinct phenomena. Employing the criteria for claiming Discriminant Validity proposed by Fornell and Larcker (1981), either the square root of AVE for a latent variable must be larger than the correlation coefficients between it and other latent variables, OR the AVE for a latent variable must be larger than the squared correlation coefficients. For example, in the Confirmatory Factor Analysis example presented in *Fig. 12* the AVE's for Latent Variables Y and Z are .603 and .590; the square roots of these values are .776 and .769; and the correlation coefficient between these is .3. Accordingly, as the square root of AVE for both latent variables is larger than the correlation coefficient, we can claim discriminant validity. Conversely, AVE for Latent Variable X is .647, but the square root of this (.804) is less than the correlation coefficient between Latent Variable X and Latent Variable Y. Therefore, we could not claim discriminant validity.

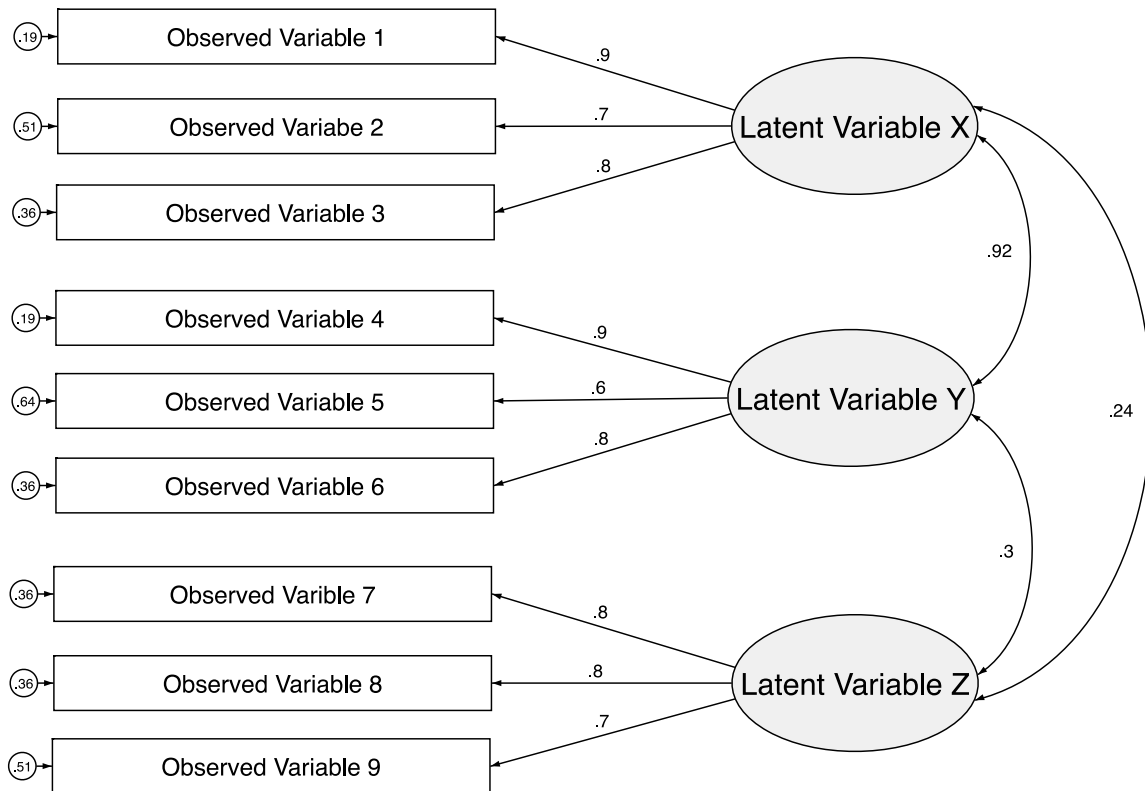


Figure 12: Example Confirmatory Factor Analysis.

Finally, it is worth noting that in some circumstances it can be difficult to establish Discriminant Validity between constructs for various theoretical and practical reasons. In these instances, there are two methods that the researcher can apply. The first is to specify a correlation between these variables or their error terms although there must be strong theoretical and statistical rationale behind this method (Hooper, Coughlan, & Mullen, 2008). The second (and far more acceptable) method, is to drop low loading (or lower loading) observed variables from each latent variable in an attempt to raise AVE, and lower the squared correlation coefficient (Bollen & Long, 1993). Naturally, the present study adopted the latter method where required.

The Full Model

The Full Model combines both the structural model⁸⁰ and the measurement model. Consequently, it is effectively a path analysis conducted between the latent variables and if relevant, observed variables which do not relate to these. With regard to the latter, these are commonly used to control for demographic variations in the study population. For example, a participant's age is not an implied construct, it is not unobserved, it is known. As may be evident from the above description and prior discussion, although all steps in SEM analysis are vital if it is to achieve its goal of conducting a robust analysis with results which are readily interpretable, the Full Model is generally where the main research questions are addressed – this is certainly the case in the present study. Therefore, there are yet more steps which must be undertaken before the researcher can arrive at an answer, and these are now discussed.

Model Specification

As discussed at the beginning of the chapter, SEM relies on path analysis as a means by which to test the relationships between variables in the model. Consequently, when specifying these relationships, we are bound by the constraints of the technique. Firstly, we cannot test reciprocal relationships unless we can draw on longitudinal data; Secondly, we must establish temporality, either literally or theoretically. Accordingly, as the study relied on cross sectional data, both of these constraints came into play.

⁸⁰ The Structural Model has not been discussed as a separate component of the SEM process to avoid unnecessary repetition.

Firstly, it was not possible to specify and consequently test reciprocal relationships. This was a distinct limitation which is covered in some detail within the discussion chapter of the thesis. Secondly, and of more importance to the present discussion, temporality could only be established on a theoretical basis.

When attempting to establish temporality in this manner, it is common practice to specify the most theoretically sound relationship/s (Schumacker & Lomax, 2010). For example, in the context of the present study, the most theoretically sound relationship between *CULTURE* and *ENGAGEMENT* would be to hypothesise that the incorporation of culture influences student engagement. The second would be the reciprocal of this. This is because to specify the first involves no other theoretical considerations beyond the core premises of Culturally Responsive Education. The second however does not, for example it would be quite strange for an educator to randomly make the decision to incorporate culture in the classroom because they had noticed their students were more engaged last month. That is of course unless they had begun to incorporate culture in the classroom during that month, noticed that it increased engagement, and then decided to expand upon this strategy as a result. In essence, the specification of models in SEM can be thought of as an exercise in Occams Razor + theory. The simplest relationship is the one we specify. If it is wrong, then we can always re-specify our models to consider the more complex alternatives⁸¹.

The second aspect of model specification often involves the selection and incorporation of control variables into the model. In most instances, these are demographic variables, but it is also common to employ variables that fall outside of these if the theory and model call for it. The role of control variables, both within SEM

⁸¹ Or of course, attempt to explore these in a subsequent analysis.

and more broadly in quantitative analysis, is to account for factors which may influence the variables (and thus their relationships) within a model. In essence, they are employed as a means to ‘control’ for the influence of factors beyond what is of interest to a given analysis so we can work towards isolating the influence of what we are actually interested in. As a consequence, the incorporation of control variables into the model can in some instances be methodologically complex. For example, in order to reduce the chance of producing biased parameter estimates and artificially decreasing the various indices which can be employed to assess model-fit, there is a need to ensure that paths are specified between these and any variables within the model they may logically influence (Bollen & Long, 1993). Furthermore, when latent variables are employed within the model, there is a need for the researcher to decide on whether paths should be specified to the observed variables employed to operationalise the latent variable, whether paths should be specified to the latent variables themselves, or a combination of both – as noted by Sriutaisuk and Pornprasertmanit (2017) each option comes with a trade-off between interpretation and accuracy. In essence, control variables in SEM, although we are not necessarily interested in them beyond their potential to better isolate the influence of the variable that we are measuring, must be treated in the same manner as any other variable within the model – with methodological caution and theory in mind.

Finally, it is worth noting that there are less pragmatic and more mathematical considerations which should be adhered to. Firstly, whilst SEM is broader than path analysis in both its methods and scope, the same rules apply. This means that in most

instances⁸² the rules for path tracing defined by Wright (1934) must be followed. These can be summarised thus:

1. Paths can be traced either backward then forward or forward but never forward then back.
2. A given variable can only be passed through once in a given chain of paths.
3. Only one correlation or covariance can be specified within each chain of paths.

In essence, these can be thought of in more general terms as: No feedback loops between variables, and only one relationship where we do not specify directionality in a chain of latent variables. Breaking these rules inevitably leads to problems with model identification which are now discussed.

Model Identification

To successfully estimate a SEM model, the model must be ‘identified’. In essence, it must be possible to calculate a unique solution for the unknown parameters in the model. For example, the specified model may suggest that $X + Y = \text{some value}$. The data may indicate that $X + Y = 10$. However, as there are an infinite number of values that X and Y could potentially take on (e.g. $X = 2, Y = 8$; $X = .5, Y = 9.5$, etc), there is no one solution. Accordingly, there is the possibility that the data may fit other models

⁸² There are some methods for breaking these rules. They are complex and beyond the scope of the present discussion, as there was no theoretical need to employ them within the present study. However, for the interested reader, Paxton, Hipp, and Marquart-Pyatt (2011) is a useful (albeit lengthy) resource.

equally as well⁸³. Models are considered to be identified if either, all parameters can be uniquely determined from the information in the data (just-identified), or there is more than one way that a parameter or set of parameters can be estimated from the information in the data (over-identified).

Model identification (especially empirical identification) is relatively complex (and in some ways impossible depending on the nature of model and data), and can be broadly split into two categories relevant to the present study. Firstly, identification problems can arise within the measurement model as latent variables in their raw form lack a scale of measurement. There are two possible solutions to this issue. The first is to fix the value of one factor loading 1, the second is to fix the variance of the latent variable to 1. Either is appropriate and is considered common practice (Schumacker & Lomax, 2010). The second category of identification issues relevant to the present study tend to arise in the full model. Whilst the vast majority of statistical software can detect whether a model is identified (and STATA is no exception here). Empirical identification of the model is very difficult (if not impossible) to detect as it relies on finding an algebraic solution - there is no sufficient test available for the researcher to use, and the tests which are available tend to be unreliable (Schumacker & Lomax, 2010). However, there are a number of more heuristic methods that can be applied. Of these, the present study employed the method described by Schumacker and Lomax (2004), which argues that the model should be calculated twice with two different starting values. If the the model converges at the same juncture, then it is highly likely that it is identified estimates remain the same then the model is identified.

⁸³ This example has been adapted from Schumacker and Lomax (2010).

Estimation

As it was established that data was MCAR, a number of methods for handling this were available to the present study, ranging from listwise deletion⁸⁴ to far more complex forms of multivariate imputation. However, as SEM employs Maximum Likelihood Estimation (ML) it was possible to adopt a far less common but far more robust approach – Full Information Maximum Likelihood Estimation (FIML)⁸⁵.

FIML works by estimating a likelihood function for each case in the data based on the variables that are present. As a consequence, all cases can be employed within the analysis regardless of the amount of missing data contained within each. Measures of model fit are obtained by the summation of fit functions across individual cases. The chi square statistic is obtained by calculating the difference between the log-likelihoods of two models, the first being an ‘unrestricted’ model within which all variables are correlated, the second being the model specified by the researcher.

FIML methods have repeatedly been shown to demonstrate unbiased estimates in simulation studies, even in the presence of considerable amounts of incomplete data in SEM models of ever increasing complexity⁸⁶. Furthermore, it has been shown by Cham, West, Ma, and Aiken (2012) how to provide un-biased estimates when non-normal data distributions are encountered – something that was of considerable benefit to the present study.

⁸⁴ Listwise deletion (also known as complete case analysis) refers to the exclusion of any cases with missing data from the analysis. It is by far the simplest way to handle missing data but is known to produce biased estimates once the number of complete cases drops below 90%.

⁸⁵ Also referred to as ‘Maximum Likelihood Missing Values Estimation’ ‘Direct Maximum Likelihood’ and ‘Raw Maximum Likelihood’.

⁸⁶ For example: Enders and Bandalos (2001); Cham, Reshetnyak, Rosenfeld, and Breitbart (2017).

Fit Indices

As addressed at the beginning of the present chapter, assessing model fit in SEM is not a straightforward process as there are many different methods, each with their own strengths and limitations. As a consequence, there is little consensus surrounding either the ‘best’ or ‘most-appropriate’ methods to employ, or the appropriate ‘cut-off’ values for each method, in order to argue that the model is a ‘good’ fit to the data (Hooper et al., 2008). Consequently, it has become common practice in SEM to report a range of both ‘absolute’ and ‘incremental’ fit-indices (Crowley & Fan, 1997). The present study takes this approach and provides the RMSEA, TLI and CFI^{87, 88}. These indices are now discussed.

Root Mean Square Error of Approximation (RMSEA)

The RMSEA was first developed by Steiger (1980). Since this juncture, it has become one of the most commonly reported ‘absolute’ fit indices in the SEM literature. It is calculated by the following equation where N = sample size and df = degrees of freedom:

$$RMSEA = \sqrt{(\chi^2 - df) / [df(N - 1)]}$$

⁸⁷ Although the model χ^2 is the traditional measure for evaluating model fit, it was inappropriate for the present study due to its inherent limitations. For example, it is known to reject perfectly specified models on the basis of sample size, the size of correlations and issues surrounding multivariate normality (Bentler & Bonett, 1980). To put this in the context of the present study, when sample size exceeds 200, the χ^2 test will almost always be significant, and thus suggest that the specified model is a ‘poor’ fit. However, when smaller sample sizes are employed, it is likely to suggest poorly specified models have ‘good’ fit (Hooper et al., 2008).

⁸⁸ It is also worth noting that the Standardised Root Mean Residual (SRMR) is another popular absolute fit-indices. However, due to the nature of FIML, estimation it cannot be calculated.

At its core, it is a measure of how well the model with unknown, but perfectly chosen parameter estimates, fits the data. It is also known to favour model parsimony, due to its sensitivity to the number of parameters within the model as a result of the χ^2 to degrees of freedom ratio on which it is calculated (Schumacker & Lomax, 2004). In regard to the heuristic cut-off values applied to this particular measure of model fit, there are considerable discrepancies in the literature. For example, MacCallum, Browne, and Sugawara (1996) suggest that values which exceed .10 suggest a poor fitting model. Bentler (1990) has suggested that values which exceed .06 indicate a poor fitting model. Whereas, Steiger (2007) has suggested that models should be rejected when values exceed .07. In essence, the heuristic cut-offs for RMSEA are somewhat arbitrary as long as they fall below .10. However, values closer to 0 suggest a better fit. Finally, as RMSEA is known to be affected by small sample size and low degrees of freedom it is appropriate in some circumstances to calculate the 90% confidence interval of the value returned. When this is done, the lower bound of the CI should be below .05 and the upper bound should not exceed .10 (Curran, Bollen, Chen, Paxton, & Kirby, 2003). It is important to note that it is widespread and accepted practice in this instance to calculate the 90% confidence interval as opposed to the 95% confidence interval, due to the ability to link this to a usual likelihood ratio test. More specifically, if the lower bound of the 90% CI is employed as opposed to the 95% confidence interval, then it is possible to calculate the probability of whether the RMSEA is less than 0.05, a statistic commonly referred to as the *pclose* value. Consequently, the present study adopted a value of .10 as a cut off point for acceptable fit, .08 as a cut-off point for claiming ‘good-fit’ and .05 for

excellent fit. The 90% confidence intervals and pclose values were calculated for the analysis of the full models⁸⁹ in order to further assess model fit.

Tucker-Lewis Index (TLI)

The TLI is an incremental fit index originally developed by Tucker and Lewis (1973) purely for factor analysis, but later extended into the broader SEM framework. At its core, it aims to compare the specified model against a null model through the following statistic where df = degrees of freedom:

$$TLI = \left[(\chi^2_{null}/df_{null}) - (\chi^2_{proposed}/df_{proposed}) \right] / [(\chi^2_{null}/df_{null}) - 1]$$

Consequently, it provides a scaled index of fit which ranges from 0 (no fit) to 1 (perfect fit). As with all fit-indices, there are a range of heuristic rules which can be employed to ascertain the level of fit demonstrated by a model. Whilst there is some variation and contention within these, it is generally accepted that if TLI values greater than .95 suggest ‘excellent’ fit, values greater than .90 suggest ‘good’ fit and so on. However, it is important when interpreting the TLI to understand what the values are actually stating – i.e. a TLI of .95 suggests that the specified model improves the fit of the model to the data by 95% relative to the null model.

The TLI was employed by the present study, in preference to similar measures, for various reasons. Firstly, it is generally accepted that the TLI performs better in situations where smaller sample sizes are employed (i.e. the present study). Secondly, it

⁸⁹ It makes little sense to continuously calculate these values for RMSEA throughout the thesis as this is both time consuming and of little value considering any issues would be captured when the full model was estimated anyway.

is a ‘harsher’ measure of fit than other similar statistics such as the NFI, due to the penalty it places on adding parameters. And finally,

Comparative Fit Index (CFI)

The CFI is an incremental fit index. Like the TLI, it is a revised form of the NFI. It is based directly on the non-centrality measure and is calculated with the following equation where df = degrees of freedom:

$$CFI = \left[(\chi^2_{null} - df_{null}) - (\chi^2_{proposed} - df_{proposed}) \right] / [(\chi^2_{null} - df_{null})]$$

Consequently, it provides a scaled index of fit which ranges from 0 (no fit) to 1 (perfect fit). In regard to the range of values which suggest ‘good’ fit, it has been argued that values must exceed 0.9 in order to ensure that miss-specified models are not accepted (Bentler, 1990). However, for good fit, it is suggested that values should approach or exceed 0.95. Although the CFI is both conceptually similar to the TLI (and thus an extended discussion is not provided), a decision was made to employ it by the present study, on the basis of various simulation studies which have demonstrated that it is generally robust to sample size (Hooper et al., 2008).

Model Modification

Finally, once a model has been estimated and fit indices have been calculated, it is common practice to interpret these results and if need be, respecify the model in an effort to improve model fit. There are a number of ways in which the researcher can go about this process, all of which were employed by the present study. Firstly, it is useful

to examine the statistical significance of each parameter within the model and consider parameters for removal. Another method which can be employed is to examine the differences between the observed covariance matrix and the implied covariance matrix, in essence the residuals of the model. As Schumacker and Lomax (2010) note, the values should be small in magnitude, and should not demonstrate considerable discrepancies from one variable to another. If they do not, it is likely that there are specification errors in the structural model. Finally, it has been accepted practice to employ lag-range multiplier tests such as the popular ‘modification indices’ which assess the change in the model χ^2 if a currently constrained parameter is freed. Generally, this involves specifying another path or covariance within the model. However, it is also possible to use this process to identify problematic cross-loadings⁹⁰ between the observed variables employed to operationalise the latent variables and as such, is employed throughout the construction of the model. However, whilst all of the above can be employed to improve model fit, this step of SEM should be approached with caution as SEM is driven by theory. Even if supported by the data, the modification of the model must be based on sound theoretical rationale⁹¹.

⁹⁰ Cross-loadings occur when there are strong correlations between the observed variables that have been employed to operationalise two or more latent variables. It is also common for a latent variable to pass all tests of reliability and validity, but still demonstrate problematic cross-loadings due to a noted short-coming of the method (Prudon, 2015).

⁹¹ There are various reasons for this. Perhaps the most pressing is the need to achieve parsimony. There is little point in attempting to fit a model perfectly to the data as this limits the generalisability of the analysis.

Section B:

Developing the Model

The role of this section is to define, operationalise and hypothesise the relationships between the constructs employed by the study. It is comprised of three similar but distinct chapters which centre on each construct employed by the study. The first of these looks at *OUTCOMES*. It begins with an exploration of the shifting discourse surrounding the purpose of education, in particular the changes which have occurred over the last half a century as education has become increasingly intertwined with economics. By taking this approach, it rationalises a conceptualisation of educational outcomes based in the current fundamental skills discourse, and subsequently in terms of achievement in Literacy and Numeracy. From this point, it breaks into separate discussions and the subsequent operationalisation and assessment of reliability and convergent validity for each. In relation to literacy, it breaks this construct down into components of phonological awareness, vocabulary, composition and comprehension. In relation to numeracy, it takes a content-based stance as opposed to a cognitive stance, thus it divides this into aspects of number sense, measurement and geometry, and statistics and probability. It then concludes with an assessment of discriminant validity and a discussion of causality.

Taking a similar approach to the previous chapter, the second chapter begins with an exploration of the emergence and development of engagement theory. It identifies a common theme within the scholarship surrounding the division of engagement into

various separate and distinct forms. It proposes a two-dimensional conceptualisation of the construct comprising of behavioural and affective forms. It then addresses each of these on an individual basis. As with the previous chapter, the theoretical and (where possible) the research literature is discussed as a means to define the specific components. This is then followed by the identification of relevant variables within the data set, normality and dimensionality, and the assessment of reliability and validity through the development and testing of Confirmatory Factor Models. Yet again, it concludes with a discussion of causality, with a view towards the specification of relationships not only between the dimensions of the construct but between constructs.

The third chapter of the section deals with the theoretical underpinnings and subsequent operationalisation of *CULTURE*. It begins with an exploration of the historical and theoretical development of the construct. Covering roughly half a century of thought, it traces the various ways in which the role of culture in the educational process has been conceptualised, ranging from the early scholarship which addressed the need for education to be culturally ‘sensitive’, to the more current scholarship which advocates for educational approaches which ‘sustain’ or in some cases ‘revitalise’ Indigenous cultures. It then engages with the broader literature in the field to explore the dimensionality of the construct, and consequently divides it into two broad dimensions – PRACTICE and PRESENCE, which are then addressed individually. For each dimension, the theoretical and (where possible), the research literature is discussed as a means to define the specific components. Following this, relevant variables are identified in the data set and models developed to assess reliability and validity. It then concludes with a discussion of causality between all latent variables employed by the present study.

The section concludes with a discussion of the control variables which were incorporated by the present study as a means to account for various demographic and social factors that had the potential to influence the relationships of interest between the constructs and the latent variables which were developed to measure these. It begins with a brief discussion of both the function of control variables and the way they were incorporated into the analysis. It then looks at each variable individually providing a discussion of the way it was operationalised, descriptive statistics, and a justification for its incorporation in the analysis grounded in theory, prior research, and in one instance, the nature of education itself. At the conclusion of the chapter the full structural model that was tested by the thesis is presented.

Chapter 4:

Outcomes

Introduction

Long before the concept of formal policy and legislation, philosophers had already given a considerable amount of thought to the different purposes education and schooling may fulfil. Indeed, the question is probably as old as education itself. Whilst of course, we cannot look back to the birth of humanity, we can find the question addressed in some of the earliest written records known to man⁹². We can also find significant tracts devoted to it within the writings of scholars throughout the ages. For example, Confucius (circa 400 BC) wrote extensively on the need for education to inculcate humanity and develop citizens who could challenge the status quo. The classical scholars upon which most of Western civilization is purportedly built, spoke of the need for education to create justice, fulfilment and welfare⁹³ amongst other things. In the modern age, we have seen the question addressed across the disciplines of knowledge from philosophy to economics and almost everything between.

However, whilst the question itself is old, relatively little has changed in regard to the response. With relatively few exceptions, the purpose of education has largely remained the same – to develop society, to develop individuals for society, or in many

⁹² For example, records from the Eduba of Mesopotamia dating back over three millennia describe in considerable detail the curriculum, pedagogy and desired outcomes of the first known formal education.

⁹³ Interestingly, Aristotle delineates between personal and state welfare in reference to the goals of education (see *Politics* viii, ch. 1 (1337a 10-33), a point which resounds to some extent with the prominent position today.

cases both. What has changed are the outcomes sought. For example, as Reaburn (2016) notes, the desired product of education within nomadic societies was as different from those in ancient Greece as it is different from the present. Furthermore, we have historically seen considerable variance within single societies. For example, in Mediaeval Europe the education of a peasant differed from that of a craftsman and the education of a craftsman differed from that of a nobleman. The reasons underpinning this are perhaps best understood⁹⁴ within the philosophy of John Dewey, who argues that, “Any education is, in its forms and methods, an outgrowth of the needs of the society in which it exists” (Dewey, 1933, p. 441). In essence, what a society ‘looks like’ determines the knowledge which is of value, and thus the outcomes which are sought from education. It is this caveat that forms the core of the present chapter.

This chapter traces the philosophical and political debate surrounding the purpose of education from the post-war era to the present. It also explores the ways in which this has shaped the outcomes which have been sought. Within this, the main emphasis is to identify the underpinnings of the present discourse of ‘fundamental skill’ development, and the rise of Literacy and Numeracy⁹⁵ as key outcomes and policy priorities (and indeed the constructs employed by the present study). This is followed by a brief discussion of dimensionality, with the view towards a model of educational outcomes grounded in the current discourse, albeit with recognition that this does not comprise the desired outcomes of education in totality. The discussion then splits into two parts which deal with the measurement of each dimension of educational outcomes to be incorporated within the final structural model.

⁹⁴ In my own mind.

⁹⁵ The term ‘numeracy’ is sometimes referred to in the literature as ‘Quantitative Literacy’. To avoid confusion, the present discussion has made this substitution where relevant.

Historical Development

In the late 18th century the philosopher-economist Adam Smith made the equivalence between a nation's capital and the skills of its inhabitants – in essence, the notion that a nation's wealth was associated with its productivity and its productivity was associated with the skills of its population. At the time, this was fundamentally new thinking in the field of political economy, as education had previously been linked to the development of morality and the inculcation of ideology⁹⁶. Such associations however lost favour in a world that was reeling from the moral repugnance of slavery. It was a particularly inappropriate time to conceptualise humans as an exploitable commodity, especially children⁹⁷. Consequently, despite some broad statements regarding the importance of education for the individual and society, it became largely peripheral to broader political and economic discourse (Teixeira, 2014). It was not until the period of post-war globalization in the latter decades of the 20th century, that the link between education and wealth was once again forged through the work of scholars such as Gary Becker (1962), Theodore Schultz (1961) and Jacob Mincer (1958) under the term 'human capital'.

At the core of this resurgence was the notion that education had an important role to play in the post-war economy as a means to remedy the scarcity of skilled labour, increase production and restore economic growth to pre-war levels. At the individual level, it was suggested that time spent in education should be viewed as either an investment in future earnings as a function of increased productivity in its own right –

⁹⁶ E.g. religion, nationalism, conformity, etc.

⁹⁷ This point was often a primary concern of early scholars in the field. For example, Schultz (1961) begins his work on human capital with a lengthy rationalisation to this effect.

i.e. education made individuals more productive and more productive individuals were rewarded economically⁹⁸. Or, as a signalling mechanism whereby employers would equate educational attainment with greater productivity and thus corporate profit – i.e. individuals with higher levels of education were more likely to be employed and be employed in positions which attracted higher wages⁹⁹. At the level of the nation-state, it was generally argued that spending on education and training should be seen as an investment in the future, as it would drive the creation and application of knowledge fundamental to productivity and economic growth. This theory was later clarified by various economic studies¹⁰⁰ which later became known as ‘New Growth Theory’.

This theory fundamentally reshaped the educational process. Firstly, the rise of human capital as a key economic theory triggered a distinct discursive shift in the purpose of education from the philosophical to the practical. Policy makers were no longer particularly concerned with whether children could ‘think’, but rather with whether they could ‘do’. Secondly, this was accompanied by an abrupt change in the perceived purpose of educational institutions from a mechanism for the transmission of values to a means by which to predict, measure and create economic performativity (Luke, 1997). Finally, when blended with cold war politics and the emergence of new trans-national economies, it became a catalyst for the emergence of standardized testing, and a discourse which equated educational outcomes with status on the world stage (Johanningmeier, 2009). The school was now a technological ‘black box’, the student a generic and infinitely adjustable machine, with an expandable repertoire of skills and competencies (Luke, 1997). It was at this point that, literacy and numeracy became

⁹⁸ E.g. Mincer (1958); Becker (1962).

⁹⁹ E.g. Arrow (1973); Spence (1973).

¹⁰⁰ E.g. Dowrick (1995); Romer (1989, 1994).

benchmarks for performance and global competitiveness, and were consequently forced to the forefront of educational discourse and policy across the globe (Lo Bianco, 1999).

In Australia, this move towards an educational discourse dominated by literacy and numeracy largely coincided with the educational reform period triggered by Commonwealth Minister for Employment, Education and Training John Dawkins in the late 1980's. For example, it was Dawkins who first made the policy link between economic productivity and 'foundational skills' within the 1991 Australian Language and Literacy policy where it was argued that:

"Literacy is the ability to read and use written information and to write appropriately, in a range of contexts. It is used to develop knowledge and understanding, to achieve personal growth and to function effectively in our society. Literacy also includes the recognition of numbers and basic mathematical signs and symbols within text. All Australians need to have effective literacy in English, not only for their personal benefit and welfare but also for Australia to achieve its social and economic goals."
(Department of Employment, 1991, p. 9)

This was further strengthened by another shift in the global economy. Firstly, markets which were once fed through manual labour were becoming increasingly mechanised and computerised through technological advances in robotics and early forms of artificial intelligence. Secondly, markets were becoming increasingly virtual as the balance between production and service-based changed and as intangible goods

became more desirable. Finally, true internationalisation and globalisation¹⁰¹ of markets was quickly becoming a reality through the introduction of high-speed global communication and data-transfer. In essence, the global economy was no longer defined solely by the production of goods but to an ever-increasing degree by the production of knowledge. Across the Western world, this began to trigger policies designed to federalize and centralize educational policy alongside a drive to raise standards and accountability. In the Australian context, the response was to manufacture a ‘crisis’ in education, a crisis that could only be solved by ‘going back to basics’, to a curriculum dominated by literacy and numeracy (Cranston, Kimber, Mulford, Reid, & Keating, 2010).

Since this juncture, relatively little has changed in relation to the trajectory of discourse and policy. The emphasis placed on knowledge as a form of capital has increased. As was foreseen by earlier scholars, control of education has become fully federalized with the introduction of a national curriculum. Accountability has become a reality both in public and private spheres, from the deployment of standardized testing to the public dissemination of results. Every December the media blame teachers and parents for slipping standards when results of NAPLAN¹⁰² become publicly available, a process which simply serves to re-fuel the cycle and re-manufacture the ‘crisis in education’. Through all of these events, the discourse of fundamental skills development characterised by the prioritization of literacy and numeracy has remained, albeit with an emerging emphasis on science and technology. And, if current rhetoric is

¹⁰¹ It is important to note that Internationalisation and Globalisation are two distinct concepts. As Lo Bianco (1999) points out, Internationalisation does not literally mean globalisation, since large parts of the world are left out, although all are profoundly affected by the domination of markets.

¹⁰² NAPLAN (National Assessment Program Literacy and Numeracy) is a series of national standardised tests conducted in Years 3, 5, 7 and 9 focussing on fundamental literacy and numeracy skills..

an indicator of discursive strength and continuity, it is here to stay for the foreseeable future.

Dimensionality

As Blackmore (2013) argues, “*Disadvantage exists, for example, when education does not provide the capability to develop and enhance other capabilities*” (p. 1007), in essence, when it fails to develop a knowledge of the self and a knowledge of knowledge. However, as the preceding discussion has identified, the purpose of education in Australia (and to a large extent globally) has become inextricably linked by policy and political discourse to economic growth. Consequently, the discourse of educational outcomes that drive pedagogy and curricula have become characterised by an emphasis on academic capacity. The fears of Grant Allen and Mark Twain have become a reality. Children are to be ‘schooled’ not ‘educated’.

Naturally, this discourse has had an impact upon what occurs within the nation’s classrooms. For example, the regime of standardized testing and subsequent emphasis placed on the accountability of practitioners to ‘provide results’ has shaped the practices and priorities of the classroom. As the findings of various studies attest¹⁰³, we are trading the development of higher order thinking for rote learning and memorization, we are trading the arts and humanities for literacy and numeracy, and we are ‘teaching to the test’. Furthermore, it has influenced the way education is conceptualised in academic spheres. Whilst there is a significant body of theoretical literature surrounding the

¹⁰³ For example; Au (2008); Hardy (2015); Polesel, Rice, & Dulfer (2014); Queensland Studies Authority (2009); and, Sabol (2010).

qualitative differences between ‘schooling’ and ‘education’, this rarely flows into research, especially when operating within the quantitative paradigm.

In this respect, the present study is no different, it is neither discourse breaking nor ground breaking in its approach to the measurement of educational outcomes. Although there is perhaps some redemption through the exploration of engagement, its links to the notion of ‘life-long-learning’, and its inclusion within the broader analysis. The study was bound by the measures contained within the data. Hence, whilst it recognises that educational outcomes are far more complex, it was restricted to a two-dimensional conceptualisation of the construct which mirrors the fundamental skills discourse propagated by current policy.

Measuring Literacy

As with other constructs employed by the present study, there is no unifying definition of ‘literacy’. What is clear however, is that firstly, over time the concept has become increasingly complex and secondly, it encapsulates far more than the ability to read and write (Forster, 2009). This increasing complexity and breadth of the construct can be seen within the progression of both scholarship and policy¹⁰⁴. As a consequence, definitions are often inherently broad with a distinct emphasis on the ability to produce and understand texts across various platforms and contexts, with increasingly broad understandings of what constitutes text. For example, the current Australian Curriculum defines literacy as:

¹⁰⁴ This progression is captured particularly well by Ahmed (2011), as he traces the evolution of literacy as a construct from the beginnings of the knowledge economy to more recent times.

“... the knowledge and skills students need to access, understand, analyse and evaluate information, make meaning, express thoughts and emotions, present ideas and opinions, interact with others and participate in activities at school and in their lives beyond school.” (ACARA, 2017, p. 1)

This view is mirrored on a more global scale by organisations such as the United Nations which through their Educational, Scientific and Cultural arm define literacy as:

... the ability to identify, understand, interpret, create, communicate and compute, using printed and written materials associated with varying contexts... (which)... involves a continuum of learning in enabling individuals to achieve their goals, to develop their knowledge and potential, and to participate fully in their community and wider society (UNESCO Education Sector, 2017, p. 13).

As can be seen from the above, literacy is conceptualised by policy (both national and global) as a complex skill demonstrated by competence across a range of dimensions. This multidimensionality is reflected in the scholarship which has begun to place considerable emphasis on the various ways literacy is employed, the things within communities and societies with which it is associated, and the various cultural, historical and socioeconomic reasons for which people acquire it. Perhaps as a consequence, we have seen a theoretical shift from older cognitive and socio-cultural underpinnings which often relied largely on print-based and verbal acuity, to understandings of literacy which recognise the agency of the individual to make meaning in various ways through various

methods of communication. This transition has seen the development of ‘multi’ or ‘multi-modal’ literacies (Haggerty & Mitchell, 2010; Pugh, 2017). For example, it is now common to speak of Digital Literacy, Visual Literacy, Media Literacy, Health Literacy, Emotional Literacy, Cultural Literacy and Functional Literacy, to name just a few forms of the ever-burgeoning construct. To this end, there is little to no consensus in the literature as to how many forms and sub-forms of literacy exist. This is largely because the term ‘literacy’ under the ‘multi-literacies’ paradigm can, and is, often applied to any activity where the production, transmission, use, or retention of knowledge occurs¹⁰⁵.

Whilst the following discussion recognises the complexity of the construct, a full discussion of the construct inclusive of all its forms, sub-forms and subsequent dimensions and sub-dimensions of these, is well and truly beyond the scope and intent of the thesis, as the measures available in the data allow only a tiny fraction of these to be operationalised. Instead, it concentrates largely on ‘Functional Literacy’, and within this the ability to construct, interpret and create meaning from a range of texts. This process can be further subdivided (albeit very broadly) into the comprehension of text, the composition of text, phonological awareness and vocabulary which broadly span both¹⁰⁶.

Phonological Awareness

¹⁰⁵ Taking this to its logical (and relatively absurd) conclusion, literacy can potentially take an infinite number of forms if we draw on the same post-modern foundations, and assume that individuals interpret the world around them in unique ways.

¹⁰⁶ It is important to note that there is also significant crossover between the skills required for comprehension and composition. Consequently, they are often thought to ‘develop together’ (Cooper, Robinson, Slansky, & Kiger, 2014).

In order to read and communicate in English, an individual must be able to make connections between words, between syllables, between letters, between the sounds these letters represent, and the ways in which this changes depending on the order in which they occur (Martinussen, Ferrari, Aitken, & Willows, 2015). This ability is broadly referred to as Phonological Awareness and forms a core component of an individual's ability to read, write, and communicate language verbally (Smith, Simmons, & Kameenui, 1998). In essence, if an individual cannot recognise and manipulate the components of language, then it is impossible for an individual to effectively communicate within that language.

Although conceptual and definitional confusion abounds, it is generally accepted that Phonological Awareness is comprised of various sub-dimensions (Watkins, 2006). At the broadest level (where the present discussion operates), these dimensions are usually related to an individual's ability to identify and manipulate phonemes, syllables and rhymes (Høien, Lundberg, Stanovich, & Bjaalid, 1995). For example, Phonemic Awareness, whilst related to the ability of an individual to detect and employ the broader components of language, is more concerned with an individual's ability to detect and employ these patterns at the level of the individual phoneme¹⁰⁷ (Ehri, 2005). Conversely, aspects of Phonological Awareness are more concerned with the recognition and manipulation of syllables. Finally, Rhyme Awareness in many ways combines both the phonemic and syllabic components of Phonological Awareness, but on a more elementary level. Consequently, it is generally one of the first dimensions of phonological awareness to develop (Jing, Vermeire, Mangino, & Reuterskiöld, 2019).

¹⁰⁷ It is important to note that Phonemic Awareness can be further broken down into its own subdimensions (e.g. sound sorting, onset rhyme segmentation, blending, segmenting, deleting, etc). However, this level of complexity is well beyond the scope of the present discussion.

Whilst a range of methods and tasks have been employed to operationalize and measure Phonological Awareness, these generally fall under one or more of the following broad categories¹⁰⁸:

- Segmentation – for example: sound isolation or phoneme segmentation.
- Identification – for example: phoneme counting; rhyme recognition; sound to word matching or word to word matching.
- Manipulation – for example: phoneme blending; phoneme deletion; phoneme reversal or invented spellings.

Vocabulary

Beyond the ability to create connections between letters, syllables and the sounds these represent, an individual must also be able to draw on knowledge to derive meaning from the final product. This knowledge is generally referred to as an individual's vocabulary, and is vital for both the ability to create and derive meaning from both written and spoken language. Vocabulary is a multidimensional construct. The number and nature of these dimensions are contested. However, in the broadest terms, these dimensions generally relate to either, the context and purpose within which an individual's vocabulary is being employed or, the type of vocabulary being employed.

In relation to context and purpose, a large portion of the literature divides vocabulary into a listening dimension, a speaking dimension, a reading dimension and a writing dimension. Under such a specification, the listening dimension generally refers to words that an individual can comprehend either by drawing on their prior knowledge,

¹⁰⁸ See Yopp (1988) for a more detailed discussion.

or through the interpretation of context, conversation, tone, gestures or topic. The speaking dimension, generally seen as a subset of the listening dimension, refers to the words employed by an individual in speech. The reading dimension refers to the words that an individual can read and understand, and the writing dimension refers to the words that an individual can use to express themselves in written form. Conversely, in relation to the type of vocabulary which is being employed, a large portion of both the theoretical and practical literature regarding the development of vocabulary either employs or builds on the ‘three tier’ model originally conceptualised by Beck and McKeown (1985). In this model, high frequency words which are commonly used in spoken language are considered ‘Tier 1’; high frequency words spoken in more complex language are considered ‘Tier 2’; and, low frequency discipline specific words are considered ‘Tier 3’.

Whilst a range of methods have been employed to operationalise and measure vocabulary in both the research and more practically orientated literature, those in line with the broader theoretical thinking surrounding the construct tend to address either vocabulary size or deeper lexical knowledge such as spellings, word associations, grammatical information and contextually dependent meaning (Cameron, 2002).

Comprehension

In order for an individual to make or create meaning from spoken and written language, they must be able to understand and draw on the interactions between the words that are written or spoken and knowledge drawn from outside the text or spoken

message (Rayner, Foorman, Perfetti, Pesetsky, & Seidenberg, 2001). This ability is broadly referred to as comprehension and is seen as an essential component of any literacy program, and a key indicator of academic achievement across all areas of the curriculum and beyond (Luke, Woods, & Dooley, 2011).

Although it is widely accepted that the process of comprehension is multi-dimensional by nature and draws on a number of skills and sub-skills, there is considerable disagreement in regard to both the number of dimensions, potential sub-dimensions and what exactly these might be. For example, Snow (2002) identifies a cognitive dimension requiring skills such as attention, memory, inference and critical thinking; a motivational dimension requiring a knowledge of purpose, interest and self-efficacy; and, a knowledge dimension which draws on linguistic knowledge, subject knowledge and discursive knowledge. Conversely, other scholars have adopted more socio-cultural perspectives. For example, Brozo and Puckett (2009) identify a cognitive dimension concerned with the skills, strategies and background knowledge of the reader; a textual dimension concerned with the way structure and properties of text influence the construction of meaning; a personal dimension concerned with prior opinions and attitudes of the learner; and, a social dimension which takes into account the influence of those within the immediate vicinity of the classroom and the broader community. Finally (although this is by no means an exhaustive summary), other scholars have taken more procedural approaches. For example, numerous scholars have built on the earlier work of Davis (1944) who theorised that comprehension could be conceptualised as a combination of the ability to understand explicit content; draw inferences; connect ideas; remember word meaning; recognize word meaning in context; follow passage

organization; recognize literary devices; and, understand the text's purpose, mood, and tone.

Overall, although there is contention and confusion in the literature regarding comprehension, there are a number of commonalities across the various positions and scholarly stances. Firstly, it is generally recognised that comprehension entails far more than simply decoding the words written on a page or spoken in a sentence. Rather, it is generally seen as the next key step towards the construction of meaning through language. Secondly, unlike the other dimensions discussed, there is no uniform comprehension process, and thus no direct way in which it can be measured (Kintsch & Kintsch, 2005). In essence, we cannot actually observe what is occurring within a student's mind as they construct meaning, we can only observe indirect symptoms and artefacts of the process (Pearson & Hamm, 2005). For example, as Caldwell (2008) explains:

"If a student correctly answers a question, we (can) infer that comprehension has occurred. Similarly, if a student composes a coherent summary, accurately fills in a diagram, or correctly completes a problem, we (can) make the assumption that the student has comprehended."
(Caldwell, 2008, pp. 34 - 35).

To this end, a number of scholars have proposed various means of measuring comprehension through either its component parts or by proxy. A useful summary of the former is provided by Caldwell (2008) who points to the seminal work of Bloom (1956),

the six dimensional model proposed by Wiggins and McTighe (1998), and the more recent work by Snow (2002) to propose the following three dimensional model for the assessment and measurement of ability in comprehension:

- Literal (e.g. the learner is able to answer questions, offer comment or identify a concept which has been explicitly stated in the text).
- Inferential (e.g. the ability to understand the underlying meaning of the text and consequently infer deeper knowledge which is not explicitly stated).
- Application (e.g. the ability to transfer this knowledge into new contexts and situations).

In regard to the latter, it is relatively common both in the scholarship and standardized testing to infer ability in comprehension through an individual's ability to recognise words, oral reading fluency or tests such as sentence verification, or tests which aim to determine an individual's vocabulary and ability to understand context (e.g. Cloze test, C-test, etc).

Composition

In order to construct meaning in both oral and written language, an individual must be able to sequence words and ideas in a coherent and interpretable manner. To achieve this, the individual must be able to create patterns of meaning across a broad spectrum of mediums through the coordination of various cognitive, linguistic and motor functions (Daffern & Mackenzie, 2015; Kalantzis, Cope, Chan, & Dalley-Trim, 2016).

This ability is broadly referred to as composition¹⁰⁹ and is seen as an essential component of any literacy program, and vital for academic success (Cutler & Graham, 2008).

In a similar manner to comprehension, composition is conceptualised as a multidimensional skill. Disagreement exists within the literature in regard to the number and nature of these, and theoretical stances range from the purely socio-cultural¹¹⁰ to the purely procedural. Where composition differs from comprehension, largely stems from the nature of the task. Composition, by its nature, requires a specific process which creates an observable or in some cases tangible product (Daffern & Mackenzie, 2015). As a consequence, the literature has a tendency to address and focus on a number of key components which align with this quality, either at the macro or micro level of the process. For example, it is common for the literature to discuss aspects of textural structure, either at the level of the sentence, paragraph or larger body of text. Conversely, it is also common for the literature to explore things such as spelling, punctuation, and in the case of written comprehension, psychomotor skills such as the ability to produce texts which demonstrate uniform size, spacing, position and placement. To better understand this distinction, it is common for the literature to distinguish between what are termed the ‘authorial’ and ‘secretarial’ aspects of composition. The former relates to the organisation of ideas and information in order to effectively communicate meaning, and the latter (largely employed in relation to the construction of a physical product) relates to the more mechanical aspects¹¹¹.

¹⁰⁹ It is common for the literature to segment this into ‘writing’ and ‘speaking’ or ‘responding’. However, the current discussion takes a broader approach to the dimension.

¹¹⁰ See Faigley (2014) for an extended discussion of the competing theories surrounding composition.

¹¹¹ This distinction first appears in Gregory (1987) who attributes this to C.P Smith (1982), which does not appear within Gregory’s list of references. In more recent literature, it is commonly attributed to Mackenzie, Scull, and Munsie (2013).

Operationalising Literacy

Literacy was conceptualised by the study as a complex construct (Kember & Ginns, 2012; Wellington & Szczerbinski, 2007) consisting of four distinct but overlapping sub-dimensions (Phonemic Awareness, Vocabulary, Comprehension and Composition). This was a decision based both on the literature and the measures available within the data set on which the study drew. Unlike other constructs employed by the study, it was possible to draw on an established and widely employed scale for its measurement.

As part of Footprints in Time, teachers were asked to complete the Language and Literacy section of the ‘Academic Rating Scale’ (ARS). This instrument was developed as part of the Early Childhood Longitudinal Survey conducted by the National Centre for Education Statistics (USA). It has been shown to be both valid and reliable across various demographic and cultural contexts¹¹². The Language and Literacy section of the ARS consists of the following ten items which aim to measure a child’s proficiency in expressing ideas, use of strategies to gain information, reading on grade level, and writing.

1. Contributes relevant information to classroom discussions.
2. Understands and interprets a story or other text read to him/her.
3. Reads words with regular vowel sounds.
4. Reads words with irregular vowel sounds.

¹¹² E.g. Justice, Bowles, Pence-Turnbull, and Skibbe (2009) in relation to children with linguistic difficulties; Dennaoui et al. (2016) in relation to the assessment of English proficiency and academic language skills of Australian bilingual children; and Graves (2011), as a predictor of academic success for African American children.

5. Reads age appropriate books independently with comprehension.
6. Reads age appropriate books fluently.
7. Able to write sentences with more than one clause.
8. Composes a story with a clear beginning, middle and end.
9. Demonstrates an understanding of some of the conventions of print.
10. Uses a computer for a variety of purposes.

It is rated on the following scale:

1. Not Yet - Child has not yet demonstrated skill, knowledge, or behaviour.
2. Beginning - Child is just beginning to demonstrate skill, knowledge, or behaviour but does so very inconsistently.
3. In Progress - Child demonstrates skill, knowledge, or behaviour with some regularity but varies in level of competence.
4. Intermediate - Child demonstrates skill, knowledge, or behaviour with increasing regularity and average competence but is not completely proficient.
5. Proficient - Child demonstrates skill, knowledge, or behaviour competently and consistently.

Critically observing the items within the scale, it became apparent that there were clear links to the four dimensions of literacy identified by the previous discussion. In relation to comprehension, items 2 and 5 explicitly addressed the dimension, either through specific reference (i.e. item 5) or by reference to its key components. Furthermore, items 1 and 6 were consistently identified in the literature as valid proxies for its measurement. In regard to phonemic awareness, items 3 and 4 were directly

related to phonics, a key sub-component of the broader construct, whereas item 6 was in many ways a valid proxy – it is impossible for an individual to read with fluency if they are unable to read words. In regard to composition, items 7, 8, and 9 explicitly addressed this. Finally, the dimension of vocabulary, through its inherent links to comprehension and composition was addressed implicitly through items 1, 2, 5, 6, and 8. In addition to this, although item 10 is generally not included in the ARS Language and Literacy scale by researchers (Tourangeau, Le, & Nord, 2005), given the increasing emphasis on ‘multi-modal’ or ‘multi-literacies’ in theory and policy, it was included by the present study as a crude proxy measure for digital and possibly visual forms of literacy.

Descriptive Statistics

As seen in *Table 4*, for the variables employed to measure literacy, both individual and combined mean values fell close to the central point of the scale (2-3). In a similar manner, both standard deviation and skewness were unproblematic. However, neither the mean value for kurtosis fell within the accepted cut-off range (2-4) nor did a number of individual items. Consequently, robust estimation procedures based on Satorra and Bentler (2001) were employed by both the preceding analysis and subsequent analysis involving these measures.

Table 4:
Descriptive Statistics for Measures of Literacy.

Variable	Mean	Std. Dev	Skew	Kurt
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Contributes relevant information to classroom discussions	3.42	1.24	-.26	1.96
Understands and interprets a story or other text read to him/her	3.40	1.21	-.24	2.02
Reads words with regular vowel sounds	3.21	1.39	-.24	1.78
Reads words with irregular vowel sounds	2.71	1.51	-.28	1.72
Reads age appropriate books independently with comprehension	2.94	1.49	-.05	1.61
Reads age appropriate books fluently	2.79	1.51	-.19	1.61
Able to write sentences with more than one clause	2.69	1.38	.30	1.91
Composes a story with a clear beginning, middle and end	2.60	1.37	.30	1.91
Demonstrates an understanding of some of the conventions of print	2.71	1.32	.26	1.89
Uses a computer for a variety of purposes	2.89	1.33	-.01	2.20
Mean	2.94	1.37	-.12	1.85

Exploratory Factor Analysis

Firstly, as both the literature dealing with theory and operationalisation of literacy is contested at best and secondly, it has been identified as a complex construct consisting of various possible sub-dimensions, a decision was made to conduct an Exploratory Factor Analysis (EFA) to assess the dimensionality/underlying structure. Prior to factor extraction, the suitability of the data for Factor Analysis was assessed. Firstly, the Kaiser-Meyer-Olkin measure of sampling adequacy (.94) exceeded the commonly accepted threshold value (.6). Secondly, Bartlett's test of sphericity was significant ($\chi^2 (45) = 3181.251, p < .001$). Combined, these results suggested that the data was suitable for Factor Analysis.

As can be seen in *Table 5*, initial extraction and application of the Kaiser Criterion ($\lambda > 1$) suggests a very strong single factor solution. The first factor explained close to 80% percent of the total variance, with factors 2 through 10 explaining the remainder. This suggests that whilst literacy is a complex construct which consists of a number of components, these have a tendency to develop together at similar rates, a result which is largely in line with the literature.

Table 5:
Initial Factor Extraction for Measures of Literacy.

Factor	Eigenvalue	Difference	Variance %	Cumulative %
Factor 1	7.88753	7.30749	0.7888	0.7888
Factor 2	0.58004	0.16356	0.058	0.8468
Factor 3	0.41649	0.08045	0.0416	0.8884
Factor 4	0.33604	0.14999	0.0336	0.922
Factor 5	0.18605	0.01115	0.0186	0.9406
Factor 6	0.17489	0.03653	0.0175	0.9581
Factor 7	0.13836	0.01826	0.0138	0.9719
Factor 8	0.1201	0.01072	0.012	0.9839
Factor 9	0.10937	0.05823	0.0109	0.9949
Factor 10	0.05114	.	0.0051	1

This hypothesis was further tested through Oblique rotation of the component matrix, which allows for the redistribution of common variance across the factors under

the assumption that potential factors are correlated (Kieffer, 1998). As can be seen in *Table 6*, the process revealed a clear single factor structure with all loadings exceeding .5.

Table 6:
Factor Loadings after Oblique Rotation of the Component Matrix for Measures of Literacy.

Variable	Factor1
Contributes relevant information to classroom discussions	0.7753
Understands and interprets a story or other text read to him/her	0.8743
Reads words with regular vowel sounds	0.9107
Reads words with irregular vowel sounds	0.8982
Reads age appropriate books independently with comprehension	0.9426
Reads age appropriate books fluently	0.9328
Able to write sentences with more than one clause	0.9276
Composes a story with a clear beginning, middle and end	0.9124
Demonstrates an understanding of some of the conventions of print	0.8592
Uses a computer for a variety of purposes	0.8345

Confirmatory Factor Analysis (CFA)

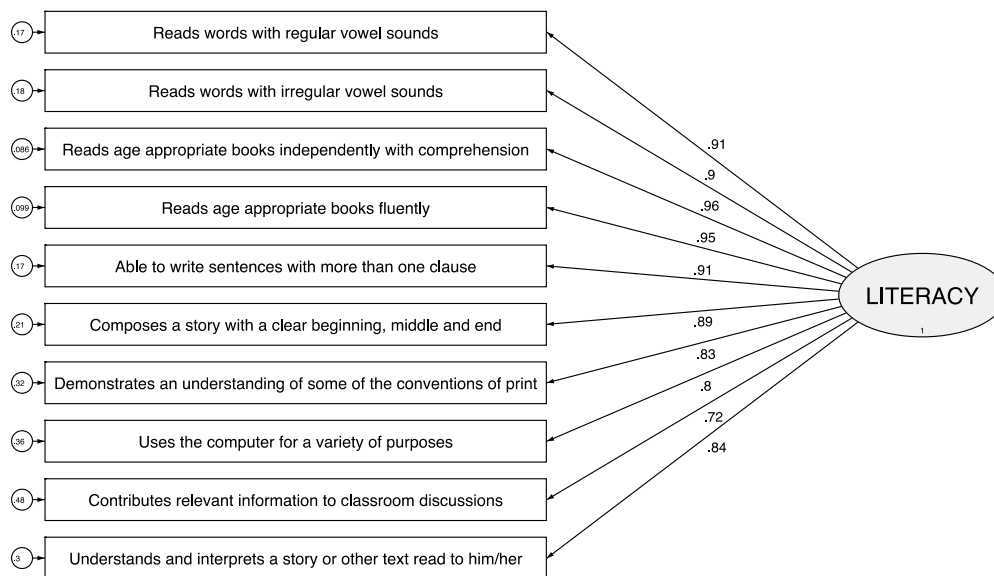


Figure 13: CFA Model for Measures of Literacy

The CFA model for Literacy (Fig.13) demonstrated mixed results. Factor loadings were high (the lowest being .72) and measures of reliability and validity considerably exceeded heuristic cut-off points (Average Variance Extracted = .764; Composite Construct Reliability = .970; Chronbach's α = .97), but model fit was poor across three of the four indices employed (RMSEA = .183; CFI = .909; TLI = .884). Such a result suggested that strong and statistically significant correlations may exist between some of the measures (Kaplan, 1989). This issue, which although previously undetected by EFA was expected, given the complex nature of the construct. Consequently, modification indices¹¹³ were run. These revealed that model fit could be considerably improved by the specification of covariance terms between the first and second item (MI = 184.9, $P > MI = .00$, StdEPC = .671); the second and third item (MI = 218.1, $P > MI = .00$, StdEPC = .876); the fifth and sixth item (MI = 98.7, $P > MI = .00$,

¹¹³ See Chou and Bentler (1990) for an extended discussion of this process.

StdEPC = .491); and, the ninth and tenth item (MI = 127.7, $P > MI = .00$, StdEPC = .509).

These correlations are not particularly surprising, for example between the third and fourth item, for an individual to read fluently, they must be able to read with comprehension. Consequently, there were two options available to improve model fit, to allow the errors of these variables to co-vary, or to drop the variable with the lowest loading from each pair of correlated variables, and re-specify the model. For both theoretical and statistical reasons as identified in Chapter 3, the second option was taken.

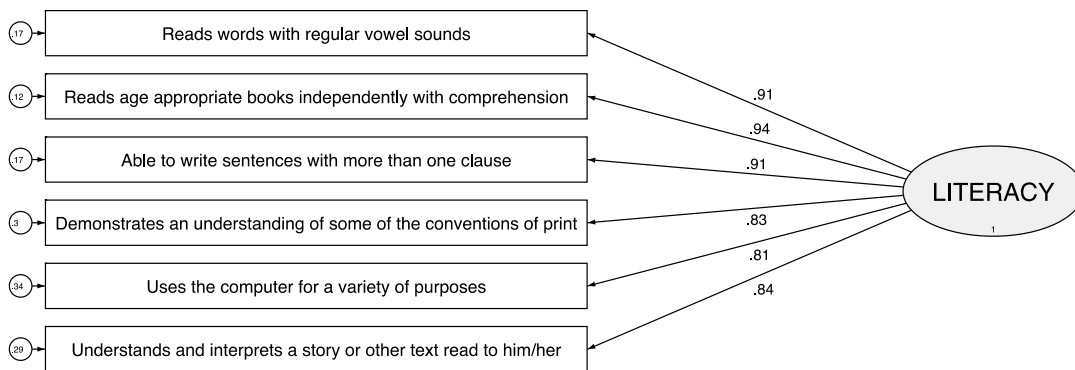


Figure 14: Re-specified CFA Model for Measures of Literacy.

As expected, the re-specified model (*Fig.14*) retained similar results in regard to measures of reliability and validity, with all measures considerably exceeding the traditional cut-off values (Chronbach's $\alpha = .95$; Composite Construct Reliability = .951; Average Variance Extracted = .765). The removal of variables considerably improved the fit of the model, bringing them well into the range of the cut-off values for either 'good' or 'excellent' fit (RMSEA = .080; CFI = .977; TLI .961). Consequently at this juncture, it was deemed unnecessary to refine the model further, and subsequent to tests

of discriminant validity, the decision was made to employ the construct as a measure of literacy in the structural model.

Measuring Numeracy

As with literacy, there is no single internationally accepted definition of ‘numeracy’ (Forster, 2009). Rather, there is a multiplicity of positions regarding the nature of numeracy. These range from those who claim that it is synonymous with mathematics, to others who see it as a term for the practical application of mathematical operations, to others still who envisage it as a combination of the above (Sullivan, 2011). What is clear however, is that firstly, for a person to be numerate they must possess mathematical knowledge and secondly, mathematical knowledge includes not only an understanding of concepts and procedures, but also the ability to employ these in a range of ways across various contexts to solve ‘real-world’ problems (Goos, Geiger, & Dole, 2010).

As a consequence, it is generally accepted that numeracy consists of a number of sub-dimensions. By far the broadest conceptualisation of what these might entail originates from the developmental literature. For example, Geary (1995) makes the distinction between biologically ‘primary’ and biologically ‘secondary’ skills, arguing that some aspects of numeracy such as counting are innate, whereas others such as the ability to perform mathematical operations are acquired mainly through social transmission. This position is further supported by Dehaene (2001), who argues that skills such as counting, addition and subtraction are easily acquired, as they draw on

universally available skills such as verbal labelling and exhaustive search. Whereas, higher order operations such as multiplication, division, and beyond require more intensive instruction.

Beyond this, the literature generally takes either a cognitive or content-based approach in regard to the nature and number of dimensions which comprise numeracy (or indeed often both). Those who adopt a cognitive approach generally focus more on the ability to apply mathematical concepts in context. For example, Kovas, Petrill, and Plomin (2007) identify the following overlapping dimensions of numeracy:

- Mathematical Application – the broad ability to employ mathematical operations in problem-solving situations.
- Understanding Number – the ability to understand numerical and algebraic processes to be applied when solving problems.
- Computation and Knowledge – the ability to perform mathematical operations, recall mathematical facts and terminology.
- Mathematical Interpretation – the ability to interpret information from graphs, tables, diagrams, charts, etc.
- Non-Numerical Processes – the ability to perform various spatial operations such as rotational or reflective symmetry.

These dimensions are remarkably similar to others such as the guidelines presented by Kilpatrick, Swafford, and Findell (2002), that suggest numeracy requires the learner to be able to comprehend mathematical concepts, operations and relations; carry out procedures flexibly accurately and appropriately; formulate and solve mathematical problems; apply logical thought and provide appropriate justification; and,

interestingly (given the theory discussed within the preceding chapter), have a ‘productive disposition’ which includes both an inclination to see mathematics as useful and possess self-efficacy. Furthermore, they broadly echo various forms of educational policy¹¹⁴. Conversely, those who adopt a more ‘content’ based approach tend to focus their attention on the various domains or disciplines of mathematical inquiry. Such an approach can often be seen in various examples of curriculum documentation.

Regardless of the stance taken, it is generally accepted that numeracy is best conceptualised not as either cognitive or content-based, but rather as both. The reason for this is, that being incredibly simple, numeracy is about finding solutions to mathematical problems. To do this, an individual must possess both the knowledge to select a method which serves them best, and have the mathematical ability to carry out the procedures which said method requires. However, choosing one over the other simplifies enormously the issue of ascertaining whether an individual has satisfactorily grasped the material which has been taught (Hilton & Pedersen, 2003). Consequently, this approach tends to feature prominently in various testing practices and procedures, the measures contained within the data-set from which the present study draws being no exception. As a result, whilst it is recognised that the concept of numeracy is far more complex, the proceeding discussion of the various dimensions concentrates its focus on

¹¹⁴ For example, the Australian Association of Mathematics teachers suggests that numeracy is best defined as: “... the ‘disposition to use, in context, a combination of underpinning mathematical concepts and skills from across the discipline (numerical, spatial, graphical, statistical and algebraic); mathematical thinking and strategies; general thinking skills; and grounded appreciation of context.” (*Australian Association of Mathematics Teachers, 1998, p. 2*).

This sentiment is generally supported by the current Australian curriculum, which, as part of the mathematical proficiencies strand, requires students to develop: a robust knowledge of adaptable and transferable mathematical concepts; skills in choosing appropriate procedures, carrying out procedures flexibly, accurately and efficiently; the ability to investigate problem situations and communicate solutions effectively; and, the capacity for increasingly sophisticated logical thought and actions.

content-based aspects.¹¹⁵ Drawing on the current Australian curriculum, it identifies number sense, measurement and geometry, and statistics and probability as key dimensions of the construct.

Number Sense

At the core of numeracy is the ability to understand numbers, their relationships, magnitudes and the various means by which they can be manipulated through mathematical operations. Without these abilities, proficiency across other dimensions of numeracy is largely unachievable (Dehaene, 2011). Fortunately, foundational number sense skills such as identification, correspondence, order and cardinality often develop early and it is common for children to bring at least some of these skills to school with them¹¹⁶. Consequently, the role of formal education in relation to this dimension of numeracy is often conceptualised in terms of the need to build on this knowledge across a range of sub-dimensions with increasing complexity. This process is typically considered to occur both directly as a consequence of explicit instruction, and indirectly through other dimensions of numeracy and the broader curriculum (Goos, Dole, & Geiger, 2012; Monroe & Mikovch, 1994).

¹¹⁵ By interpreting numeracy in this manner, the structure of discussion differs slightly from that of literacy. Unlike literacy, where there are various ways to measure its components as they are somewhat ‘unbounded’ and highly contextual, the way numeracy is measured generally mirrors the components of numeracy one wishes to measure. For example, to measure whether an individual has mastered the use of mathematical operations, the most logical way is to test whether the individual can perform mathematical operations. Subsequently, there is no specific discussion of the way various sub-dimensions of numeracy are assessed or measured.

¹¹⁶ For example, the findings of Feigenson and Carey (2003) suggest that the ability to precisely represent small numbers begins as early as 12 – 14 months of age, and the ability to demonstrate symbolic or verbal representations, generally occurs before the child enters formal education.

Whilst it is accepted that number sense is comprised of various sub-dimensions, there is general disagreement in the literature as to the exact number and nature of these. For example, Nickerson and Whitacre (2010) argue that in the broadest terms, number sense draws on two core skills – computation and estimation. Conversely, others take more a more expansive view. For example, Reys et al., (1999) identify the following core components:

- The ability to understand the meaning and size of numbers (e.g. the ability to compare whole numbers, proportions, etc).
- The ability to understand and use equivalent representations of numbers (e.g. simplification of fractions).
- The ability to understand the meaning and effect of operations (e.g. the understanding that 750×0.9 is less than 750).
- The ability to understand and use equivalent expressions (e.g. the understanding that $70 \div 0.5$ and 70×2 produce the same result).
- Computational strategies across various platforms (e.g. mental computation, written computation, calculator use, etc).

Finally, there is also some indication in the literature that the dimensionality of number sense shifts on the basis of age, skill and ability. For example, Faulkner and Cain (2009), in relation to number sense in upper primary and middle school, suggest division into aspects of quantity; numeration; equality; number forms; number systems; proportional reasoning; and, algebraic thinking.

Measurement & Geometry

In the broadest terms, Measurement is the numerical representation of physical space, properties, or in instances such as time, concepts. It is a means to order the surrounding world through numbers in order to better control that world (van den Heuvel-Panhuizen & Buys, 2008). Conversely, whilst related, Geometry is more concerned with the relationships between these properties, and consequently the ability to apply the principles of spatial visualization and reasoning to the world (Van de Walle, 1998). Together, they can be seen as the vehicle by which the learner can employ mathematical tools and insights to gain a better understanding of their physical surroundings.

As with number, measurement and geometry are comprised of a range of sub-dimensions or skills which the learner must acquire. In relation to measurement, these can be broadly divided into the following categories:

- The ability to make physical comparisons (e.g. to physically compare the volume of two containers).
- The ability to understand and employ both standard and non-standard units of measurement (e.g. to use a ruler to ascertain the length of an object in centimetres or to ascertain the area of an object by the quantity of smaller objects which can be placed within).
- The ability to employ mental or visual information to measure or make estimations or approximations of an object's physical properties.

Conversely, in relation to Geometry it is generally accepted by the literature that for an individual to demonstrate proficiency they must be able to:

- Understand the properties of shapes as well as the relationships built on these properties (e.g. to understand that a square has four sides and each side connects at a 90 degree angle).
- Employ spatial reasoning to recognise or create translations, reflections, rotations, symmetry, etc.
- Locate and/or define the location of an object in a plane or space (e.g. to identify the coordinates of a location on a map).
- Recognise shapes within the environment and employ visualisation to interpret objects from different view-points (e.g. pattern folding, cube rotation, etc).

Statistics and Probability

The ever increasing prevalence of data and technology in modern society means that individuals now require some understanding of the meaning and manipulation of data, if they are to fully participate in the world around them (Ginsburg, Manly, & Schmitt, 2006). Consequently, school curricula have and continue to evolve so that children are exposed to such ideas at increasingly earlier ages¹¹⁷. These are usually represented by the related but distinct areas of Statistics and Probability. The former is largely concerned with how data is handled through various techniques of interpretation

¹¹⁷ This can be evidenced in the current Australian curriculum, where students as young as five are expected to be able to both “use data displays to answer simple questions”, and “represent responses to questions using simple displays, including grouping students according to their answers”.

and representation. The latter is concerned with an understanding of, and in the later stages, the ability to quantify chance.

As Ginsburg et al. (2006) writes, the manipulation of data through the use of statistics and probability “is as much art as it is a science” (p. 19). Hence, it could be argued that they represent the domain of numeracy where content and cognitive aspects are most closely aligned. This is because even the simplest of questions requires both interpretation and decision making – in essence the use of statistics and probability is rarely without context. For example, proficiency in statistical reasoning at the foundational level requires an individual to be able to formulate questions, collect data, organise, summarize and make conclusions. When blended with probability, it requires the individual to formulate questions and collect data in a specific manner, manipulate data through various operations, summarize, and make conclusions. At every step of the process, interpretation, decision and justification are required.

Operationalising Numeracy

Numeracy was conceptualised by the study as a complex construct (Kember & Ginns, 2012; Wellington & Szczerbinski, 2007) consisting of three distinct but overlapping sub-dimensions (number sense, measurement & geometry, and statistics & probability). This was a decision based both on the literature and the measures available within the data set on which the study drew. Unlike other constructs employed by the study, it was possible to draw on an established and widely employed scale for its measurement.

As part of Footprints in Time, teachers were asked to complete the Mathematical Thinking section of the 'Academic Rating Scale' (ARS). As with its language and literacy counterpart, this instrument was developed as part of the Early Childhood Longitudinal Survey conducted by the National Centre for Education Statistics (USA). It has been shown to be both valid and reliable across various demographic and cultural contexts. The Mathematical Thinking section of the ARS consists of the following nine items which aim to measure a child's proficiency in number concepts, measurement, operations, geometry, application of mathematical strategies, and beginning statistical thinking. (Tourangeau et al., 2005).

1. Can continue a pattern using three items.
2. Demonstrates an understanding of place value.
3. Models, reads, writes and compares whole numbers.
4. Counts change with two different types of coins.
5. Surveys, collects and organises data into simple graphs.
6. Makes reasonable estimates of quantities.
7. Measures to the nearest whole number using common instruments.
8. Uses a variety of strategies to solve maths problems.

It is rated on the following scale:

1. Not Yet - Child has not yet demonstrated skill, knowledge, or behaviour.
2. Beginning - Child is just beginning to demonstrate skill, knowledge, or behaviour but does so very inconsistently.

3. In Progress - Child demonstrates skill, knowledge, or behaviour with some regularity but varies in level of competence.
4. Intermediate - Child demonstrates skill, knowledge, or behaviour with increasing regularity and average competence but is not completely proficient.
5. Proficient - Child demonstrates skill, knowledge, or behaviour competently and consistently.

Descriptive Statistics

As can be seen in *Table 7*, in relation to the ARS variables employed to measure numeracy, both individual and combined mean values fell close to the central point of the scale (2-3). In a similar manner both standard deviation and skewness were unproblematic. However, a number of values for kurtosis, fell outside traditional cut-off range (2-4) and the mean value for all variables approached this. Consequently, robust estimation procedures based on Satorra and Bentler (2001) were employed by both the preceding analysis and subsequent analysis involving these measures.

Table 7:
Descriptive Statistics for Measures of Numeracy.

Variable	Mean	Std. Dev	Skew	Kurt
Can continue a pattern using three items	3.76	1.21	-0.54	2.20

Demonstrates an understanding of place value	3.00	1.37	-0.09	1.76
Models, reads, writes and compares whole numbers	3.15	1.38	-0.10	1.78
Counts change with two different types of coins	2.62	1.40	0.36	2.08
Surveys, collects and organises data into simple graphs	2.98	1.30	0.05	2.08
Makes reasonable estimates of quantities	2.88	1.27	0.04	2.06
Measures to the nearest whole number using common instruments	2.69	1.39	0.44	2.35
Uses a variety of strategies to solve maths problems	2.75	1.26	0.30	2.28
Mean	2.98	1.32	0.06	2.07

Exploratory Factor Analysis

As the literature dealing with the theory and operationalisation of numeracy has a diversity of positions and furthermore, identifies it as a complex construct consisting of various components, a decision was made to conduct an Exploratory Factor Analysis to assess the dimensionality/underlying structure. Prior to factor extraction, the suitability of the data for Factor Analysis was assessed. Firstly, the Kaiser-Meyer-Olkin measure of sampling adequacy (.94) exceeded the commonly accepted threshold value (.6). Secondly, Bartlett's test of sphericity was significant ($\chi^2 (28) = 2109.606, p < .001$). Combined, these results suggested that the data was suitable for Factor Analysis.

As can be seen in *Table 8* initial extraction and application of the Kaiser Criterion ($\lambda > 1$) suggests a strong single factor solution. The first factor explained close to 80% percent of the total variance with factors 2 through 8 explaining the remainder.

This suggests that whilst numeracy is a complex construct which consists of a number of components, these have a tendency to develop together at similar rates, a result which is largely in line with the literature.

Table 8:
Initial Factor Extraction for Measures of Numeracy.

Factor	Eigenvalue	Difference	Variance %	Cumulative %
Factor 1	6.23134	5.66077	0.7789	0.7789
Factor 2	0.57057	0.28655	0.0713	0.8502
Factor 3	0.28402	0.04096	0.0355	0.8857
Factor 4	0.24305	0.0194	0.0304	0.9161
Factor 5	0.22365	0.04014	0.028	0.9441
Factor 6	0.18351	0.03556	0.0229	0.967
Factor 7	0.14795	0.03203	0.0185	0.9855
Factor 8	0.11591	.	0.0145	1

This hypothesis was further tested through Oblique rotation of the component matrix which allows for the redistribution of common variance across the factors under the assumption that potential factors are correlated (Kieffer, 1998). As can be seen in *Table 9*, the process revealed a clear single factor structure with all loadings exceeding .5.

Table 9:
Factor Loadings after Oblique Rotation of the Component Matrix for Measures of Numeracy

Variable	Factor1
Can continue a pattern using three items	0.8279
Demonstrates an understanding of place value	0.8921
Models, reads, writes and compares whole numbers	0.9148
Counts change with two different types of coins	0.8632
Surveys, collects and organises data into simple graphs	0.9097
Makes reasonable estimates of quantities	0.9262
Measures to the nearest whole number using common instruments	0.8440
Uses a variety of strategies to solve maths problems	0.8779

Confirmatory Factor Analysis

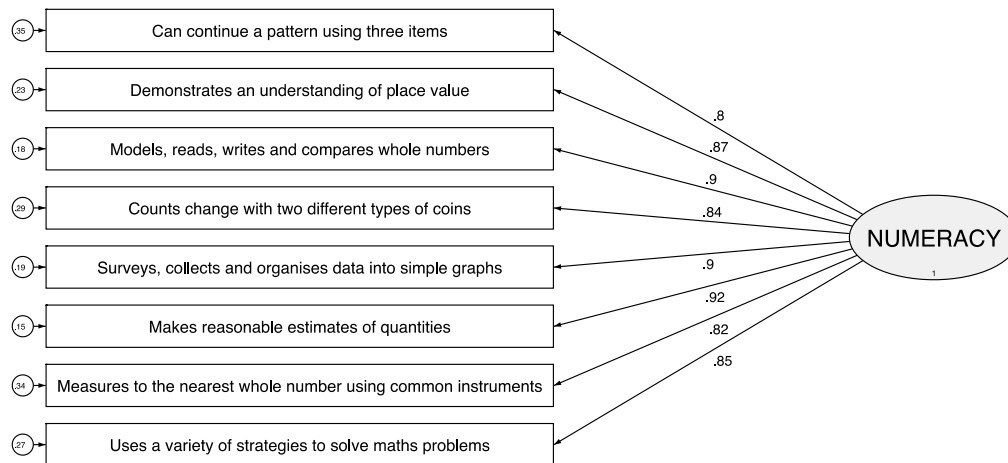


Figure 15: CFA model for Measures of Numeracy.

The CFA model for numeracy (*Fig.15*) demonstrated mixed results. Factor loadings were high (the lowest being .8) and measures of reliability and validity considerably exceeded heuristic cut-off points (Average Variance Extracted = .745; Composite Construct Reliability = .959; Chronbach's α = .96). Furthermore, two of the three fit indices exceeded their respective cut-off values for 'excellent' fit (CFI = .938; TLI = .913). However, the value for RMSEA (.163) was problematic. Based on the complex nature of the construct, for the same reasons as they were for the literacy construct, modification indices were run to assess whether the specification of covariances had the potential to improve this. These revealed that model fit could be improved by the specification of covariance terms between the second and third item (MI = 121.11, $P > MI = .00$, StdEPC = .567). As discussed previously, modification indices should be interpreted with caution. They should be statistically significant, improve model fit, and be theoretically sensible - these conditions were met. From a theoretical perspective, both the second and third item broadly reflect the 'number sense'

component of numeracy. Furthermore, they reflect the progressive nature of the construct – i.e. an individual cannot read, write and compare whole numbers without an understanding of place value. Based on this, the model was re-specified with the lowest loading variable removed.

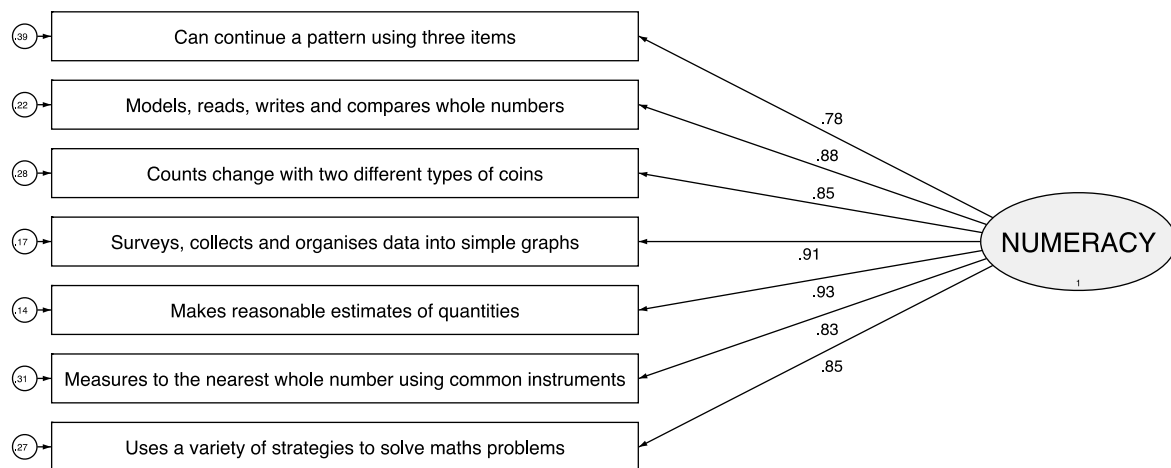


Figure 16: Re-specified CFA Model for Measures of Numeracy.

As expected, the re-specified model (*Fig.16*) retained similar results in regard to measures of reliability and validity with all measures considerably exceeding the traditional cut-off values (Chronbach's $\alpha = .95$; Composite Construct Reliability = .95; Average Variance Extracted = .744). The addition of the covariance term between the second and third item had little impact on CFI (0.949) and TLI (0.924) with these values suggesting a slightly better fit. On the other hand, the value for RMSEA (.08) which was previously problematic decreased below the threshold for 'acceptable fit'. Consequently, at this juncture it was deemed unnecessary to refine the model further and

subsequent to tests of discriminant validity, the decision was made to employ the construct as a measure of numeracy in the structural model.

Bringing it Together

To this point, the discussion has identified the two dimensions by which educational outcomes were conceptualised by the present study. It has identified measures within the data set that relate to these, compiled descriptive statistics, operationalised distinct latent variables, and tested these for reliability and convergent validity. It is now time to bring these dimensions together in both a statistical and theoretical sense. The purpose of the following section of the chapter is to do this. It begins by testing for discriminant validity, to ascertain whether the latent variables which have been constructed are statistically distinct from one another, and modifications are made as necessary. It then explores potential causality between these and concludes with a brief discussion of the way these latent variables were specified in the full model.

Discriminant Validity

As discussed in Chapter 3, it is vital that the latent variables employed by any SEM analysis are statistically distinct. There are a number of methods by which this can be tested, however by far the most common in SEM is the method defined by Fornell and Larcker (1981). Within this method, a CFA model containing the latent variables of

interest is specified and the correlation between these compared to the AVE for each factor. To claim discriminant validity, either the square root of AVE must exceed the correlation coefficient or AVE must exceed the squared correlation coefficient. As the choice of method is arbitrary, the present study opted for the later. It is worth noting that, due to the use of FIML estimation, the factor loadings for each latent variable and consequently the AVE is liable to shift slightly, as the number of cases which can be drawn on is increased due to the presence of other variables in the model¹¹⁸.

As has been alluded to throughout the chapter, literacy and numeracy are closely related to one another in a theoretical sense. Furthermore, we have already seen that there were strong correlations between a number of the observed variables which were initially employed to operationalise these as latent variables. Bearing these issues in mind, issues surrounding discriminant validity were expected by the present study. The results of the initial two factor CFA to test for this did not disappoint in that respect.

¹¹⁸ For example, on its own, PRACTICE can draw on 299 cases in order to estimate the factor loadings. This is due to the large amount of missing data. Conversely, PRESENCE is included in the model, due to the minimal amount of missing data associated with its indicators. It is possible to draw on 323 cases. For this reason, all AVE values should be considered 'provisional' until all latent variables have been estimated in the same model.

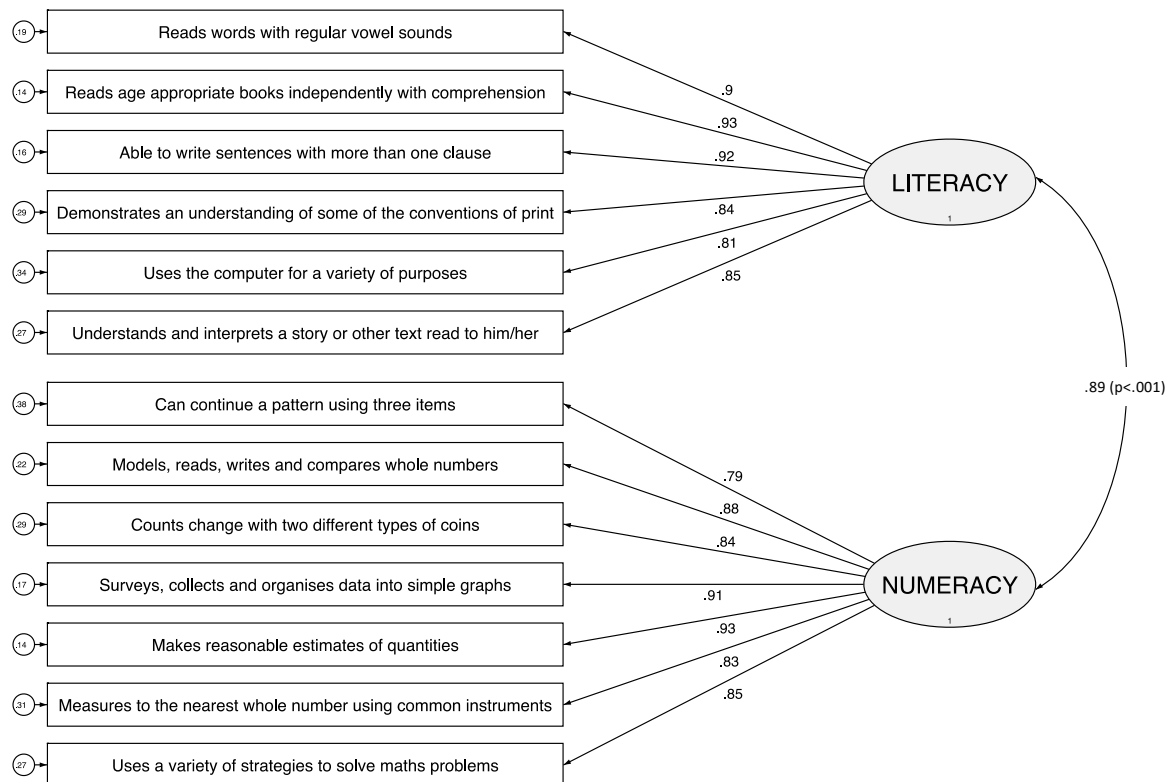


Figure 17: Two Factor CFA (LITERACY & NUMERACY).

Whilst the two factor model (*Fig.17*) was an excellent fit to the data with all fit-indices within or exceeding the cut-off values for ‘good’ fit (CFI = .98; TLI = .97; RMSEA = .07), when applying the method proposed by Fornell and Larcker (1981), the squared correlation coefficient ($.89^2 = 0.79$) exceeded the AVE for both LITERACY (.77) and NUMERACY (.75), thus discriminant validity was not achieved.

This left the study with three options: allow LITERACY and NUMERACY to correlate (or more specifically their error terms to correlate) in the full model, collapse LITERACY and NUMERACY into a single latent variable, or remove observed variables in an attempt to both increase the AVE of each latent variable and potentially decrease the correlation between them. The latter option was taken for two reasons.

Firstly, to allow correlation between latent variables in SEM is generally frowned upon, especially when they represent the outcome of interest and secondly, although highly correlated, collapsing the two dimensions of educational outcomes into one is not particularly desirable, as it is possible that they may still be influenced in different ways by other variables in the model. Consequently, only the three highest loading observed variables were kept for each latent variable and the model re-estimated.

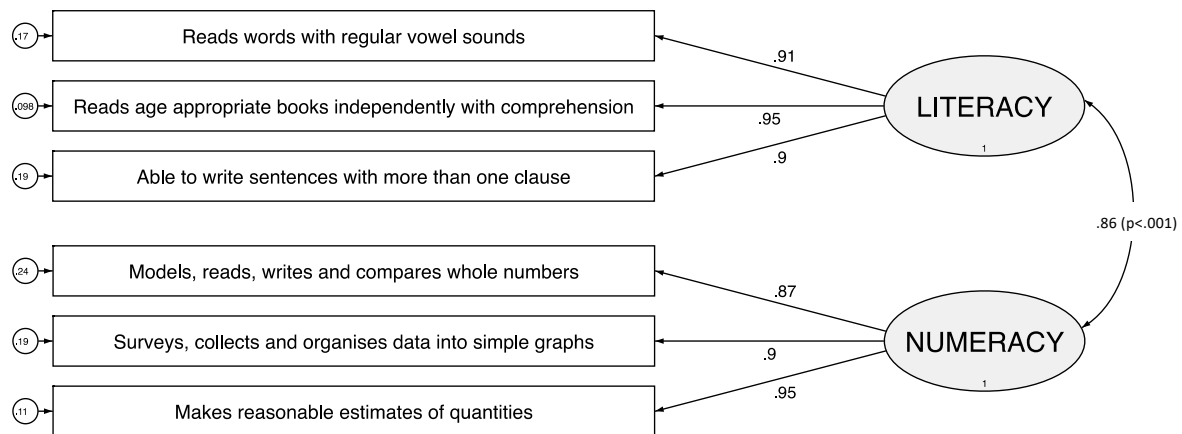


Figure 18: Re-specified Two Factor CFA (LITERACY & NUMERACY).

As can be seen in (Fig.18), this process was a success. Firstly, the values for fit indices (CFI = .99; TLI = .98; RMSEA = .07) were improved over the original model. Secondly the AVE values for LITERACY (.85) and NUMERACY (.82) were increased. They now exceeded the squared correlation coefficient ($.85^2 = 0.73$) and thus it was possible to claim discriminant validity. However, with such a large correlation coefficient, issues surrounding model fit were still expected when estimating the Full Model.

As a final test of discriminant validity, Lagrange Multiplier tests (modification indices) were conducted to determine whether the model would benefit from the inclusion of any further paths (i.e. covariences between observed variables) and to detect any problematic crossloadings. The results of these tests did not identify any problematic crossloadings and suggested that no further modification to the model was necessary.

Causality

In relation to the theoretical literature, seminal work on the use of language such as Lemke (1988) has identified that words do not carry meanings across disciplines of study, instead the learner must employ strategies to construct meaning from particular patterns of linguistic items. For these reasons, it is generally accepted that literacy extends not only into the domain of numeracy, but indeed all disciplines of study. Conversely, as others such as Moffett (1968) argue, the need to apply numeracy skills within non-mathematical contexts is far from uncommon, and thus it becomes necessary for the individual to have at least a fundamental grasp of mathematical concepts in order for comprehension to occur. To put such an argument in more concrete terms, it is rare that we encounter a text that does not require us to understand concepts of number, proportion or basic operations such as addition and subtraction. Conversely, it is equally as rare to encounter mathematical problems devoid of context, especially within the age and level of expertise that the present study is concerned with. In essence, as Chapman and Lee (1990) put it, it is not difficult to see that under such conditions, the skills literacy and numeracy are inextricably linked through the ways in which they are employed within the process of communication and hence in learning.

In relation to the research literature, such an argument is wholeheartedly supported. For example, Krajewski and Schneider (2009b) found a strong relationship between phonological awareness and skills such as quantity, discrimination and number sequence. Krajewski and Schneider (2009a) in a longitudinal analysis of the early years also noted a strong link between the ability of children to understand quantities and interpret number through words. Furthermore, this has been broken down into even smaller components. For example, Purpura and Napoli (2015) in a study of 180 children in the early stages of developing formal skills in literacy and numeracy, identified a strong relationship between linguistic and numeric knowledge. However, perhaps more tellingly, they found that the relationship between the development of language and numeral knowledge was fully mediated by ‘informal numeracy skills’¹¹⁹, and the relationship between these skills and numeral knowledge was partially mediated by print knowledge. In essence, in order to be numerate, one must be literate and to be literate, one must be numerate.

From a more practical perspective, as literacy and numeracy are somewhat inseparable in the process of communication and thus learning, it is of little surprise that these skills tend to enter curriculum and classroom practice in a manner which enables them to ‘develop together’, be ‘taught together’, and perhaps more importantly in the present context, to be ‘assessed together’. Indeed as a country, we set national ‘benchmarks’ for where we expect our children to be ‘at’ from a developmental perspective, as teachers, we work towards these benchmarks, and as assessors, we grade against these benchmarks. Furthermore, as ever increasing scrutiny is placed on student achievement,

¹¹⁹ The authors define this as “skills that children generally learn prior to, and outside of, formal schooling ... (that are) focused on flexibly connecting quantities to number words and understanding the relations among quantities.” (Purpura & Napoli, 2015, p. 199).

we tie both school support and funding to these benchmarks. Given this, it is of little surprise that achievement in literacy and numeracy tend to ‘move together’, as we have effectively set the goal posts to achieve this outcome.

Finally, this line of thinking naturally flows into the development of measurement instruments such as the one employed by the present study. For example, when developing these, we are concerned that the measures we apply are appropriate to the population we are attempting to measure - i.e. an instrument that measures proficiency in calculus would be of little use in the third-grade classroom. Furthermore, we are also concerned about the ability of an instrument to demonstrate a ‘normal-distribution’ when it is employed to collect data. As a consequence, instruments, especially those designed to measure broad developmental skills such as literacy and numeracy, tend to be both reflective of population norms and these norms tend to sit within the middle of these instruments. In essence, they tend to be highly correlated.

Specification (the model)

For these reasons, which range from the theoretical to the statistical, it was deemed that specifying a causal relationship between the latent variables LITERACY and NUMERACY, given the inherent broadness of the observed variables that were employed to operationalise them, was neither a theoretically nor a methodologically sound decision. In essence, it was decided that, based on the information that could be gleaned from the data, it was not possible to theorise whether the development of literacy would occur before numeracy or vice versa – causality could not be established. Consequently, it was decided to specify these variables within the full model as two

distinct outcome variables, with an understanding that the correlation of their error terms (whilst unfortunate) may be necessary, despite the methodological attempts that were made to distinguish them described previously. This is represented visually in *Fig.19*.

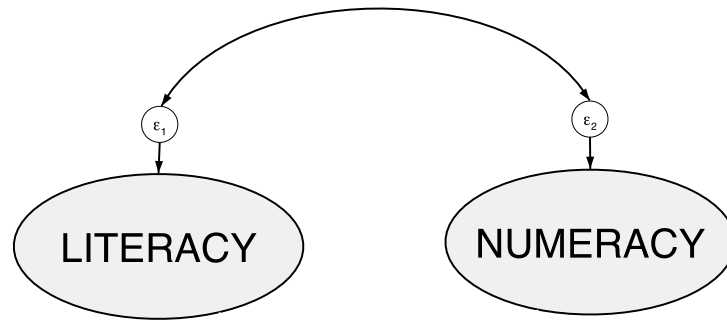


Figure 19: Path Model within Construct (OUTCOMES).

Chapter 5:

Engagement

Introduction

As it becomes increasingly apparent that educators can no longer rely on the inherent investment of their students in the educational process, ‘Engagement’ has become the new panacea for declining achievement, disaffection and dropout (Fredricks, Blumenfeld, & Paris, 2004). In the Australian context, it has entered the educational policy arena at various levels ranging from Federal directives (MCEETYA, 2008) to the procedures and guidelines of individual institutions. It has also underpinned numerous programs and interventions across a wide range of educational contexts. At its core, Engagement is largely concerned with what Russell, Ainley, and Frydenberg (2005) call “Energy in action” in relation to the “connection between person and activity” (p. 4).

Such a definition is inherently broad. This is not a coincidence, but rather an informed choice of the present study at this juncture, as various issues have made the literature and theory surrounding engagement as a construct contested at best. Its relative infancy and inherent commonalities with prior research have hindered scholarly consensus, an issue which has been further compounded by political pressure and financial incentives that have driven questionable research agendas and practice. Consequently, policy makers demand ‘engagement’, but often define it within the narrow terms of attendance and retention (or not at all). Academics point to ‘engagement’ as the root of productive learning, but fail to convey what exactly such a

condition entails (Zyngier, 2008), and educators seek ‘engagement’, but often know neither how to achieve it nor how to determine when it has been achieved (Woodward & Munns, 2003).

However, ‘engagement’ (in many ways regardless of how it is defined), is strongly correlated with improved academic outcomes (Fredricks et al., 2004). For example, in the broader context, it has been correlated with increased retention (Archambault, Janosz, Fallu, & Pagani, 2009), standardised test scores and performance in literacy, numeracy and science (Willms, 2003). Furthermore, it has been widely recognised as a mediator between institutional reform and achievement in the academic sense of the term (Wigfield & Guthrie, 2000), a position which it occupies in the theoretical and analytical frames of the current study.

In line with the preceding chapter, this chapter begins by outlining the development of Engagement Theory as a distinct field of inquiry. It then briefly explores the dimensionality of the construct to define, identify and align the present study with the current literature and scholarship. Following this, it then explores the theoretical definitions and operationalisation of each dimension (Affective and Behavioural), drawing on these to identify available measures within the data set. Subsequently, it constructs and tests hypothesised constructs for reliability and validity, with the view towards their inclusion in the broader structural model to be analysed by the present study.

Theoretical Development

Whilst the foundations of ‘engagement’ can be traced to various seminal theories of education, it is a relatively new concept which first appeared in the literature during the early mid-1980’s (Appleton, Christenson, & Furlong, 2008). Prior to this juncture, it was necessary to infer such processes from the literature regarding resistance, alienation and drop-out (Mosher & MacGowan, 1985). Consequently, much of the literature was framed within a deficit discourse which located blame within students and communities. For example, the popular ‘frustration/self-esteem’ model employed in various incarnations by much of this literature, proposed that disengagement was best theorised as a causal process, where poor performance resulted in impaired self-concept that subsequently created oppositional attitudes towards the responsible context – most commonly the institution or education in general¹²⁰. It was not until 1989 that the literature body experienced a discursive shift, and the construct of ‘engagement’ as we understand it today began to take shape.

This shift began with the seminal work of Finn (1989) which laid the ground-work for the next thirty years of research (Zyngier, 2008). Diverging from previous thought, Finn (1989) argued that the process by which students became disaffected with education could be better understood if engagement was conceptualised as a pre-cursor to academic performance. At the core of his work Finn (1989) proposed a reciprocal relationship, whereby participation in school activities led to successful performance

¹²⁰ It is interesting to note that similar theorisation still appears more within the literature, especially where the education of minority groups is concerned. A quintessential example of this would be Ogbu’s oppositional culture theory (Ogbu, 1979), which has been employed by numerous scholars to explain patterns of resistance and alienation in the education of ethnic and racial minorities.

outcomes, successful performance outcomes led to identification with the school, and identification with the school led to further participation in school related activities (See *Fig 20*).

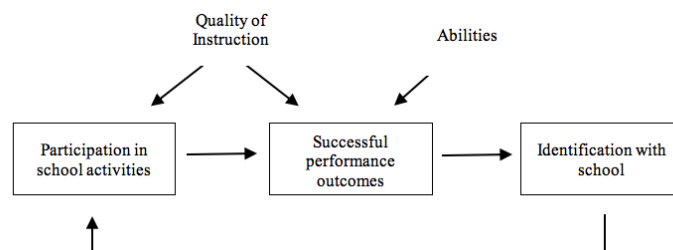


Figure 20: Participation/Identification Model (Finn, 1989)

Finn’s research is significant for three reasons. Firstly, it is one of the first instances within the literature where engagement is identified as a construct in its own right. Secondly, it marks the beginning of a literature body which acknowledges the multidimensional nature of the construct. Finally, it marks a point of divergence within the literature from an obsession with retention and drop-out to the study of engagement as a facilitator of academic success.

From this juncture, the literature concerned with engagement as a construct in its own right grew exponentially, as interest in the manipulation of engagement as a means to improve the academic outcomes of all students, not simply the disaffected and those deemed ‘at-risk’ of dropping-out, came to the forefront of scholarship in the area. Perhaps one of the first studies to employ these new understandings was Skinner, Wellborn, and Connell (1990), who proposed that engagement acted as a mediator between a child’s perceived control (a combination of self-efficacy and perceived

ability) and academic success. As the authors note, the results of the study highlighted a strong correlation between engagement and academic outcomes as well as insights into the importance of perceived control. These results were soon to be replicated by Skinner and Belmont (1993) in a further study that explored the influence of teacher behaviour in terms of involvement, structure and autonomy support on engagement, and subsequently academic outcomes defined in terms of ability and adjustment. Other scholars followed, with increasing complexity. For example, Connell, Spencer, and Aber (1994) identified a positive relationship between parental involvement, engagement and subsequently academic outcomes. Miller, Greene, Montalvo, Ravindran, and Nichols (1996) explored the relationships between learning goals, future consequences, pleasing others, perceived ability, engagement and academic outcomes. However, whilst these early studies are particularly useful in terms of substantiating the links between engagement and outcomes, they shared distinct methodological caveats. The majority of the studies assumed linear relationships between constructs. Few of them explored the relationships between the antecedents of engagement they proposed. And, although the majority recognised that engagement could take multiple forms, this is rarely expressed in their analysis. It was not until later, that the literature truly reflected the multidimensional nature of the construct. It was even later still, that it began to explore the inherent interrelationships between such dimensions.

One of the earliest studies to make clear analytical distinctions between different forms and dimensions of engagement was Willms (2003). Drawing on PISA¹²¹ data, this study employed a multi-level analysis to explore both the relationships between

¹²¹ PISA refers to the Programme for International Student Assessment, a global educational study of 15-year-old students' performance in mathematics, science, and reading compiled by the Organisation for Economic Co-operation and Development.

engagement, literacy and numeracy outcomes, and the relationships between what they termed Behavioural and Affective Engagement (defined as participation in the educational process and a sense of belonging within the educational environment). The findings suggested firstly, that correlations existed between engagement and outcomes. However, more interestingly in the context of the present review, the findings suggest that at the school level, moderately strong relationships exist between Behavioural and Affective Engagement. However, interestingly, these findings were not replicated at the student level of analysis. Instead, only weak relationships existed between Behavioural and Affective Engagement, and between engagement and academic outcomes, which suggested a deeper level of complexity. Students could feel involved but not participate, they could participate but not feel involved, they could excel academically but not be “engaged”, and they could be “engaged” but receive poor grades.

This complexity was later brought to the attention of the scholarship by Fredricks et al. (2004) in their seminal review of the construct. Within this, the authors identified many of the most pressing issues surrounding conceptual clarity. For example, the authors noted that the literature generally failed to differentiate between adherence and autonomy. Were students simply following the rules to avoid adversity? Between deep and surface engagement, were students doing just enough to ‘get-by’, or were they engaging on a more fundamental level with the subject material? And, between stable and transitory forms of engagement, students can be engaged in one setting or task but not another; they can be engaged with one subject but not another; they can be engaged with education in the broader sense but not with the institution, and so on. At the heart of this work was an argument for the elevation of engagement to a meta-construct, which brought the separate lines of research across various fields and disciplines together.

Within this, Fredricks et al. (2004) proposed a three dimensional model of the engagement process: Cognitive Engagement, Affective Engagement and Behavioural Engagement, the added Cognitive dimension drawing largely on the motivational literature. From this juncture, the literature has generally accepted the notion of ‘Engagement as a meta-construct’ comprising of a number of differing dimensions. However, the number of dimensions and what exactly these dimensions entail is unclear.

Dimensionality

It is generally accepted that engagement operates as two or more dimensions (Appleton et al., 2008). Those who expound a two dimensional model often draw on the initial work of Finn (1989), and consequently operationalise the construct in terms of Behavioural and Affective/Affective components¹²². Those who expound a three dimensional model commonly draw on Fredricks et al. (2004), and subsequently add a further cognitive dimension. Whilst these are by far the most common conceptualisations of the construct, there are also a small number of scholars who have proposed four dimensional models of engagement and beyond. For example, Appleton, Christenson, Kim, and Reschly (2006) operationalise the construct in terms of academic, behavioural, cognitive and psychological dimensions, where behavioural and psychological engagement address the measurement of belonging and identification with the institution.

¹²² This is particularly common within the scholarship which differentiates between motivation and engagement.

Whilst not inherently problematic in itself, differences in dimensionality employed by various scholars have led to significant issues in terms of the measures employed to assess each dimension, and indeed their over-arching natures. For example, Archambault, Janosz, Fallu, and Pagani (2009) see Behavioural Engagement as the sum of positive behaviours, participation in school related tasks and participation in extracurricular activities. Affective Engagement, on the other hand, has been operationalised as belongingness and the perceived benefits of education (Eccles & Roeser, 2009; Finn, 1989), and as a combination of attitudes and self-efficacy (Archambault et al., 2009; Valeski & Stipek, 2001) amongst other proposals. Finally, Cognitive Engagement, has been defined in terms of psychological investment in learning (Fredricks et al., 2004), self-regulation, or a broader conceptualisation that incorporates measures which aim to assess mastery and task orientation (Appleton et al., 2006). It has also been blended with aspects of motivational psychology or bifurcated into separate dimensions of engagement and motivation by scholars such as Martin (2007). To further compound such issues, scholars such as Marks (2000) have subsumed elements of the above into a single measure of engagement, in essence nullifying the notion that engagement operates in a multidimensional manner.

The following discussion, whilst recognising this complexity, draws on the work of various scholars in the field to define a two dimensional conceptualisation of engagement comprising of Affective and Behavioural forms, and discusses the ways in which each have been operationalised in the quantitative paradigm. This decision is based firstly on the available data from which the current study drew, and secondly, on the current state of the literature. Whilst three dimensional conceptualisations are more common in the theoretical literature, much of the empirical literature is yet to ‘catch-up’

in this respect. Thus, defining it in this manner makes comparisons between Indigenous and non-Indigenous applications of the construct a possibility.

Measuring Affective¹²³ Engagement

Affective Engagement is generally defined by the literature in terms of the affective reactions of students within the classroom towards the school, or more broadly, towards the process of education itself (Fredricks et al., 2004). As Murray, Mitchell, Gale, Edwards, and Zyngier (2004) note, these can be both positive and negative (e.g. boredom vs interest, like vs dislike, etc), and are generally seen to correspond with either a sense of belonging within the school, or for some scholars, a sense that the school and consequently education is of some intrinsic value.

In the broader context of the construct, Affective Engagement has been conceptualized in a multitude of ways. For example Fredricks et al. (2011) note the literature has defined it as being “happy or anxious, expressing interest and enjoyment, reporting fun and excitement, feeling safe, having supportive or positive relationships with teachers and peers, having family support for learning and expressing feelings of belonging, and valuing school.” (p. 10) . It has also been theorised to have numerous antecedents and outcomes. In relation to the former, the vast majority of the literature has concentrated on context – e.g. warmth and support, instructional approaches, organizational features and perceptions of safety (Finn & Frone, 2004). In relation to the latter, it has consistently been linked to improved academic outcomes – e.g. the

¹²³ Affective Engagement is sometimes referred to in the literature as Emotional Engagement, depending on the scholar/context.

probability of finishing school and improved test scores (Finn & Zimmer, 2012) and improved behavioural outcomes – e.g. the absence or reduction in negative behaviours (Finn & Frone, 2004). Furthermore, other scholars such as Connell et al.(1994) and Skinner et al. (1990) have demonstrated correlations with other dimensions of engagement itself.

In the specific context of Indigenous education, whilst it is often assumed that broad theoretical principles still apply, we know relatively little about cross cultural relevance of the construct, the socio-structural context of the construct, or indeed how we should go about operationalizing and subsequently measuring the construct. Instead, the relatively limited literature in the area has been largely concerned with demographic or attitudinal factors, which is problematic, given that the literature within this context is in many ways yet to define the construct itself in relation to Indigenous learners. However, the work of scholars such as Andrew Martin and Dennis McInerney are invaluable in terms of providing insights regarding related concepts and constructs within the broader field of motivation. For example, McInerney (1991) notes that facilitators of motivation for Indigenous students surround self-reliance, confidence, task orientation and mastery. Whereas, facilitators of engagement include parental support, peer influence, school influence through responsiveness to the needs of students and support and encouragement from teachers and staff. Such findings have led to various programs and policies in Indigenous education. Martin (2015) takes a far broader approach, identifying cognitive and affective factors such as learning styles; identity as an Aboriginal person, a student; socio-cultural factors such as the role of family and community; and, the dynamics of failure and academic resilience.

In regard to the ways in which Affective Engagement has been operationalised in the quantitative paradigm, by far the most common method has been the deployment of self-report instruments. As Appleton et al. (2006) suggest, this is largely because other methods of data collection such as teacher-report or observational instruments which fail to incorporate the student's perceptions are inferential at best. Such instruments generally ask students to rate their interest and emotional reactions to learning tasks, the school environment or education itself. For example, Skinner et al. (1990); Skinner and Belmont (1993); and, Skinner, Furrer, Marchand, and Kindermann (2008) employ the "Engagement vs Disaffection with Learning Instrument" (EDSV) to measure Affective/Emotional Engagement in terms of positive and negative emotions in relation to school work and the classroom environment. It asks students to report on the applicability of statements such as: "When I'm in class I feel good" and "I enjoy learning new things". Others have applied similar principles, but with a stronger focus on participatory elements of the dimension, for example: Jelicic, Bobek, Phelps, Lerner, and Lerner (2007) and Li, Bebiroglu, Phelps, Lerner, and Lerner (2008). Conversely, others such as Appleton et al. (2006) and Carter, Reschly, Lovelace, Appleton, and Thompson (2012), based on underlying theory, take a different approach to measurement. Rather than assessing emotional responses to school work and the school itself, they apply aspects of the participation/identification model proposed by Finn (1989) to investigate student/teacher relationships, peer support for learning, and family support for learning. The participation/identification model has also been employed in a stricter manner by Voelkl (1996) who explored student beliefs regarding their sense of belonging within the school, and the value they placed on education through survey items such as "Proud of School", "Participate in Activities" and "School is Important".

In regard to the quantitative measurement of Affective Engagement in the context of Indigenous learners, the literature is sparse at best. For example in the Australian context, we know from the work described in Biddle (2015) that affective factors such as the following drawn from the Longitudinal Study of Indigenous Children may influence attendance:

1. The child is happy about going to school.
2. The child wishes they didn't have to go to school.
3. The child asks parents if they can stay home from school.
4. The child feels that their teacher is not nice to them.
5. The child feels that the children in school are not nice to them.
6. The child is picked on at school.

We also know from the work of Dunstan, Hewitt, and Tomaszewski (2017), who employed the following items from a latter wave of the Longitudinal Study of Indigenous Children, that Affective Engagement may be related to child health, remoteness of location, teacher relationships and whether children feel 'good' about being Indigenous at school amongst other factors.

1. I find school fun.
2. I feel happy about going to school when I get up in the morning.
3. I wish I didn't have to go to school.
4. I try to find ways of getting out of going to school.
5. I feel safe at school.
6. I like all school lessons.

Beyond this, much of the literature is intertwined with aspects of motivation. For example, ‘positive self-concept’ has been linked to increased literacy outcomes by Purdie, Ellis, and Stone (2004), and to attendance and retention by Craven and Parente (2003). Taking a slightly different theoretical approach, ‘motivation’ and ‘self-concept’ have been linked to increased literacy and numeracy outcomes as well as improved attendance rates by McNerney (2001). However, whilst similar, it is important to remember that ‘engagement’ and ‘self-concept’ are distinct constructs with distinct fields of inquiry, and should be treated as such lest we further add to the already perplexing definitional irregularities surrounding engagement.

Operationalising Affective Engagement

Affective Engagement was conceptualised by the present study in terms of students’ emotional responses to the school and the broader educational process. This decision was made firstly, on the basis that this conceptualisation aligns with the few previous studies in the context of Australian Indigenous Education that have attempted to capture Affective Engagement. And secondly, as the measures employed by these studies could for the most part be used by the present study, as it draws on the same data-set, albeit a different wave. Consequently, the following variables were chosen from the ‘child survey’ component of the LSIC (wave 7). Each item is measured on a 3 point Likert scale ranging from 1 – Yes, always, to 3 – No. As this scale is the inverse of the other Likert scales employed by the present study, many of the items were reverse coded to maintain directionality with other variables in the study, these are denoted by a ‘*’.

1. “Is your teacher nice to you?” *
2. “Are the children at school nice to you?” *
3. “Do children at school pick on you?”
4. “Do you find school fun?”*
5. “When you get up in the morning do you feel happy about going to school?”*
6. “Do you wish you didn’t have to go to school?”
7. “Do you ask your parents to stay home from school?”

As noted by Dunstan et al. (2017), these items align with previous studies used to capture Indigenous children’s engagement, early development, and contributories to school success. Furthermore, they are generally comparable with various established scales in the literature.

Descriptive Statistics

In relation to the variables identified as potential measures of Affective Engagement within the data-set, both individual and combined mean values fall close to the central point of the scale employed. In a similar manner, both individual and combined values for standard deviation were relatively unproblematic as were those for skewness. However, as can be seen in *Table. 10*, the kurtosis values for several measures fall outside the traditional heuristic cut-off range (2-4). Consequently, robust estimation procedures based on Satorra and Bentler (2001) were employed by both the proceeding analysis and subsequent analysis involving these measures.

Table 10:
Descriptive Statistics for Measures of Affective Engagement.

Variable	Mean	Std. Dev	Skew	Kurt
Is your teacher nice to you *	1.30	0.63	1.92	5.22
Are the children at school nice to you *	1.53	0.74	1.01	2.54
Do the children at school pick on you	2.44	0.78	-0.94	2.29
Do you find school fun*	2.66	0.68	-1.65	4.05
Do you feel happy about going to school *	2.40	0.83	-0.70	1.74
Do you wish you didn't have to go to school	1.96	0.93	0.14	1.16
Do you ask your parents to stay home from school	2.16	0.89	-0.27	1.32
Mean	2.06	0.78	-0.07	2.62

Exploratory Factor Analysis

As both the literature dealing with theory and operationalisation of engagement is ‘confused’ at best, a decision was made to conduct an Exploratory Factor Analysis to assess the dimensionality/underlying structure of the chosen measures. Prior to factor extraction, the suitability of the data for Factor Analysis was assessed. Firstly, the Kaiser-Meyer-Olkin measure of sampling adequacy (.707) exceeded the commonly accepted threshold value (.6). Secondly, Bartlett’s test of sphericity was significant ($\chi^2(21) = 312.246, p < .001$). Combined, these results suggested the data was suitable for Factor Analysis.

As can be seen in *Table 11* initial extraction and application of the Kaiser Criterion ($\lambda > 1$) suggests a two-factor solution. The first factor explaining 34.1 percent

of the total variance, the second explaining a further 16.9 percent and the remaining five factors explain the remainder.

Table 11:
Initial Factor Extraction for Measures of Affective Engagement

Factor	Eigenvalue	Difference	Variance %	Cumulative %
Factor 1	2.38771	1.20491	0.3411	0.3411
Factor 2	1.1828	0.19501	0.169	0.5101
Factor 3	0.98779	0.14565	0.1411	0.6512
Factor 4	0.84214	0.24514	0.1203	0.7715
Factor 5	0.597	0.05859	0.0853	0.8568
Factor 6	0.53841	0.07426	0.0769	0.9337
Factor 7	0.46415	.	0.0663	1

As can be seen in *Table 12*, Oblique rotation of the component matrix revealed a clear factor structure with all primary loadings bar one exceeding .5 and no problematic cross loadings (secondary loading $>.3$). Interpretation of the loadings suggests that Factor one is associated with broader emotions towards the school, and perhaps to some extent towards education in general. Whereas factor 2 appears to be associated with feelings of safety and the nature of interpersonal relationships.

These results are somewhat confounding considering previous research which has employed these exact measures (or similar) contained within the LSIC. For example, Biddle (2015) who used similar measures to those employed by the present

study, stated that factor analysis was employed to determine whether it was appropriate to collapse these indicators into a single standardized variable. To rationalise this decision, the author stated that variables had a large loading on the first factor in the analysis, had the expected sign, and that eigenvalues suggested a one-factor solution was appropriate. In a similar manner, although no factor analysis appears to have been conducted, Dunstan et al. (2017) who used 5 similar questions drawn from the LSIC data set, report a satisfactory value for Chronbach's Alpha as the basis on which it was deemed appropriate to collapse indicators into a single standardized variable. Both results, either explicitly through analysis or, implicitly through methodology, suggest a single factor solution.

Although it is beyond the scope of the current study to delve into the reasons underpinning the differences in findings in any depth, there is perhaps a logical explanation which is worth relating. In relation to the findings of Biddle (2015), the analysis appears to have been conducted on an earlier wave of the LSIC. It is not unreasonable to suggest that the dimensionality of Affective Engagement may shift based on age, due to changes in needs and desires, a phenomenon which could be explored under any number of theories¹²⁴. In relation to Dunstan et al. (2017), although the analysis was conducted on a far more recent wave of data (wave 6), the method employed to rationalise the parcelling of items into a single measure does not provide any insights into the underlying structure of the data. Chronbach's Alpha is a measure of statistical reliability – i.e. consistency of results. It is not a measure of validity – i.e. whether a series of items is measuring what it is supposed to.

¹²⁴ E.g: Bronfenbrenner's Ecological Systems Model; Maslow's Hierarchy of Needs, etc.

Table 12:

Factor Loadings after Oblique Rotation of the Component Matrix for Measures of Affective Engagement with Primary Factor Loadings in bold.

Variable	Factor1	Factor2
Is your teacher nice to you *	-0.2387	0.3035
Are the children at school nice to you *	0.0173	0.8272
Do the children at school pick on you	0.0462	0.7647
Do you find school fun*	0.6937	-0.1207
Do you feel happy about going to school *	0.7314	-0.1369
Do you wish you didn't have to go to school	0.7672	0.0433
Do you ask your parents to stay home from school	0.6260	0.2919

Confirmatory Factor Analysis

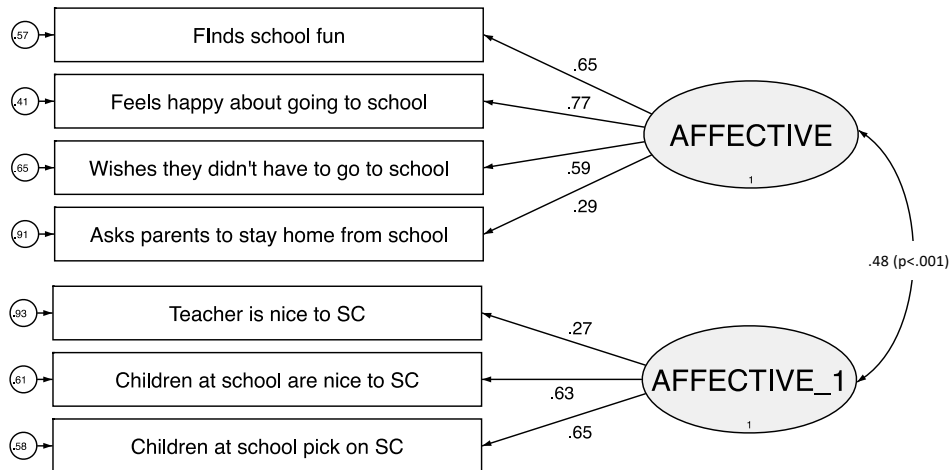


Figure 21: Two Factor CFA Model for Measures of Affective Engagement.

Based on the findings of Exploratory Factor Analysis, a two-factor model (*Fig. 21*) derived from the factor structure identified from the rotated component matrix was hypothesised and tested. The first factor (AFFECTIVE) contained the items: Do you find school fun; Do you feel happy about going to school; Do you wish you didn't have to go to school; and, Do you ask your parents to stay home from school. The second factor (AFFECTIVE_1) contained the items: Is your teacher nice to you; Are the children in the school nice to you; and, Do the children at school pick on you.

Whilst the two factor CFA model demonstrated excellent results in regard to model fit with all values for fit indices exceeding traditional heuristic cut off points (CFI = .94; TLI = .91; RMSEA = .07), tests of reliability and validity were problematic. In regard to these, for AFFECTIVE_1 the value for Chronbach's alpha (.49) was below the heuristic cut-off point as was the value for Composite Construct Reliability (.53) and Average variance extracted (.29). As the removal of indicators to improve reliability and validity would result in model identification issues, both in the current context and within the context of the larger structural model (i.e. the measurement model would be 'unidentified' without the application of constraints), a decision was made to exclude AFFECTIVE_1 from further formal analysis. Conversely, the values for Chronbach's alpha (.66); Composite Construct Reliability (.68) and Average variance extracted (.36) in regard to AFFECTIVE showed promise. Consequently, a decision was made to drop the observed variable with the lowest loading and respecify the model for AFFECTIVE.

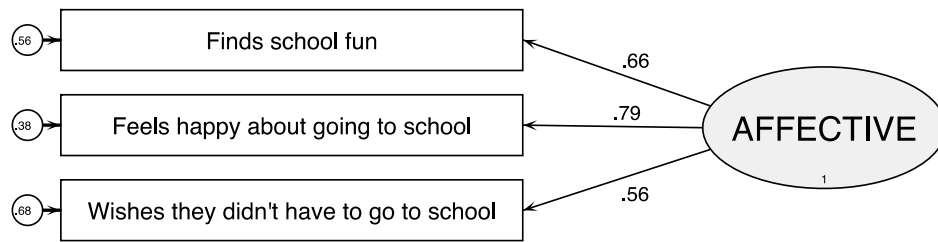


Figure 22: Respecified CFA Model for AFFECTIVE.

The respecified model (*Fig.22*) demonstrated far more acceptable values for all measures of reliability with the values for both Chronbach's Alpha (.70) and Composite Construct Reliability (.71) exceeding the heuristic cut-off points. However, the value for Average Variance Extracted (.46) was still lower than ideal, but taken in context with the measures of reliability, it was possible to incorporate the value into the Full Model with some caution surrounding its interpretation.

Measuring Behavioural Engagement

Behavioural Engagement is generally defined in terms of actions which are often linked to observable indicators. At its core is the concept of participation within the educational environment. For some scholars, this concept is literal (e.g. taking part in extra-curricular activities, contributing to tasks and events outside the classroom, etc). For others, it takes on more abstract forms (e.g. following the rules, adhering to norms, effort, persistence, concentration, attention, etc). For other scholars still, it is envisaged on a continuum (e.g. Appleton et al. (2008)). Regardless, much of the theory and

literature regarding the behavioural component of engagement can be traced back to the initial work of Finn and the ‘participation/identification’ model. Consequently, it is often heavily linked to aspects of Affective Engagement, especially where the lines between identification with the school and the educational process blur at the intersection between, what an individual feels, and how they enact these feelings. Furthermore, it is often theorised to act in a reciprocal manner in this respect. In essence, that engagement influences the dynamics of classroom and school relationships which consequently foster deeper engagement with the classroom and school. As Appleton et al. (2008) suggest, it has a “rich-get-richer” quality.

Similar to Affective Engagement, Behavioural Engagement has been conceptualised in the literature in various manners. As noted at the beginning of this Section, Archambault et al. (2009) saw engagement as the sum of positive behaviours, participation in school related tasks and extracurricular activities. Whilst this is perhaps the most common conceptualisation of the dimension, it is common for the scholarship to explore specific aspects and sub-dimensions of these factors. For example, Fredricks et al. (2011) in reviewing a number of studies identified attention, attendance, time spent on homework, preparation for class, participation in class, concentration, participation in activities, effort, persistence, adherence to rules and the absence or presence of ‘risk-behaviours’ such as skipping school – a list which is by no means extensive in terms of the literature.

Regarding the outcomes of Behavioural Engagement, the findings are mixed. There is a consistent correlation in the literature between students’ achievement and their ability to ignore distractions, persevere on tasks, and act purposefully (Fredricks, 2004). However, the findings for aspects of Behavioural Engagement related participation are

mixed, and appear to relate somewhat to the nature of the activity in which students are participating. In relation to this caveat, Finn and Zimmer (2012) note the differences in results between the limited number of studies which have explored this specific aspect of Behavioural Engagement in depth. They suggest that participation in academically oriented extracurricular activities is significantly related to academic achievement, and non-participation in non-academically oriented extracurricular activities is generally unrelated to academic achievement.

In the specific context of Indigenous education, the behavioural dimension is by far the most commonly explored aspect of student engagement. This is a likely consequence of the obsession with retention and drop-out which has characterised much of the extant literature in the field. Whilst issues surrounding cross-cultural relevance remain, unlike Affective Engagement, there is a relative wealth of literature and scholarship which explores antecedents and outcomes across a variety of levels and social contexts. Furthermore, whilst a considerable portion of the literature in this respect has focussed on demographic characteristics (e.g. remoteness, socioeconomic status, household income, etc) which impact on aspects of engagement, there is a distinct consideration of the more ‘malleable’ factors, especially in relation to classroom and organizational contexts. There is even literature which explores the impact of parental and community attitudes on aspects of Behavioural Engagement. For example, Gray and Partington (2003) have noted the role that positive community perceptions of education and the school can have on attendance, and de Plevitz (2007) has discussed the relationships between negative experiences with education and the ability of parents to provide support and encouragement.

In regard to the ways in which Behavioural Engagement has been operationalised in the quantitative paradigm, by far the most common method has been the deployment of teacher-report or observational instruments. This is largely due to issues surrounding bias and to some extent the difficulties students may experience in reporting on their own behaviour. As Fredricks et al. (2004) suggests, Behavioural Engagement is usually defined in terms of positive conduct, involvement in learning or participation in school related activities. Consequently, the measurement of Behavioural Engagement generally takes one (or a combination) of these forms. For example, the participation/identification model developed by Finn (1989) proposed that Behavioural Engagement should be conceived in terms of participation within the school. However, later work by the same author adopted a broader view which incorporates aspects of positive behaviour¹²⁵. Conversely, the work of Skinner et al. (1990), grounded more within the motivational literature, conceptualises Behavioural Engagement as part of a broader model encompassing participation within the classroom, effort, attention and persistence. As noted previously, further work by the same scholar and colleagues, for example Skinner and Belmont (1993) and Skinner, Kindermann, and Furrer (2009), has employed teacher report instruments which aim to measure such aspects of Behavioural Engagement and disaffection through responses to questions such as, “In my class, this student works as hard as he/she can”; “When I explain new material, this student listens carefully”; and, “In my class, this student does just enough to get by”. Lastly, other scholars, particularly those who have conceived engagement within the broader process of educational disaffection and drop-out, have focussed specifically on positive or negative conduct to assess the dimension. For example, Glanville and Wildhagen (2007)

¹²⁵ E.g. Finn & Pannozzo (2004); Finn & Zimmer (2012), etc.

measure Behavioural Engagement through instruments which ask teachers to report on class-skipping, tardiness, violence and rule-breaking.

With regard to the quantitative operationalisation of Behavioural Engagement in the context of Indigenous learners, whilst there is literature to draw upon, it is important to note that much of the scholarship (especially within the Australian context) has focussed predominantly on attendance and retention. This is not particularly surprising, given the key positions these factors have held in Indigenous education policy since the introduction of ‘Closing the Gaps’ and indeed prior to this¹²⁶.

Operationalising Behavioural Engagement

Behavioural Engagement was conceptualised by the present study in terms of ‘positive behaviours’ encompassing participation, effort, attention and persistence within the classroom. This conceptualisation of Behavioural Engagement is largely in line with both the literature dealing specifically with engagement¹²⁷ and the literature which has taken an approach grounded more in motivational psychology¹²⁸. This decision was made firstly, on the basis that this conceptualisation aligns with the broader literature regarding Behavioural Engagement, the few previous studies in the context of Australian

126 This emphasis has by no means been tacit in policy and political discourse. For example, the 2014 Prime Minister’s report on closing the gap states: “Getting children to school is the Australian Government’s number one priority in Indigenous affairs. Poor attendance means that Indigenous children find it hard to perform at school” (Abbott, 2014, p. 2).

127 E.g. Finn & Pannozzo (2004); Finn & Zimmer (2012); Finn & Frone (2004); Fredricks et al. (2004); Fredricks & McColskey (2012), etc.

128 E.g. Skinner & Belmont (1993); Skinner et al. (2008); Skinner et al. (2009); Skinner et al. (1990).

Indigenous education which have attempted to capture Behavioural Engagement, and the presence of appropriate variables within the data-set.

Consequently, the following variables were chosen from the ‘teacher survey’ component of the LSIC (wave 7). Each item is measured on a 4-point Likert scale ranging from 1 – Never to 4 – Very often. The item set is preceded by the instructions, “Please think about the student’s behaviour during the past month or two. Please indicate how often the student does the behaviour described”.

1. Keeps belongings organised.
2. Shows eagerness to learn new things.
3. Works independently.
4. Easily adapts to changes in routine.
5. Persists in completing tasks.
6. Pays attention well.

Although it is not addressed within the LSIC data documentation, these measures appear to have been adapted from the ‘Approaches to Learning Subscale’ of the ‘Social Skills Rating System’ (SSRS) developed by Gresham and Elliott (1990). This subscale appears in various ‘high-level’ national and international data-sets¹²⁹. It has been assessed for reliability and validity numerous times across various contexts¹³⁰, and it has been employed to measure Behavioural Engagement by seminal scholars in the field¹³¹. Given these circumstances, the following tests and discussion are perhaps more a formality than a necessity. However, academic rigour demands evidence, and it must be

¹²⁹ E.g. Diperna & Volpe (2005); Ogden (2003); Shahim (2001); Stuart, Gresham, & Elliott (1991), etc.

¹³⁰ E.g. The Early Childhood Longitudinal Study (United States); The NICHD Study of Early Child Care and Youth Development (United States); The Longitudinal Study of Australian Children (Australia), etc.

¹³¹ E.g. Finn & Pannozzo (2004).

noted that these measures do not appear to have been formally validated in the statistical sense within the specific context of Indigenous Australian learners.

Descriptive Statistics

In relation to the variables identified as potential measures of Behavioural Engagement within the data-set, both individual and combined mean values fell close to the central point of the scale employed. In a similar manner, both individual and combined values for standard deviation were relatively unproblematic as were those for skewness. However, as can be seen in *Table. 13*, the kurtosis values for all measures fell outside the traditional heuristic cut-off range (2-4). Consequently, robust estimation procedures based on Satorra and Bentler (2001) were employed by both the preceding analysis and subsequent analysis involving these measures.

Table 13:
Descriptive Statistics for Measures of Behavioural Engagement.

Variable	Mean	Std. Dev	Skew	Kurt
Keeps belongings organised	2.95	1.00	-0.34	1.80
Show eagerness to learn new things	3.01	0.93	-0.32	1.81
Works independently	2.71	1.06	-0.07	1.71
Easily adapts to changes in routine	3.03	0.93	-0.39	1.91
Persists in completing tasks	2.76	1.04	-0.16	1.76
Pays attention well	2.83	1.00	-0.19	1.80
Mean	2.88	0.99	-0.25	1.80

Exploratory Factor Analysis

In line with the methodological process for assessing reliability and validity which has been applied to this point by the present study, an exploratory factor analysis was conducted to assess the underlying structure of the variables. Prior to factor extraction, the suitability of the data for Factor Analysis was assessed. Firstly, the Kaiser-Meyer-Olkin measure of sampling adequacy (0.926) exceeded the commonly accepted threshold value of .6. Secondly, Bartlett's test of sphericity was significant ($\chi^2(15) = 1270.075, p < .001$). Combined, these results suggested that the data was suitable for Factor Analysis.

As can be seen in *Table 14*, initial extraction and application of the Kaiser Criterion ($\lambda > 1$) suggests a single solution. The first factor explains 77.36 percent of the total variance, the remaining five factors explaining the remainder.

Table 14:
Initial Factor Extraction for Measures of Behavioural Engagement.

Factor	Eigenvalue	Difference	Variance %	Cumulative %
Factor 1	4.64173	4.25325	0.7736	0.7736
Factor 2	0.38848	0.06903	0.0647	0.8384
Factor 3	0.31945	0.04141	0.0532	0.8916
Factor 4	0.27804	0.07561	0.0463	0.9380
Factor 5	0.20243	0.03256	0.0337	0.9717
Factor 6	0.16987	.	0.0283	1

As can be seen in *Table 15*, Oblique rotation of the component matrix revealed a clear factor structure with all primary loadings exceeding .5, thus providing further evidence that a one factor solution was appropriate – i.e. items loaded onto a single factor, not multiple highly correlated factors. Consequently, the decision was made to continue the methodological process and conduct a Confirmatory Factor Analysis (CFA).

Table 15:
Factor Loadings after Oblique Rotation of the Component Matrix for Measures of Behavioural Engagement.

Variable	Factor 1
Keeps belongings organised	0.8404
Show eagerness to learn new things	0.8574
Works independently	0.8843
Easily adapts to changes in routine	0.8593
Persists in completing tasks	0.9209
Pays attention well	0.9120

Confirmatory Factor Analysis

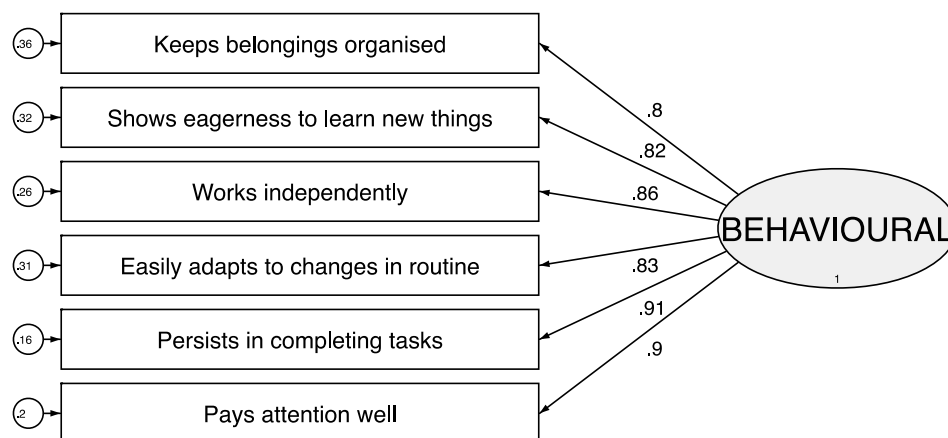


Figure 23: CFA Model for Measures of Behavioural Engagement.

The CFA model for Behavioural Engagement (*Fig.23*) based on the findings of the previous Exploratory Factor Analysis demonstrated excellent results in regard to model fit, with all values for fit indices exceeding traditional heuristic cut off points (CFI = .99; TLI = .99; RMSEA = .05). In a similar manner, traditional measures of construct reliability considerably exceeded acceptable values (Chronbach's α = .94; Composite Construct Reliability = .94). Convergent validity was achieved with the value for Average Variance Extracted (.73) exceeding the traditional heuristic value (.5). Consequently, it was deemed unnecessary at this juncture to refine the model further, and subsequent to tests of discriminant validity, the decision was made to employ the construct as a measure of Behavioural Engagement in the structural model.

Bringing it Together

To this point, the discussion has identified the two dimensions of by which engagement is best conceptualised. It has identified measures within the data set that relate to these, compiled descriptive statistics, operationalised distinct latent variables, and tested these for reliability and convergent validity. In a similar manner to the previous chapter, it is now time to bring these dimensions together in both a statistical and theoretical sense and work towards their incorporation in the full model. The purpose of the following section of the chapter is to do this. It begins by testing for discriminant validity, to ascertain whether the latent variables which have been constructed are statistically distinct from one another, and it seeks to identify any issues with their specification. Within this, both the latent variable operationalised within the present chapter and the previous are employed. It then explores causality, both within and between constructs, and concludes with a brief discussion of model specification.

Discriminant Validity:

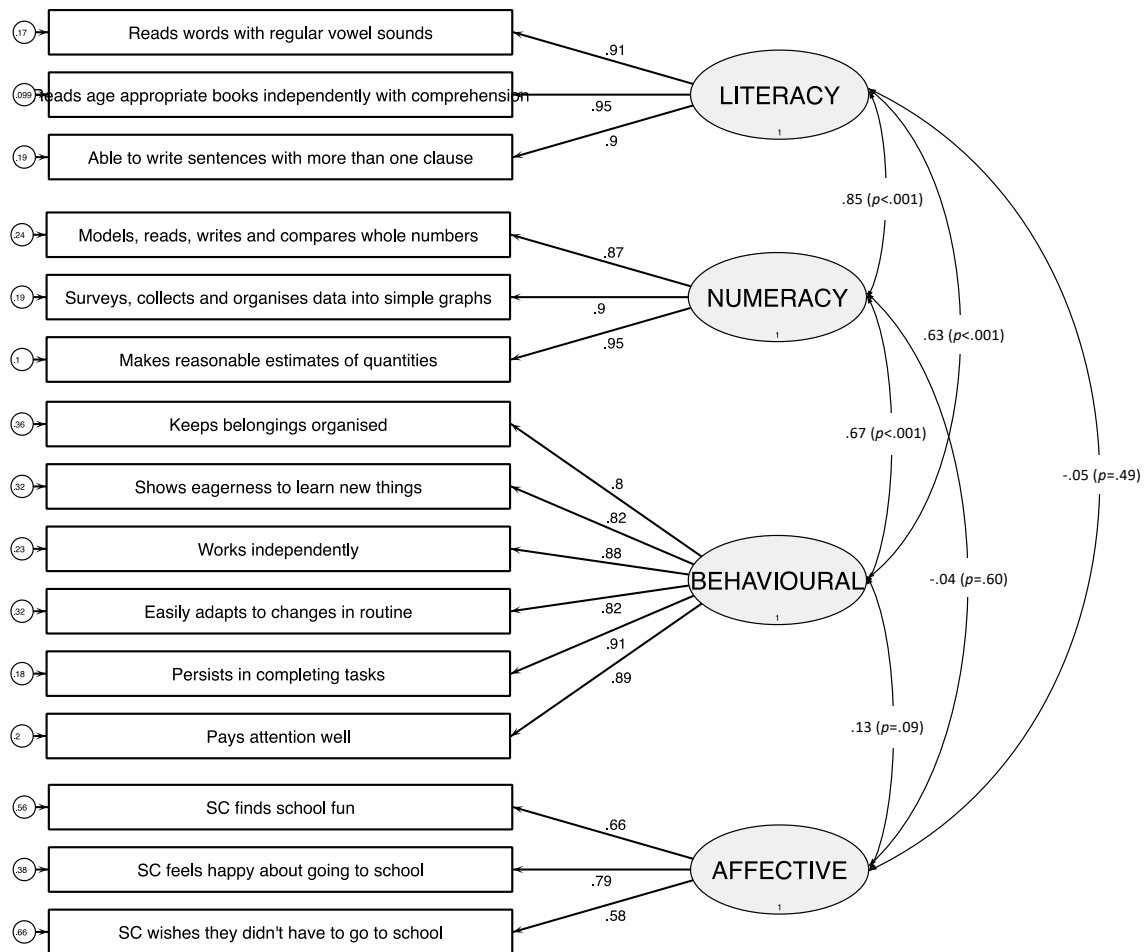


Figure 24: Four Factor CFA (LITERACY, NUMERACY, BEHAVIOURAL & AFFECTIVE).

When applying the method proposed by Fornell and Larcker (1981), the four factor CFA containing the latent variables LITERACY, NUMERACY PRACTICE and PRESENCE (Fig.24) provided strong evidence that discriminant validity had been achieved. The model was a good fit to the data with all fit-indices within or exceeding the cut-off values for 'good' fit (CFI = .96; TLI = .95; RMSEA = .08), and with the AVE

for all latent variables exceeding the relevant squared correlation coefficients (see *Table 16*).

Table 16:
Discriminant Validity between LITERACY, NUMERACY, BEHAVIOURAL and AFFECTIVE

	LITERACY	NUMERACY	BEHAVIOURAL	AFFECTIVE
LITERACY	.85			
NUMERACY	.73	.82		
BEHAVIOURAL	.39	.45	.73	
AFFECTIVE	.01	.01	.01	.47

Note: Diagonal values (in bold) are the AVE values for each latent variable, off diagonal values (regular text) are the squared correlation coefficients between latent variables.

However, from a theoretical perspective, in many ways the statistical distinction between these latent variables was perhaps ‘too-good’. As can be seen in *Fig.24*, the correlation between BEHAVIOURAL and AFFECTIVE was both small and statistically non-significant. This suggests that the relationship between these dimensions of engagement (or at least the latent variables which have been employed to operationalise them) is very weak from a statistical point of view – a conclusion which is considerably at odds with the theory. Subsequently, Lagrange Multiplier tests were conducted to identify any problematic crossloadings which may be impacting this, and identify whether model fit could be further improved.

These tests revealed issues surrounding the third observed variable employed to measure BEHAVIOURAL ('Works independently'), with results suggesting that model fit could be considerably improved by specifying a path from this to both LITERACY (MI = 56.78; $P < MI = .00$; Epc = .35) and NUMERACY (MI = 50.99; $P < MI = .00$; Epc = .35). Such results suggested the presence of a problematic crossloading, and thus the variable was removed and the model re-estimated.

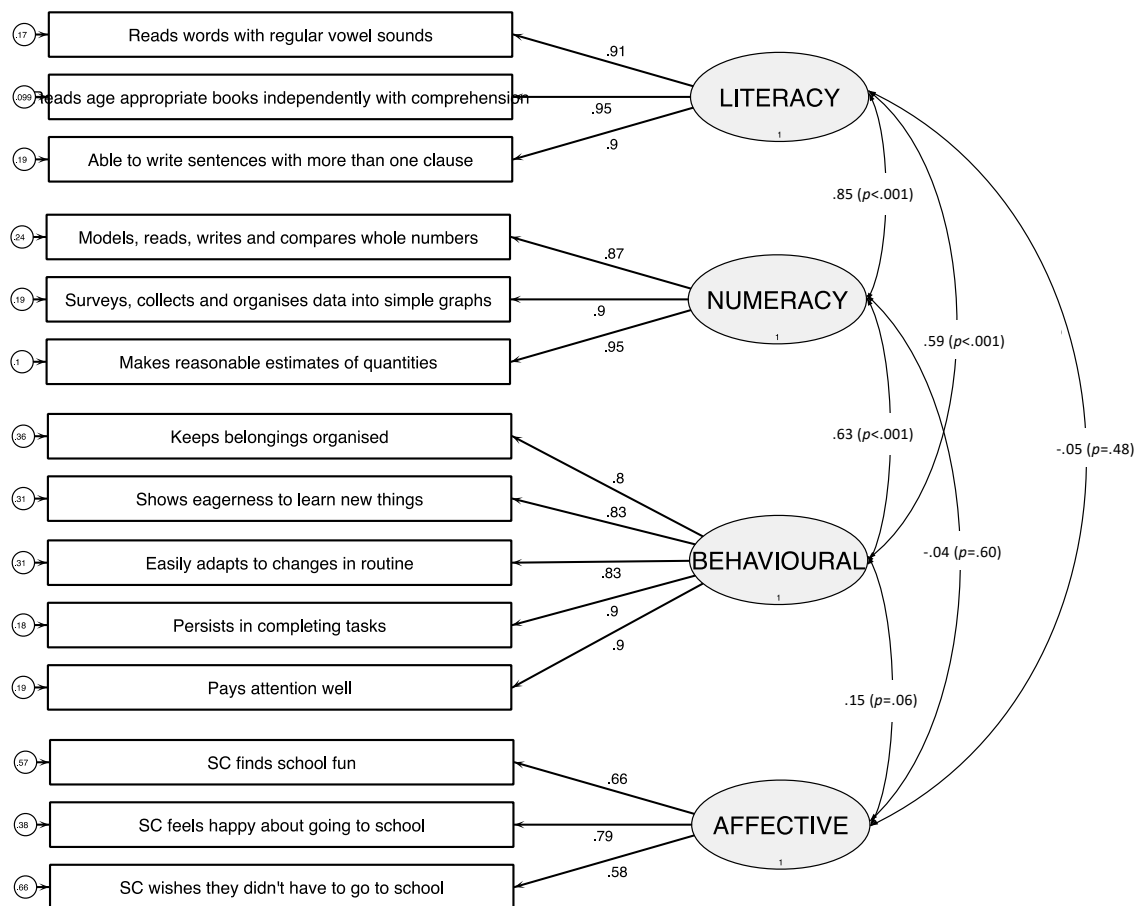


Figure 25: Re-specified Four Factor CFA (LITERACY, NUMERACY, BEHAVIOURAL & AFFECTIVE).

The re-specified CFA (Fig. 25) demonstrated improved results in regard to model fit, with all fit-indices increasing over the initial model (CFI = .98; TLI = .97;

RMSEA = .06). In regard to discriminant validity, as can be seen in *Table 17*, these results were largely unchanged, with all AVE values exceeding their relevant squared correlation coefficients.

Table 17:
Discriminant Validity between LITERACY, NUMERACY, BEHAVIOURAL and AFFECTIVE

	LITERACY	NUMERACY	BEHAVIOURAL	AFFECTIVE
LITERACY	.85			
NUMERACY	.73	.82		
BEHAVIOURAL	.35	.40	.73	
AFFECTIVE	.01	.01	.02	.47

Note: Diagonal values (in bold) are the AVE values for each latent variable, off diagonal values (regular text) are the squared correlation coefficients between latent variables.

Finally, in regard to the correlations between latent variables, a decrease in the coefficients between BEHAVIOURAL, LITERACY and NUMERACY provide further evidence to suggest that the re-specification was appropriate. Perhaps more promisingly, there was an increase in both the magnitude and statistical significance of the correlation between BEHAVIOURAL and AFFECTIVE. However, .056 is not .050 – the threshold for statistical significance was close but not quite achieved.

This posed some issues in regard to whether both BEHAVIOURAL and AFFECTIVE should be employed in the full analysis. Firstly, if a latent variable were to be dropped, a decision would need to be made as to which one to drop. From a

statistical perspective, the obvious choice would be to drop AFFECTIVE, as it had a considerably lower AVE. Although this would certainly be a rational decision, it is very empirical and theoretically flawed. This is because, from a theoretical perspective, AFFECTIVE has far stronger links to the post-colonial/resistance perspective on Indigenous education – i.e. resistance would be likely to manifest first as dissatisfaction with the educational process, and perhaps later (or perhaps not at all) as actions more closely related to the behavioural dimension of engagement. Consequently, although tests of discriminant validity ran counter to theory and prior research, a decision was made to retain both and specify them within the model. For if nothing else, through analysis of the relationships it possessed with other variables in the model, there was potential to gain some insight into why this may have occurred.

Causality (within construct)

From a theoretical perspective, the causality between Affective and Behavioural forms of engagement is relatively clear despite the myriad of issues surrounding definitional and conceptual clarity. As Fredricks et al. (2011) argues, Affective Engagement tends to lead to increases of Behavioural Engagement, both of which mediate subsequent achievement. In essence, happy children are behaved children who tend to do better at school. Interestingly however, much of the theory on which this relationship is hypothesised originates from other domains of the literature. For example, a popular rationalisation of this causality originates from theories of self-determination such as the work of Deci and Ryan (1985), or theories of motivation such as the work of Harter (1978) which suggest that engaged emotions such as enjoyment, interest and enthusiasm tend to fuel engaged behaviours such as effort and persistence.

Perhaps the exception to this quality of the literature lies in some of the earlier work surrounding disaffection and disengagement. For example, scholars such as Finn (1989) and Voelkl (1996) have theorised that boredom, frustration and anxiety surrounding education may undermine participation within the classroom and broader school environment, so perhaps we could therefore assume that the inverse is equally as correct.

In regard to the research literature, the causality of Behavioural and Affective engagement is far less clear with the vast majority of key scholars noting that this is relatively ‘uncharted-terrain’¹³². As a consequence, the scholarship which specifically addresses and explores this relationship is somewhat limited. Regardless, the results of the available research are largely in line with theory. For example, Skinner et al. (2008) found both a relationship between Affective and Behavioural Engagement and evidence surrounding its causality. They noted that, when employing a series of mediation models, both the path from Emotional Engagement to Behavioural Engagement, and the path from Behavioural Engagement to Emotional Engagement were significant, but the magnitude of the path coefficient between Emotional Engagement and Behavioural Engagement was considerably larger. Since this juncture, both similar and somewhat contradictory results have been found. These results were later replicated by Green et al. (2012). They employed a SEM analysis to explore the relationships within a sample of 1886 Australian high school students between perceptions of self, positive attitudes towards school (Affective Engagement), class participation, homework completion and absenteeism (Behavioural Engagement), and performance on standardised tests. Their results demonstrated a strong positive effect between positive attitudes to school and

¹³² For example: Appleton et al. (2008); Appleton et al. (2006); Archambault et al. (2009); Blumenfeld, Kempler, & Krajcik (2006); Fredricks et al. (2004); Fredricks & McColskey (2012); Fredricks et al. (2011); Trowler (2010) amongst others.

class participation, and a medium positive effect between positive attitudes to school and homework completion, and a medium negative effect between positive attitudes to school and absenteeism. Furthermore, there have also been limited attempts to examine the causal order of these relationships in a more formal manner. For example Li, Lerner, & Lerner (2010), in an analysis not unlike that conducted by the present study, drew on data from 960 grade 5 and 6 students to explore the relationships between ecological and personal assets, Affective and Behavioural Engagement and academic outcomes. Their findings suggested that children who felt a sense of belonging to and enjoyment towards school were more likely to attend school, complete homework and come to class prepared. In essence, that Affective Engagement was a precursor to Behavioural Engagement.

Causality (between constructs)

As much of the literature surrounding engagement has focussed on either its impact on retention or educational outcomes, there is a surprising amount of literature which has explored its role both in terms of a precursor to or mediator of academic achievement. However, unfortunately, the vast majority of this has either focussed on Behavioural Engagement in isolation or like the research described previously, has explored the role of Behavioural Engagement as a mediator between Affective Engagement and educational outcomes. This has left the literature body somewhat limited.

With regard to the relationships between Behavioural Engagement and academic outcomes, the literature is both broad and clear in the manner by which it has

hypothesised and tested these. Furthermore, unlike much of the literature regarding the links between the dimensions of engagement, much of it deals with engagement as a construct in its own right, as opposed to operationalising it within the related but qualitatively different concepts arising from the psychological literature. This is perhaps because from a theoretical perspective, the relationship (at its core) is incredibly simple and needs relatively little discussion or explanation. In essence, students who turn up to school and pay attention in class tend to do better in school. From a research perspective, such a hypothesis has stood the test of time. For example, in some of the earlier work on the construct, links between Behavioural Engagement (usually operationalised as participation in the educational process) and educational achievement have been identified by Finn (1989); Finn (1993); Finn and Voelkl (1993); Voelkl (1995); Voelkl (1996); and, Voelkl (1997) amongst others. In later research, this connection has been identified by Willms (2003); Murray et al. (2004); Blumenfeld et al. (2006); and, Appleton et al. (2008). And more recently by Li et al. (2010); Green et al. (2012); van Rooij, Jansen and van de Grift (2017); and, Putwain, Symes, Nicholson, and Becker (2018). In essence, as Fredricks et al. (2011) noted in their review of the literature, there is a consistent association between Behavioural Engagement and academic outcomes across a variety of conceptualisations of the construct and research samples. The consistency of the more recent research suggests that there is little reason to suggest that this relationship has changed since this juncture.

With regard to the relationship between Affective Engagement and educational outcomes, the theory is far less clear with links to various constructs arising from related disciplines. However, in general, it is often argued that Affective Engagement provided the incentive for individuals to both participate and persist in education (Christenson,

Reschly and Wylie, 2012). In essence, it is theorised that affectively engaged students feel included in the school community, see school as a significant part of their own lives, and as a means by which to achieve goals in later life (Appleton et al., 2008). In terms of research, beyond the studies which have conceptualised it as a precursor to Behavioural Engagement, the vast majority of the literature has either ignored it or employed within a broader measure of engagement in general¹³³. However, there are some notable exceptions. For example, in the earlier literature a relationship between educational outcomes and Affective Engagement operationalised as interest in school was identified by Schiefele, Krapp, and Winteler (1992). A relationship between educational outcomes and Affective Engagement operationalised as perception of school warmth was identified by Voelkl (1995). And, a relationship between educational outcomes and Affective Engagement operationalised as a sense of belonging and value was identified by Voelkl (1997). In later work, McNeely and Falci (2004) identified connections between academic achievement and Affective Engagement operationalised as identification with the school. However, there is also evidence to suggest that there are no direct links between Affective Engagement and academic outcomes. For example, in a mixed method study of African American students, Booker (2004) found little to no relationship between identification with the school and academic outcomes, a result which was replicated a few years later by Booker (2007). Finally, there is some evidence to suggest the relationship between Affective Engagement and academic outcomes is reciprocal.

¹³³ This is particularly common practice in larger studies. For example: The National Survey of Student Engagement (Kuh, 2009) and The Australasian Survey of Student Engagement (Coates, 2010).

Specification (the model)

In regard to model specification, the present study decided to follow in the footsteps of both theory and prior research and by in large, treat Behavioural Engagement as a mediator between Affective Engagement and academic outcomes. As a consequence, paths were drawn from AFFECTIVE to BEHAVIOURAL and from BEHAVIOURAL to LITERACY and NUMERACY. However, on the basis of the literature surrounding Affective Engagement, it was also hypothesised that there was potential for this to impact on outcomes in its own right. In essence, it was specified that the relationship between Affective Engagement and academic outcomes was only *partially* mediated by Behavioural Engagement. Consequently, paths were also drawn from AFFECTIVE to LITERACY and from AFFECTIVE to NUMERACY. This is represented visually in *Fig. 26*.

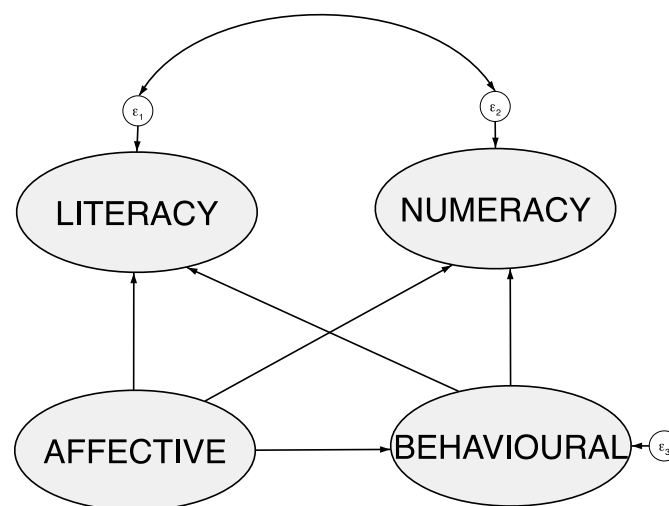


Figure 26: Path Model between Constructs (ENGAGEMENT and OUTCOMES).

Chapter 6:

Culture

Introduction

The principle of Culturally Responsive Education¹³⁴ (CRE) is built on the premise that an educational system grounded in heritage, language and culture is a fundamental prerequisite for the development of healthy students, communities and places (Richards, Brown, & Forde, 2007). It aims to employ the cultural knowledge, prior experiences and performance styles of students as a foundational basis for learning (Gay, 2000). To this end, it is expected that CRE should adopt a pedagogy which aims to build bridges of meaningfulness between home and school experience, use a wide variety of instructional strategies connected to different learning styles, and ground academic abstractions within lived sociocultural realities (Gay, 2000). Furthermore, it should adopt a curriculum grounded in the local and familiar that re-enforces the integrity of the cultural knowledge and backgrounds of students (Bottiani, Larson, Debnam, Bischoff, & Bradshaw, 2018; Castagno & Brayboy, 2008; Pewewardy & Hammer, 2003); present accurate images of both the past and present (Agbo, 2001, 2004); and, engage with the politics of place, space and race (Ladson-Billings, 1995, 2014). Overarching this, it is generally accepted that educators who practice CRE must hold certain values, attitudes and ideologies. For example, scholars such as Cleary and

¹³⁴ For the purpose of simplicity, the term Culturally Responsive Education has been employed throughout this chapter to refer to both Culturalist and Marxist/Post-colonial approaches to the incorporation of Indigenous culture in education. However, where relevant, specific approaches are referred to by their respective terminology.

Peacock (1997) and Ladson-Billings (2014) argue that teachers must see past the deficit discourse which so often surrounds minority learners, and instead maintain expectations of excellence, a premise supported consistently by Indigenous voices both in scholarship and more broadly¹³⁵. Others such as Yazzie (1999) argue that teachers must be warm, informal, caring, give up authority and have and show respect for students.

As should be evident from the above, the provision of CRE is not a simplistic process. Rather, it is multidimensional and consequently requires fundamental shifts across the spectrum of the educational process from what occurs within the classroom to aspects of administration, community, policy and politics¹³⁶. In essence, it is not a single method, nor several methods, but rather an “attitude towards students, a concept of learning, a whole way of life within the classroom and, hopefully throughout the school” (Gilliland, 1995, p. 43). This is a quality which poses implications for research, practice and consequently for the current project in relation to the way in which CRE could, should and realistically can be operationalised, given the limitations posed by drawing on an established data set. Consequently within this chapter, the development of CRE theory since its conception in the latter decades of the 20th Century is briefly explored. Then follows a discussion of the various dimensions of CRE commonly identified within the literature. This has been undertaken both as a measure of scholarly rigour and academic integrity and as a means by which to ensure differentiation between the myriad of definitions offered by the literature, and what exactly the present study has captured. Finally, the operationalisation and measurement of CRE by the present study is discussed, and the hypothesised model for statistical validity and reliability is tested.

¹³⁵ E.g. Rose (2012); Munns, Martin, & Craven (2006, 2008); Perso (2012); Purdie & Buckley (2010); Purdie et al. (2004); Purdie et al. (2000) and others.

¹³⁶ For an in-depth discussion of these factors see (Castagno & Brayboy, 2008).

Theoretical Development

The 1960's and 70's were a period of immense social change across the Western world. As the various civil rights movements were gaining traction, there was genuine hope for a better future, a possibility for those who had suffered at the hands of successive governments, communities and individuals. For example, in the United States of America, the concerted efforts of individual activists and organizations saw the development of the *Civil Rights Act* and several other key pieces of legislation. Whilst in Australia, the *Racial Discrimination Act* entered the nation's legislation in 1975.

Alongside these significant steps towards social justice there were considerable advances in educational policy¹³⁷. For example in the United States of America the *Bilingual Education Act*¹³⁸ was passed in 1968 in relation to the education of Latino immigrants as a means to address the “poor performance in school and great psychological harm caused by English-only policies” (Yarborough, 1967, p. 2)¹³⁹. Similarly, in the Australian context, the first formal policy to recognise the linguistic diversity of the nation's Indigenous population was enacted in 1972 as part of the

¹³⁷ It is important to recognise that in almost all cases, policy preceded both theory and research. For example, in the American context Banks (1974) notes that:

“The concept of multicultural education and the practices which it describes, like the concept of Black Studies, did not emerge from a carefully delineated philosophy which was developed and envisioned by enlightened educational leaders, but rather it is a term which was hastily coined in order to help educators to deal with militant demands, harsh realities, and scarce resources ... institutions had few faculty members with the skills and commitment needed to establish sound Black Studies programs. Consequently, most Black Studies programs have had a turbulent birth and a shaky existence”.

¹³⁸ This was an important step in the direction of social justice in education. However, as Petrzela (2010) notes, its initial zeal was ‘watered-down’. Furthermore, in its final form, the role of cultural difference was recognised, not in terms of its potential value in relation to academic and civic development, but rather in terms of disadvantage, in line with the ‘culture of poverty’ thesis which posited that the home cultures of minority students were bankrupt of any language and cultural practice of value in schools and society e.g. Jensen (1969).

¹³⁹ Whilst the Act was initiated by and initially aimed at Latino immigrants, its influence extended considerably into the domain of Indigenous Education.

broader framework of Indigenous self-determination¹⁴⁰. These developments were accompanied by an ‘explosion’ in the literature concerned with minority education¹⁴¹. It was at this time that some of the first formal theories seeking to move beyond notions of cultural deficit as the driver of poor performance came to prominence under a litany of different titles, guises, purposes and target demographics. At the centre of this scholarship was the premise that curriculum, assessment and instruction were steeped in the ideology and discursive structures of the white middle class, and it consequently placed children who fell outside that demographic at a distinct disadvantage (Howard, 2003).

Some of the earliest writing in this respect appeared in the field of curriculum design, and generally arose from the expansion of Marx’s dialectical class analysis, to include a broader framework of inequalities based on aspects of race, ethnicity and gender (amongst other things). However, scholarship which explored the enaction of curriculum, and took an approach grounded more within the practicalities of the classroom, was not far behind. In this respect, perhaps the most widely recognised theory originated from the scholarship of Geneva Gay and the concept of a ‘culturally

¹⁴⁰ In what is described as a “radical move by Prime Minister Gough Whitlam” (Bianco & Slaughter, 2016, p. 351), this program aimed to employ literacy instruction in local languages as a means to ‘bridge’ into English later down the track. Throughout the early years, children received the majority of instruction in their local or ‘home language’. By year 4 there was a 50/50 allocation of time in the classroom between the home language and English, and from this juncture the fraction was reversed to favour English as the main language of instruction (Devlin, Disbray, & Devlin, 2017). Although the program was initially enacted within a small number of schools situated in the Northern Territory, it quickly expanded. By the early 1980’s approximately half of all Indigenous primary students in the Territory were enrolled in bi-lingual education programs taught in 13 different languages (Mills, 1982).

¹⁴¹ Of particular interest to the present study was the interaction of anthropology, psychology and sociology during this period. As the prevailing deficit discourse was challenged, much was learnt about the various pathways of motivation and engagement and their interaction with culture in the context of education (Pewewardy & Hammer, 2003).

pluralistic curricula'. At the core of Gay's work¹⁴² was the premise that a 'rethinking' of curriculum content in relation to ethnic and racial minorities had the potential to fundamentally reform American Education. But to do so, it was imperative that curriculum moved beyond additive approaches where fragmented and isolated bits of information about ethnic groups are incorporated as an addendum (Gay, 1975). As a remedy to this fragmented nature of the burgeoning discipline, Gay argued for a standardised approach to minority education and curriculum development set in policy and grounded in theory. As an alternative to the other scholarship of the time, she framed her approach not only in terms of the education of ethnic and racial minorities, but also in terms of education about ethnic and racial minorities which moved beyond crude stereotypes and broad generalisations. Perhaps the most important aspect of Gay's work, was the ways in which she translated theory to practice in a manner that educators could easily implement in the classroom. It was largely this aspect of the scholarship which brought the concept of CRE into the mainstream.

In the 1980's and 1990's the literature body surrounding CRE exploded as scholarship from disciplines as diverse as anthropology, psychology, applied linguistics and sociology began to add to the knowledge about the educational challenges faced by minority students and the potential means to ameliorate them (Castagno & Brayboy, 2008). Perhaps the defining factor of this era, was the gradual transition in the literature from a focus on cultural 'sensitivity' to one of cultural 'competence'¹⁴³, in essence a

¹⁴² It is important to note that whilst the earlier work of Geneva Gay in the field of CRE concentrated mainly on the development of curriculum. Her later work is far broader, and generally in line with more modern approaches which consider a far broader range of aspects relating to CRE (e.g. pedagogy, policy, ideology etc.) It is also important to note that some of Geneva Gay's early work also explored the role of teacher disposition e.g. (Gay, 1974). However, this was tied largely to the current process of school desegregation as opposed to CRE.

¹⁴³ For a more in depth discussion of this process see Perso (2012).

transition from awareness of cultural difference to accommodation of cultural difference. In many ways, this was also the point in time when the literature began to diverge into the two theoretical positions at the core of the present study – the Marxist/Post-colonial position which theorised that educational disadvantage was largely a product of socio-cultural forces, and the culturalist position which hypothesised that the disparate outcomes of minority students was best explained through cultural differences in the way which children learnt.

In regard to the culturalist position, as covered to some extent within the earlier chapters of the thesis, perhaps the most recognisable impact of this on pedagogy and practice was the emergence of learning styles theory. In essence, this involves the hypothesis that culture had both a strong and direct influence on the way an individual learnt, and thus at a minimum, education should recognise the impact of culture, but more ideally, education should be delivered through culture. As a result, we saw the emergence of various practical suggestions and ‘pedagogies’ for minority learners across the globe. In the Indigenous context literature such as Browne (1990); Swisher and Pavel (1994); and Pewewardy (2002), applied such theories to the educational of native Americans. Literature such as Pepper and Henry (1986), Sawyer (1991) and Sawyer and Rodriguez (1992) applied them to Indigenous Canadians. And, in the specific context of the present study (Australia), literature such as Harris and Kinslow-Harris (1980) and its subsequent re-specifications such as Harris (1984); Harris, Christie, and McClay (1987); Harris (1990); and, Hughes and Moore (1997) applied them to Aboriginal Australians.

Following this, the concept that Indigenous cultures possessed distinct and knowable learning styles, generally fell out of favour in the academic literature for much of the period between the early 2000’s and the present. This was largely due to a

concerted critique by a number of scholars such as Nichols et al. (1996) and Nicholls, Crowley, and Watt (1998), amongst others. However, this is not to suggest that the concept disappeared neither from pedagogy and practice, nor from the literature entirely. For example, as Vass (2018) notes, it has remained a pervasive force both in the nation's classrooms, teacher training, and textbooks. Furthermore, as noted within the theoretical framework of the present study, there has been a concerted resurgence of both theory, practice, and curriculum under the guise of 8-ways pedagogy.

With regard to the theories of CRE grounded in Marxist and Post-colonial thought, the period saw a far more political discourse of CRE begin to develop. This new direction was largely concerned with aspects of teacher and institutional disposition, and consequently began to explicitly question the underlying philosophies and ideologies of education. Perhaps the most prominent work of this era was developed by Ladson-Billings (1995), who generally argued that education, where culturally diverse students are concerned, must at its core, be critical. It must recognise that knowledge is not static, but rather shared, recycled and constructed and within this, it must recognise the wealth of cultural knowledge and skills that students bring to the classroom, and seek practices which embody political, cultural and ethical dispositions which supersede simply teaching.

Following this, the scholarship began to turn towards a discourse of cultural maintenance with the emergence of work by scholars such as Alim (2007) and Paris (2012), that questioned whether the prevailing theory was adequate, in terms of its orientation towards the languages, literacies and cultural practices of marginalised people. It considered whether in essence, it is enough to be 'responsive' to culture, or whether there was a need to move beyond practices which simply employed the

language and culture of students to teach them as part of the ‘acceptable’ curricular canon. Taking this further, McCarty and Lee (2014) argue for a culturally revitalizing pedagogy, a form of education which ‘reaches’ back to disappearing languages and cultures which must be restored, whilst moving forwards towards a consideration of what it means to work in culturally and linguistically pluralistic spaces, and the role of educational sovereignty and survivance. As Ladson-Billings (2014) points out, this is a particularly salient approach when exploring educational practice concerning Indigenous peoples.

Dimensionality

There is a distinct tendency within the CRE literature to separate different aspects of the educational process into various domains, requiring different approaches across different strata of the educational environment (Castagno & Brayboy, 2008). This is not without reason. For example, it is not unreasonable to assume that the recognition of culture within a classroom may fall anywhere on a spectrum between tokenistic gestures, to fundamental shifts in knowledge production and practice. Furthermore, it is not unreasonable to assume that there will be varying levels of systemic support provided by schools which guide and shape what occurs within individual classrooms.

These discrepancies, if evident, are something the current study aimed to capture. Consequently, the following discussion and analysis separates CRE into two broad interrelated dimensions. Firstly, it begins by exploring the ways in which CRE has been

theorised in relation to the relatively intractable domains of curriculum and pedagogy - in essence, the ways in which CRE is practised within the classroom itself. This is then preceded by the development of a construct to be employed within the larger structural model. Following this, it explores the CRE literature surrounding the importance of community engagement, the presence of Indigenous Elders, Indigenous Educators and Support Staff – in essence the presence of Indigenous people and voices within the educational environment. As with practice, this is preceded by the development of a construct to be employed within the larger structural model.

Measuring Practice

Depending on the scholar, aspects of classroom practice grounded in the principles of CRE have been subdivided into anywhere between two and ten sub-dimensions, each with various intersections and points of contention. Furthermore, there is a tendency for different scholars to place different aspects of CRE within different dimensions. This is largely a product of the holistic nature of the approach. For example, if one adopts a pedagogy that recognises culture, then culture becomes part of the curriculum (albeit perhaps the informal curriculum). Conversely, if one includes culture within the curriculum, then this consequently becomes enmeshed with pedagogy. Therefore, it should be noted that the choice of three sub-dimensions (pedagogy, language and curriculum) which shape the following discussion is entirely arbitrary, and the inherent tensions and crossover between these is unavoidable.

Pedagogy

The overarching argument of the literature addressing pedagogical aspects of CRE is the premise that the educational environment should connect and relate to students' lives outside of the classroom. For example, Morrison, Robbins, and Rose (2008) note that teachers should draw upon the interests of their students in creating classroom activities, create opportunities for students to bring their culture into the classroom, and create assessment topics which fall outside the 'textbook'. Conversely, other scholars have taken an approach which is more explicitly concerned with culturally situated knowledge and knowledge production through assessment. For example, Morrison, Robbins, and Rose (2008) suggest that the strengths and norms associated with a student's cultural knowledge should inform the planning of activities or sequences of activities which allow students to have 'positive first encounters' with subject matter, before moving on to areas of greater challenge – in essence, to work from 'known' to 'unknown'.

Within in the narrower context of Indigenous education the literature largely maintains this argument, but generally with some important additions and caveats. For example, it is common for the literature to advocate for a pedagogy which relinquishes power as a means to connect learning to every-day life in a more holistic and authentic manner. This suggestion is often coupled with the need to develop pedagogical strategies which enable students to "read the world", and act in ways which create social change: Castagno and Brayboy (2008); and Sims (2011). In addition, a significant focus on pedagogies which connect students to place and space as a means to capitalise on synergies between Western and Indigenous knowledge systems is common. See for

example Fogarty (2010); Yunkaporta (2009) and to some extent Martin, Nakata, Nakata, and Day (2017); Nakata (2007); Nakata, Nakata, Keech, and Bolt (2012). However, this work is largely situated in the domain of tertiary education. Others still, such as Castagno and Brayboy (2008); Perso (2012) and Rose (2012) have discussed the need to develop pedagogical practices which create and maintain high expectations for students amongst other strategies.

Language

Although language is a commonly neglected element of CRE within the broader literature, the CRE literature specifically relating to practice where Indigenous students are concerned, commonly has a strong emphasis on the need to incorporate and legitimise Indigenous languages as valid and important aspects of the learning process. In many ways, this aspect of CRE for Indigenous learners has been largely influenced by scholarship operating in the field of educational decolonization that has advocated for a transition from approaches grounded in cultural ‘responsiveness’ to those which promote cultural ‘sustainability’, and in some cases ‘revitalization’. Within this literature, the core theoretical thrust is often concerned with the inextricable link between language and culture¹⁴⁴.

Naturally, there are various views on how such a link should be accommodated and indeed utilised within the classroom. For example, the vast majority of the older

¹⁴⁴ For further discussion of this in the broad context of First Nation’s education see Battiste (1998). In the context of Australian Indigenous education see: Nakata (2007); Rigney & Hattam (2018); Yunkaporta & McGinty (2009).

literature dealing with bilingualism, especially in the Australian context, tends to suggest Indigenous language should be employed as a means to scaffold the development of proficiency in English. This position has been extended by scholars such as Nakata (1995), who argues that there is a need to use the language of the colonizer in order to make themselves understood. Conversely, other scholars have approached the question from a more technical perspective. For example, Perso (2012) suggests the following, which would be equally at home in a discussion of pedagogy and practice for teachers of any student from a background where English is a second language:

- Teach new vocabulary each and every day, by supporting new words with visual drawings and pictures placed around the room and school.
Progress can be shown by developing a graph for the wall, indicating the number of new words and phrases learned each day/week by each student. This also serves to raise self-esteem and confidence.
- Acknowledge the linguistic strength-base of students: ‘Talking up’ the unique ability to speak many languages, showing awe and even envy.
- Include substantial repetition of phrases and words so that students can become familiar with them (in particular, verb phrases like, “I am”, “I’m going to”, “I have.....” where students can insert different new words to change the meaning). This is how foreign languages are taught.
- Use relevant, meaningful and interesting contexts that include the students themselves and/or people they know, whenever possible.
- Learn some of the students’ home language/s so that letter-sound (phonic) knowledge can be scaffolded from students’ home language/s (especially

if they come from an oral tradition). This will also help students to understand that you value their home language/s. Aboriginal English words can also be used for this purpose.

- Use the same big books and DVDs repetitively so that students can learn new words, repeating phrases with confidence, knowing what to expect and ‘read’ body language, illustrations and behaviours that may go with the new language.
- Use repetition in programs and routines so that students know what to expect in the school environment each day and feel safe.

Curriculum

As there is significant crossover between curriculum and pedagogy, it is not surprising that much of the broader CRE literature dealing specifically with curriculum also stresses the need for teachers to draw on ‘funds of knowledge’, understand and work with cultural strengths, and explicitly connect learning to students’ ‘every-day’ lives. This crossover between curriculum and pedagogy also extends into the literature which deals specifically with Indigenous learners. As with pedagogy in this context, a core argument of the literature surrounds the need to legitimize Indigenous knowledge as valid and useful, not only within the classroom, but also within broader society through content as opposed to praxis. Furthermore, there are often distinct crossovers between what is deemed curriculum, and what is seen as language, especially across the core curriculum areas.

Beyond this, it is useful to note that the CRE literature dealing with curriculum is in many ways broader than the literature regarding pedagogy. In particular, there is a tendency to explore different approaches to different disciplines and subject areas, especially where Indigenous learners are concerned. For example, in the case of numeracy, Castagno and Brayboy (2008) note the importance of mapping numerical concepts and procedures to the lives and communities of students. This process can be seen in the work of Lipka, Adams, Wong, Koester, and Francois (2019); Lipka et al. (2015); Rickard (2017); and, Trinick, Meaney, and Fairhall (2015) amongst others. In terms of Culturally Responsive Approaches to literacy, Perso (2012) discusses the need to employ texts that are related to the experiences and worlds of the students daily lives. This point is echoed by Castagno and Brayboy (2008), who recommend incorporating the stories and histories from local communities collected from Elders, as part of a Culturally Responsive Curriculum. Furthermore, there are often strong parallels between what scholars term a Culturally Responsive Curriculum, and a curriculum designed to engage learners for whom English is not a first language.

For curriculum areas such as the sciences, in a similar manner to much of the literature surrounding pedagogy, it is common within the literature to focus on the incorporation of Indigenous knowledge in the classroom, and the points at which this may intersect with Western knowledge. In this respect, scholars such as Marie Battiste, Youngblood Henderson and Graham Hingaroa-Smith provide useful frameworks for the decolonization of knowledge in the broader sense of the process¹⁴⁵. Conversely, scholars such as Martin Nakata and Lester Rigney provide useful discussion on decolonizing specific disciplines, for example the concept of the ‘Cultural Interface’ and

¹⁴⁵ For example: Battiste (1998, 2000, 2002, 2008); Battiste, Bell, & Findlay (2002); Battiste & Henderson (2000); Hingaroa Smith (2000, 2003); Smith (2000).

the historical transformation of Indigenous people from objects of scientific investigation to scientific investigators¹⁴⁶. Whilst other scholars have explored the development and implementation of a Culturally Responsive Science curriculum in more concrete terms. For example, Castagno and Brayboy (2008) note the need to incorporate connections between science and spirituality, to draw on stories and knowledge from local communities, and to evaluate curricular material for accuracy, inclusivity, bias and stereotyping.

While in the social sciences, it is worth noting that there is surprisingly little literature, given the often-contentious nature of the discipline in terms of the ways in which it has historically rendered Indigenous people and voices a casual footnote bound in stereotypes and deficit. Furthermore, the existing literature has a tendency to over-generalise, and consequently provide relatively useless suggestions, such as the need to teach from an ‘Indigenous Perspective’¹⁴⁷. This is perhaps because approaches to the discipline of social sciences, which incorporate or focus on Indigenous knowledge and experience, have historically been segregated into its own distinct discipline of ‘Indigenous Studies’, a point of contention for some scholars¹⁴⁸. Drawing upon this

¹⁴⁶ For example: Nakata (1995, 2006, 2007, 2008, 2011); Nakata et al. (2012); Rigney (1997, 2001); Rigney & Hattam (2018).

¹⁴⁷ It is very rare for this literature to explore in any detail what such a perspective may be. In the few cases where this question is engaged with, the inherent contradiction between defining an ‘Indigenous Perspective’ and retaining a non-homogenistic conceptualisation of Indigenous identities and realities is almost always ignored. Rather, it is often assumed that the perspective of an Indigenous person is by default an ‘Indigenous perspective’, which can be generalised to all Indigenous people within a given area, a given country and more concerningly, globally.

¹⁴⁸ An in-depth exploration of such issues is beyond the scope of the current discussion. However, it is worth noting that there is a concerted effort within a range of contexts to ‘Indigenize’ various educational institutions through the incorporation of content and acknowledgement of Indigenous knowledge. However, there is contention as to whether such an approach ‘goes far enough’. For example Darlaston-Jones et al. (2014) have argued for an approach based in principles of conscientization. Conversely, Nakata (2006) discusses the issues of segregating Indigenous content into distinct disciplines, as such a process inevitably decontextualizes Indigenous knowledges through the imposition of Western ontologies and epistemologies.

literature, it quickly becomes apparent that there are significant links to the core premises of CRE theory expounded by scholars such as Ladson Billings (1995, 2014), in particular the need to develop students' socio-political and critical consciousness through cultural critique. For example, within Castagno and Brayboy (2008), there is a distinct and strong emphasis on the need to develop Culturally Responsive Curricula with an understanding of sovereignty, self-determination and racism, an aspect echoed by other scholars in the area such as the Alaska Native Knowledge Network (1998); Castagno and Brayboy (2008); Gillan, Mellor, and Krakouer (2017b); McCarty and Lee (2014); Milloy (1920); Nakata (2006); Perso (2012); Vass (2018).

Operationalising Practice

As the present study drew upon an already established data set, it did not have the benefit of creating variables which could tap into the specific aspects of various pedagogical, curricular and linguistic suggestions made by the scholarship. As a consequence, it was largely necessary to operationalise Practice in line with the core tenets of the theory. The incorporation of culture/s within the educational process improves outcomes for Indigenous students. With the exception of one variable, this was done in a very literal manner through the following variables contained within Wave 7 of Footprints in Time. These were collected as part of the teacher survey and were measured on a 4-point Likert scale ranging from 1 – Never to 4 – Very often.

1. Do you typically do activities conducted in an Indigenous language?
2. Do you typically do Indigenous singing/storytelling?

3. Do you typically do Indigenous arts or practices?
4. Do you typically do child-initiated activities?

Descriptive Statistics

In relation to the variables identified as potential measures of practice, both individual and combined mean values fell close to the central point of the scale employed. In a similar manner, both individual and combined values for standard deviation were relatively unproblematic as were those for skewness (with the exception of the first measure). However, as can be seen in *Table 18*, kurtosis values for a number of measures fell outside the traditional heuristic cut-off range (2-4) as did the mean value for all items. Consequently, robust estimation procedures based on Satorra and Bentler (2001) were employed by both the proceeding analysis and subsequent analysis involving these measures.

Table 18:
Descriptive Statistics for Measures of Practice.

Variable	Mean	Std. Dev	Skew	Kurt
... activities conducted in an Indigenous language	1.23	0.48	2.08	6.57
... typically do Indigenous singing/storytelling	2.10	0.58	1.38	6.76
... typically do Indigenous arts or practices	2.04	0.60	1.11	6.20
... typically do child-initiated activities	2.42	0.65	0.65	2.83
Mean	1.95	0.58	1.30	5.59

Exploratory Factor Analysis

In line with the methodological process for assessing reliability and validity outlined within the methodology of the present study, an Exploratory Factor Analysis (EFA) was conducted to assess the underlying structure of the variables. Prior to factor extraction, the suitability of the data for Factor Analysis was assessed. Firstly, the Kaiser-Meyer-Olkin measure of sampling adequacy (0.715) exceeded the commonly accepted threshold value of .6. Secondly, Bartlett's test of sphericity was significant ($\chi^2(6) = 245.362, p < .001$). Combined, these results suggested that the data was suitable for Factor Analysis.

As can be seen in *Table 19*, initial extraction and application of the Kaiser Criterion ($\lambda > 1$) suggested a single factor solution. The first factor explained 56.9 percent of the total variance. The other three factors explained the remainder.

Table 19:
Initial Factor Extraction for Measures of Practice.

Factor	Eigenvalue	Difference	Variance %	Cumulative %
Factor 1	2.27608	1.47944	0.5690	0.5690
Factor 2	0.79663	0.21044	0.1992	0.7682
Factor 3	0.58619	0.24509	0.1465	0.9147
Factor 4	0.34110	.	0.0853	1

As can be seen in *Table 20*, Oblique rotation of the component matrix revealed a clear factor structure with all primary loadings exceeding .5, thus providing further evidence that a one factor solution was appropriate – i.e. items loaded onto a single factor, not multiple highly correlated factors. Consequently, the decision was made to continue the methodological process and conduct a Confirmatory Factor Analysis (CFA).

Table 20:

Factor Loadings after Oblique Rotation of the Component Matrix for Measures of Practice.

Variable	Factor 1
Activities conducted in an Indigenous language	0.6749
Typically do Indigenous singing/storytelling	0.8284
Typically do Indigenous arts or practices	0.8620
Typically do child-initiated activities	0.6255

Confirmatory Factor Analysis:

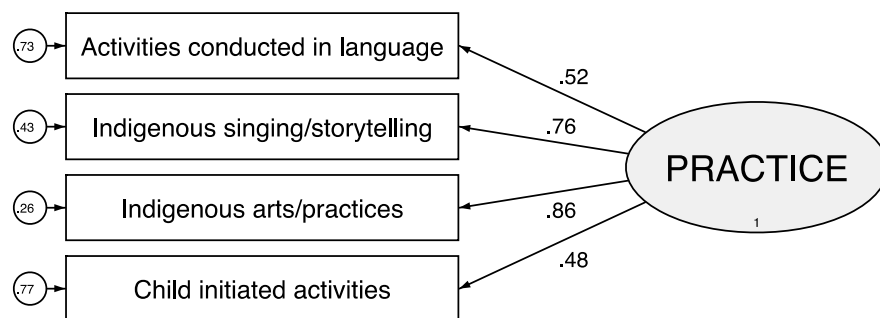


Figure 27: CFA Model for Measures of Practice.

The initial CFA model for the construct (*Fig.27*) demonstrated excellent results in regard to model fit, with all values for all fit indices exceeding traditional heuristic cut off points (CFI = .99; TLI = .98;; RMSEA = .05). In a similar manner, traditional measures of construct reliability either reached or exceeded acceptable values (Chronbach's α = .72; Composite Construct Reliability = .76). However, despite the model demonstrating these qualities, convergent validity was problematic, as the value for Average Variance Extracted (AVE) (.45) fell below the traditional heuristic value (.5). Consequently, the standardized factor loadings for each indicator were analysed in light of the literature. As a consequence, the variable which measured the frequency that child-initiated activities were conducted within the classroom was dropped from the model. This decision was based firstly on the comparatively low factor loading (.42), and secondly on the basis that whilst the use of child-initiated activities as a pedagogical and curricular strategy is related to practice, this relationship is not direct, nor is it a strategy unique to CRE, or a strategy unique to CRE in the context of Indigenous education. Consequently, a refined CFA model based on the three remaining variables was estimated.

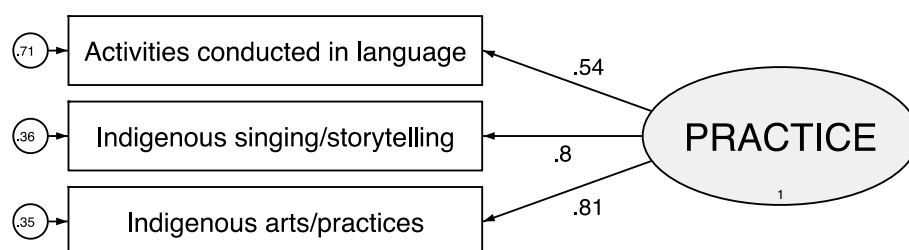


Figure 28: Re-specified or CFA Model for Measures of Practice.

As the refined CFA model (*Fig. 28*) employed only three indicator variables, it was not possible to calculate model fit statistics, as any attempt to do so would simply return perfect values due to the saturated nature of the model ($Df = 0$). Similar to the previous model, traditional measures of construct reliability either reached or exceeded acceptable values (Chronbach's $\alpha = .75$; Composite Construct Reliability = .77). Finally, in relation to convergent validity, the AVE for the refined model (.53) exceeded the traditional heuristic cut off point (.5). Consequently, the refined model for PRACTICE was accepted for incorporation within the structural model pending demonstration of discriminant validity.

Measuring Presence

Within the literature regarding school-based approaches to CRE, where Indigenous students are concerned, there are certainly commonalities. However, the requirement for Indigenous presence and voice in the educational process, and the role that schools and policy makers can play, is an equally important theme. Scholars such as Krakouer (2015) have argued this from a perspective which makes clear the need for Indigenous voice and input into policy and curriculum development. Conversely, others have taken a more pragmatic approach. Of note in this respect are the following guidelines developed by the Alaska Native Knowledge Network (1998), which provide a useful starting point for identifying facilitators of CRE within the school:

- A culturally responsive school fosters the on-going participation of Elders in all aspects of the schooling process.

- A culturally responsive school provides multiple avenues for students to access the learning that is offered, as well as multiple forms of assessment to demonstrate what they have learnt.
- A culturally responsive school provides opportunities for students to learn in and/or about their heritage language.
- A culturally responsive school has a high level of involvement of professional staff who are of the same cultural background as the students with whom they are working.
- A culturally responsive school consists of facilities that are compatible with the community environment in which they are situated.
- A culturally responsive school fosters extensive on-going participation, communication, and interaction between the school and community personnel.

Regardless of approach, it is clear within the literature that a vital component of CRE for Indigenous students is the presence of Indigenous voice within the educational process. Consequently, a key facilitator of CRE for Indigenous students appears to lie in the way in which this enters the policy, practice and discourse of the institution. Within the literature this tends to be largely associated with two interconnected factors, namely: community engagement and the presence of Indigenous people within the institution.

Community engagement

Castagno and Brayboy (2008) argue that, teachers must know the community in which the school resides, interact with the community and support community agendas.

Simultaneously, the community must be invited into the school and given authentic opportunities to connect with teachers. As Castagno and Brayboy (2008) note, this process has a multifaceted effect. Not only does it assist educators to develop curricula which more accurately represents the lived realities of their students, but parental and community engagement with the classroom (and school) can enable parents to help their children negotiate the culture of the school, understand the importance of education, and support them in their educational goals. However, despite several commonalities with the broader literature, a distinct emphasis on educational sovereignty, self-determination and the role that Indigenous people and communities should play in the education of their children generally sets it apart. As Deloria, Deloria Jr, and Wildcat (2001) argue, *“the thing that has always been missing from Indian education ... is Indians”* (p. 152). This is a point which is no less salient in any settler colonial context, and perhaps as a consequence, a point that remains at the forefront of CRE where Indigenous learners are concerned. To this end, the literature argues for an increased level of community involvement above and beyond the broader literature. However, in a similar manner to other aspects of CRE, suggestions of how this may be enacted appear to operate on a continuum ranging from tokenistic gestures, to full-scale institutional restructuring. For example, some scholars simply state that communities should be engaged, or conceptualise community engagement in terms of ‘inviting an elder to share stories’ – an approach often echoed within educational policy. Conversely, others such as Castagno and Brayboy (2008) in their synthesis of the literature, note that members of the community should be given active roles within the educational process. However, this appears to be limited to ‘culture-based’ educational initiatives, programs and school policies. While, at the other end of the spectrum, scholars such as Barnhardt (2014); Battiste (2008) and Gillan et al. (2017a) have advocated for the community to take a

central role within the educational process. This approach has been adopted with varying levels of political struggle and success across various contexts¹⁴⁹.

Indigenous educators and staff

Beyond the need to engage with the local community, the literature often explores the importance of more formalized roles for Indigenous People in education. In this respect, it is common for the literature to take a position grounded in the theory that ‘lived-experience’ may improve an educator’s abilities to engage with and understand Indigenous students. For example, in the context of Indigenous teachers, Santoro, Reid, Crawford, and Simpson (2011) argue, that although due to the sheer diversity of Indigenous cultures, they may not have the same cultural backgrounds of their Indigenous students. Teachers often share experiences of marginalisation which enable them to better understand the struggles their students may face to succeed within white schooling systems. Furthermore, Indigenous teachers may be more knowledgeable in Indigenous epistemologies, and consequently better placed to develop and implement pedagogies which respond to Indigenous students (Santoro et al., 2011).

Another reason cited in the literature for the presence of Indigenous teachers and staff surrounds notions of cultural visibility. Earlier work by Frigo and Adams (2002) demonstrated the benefits of familiar faces and familiar languages within early-childhood educational settings, a factor which has since been explored in a more

¹⁴⁹ For example, Gillan et al. (2017a) when discussing the role of Indigenous voices in education briefly explore practice at the Gunbalanya School in East Arnhem Land where local cultures and knowledge informs everything from the schools planning cycle to data interpretation.

empirical manner by Biddle (2007) who found that the presence of Indigenous educators had a significant influence on attendance. In a similar vein, the qualitative work of Dockett, Mason, and Perry (2006) in conjunction with the ‘Starting School Research Project’, found that the presence of Aboriginal people within the school in various roles such as teachers, teacher aides, general staff, or members of councils and committees was a crucial factor in developing a sense of belonging within the school environment for Aboriginal children. The respondents also stressed the importance of an Aboriginal presence for the development of Aboriginal childrens’ cultures and identities.

The literature also suggests that Indigenous teachers and staff may play a significant role in building bridges and connections, both between the school and community, and between teachers and students as Santoro, Reid, Crawford, and Simpson (2011) suggest, beyond shared experiences. Simultaneously, it has been argued by Santoro (2007); Santoro and Reid (2006) and Santoro et al. (2011), that Indigenous educators can play an important role in the professional development and mentorship of non-Indigenous educators and staff. As Santoro and Reid (2006) note, not only is it often difficult for non-Indigenous educators to understand and engage with the needs of students whose lived experiences differ from their own, but membership of the dominant culture can preclude the recognition of ethnocentric curricula and other schooling practices that privilege the dominant majority – an issue Indigenous educators are uniquely positioned to illuminate.

Finally, one of the most commonly cited manifestations of Indigenous educators surrounds the role of Elders, both as teachers, facilitators of curriculum development and, in some instances, a source of knowledge for teacher development training and professional learning programs. It is likely that such a recommendation stems from the

role of Elders within Indigenous communities as bearers of knowledge, culture and language both in the international context and the Australian context (Battiste, 1998; Hingangaroa Smith, 2000; Perso, 2012).

Operationalising Presence

Indigenous presence was conceptualised by the current study as a combination of community engagement, the employment of Indigenous educators, Indigenous staff and Indigenous education workers. This is largely in line with both current research and theory.

Consequently, the study drew upon the following measures from the ‘school cultural awareness’ section of the ‘parent survey’ conducted as part of LSIC¹⁵⁰. Within this survey parents were asked to respond to the following questions on a 4-point Likert scale where 1 = all of the time and 4 = never. To better align with the directionality of other scales employed by the current study these items were reverse coded:

1. Elders visit or teach.
2. Indigenous education workers.
3. Indigenous teachers or staff.
4. Involvement with the Indigenous community.

Although there are equivalent measures within the ‘teacher survey’, based on the literature, a decision was made to draw on the responses collected as part of the parent

¹⁵⁰ Whilst there are similar measures available within the ‘Teacher Survey’, the nature of the questions gives rise to a number of issues.

interview process. This decision was based on a number of key factors. Firstly, as Ladson-Billings (2014) and Vass (2018) (amongst others) have noted, the original theory and intent of CRE has been largely corrupted. What passes for the incorporation of culture in the educational environment can range anywhere from, simple tokenistic gestures, to a wholesale restructuring of the educational process and the institution itself. The ambiguity of the questions allows considerable scope for such an issue to impact responses. Secondly, there are issues surrounding the potential for culture bias, an impediment to research whereby assumptions and consequently responses are influenced by the cultural lens of the participant. For example, what may represent engagement with the Indigenous community for a non-Indigenous educator may be entirely at odds with what the community itself considers community engagement. Thirdly, there is significant potential for the presence of social desirability bias, a phenomenon where respondents may have a tendency to answer questions in a way that either conforms to social norms, or in a manner that will be accepted or 'liked'. This phenomenon is particularly problematic when dealing with sensitive topics such as Indigenous education which is both politically and racially charged¹⁵¹. Furthermore, as many of the questions employed within the teacher survey are inextricably linked to current curriculum and teacher standards (which educators must be seen to be following and demonstrating), it is not unreasonable to assume that a non-Indigenous educator reporting on the extent to which they comply with government policy, and subsequently respond to the needs of their Indigenous students, may overstate what actually occurs within the school and classroom. Finally, the nature of the coding of the items contained

¹⁵¹ To evidence this, one need do no more than examine a newspaper. However, to substantiate such a claim in a more academic manner, the reader is directed to peer reviewed articles in the field of teacher education such as Aveling (2006, 2010); curriculum studies such as Hickling-Hudson and Ahlquist (2003); Nakata (2011); and explorations of pedagogy and practice such as Vass (2012, 2013, 2015).

within the teacher survey poses issues for analysis. Although there are three potential responses, they are effectively dichotomous if one is attempting to employ the variables as measures of whether or not a particular action is occurring within the educational environment (i.e. ‘working on’ is effectively the same as ‘not-doing’ – the action has not occurred). Consequently, there is no scale by which to delineate the level to which a particular action occurs. Rather, it either occurs or it does not, which, when taken in conjunction with the first point, has the potential to considerably weaken the analysis.

Descriptive Statistics

In relation to the variables identified as potential measures of Indigenous presence, both individual and combined mean values fell close to the central point of the scale employed. In a similar manner, both individual and combined values for standard deviation were relatively unproblematic as were those for skewness. On the other hand, all values for kurtosis fell outside the heuristic cut-off range (2-4) thus robust estimation procedures were employed. These values are displayed in *Table 21*.

Table 21:
Descriptive Statistics for Measures of Presence.

Variable	Mean	Std. Dev	Skew	Kurt
Elders visit/teach	2.65	1.07	-0.20	1.80
Indigenous education workers	3.04	1.12	-0.64	1.72
Indigenous teachers/staff	2.82	1.31	-0.37	1.36
Involved with the Indigenous community	2.74	1.12	-0.23	1.65
Mean	2.81	1.15	-0.36	1.61

Exploratory Factor Analysis

In line with the methodological process for assessing reliability and validity employed by the present study, an exploratory factor analysis was conducted to assess the underlying structure of the variables. Prior to factor extraction, the suitability of the data for Factor Analysis was assessed. Firstly, the Kaiser-Meyer-Olkin measure of sampling adequacy (0.745) exceeded the commonly accepted threshold value of 0.6. Secondly, Bartlett's test of sphericity was significant ($\chi^2(6) = 164.272, p < .001$). Combined, these results suggested that the data was suitable for Factor Analysis.

As can be seen in *Table 22*, initial extraction and application of the Kaiser Criterion ($\lambda > 1$) suggests a single factor solution. The first factor explains 53.27 percent of the total variance. The other three factors explain the remainder.

Table 22:
Initial Factor Extraction for Measures of Presence.

Factor	Eigenvalue	Difference	Variance %	Cumulative %
Factor 1	2.13075	1.42553	0.5327	0.5327
Factor 2	0.70521	0.10308	0.1763	0.7090
Factor 3	0.60213	0.04022	0.1505	0.8595
Factor 4	0.56191	.	0.1405	1

As can be seen in *Table 23*, Oblique rotation of the component matrix revealed a clear factor structure with all primary loadings exceeding .5 thus providing further

evidence that a one factor solution was appropriate – i.e. items loaded onto a single factor, not multiple highly correlated factors. Consequently, the decision was made to continue the methodological process and conduct a Confirmatory Factor Analysis (CFA).

Table 23:

Factor Loadings after Oblique Rotation of the Component Matrix for Measures of Presence.

Variable	Factor 1
Elders visit/teach	0.7635
Indigenous education workers	0.6989
Indigenous teachers / staff	0.7383
Involved with the Indigenous community	0.7171

Confirmatory Factor Analysis

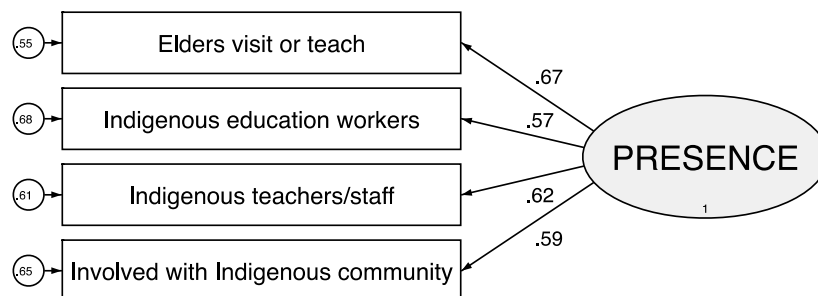


Figure 29: CFA Model for Measures of Presence.

The initial CFA model for Presence (Fig.29) demonstrated excellent results in regard to model fit, with all values for all fit indices exceeding traditional heuristic cut

off points (CFI = .99; TLI = .97; RMSEA = .05). In relation to construct reliability, the value for Composite Construct Reliability (.71) reached the heuristic cut-off point, as did the value for Chronbach's Alpha (.71). In regard to convergent validity, yet again, the value for Average Variance Extracted (.38) was problematic. Consequently, the standardized factor loadings for each indicator were analysed in light of the literature. As a consequence, the variable which measured the frequency that Indigenous education workers were present within the educational environment, was dropped from the model. This decision was taken firstly, because of the comparatively low factor loading and secondly, because the employment of Indigenous education workers is often dictated by policy and guidelines, whereas the employment of Aboriginal teachers, engagement with the community and within this, the presence of Indigenous elders as both teachers and visitors, is not. These factors are entirely at the discretion of the school itself, and consequently, it could be argued that these elements of CRE are more likely to originate from a genuine desire by educators and senior staff to engage in CRE, as opposed to simply being a response to policy directives. Whilst such an argument is relatively unsubstantiated in a direct manner by the literature, the findings of relatively recent research into the role of Indigenous education workers by Andersen, O'Dowd, and Gower (2015) suggest that their role is often hindered by short term contracts which preclude future planning. Furthermore, findings suggested that Indigenous education workers often lacked influence, support and structure which lead to the undervaluation and underutilisation of skills. Consequently, the model was re-specified with the three remaining variables and re-estimated.

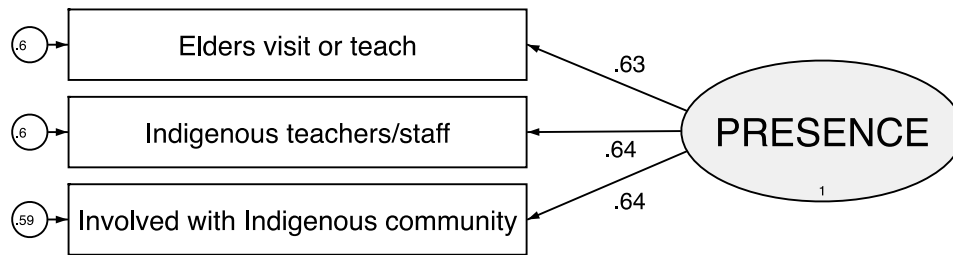


Figure 30: Re-specified CFA Model for Measures of Presence.

As the refined CFA model (*Fig 30*) employed only three indicator variables, it was not possible to calculate model fit statistics, as any attempt to do so would simply return perfect values due to the saturated nature of the model ($Df = 0$). Traditional measures of construct reliability reached the traditional cut-off point (Chronbach's $\alpha = .67$; Composite Construct Reliability = .67), and convergent validity (AVE = .405) was considerably improved, but still failed to achieve the cut-off point (.5). This poses some issues for the analysis, as there are neither more variables within the data set on which to draw that relate to the construct, nor can any variables be removed without further calling into question the validity of the measure. However, there is some support within the statistical literature in terms of accepting lower values for AVE than .5. In essence, it is important to remember that this is a heuristic rule. For example, Fornell and Larcker (1981) suggest that an AVE value that exceeds .4 may be accepted as evidence of convergent validity, as long as the value for composite reliability exceeds .6. This has been further supported more recently by Cheung and Wang (2017), who argue that convergent validity can still be achieved, as long as AVE is not significantly smaller than 0.5, and no loadings are significantly less than .5. As evidenced in *Fig. 30*, the refined model fulfils and, in most cases, considerably exceeds these requirements. This established, it is still important to remember that once AVE crosses the .5 threshold,

there is more error variance than explained variance in the model. However, given the novel nature of the current construct, a decision was made to retain the construct for use in the full structural model. However, the limitations posed by questions surrounding validity and reliability are recognised, and any relationships between this construct and others are interpreted with considerable caution.

Bringing it Together

To this point, the discussion has identified the two dimensions of the way in which culture is best incorporated in the educational process. It has identified measures within the data set that relate to these, compiled descriptive statistics, operationalised distinct latent variables, and tested these for reliability and convergent validity. It is now time to bring these dimensions together in both a statistical and theoretical sense and work towards their specification within the full model. As with the previous chapters, we begin by testing for discriminant validity, to ascertain whether the latent variables which have been constructed are statistically distinct from one another, and of course the other variables within the model. Lagrange Multiplier tests are then conducted to identify any potential issues with specification. We then explore model specification, both within the construct itself, and in relation to the other latent variables in the model. The result of this process is the specification of the Full Structural Model (with the exception of control variables) that was tested by the present study.

Discriminant Validity

The six factor CFA containing the latent variables PRACTICE, PRESENCE, AFFECTIVE, BEHAVIOURAL, LITERACY and NUMERACY (*Fig. 31*) provided strong evidence that discriminant validity had been achieved. The model was a good fit to the data, with all fit-indices within or exceeding the cut-off values for 'good' fit (CFI = .96; TLI = .95; RMSEA = .06). As can be seen in *Table 24*, discriminant validity was also achieved, with all AVE values exceeding the relevant squared correlation coefficients.

Table 24:

Discriminant Validity between LITERACY, NUMERACY, BEHAVIOURAL, AFFECTIVE, PRACTICE and PRESENCE

	LIT.	NUM.	BEHAV.	AFFECT.	PRAC.	PRES.
LIT.	.85					
NUM.	.73	.82				
BEHAV.	.35	.40	.73			
AFFECT.	.01	.01	.02	.47		
PRAC.	.01	.01	.04	.02	.53	
PRES.	.01	.01	.01	.01	.06	.40

Note: Diagonal values (in bold) are the AVE values for each latent variable, off diagonal values (regular text) are the squared correlation coefficients between latent variables.

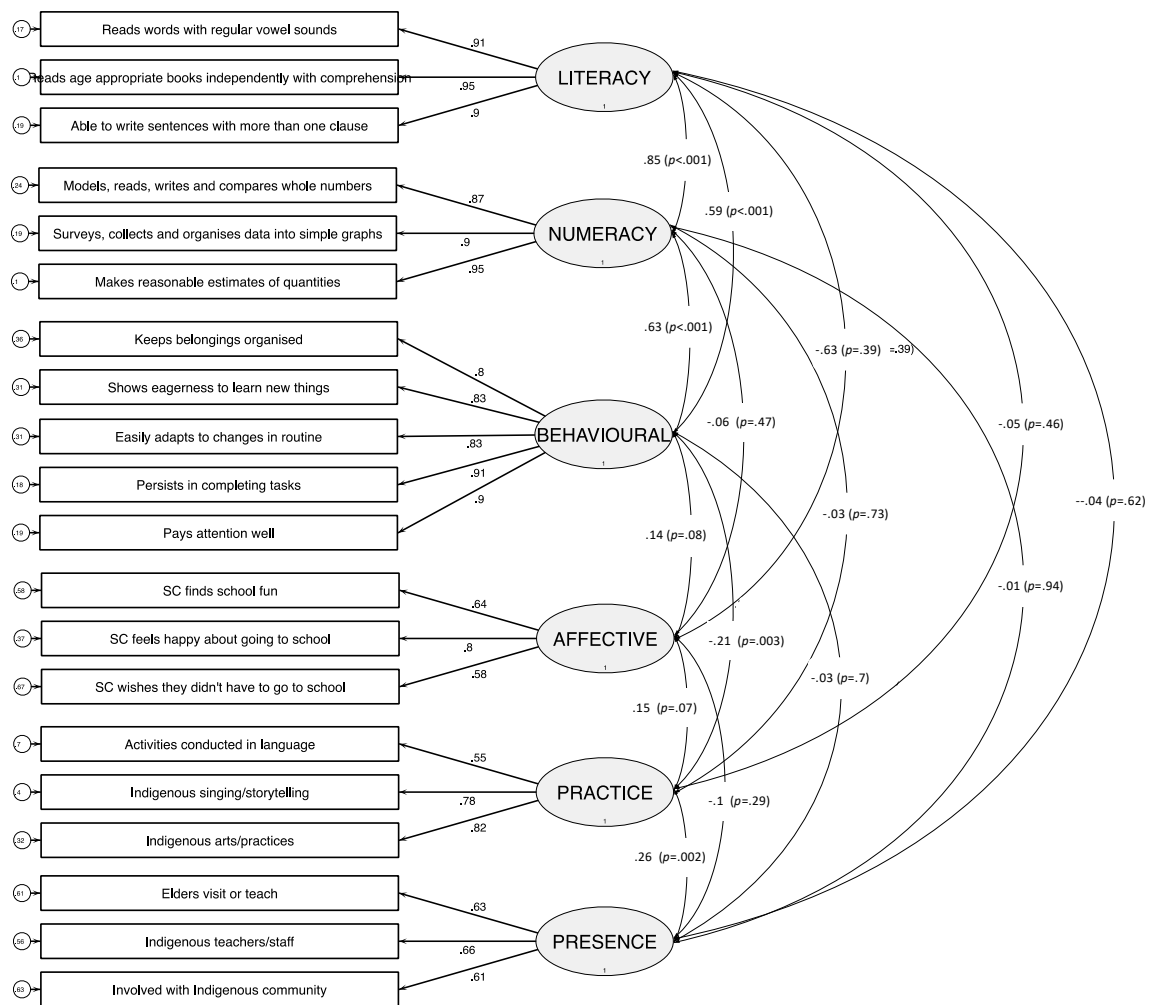


Figure 31: Six Factor CFA (PRACTICE, PRESENCE, AFFECTIVE, BEHAVIOURAL, LITERACY AND NUMERACY).

As a final step in the process, Lagrange Multiplier tests were conducted to identify whether model-fit could be improved, and to identify the potential presence of problematic cross-loadings between latent variables. The results of these tests suggested that model-fit would not be significantly improved by the addition of any paths; in doing so, it also provided evidence that there were no problematic cross-loadings.

Causality (within construct)

Given the nature of the broader literature surrounding CRE, it is perhaps of little surprise that the literature surrounding the relationships between the various dimensions of CRE is both limited, and prone to broad generalisations. Naturally, this posed some issues for the present study in regard to specification, as there was effectively no research literature to guide the process. However, as SEM is largely a theory driven process, this limitation was not overly problematic. There are certainly theoretical arguments that can be employed to aid in the development of a causal hypothesis, many of which have been presented previously. For example, before the thesis formally began, the argument that Indigenous worldviews and knowledges are distinctive, vital to survival, and provide a point from where the non-Indigenous can begin to develop an understanding of experiences, realities, and cultures, was presented. Throughout the Introduction, it was argued that Indigenous children bring both knowledge and cultural identity with them to the classroom, and this knowledge must be built upon in order to provide effective education. Within the theoretical framework, it was argued that shared values, habits and worldviews are passed through successive generations as traditional knowledge and practice, and are the underlying core of culture and identity, and within Indigenous societies, communities and Elders are often in a position to facilitate this process. Finally, within this chapter, the role of Indigenous educators in regard to the knowledge and lived-experience they may bring to the classroom; the role that Indigenous educators may play in the professional development and mentorship of non-Indigenous staff; and, the role that the local community and Elders may play as facilitators of curriculum development, teacher training and professional learning, have been discussed.

As may be evident, there is a common thread which runs through all of the arguments identified above. Indigenous peoples are the keepers of Indigenous knowledges and subsequently, of the knowledge on which CRE must be built. This is certainly not an uncommon argument in the literature where either Indigenous knowledges or CRE are concerned, nor are more explicit statements surrounding this lacking. For example, as identified earlier within the current chapter, literature such as Battiste (1998) and Nakata (2007) has presented strong cases surrounding both the role and control of Indigenous knowledges in education, both of which point towards Indigenous people as the rightful owners of this knowledge, and a key medium through which it can begin to accurately and respectfully enter the classroom. Furthermore, as we have seen, others have been somewhat more explicit in regard to this. For example, Hingangaroa Smith (2003) and Perso (2012) have discussed the role of Elders. Gillan et al. (2017a) and Castagno and Brayboy (2008) have discussed the role of the community. Demmert Jr and J. C. Towner (2003) have discussed the role of parents in the transmission of cultural knowledge from the home to the classroom and beyond. Consequently, in terms of causality within the construct, it is fairly clear from a theoretical perspective. Whilst it is certainly possible that schools looking to begin practice in CRE may seek out Indigenous peoples to aid in this process, and thus at the initial level we may argue that CRE influences the probability of Indigenous presence, it is Indigenous presence that facilitates the transference of Indigenous knowledge into classroom practice. Thus, at least from a theoretical perspective, the argument that the presence of Indigenous people influences practice within the classroom is by far the strongest.

Causality (between constructs)

As noted in the beginning of this Section, much of what needs to be said in regard to causality has already been addressed. This is certainly the case with regard to the broader relationships between PRACTICE and PRESENCE, and the other latent variables employed within the model. This is largely because these broader relationships have been a core focus of the present study, and explicitly tied to the research questions it aimed to address¹⁵², as in many ways this was the core focus of the present study. However, what has not been discussed in as much detail, are the intricacies of the relationships between the various dimensions of these which have been operationalised. For example, whilst a direct relationship between either a PRACTICE or PRESENCE, and the latent variables employed to operationalise educational outcomes would suggest a culturalist orientation, as per the arguments presented within the theoretical framework, the potential relationship between say PRACTICE and LITERACY is both theoretically and practically distinct from the potential relationship between PRESENCE and LITERACY. The former suggests that aspects of pedagogy and curriculum directly influence the educational outcome of Indigenous students. The latter suggests that the educational outcomes of Indigenous students are influenced simply by the presence of Indigenous people in the classroom and school. For these reasons, it makes sense to engage in the following discussion which aims to identify the theoretical, practical, and where possible, research based reasons for the relationships that were specified between PRACTICE and PRESENCE, and the other latent variables contained within the model.

¹⁵² That is: to establish evidence of a pathway of action between what occurs in the classroom in regard to CRE, the effect this may have on student engagement, and subsequently, the potential effect on educational outcomes.

PRACTICE

With regard to the potential relationships between PRACTICE, and the latent variables that were employed to operationalise engagement, there are perhaps two key arguments that arise from the literature. Both are situated within the Marxist/Post-colonial perspectives surrounding the role and impact of CRE for Indigenous students. The first argument has been largely covered within the theoretical frame, and relates to the notion that the disparate outcomes of Indigenous students may potentially be a product of resistance to the school, its curriculum, and the manner in which it is enacted. The second is largely similar but leans more towards a process of alienation from the school, its curriculum and the manner in which it is enacted. In essence, the difference between these two arguments can be conceptualised as whether the response to an education which does not reflect the culture, history and identity of Indigenous students, is active or passive.

As may be evident from the above, each of the arguments proposes a slightly different process of cause and effect between the various dimensions of the constructs. For example, much of the literature regarding resistance identifies various readily observable behavioural manifestations, such as: ‘acting-out’; truancy; a lack of effort; attention and the like, as symptomatic of the phenomenon. As should be evident, there are certainly clear links to Behavioural Engagement here, especially when operationalised in the manner of the present study. Conversely, in regard the mechanism which leans more towards alienation, as the literature identifies, this largely manifests as passive withdrawal, often with no readily observable behaviours, beyond perhaps a discernible decline in effort. In essence, it is seen as largely an emotional process, and thus has clear links to Affective Engagement.

Finally, with regard to the potential relationships between PRACTICE and the latent variables that were employed to operationalize educational outcomes, much has already been discussed throughout the thesis. Indeed, this is the foundational principle of the culturalist perspective on CRE, that the process of learning is culturally situated and thus, the incorporation of culture in the learning process directly affects outcomes. To briefly re-state from previous discussion, this has generally manifested in the context of Indigenous education as various sets of dichotomous and oppositional beliefs surrounding the way in which Indigenous people learn, much of which have originated in the Australian context from literature such as Harris and Kinslow-Harris (1980), Harris (1984), and Keefe (1988). With regard to the research literature surrounding this relationship that has been identified previously, it is scant, conflicting with the vast majority, and concentrates on the attempt to identify differences in the way that Indigenous people learn, as opposed to the impact that attending to this may have upon educational outcomes. Indeed, a concerted search of the literature was able to find no evidence (either qualitative or quantitative), that distinctly supported a direct relationship – a point which has been made by various critiques of the position over the years¹⁵³, and often sheepishly avoided by its proponents¹⁵⁴. Regardless, due to the prevalence of the theory, and of course the centrality of it to the present study, it makes sense at least from a practical perspective, to specify a relationship between these variables.

¹⁵³ For example: Ryan (1992), Nichols et al. (1996) and Nicholls et al. (1998).

¹⁵⁴ There are certainly exceptions to this. For example, in their extensive review of the literature, Hughes and Moore (1997) note that little of the research regarding the links between culture and the process of learning is situated within the classroom context, little has been explored in relation to cognitive and cultural psychology, and there is limited research on the ways in which it affects achievement. It is perhaps important to note however, that whilst this is certainly an important step towards transparency in this domain of the research, this admission constitutes a single paragraph in a 56 page document.

PRESENCE

In relation to presence, the relationships in research literature are far less clear. In essence, the vast majority of the literature begins and ends with the premise that the presence of Indigenous people in the educational environment is beneficial for Indigenous students. The limited literature which does not follow this pattern is generally highly contextualised, and often only relevant to a single location and time - a point which is often overlooked by the various scholars operating in the area¹⁵⁵. However, as noted earlier in the chapter, there are a number of key theoretical themes which help to shed light on these, and allowed the present study to ground the specification of various paths between constructs at least in logic but for the large part, in theory.

In regard to the relationship between PRESENCE and the latent variables which have been employed to operationalise Engagement, beyond the broader links which have been established previously in the theoretical framework (Chapter 2), yet again, there are perhaps two key arguments that can be gleaned from the literature. The first surrounds the potential for the presence of Aboriginal people in the school to aid in the development of positive relationships, and thus contribute to the Behavioural Engagement of Indigenous students. In many ways, this has already been discussed by the present chapter in the respect to the relationships which may be encouraged between the broader community and the school. In essence, this concerns the notion that good-

¹⁵⁵ There are certainly exceptions to this. For example Dockett et al. (2006) when discussing strategies for engaging Indigenous students with education note that, "*In summary, these practices have been successful in at least one context and at one time. There is no guarantee that they will be successful in a different context or even in the same context at a different time.*" (p. 145).

will may flow from the community, to the home to the institution. However, another (and perhaps more salient) way of conceptualising this relationship in the context of the present study, is to do so with the individual actors at each point of this path in mind. In precis, if it can be argued that ‘good-will’ may flow from the community to the home to the institution, then it can be argued equally as easily that the same ‘good-will’ is likely to flow from the community, to the parents, to the students themselves, and thus influence the way in which they interact in the classroom. This argument has been substantiated to some extent by the suggestions of scholars such Perso (2012); Gray and Partington (2003); and, Gribble (2002).

The second of these arguments surrounds the sense of belonging that may arise for Indigenous students, simply by seeing and interacting with Aboriginal people within the school environment. Within the present chapter, the work of Frigo and Adams (2002) which explored the benefits of familiar faces and languages in early childhood, and the work of Dockett et al. (2006) that linked the presence of Aboriginal people to the development of cultural identity and a sense of belonging in the school, have already been discussed. As may be evident, particularly from the latter, although there is a dearth of literature on the subject, there appears to be a relationship between the presence of Aboriginal people and Affective forms of engagement¹⁵⁶ in the Australian context. Interestingly however, findings from further abroad are mixed. For example, in the Canadian context a qualitative study conducted by MacIver (2012) found that, although students consistently identified the importance of cultural and community connections as a factor influencing their engagement with education, only half of the

¹⁵⁶ As noted in the previous chapter of the thesis, a sense of belonging has clear links to Affective Engagement, and has been used to operationalise the phenomenon by a range of scholars since it was first identified in the seminal work of Finn (1989).

participants viewed aspects such as teacher's cultural background as significant. The authors argued that this may be a result of the relatively little contact students would have had with Aboriginal educators, due to a relatively low prevalence within the educational system.

Finally, in regard to the relationship between PRESENCE and the latent variables which have been employed to operationalise educational outcomes, whilst it is common practice to cite the positive influence Aboriginal educators and the like may have on the educational achievement of Indigenous students, evidence of these relationships is unfortunately difficult, if not impossible¹⁵⁷, to identify within the literature, a point which has been noted by Lowe, Harrison, Burgess, and Vass (2019) who state that, "*The research was scant in respect to findings that were able to show a direct effect of school and community engagement on students' learning outcomes.*" (p. 15). Furthermore, it is also important to remember that the latent variable PRESENCE does not distinctly capture the influence of Indigenous educators on the educational process (i.e. on curriculum, pedagogy and practice), but rather the presence of Indigenous people within the educational environment. Indeed, this is something which the present study aimed to explore through the relationships hypothesised between PRESENCE and PRACTICE. As a result, there is no theory available on which to draw and subsequently hypothesise potential relationships – it has simply not been considered at the level of specificity required to make it relevant to the present study. That leaves us with the suggestion that Indigenous children may learn best when taught by Indigenous people. However, whilst this is certainly a compelling argument, it is yet

¹⁵⁷ As with other areas of the scholarship surrounding CRE, a concerted search of the literature was undertaken. Whilst the statement that Indigenous educators, community engagement, and other factors associated with Indigenous presence were vital to the success of Indigenous students was consistently made, support for such a statement grounded in either research or theory was consistently absent.

again important to remember the nature of the variable and what it represents. In a similar manner to the issues surrounding the application of theory to aid in specification, it does not capture whether Indigenous people are involved with teaching Indigenous students, simply that there are Indigenous people involved with the school in some way, shape or form. As a result, of these issues, it makes little sense to attempt to hypothesise relationships between PRESENCE and the latent variable employed to operationalise educational outcomes.

Specification (the model)

With regard to model specification, the present study decided to follow in the footsteps of both theory and prior research (where possible) and specify causal relationships between PRESENCE and PRACTICE; PRESENCE and AFFECTIVE; PRESENCE and BEHAVIOURAL; PRACTICE and AFFECTIVE; PRACTICE and BEHAVIOURAL; PRACTICE and LITERACY; and PRACTICE and NUMERACY. This, combined with the relationships articulated throughout the previous chapters is displayed in *Fig. 32*. It is worth noting that this path diagram is effectively the Full Structural Model (with the exception of control variables) that was employed by the present study.

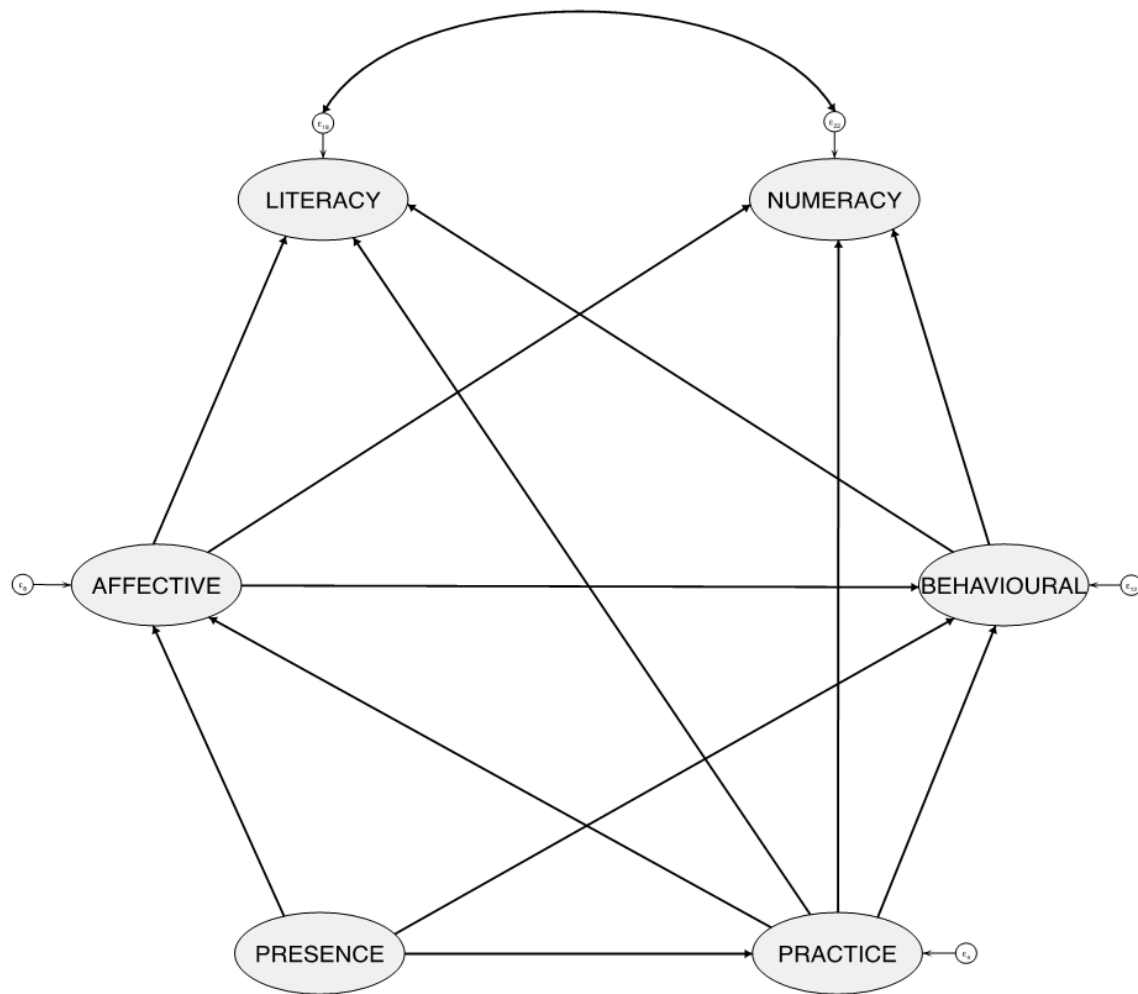


Figure 32: Full Structural Model (with the exception of control variables)

Chapter 7:

Controls

Introduction

The role of control variables, both within SEM and more broadly in quantitative analysis, is to account for factors which may influence the variables (and thus their relationships) within a model. In essence, they are employed as a means to ‘control’ for the influence of factors beyond what is of interest to a given analysis, so we can work towards isolating the influence of what we are actually interested in. As a consequence, the incorporation of control variables into the model can, in some instances, be methodologically complex. For example, in order to reduce the chance of producing biased parameter estimates, and artificially decreasing the various indices which can be employed to assess model-fit, there is a need to ensure that paths are specified between these and any variables within the model they may logically influence (Bollen & Long, 1993). Furthermore, when latent variables are employed within the model, there is a need for the researcher to decide on whether paths should be specified to the observed variables employed to operationalise the latent variable, whether paths should be specified to the latent variables themselves, or a combination of both. As noted by Sriutaisuk and Pornprasertmanit (2017), each option comes with a trade-off between interpretation and accuracy. In essence, control variables in SEM, although we are not necessarily interested in them beyond their potential to better isolate the influence of the

variable that we are considering, must be treated in the same manner as any other variable within the model – with methodological caution and theory in mind.

Due to the nature of the way that control variables must enter SEM analysis, there are two approaches which are perhaps equally as common in the literature, to exclude them from the model, or to include them within the model in a relatively ‘ad-hoc’ manner, with little consideration or justification of the relationships which are being specified¹⁵⁸. Neither of these approaches were an option for the present study for two key reasons. Firstly, to incorporate these variables into the model without a strong theoretical case or in a methodologically solid manner, would be simply un-ethical, as they have the potential to significantly change both the relationships between variables and the overall fit of the model to the data. Quantitative methodologies have already done enough damage to Indigenous peoples. The present study did not wish to further contribute to this by employing methods that have the potential to shape lives in an ad-hoc manner. Secondly, the thesis has spent over one hundred pages justifying the manner in which the variables within the model were operationalised and specified in the model. It would be absurd to drop this level of rigour, and call into question the validity of the analysis, for the sake of some thought and a few more pages to write.

¹⁵⁸ For example, in an extensive review of SEM literature Becker (2005) found that 63% of peer reviewed articles provided no reason for the use of control variables, and 50% of authors failed to explain how control variables were operationalised.

Variables

Although there are certainly factors that may influence both the provision of CRE and the way in which it is delivered, this was not the main focus of the present study. Rather, the present study was interested in the influence of CRE on student engagement and educational outcomes. As a result, these are the relationships where control variables were employed in an attempt to mitigate the potential influence of various social and demographic factors. To this end, whilst it is important to remember that there are potentially an infinite number of such factors (both known and unknown) which may impact on these relationships practically, the availability of data, and the constraints of SEM in relation to the sample size of the present study, meant that these needed to be carefully selected in order to control for the most influence possible through a relatively small number of variables (3). What follows is a detailed description of these variables, the way in which they were measured, and a justification for their incorporation and specification in relation to the latent variables employed to measure student engagement and educational outcomes.

Age

Age (in months) was the first control variable to enter the model. As discussed in Chapter 3 when identifying the impact of delimitation on demographics, it was calculated in months. The reasons for incorporating were grounded in the entirely in the developmental nature of engagement and educational outcomes – this is one of the few

control variables that were employed by the present study where its inclusion could be justified based on theory, prior research and the nature of education itself.

Descriptive Statistics

In relation to the data employed by the present study, the mean age was 83.9 months (or roughly seven and a half years of age), and the standard deviation was 5.3 months, meaning that close to 70% of the participants were aged between roughly 78 and 89 months (or between 6 and a half and 7 and a half years of age). This can be seen in (Fig. 33), and supported by the values for skewness (.25) and kurtosis (2.7), demonstrated a (relatively) normal distribution.

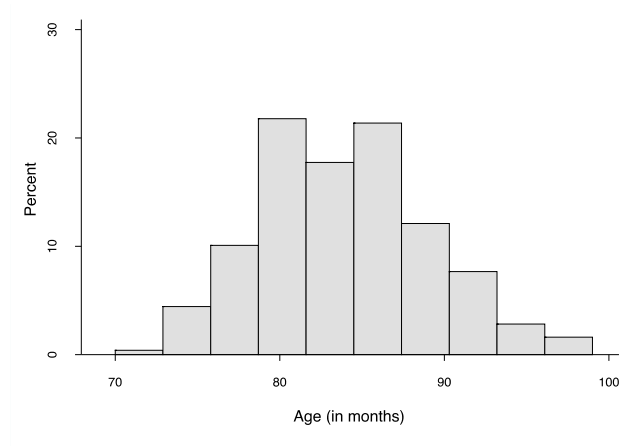


Figure 33: Age by Percentage of Study Population

Impact on Engagement

From a theoretical perspective, the case for age as a factor implicated in student engagement is strong, and can even be found prior to the formal identification of the construct. For example, the ‘frustration/self-esteem’ models explored by literature such

as Bernstein and Rulo (1976) and Bloom (1976) generally posited that without intervention, a decline in engagement (generally discussed in terms of various behavioural manifestations) was likely to occur for many students as they progressed through the educational system, due to the reciprocal relationship between achievement, self-esteem, and effort. Similar arguments can also be found in the seminal literature from which the construct of engagement emerged in its own right. For example, Finn's participation/identification model (Finn, 1989) discussed in the early stages of Chapter 4, specifically contextualises the proposed relationships within a 'developmental cycle'. The relationship is perhaps best described by the proposition that most children arrive at school as willing participants. However, as the individual progresses through the grades and autonomy increases, this relationship with education shifts to a paradigm where success will lead to engagement and failure will lead to frustration. Finally, in the more recent literature, a range of positions regarding the relationship between age and engagement have emerged. For example, some such as Green et al. (2012) have followed on from the initial work of Finn, and conceptualised the process as a product of success and failure. Conversely, other literature such as Skinner et al. (2008) has concentrated on aspects of educational relevance. Finally, literature such as Freire (1968), Ogbu (1991) and Foster (2004) has focussed on the relationships between age and the political and social understandings of students. For many of those who hold this position, it is theorised that as students age, they begin to better understand the social stratification and inequalities present within society which preclude them from success, and they simply 'stop- trying'.

With regard to the research literature, in both Affective and Behavioural forms of engagement, it has been noted that there is a change between differing age groups of

students. For example, Archambault, Janosz, Morizot, and Pagani (2009) in a study of 13,300 students across 69 Canadian schools observed a distinct decline in both Behavioural and Affective forms of engagement, noting that decreases in Affective Engagement began from age 12, and decreases in Behavioural Engagement were consistently evident from age 13. These findings were later supported by Amir, Saleha, Jelas, and Hutkemri (2014), who found evidence that the various forms of engagement declined over the years, noting that this was possibly a function of a shift in interest and perception regarding the relevance of education. They have also been supported by Goñi, Ros, and Fernández-Lasarte (2018), who in a study of 828 secondary school students, found that engagement declined on the basis of age, noting that this was most pronounced in the final two years of education. They argue that this may be in-part due to the ability of students to adjust to the different demands of education as they progress through the grades. Finally, it is perhaps worth noting, that the relationship between age and engagement has also been identified in the broader sense of the construct. For example, the 2011 Gallup Student Poll found that for 45 thousand American students, engagement peaked during elementary school, then decreased markedly through early, middle and high school (Lopez, 2011). In conclusion, the relationship between age and engagement is very clear from both a theoretical and research perspective – it declines with age.

Impact on Educational Outcomes

In relation to the link between age and educational outcomes, this is perhaps the clearest of all, as it can be justified on practical terms, theoretical terms, and the myriad of studies and standardized tests that are conducted every year. In relation to the first of

these, it is an undisputable fact that curriculum is sequenced on the basis of age. We do not find algebraic topology in a grade 1 classroom, nor do we find our pre-tertiary students sitting quietly on the mat sounding out “dog” and “cat” for their final exams. For this very reason alone, there is a clear link between age and educational outcomes. Younger students will not have the same outcomes as older students, as they have simply not been taught the required information for this to occur. However, in the interest of academic rigour, it is important to move beyond the practical in terms of justifying model specification.

From a theoretical perspective, there is no shortage of age-based models of development in relation to educational outcomes. For example, in relation to literacy, it is widely accepted that the ability to both produce and process text is dependent upon the ability of the individual to recognise words. In essence, the development of literacy is dependent on an individual’s vocabulary, and it is generally assumed that these develop at a similar rate. Based on this premise, various scholars such as Frith (1985) and Ehri (1995) have proposed stage-based models, and others have drawn these together into broader frameworks. There are also various theories of cognitive development which support the relationship between age and educational outcomes. For example, it is far from uncommon in the literature for scholars to apply the work of grand theorists such as Piaget and Vygotsky to the context of literacy and numeracy. A particularly salient example of such theorisation in relation to numeracy would be Ojose (2008), who proposes the following links in regard to the various stages of development:

1. Sensorimotor - beginning to link numbers to objects, has some understanding of the concept of counting.

2. Preoperational – are able to employ simple problem-solving methods, are beginning to conceptually understand basic operations such as addition and subtraction.
3. Concrete Operations – are developing the capacity for seriation (changes in magnitude) and classification, are beginning to develop the ability to link concrete and the abstract (i.e. link what occurs in the real world to work with pencil and paper)
4. Formal Operations – are capable of forming hypothesis and deducing consequences, can make inductive and deductive inferences, are able to evaluate various methods for solving a problem, and are able to connect mathematical concepts to ‘real-life’ situations.

From a research perspective, both forms of theory have been widely tested. For example, in relation to relevance of stage-based models of literacy development, work of scholars such as Martinet, Valdois, and Fayol (2004) and the National Reading Panel (2000) provide support for both the relevance of such models, and the sequential co-development of lexical and non-lexical knowledge (e.g. vocabulary and comprehension/composition). Conversely, in relation to numeracy, scholars such as Forster (2009), Lefevre (2000), and Van De Rijt and Van Luit (1999) provide strong evidence suggesting that the acquisition of skill is linked to both the sequence of components and human development.

Strengths and Difficulties Questionnaire (SDQ)

The second control variable to enter the model was a global measure of behavioural, emotional and subsequent learning difficulties derived from the SDQ developed by Goodman (1997). The questionnaire is one of the most widely employed screening instruments to identify the presence and severity of psychosocial issues throughout childhood (Stone et al., 2015). It consists of 25 items across five subscales for emotional symptoms; conduct problems; hyperactivity-inattention issues; peer problems; and, prosocial behaviour. By combining these subscales (with the exception of prosocial behaviour), a ‘total difficulties’ score can be obtained which ranges from 0 – 40, with higher scores indicating a higher prevalence of psychosocial issues (Goodman, 2001). Whilst such a practice is often frowned upon due to the issues which can arise in relation to the accuracy of measurement, due to its popularity, the SDQ is one of the few psychometric instruments where these issues are less pronounced, due to intensive testing for various forms of reliability, validity, and measurement invariance across a range of ages, demographics, ethnicities, and countries¹⁵⁹.

Whilst this may seem an odd control variable to include in a model which already incorporates similar measures under the guise of Behavioural and Affective Engagement, there are solid reasons behind this decision. The present study was not concerned with the effect of CRE on the broader well-being of Indigenous students. It was interested solely in the impact of CRE on engagement with education, and subsequently educational outcomes. Accordingly, in order to accurately estimate this, it was necessary to isolate the broader emotional and behavioural difficulties that students

¹⁵⁹ Due to the sheer abundance of literature, it is of little use to cite individual studies. For example, a targeted search in regard to reliability yields over 17,000 results.

may experience from those which are experienced specifically within the educational environment.

Descriptive Statistics

In relation to the data employed by the present study, the mean age was 83.9 months (or roughly seven and a half years or age), and the standard deviation was 5.3 months. This meant that close to 70% of the participants were aged between roughly 78 and 89 months (or between 6 and a half and 7 and a half years of age). This can be seen in (*Fig. 34*), and supported by the values for skewness (.25) and kurtosis (2.7), demonstrated a (relatively) normal distribution. Although not directly relevant to the present study, it may be of interest for those who have a desire to challenge the deficit discourse which so often surrounds Aboriginal and Torres-Strait Islander children, to note that: firstly, the mean score fell well within what is categorised as ‘normal’¹⁶⁰. Secondly, no child scored over 30. And finally, although there are certainly a larger number of children at the higher end of the scale, the distribution of scores is not considerably different from what should be expected within non-Indigenous populations.¹⁶¹

¹⁶⁰ This suggestion is based on both the original ‘three-band’ and newer ‘four-band’ classification system.

¹⁶¹ See Goodman (2014).

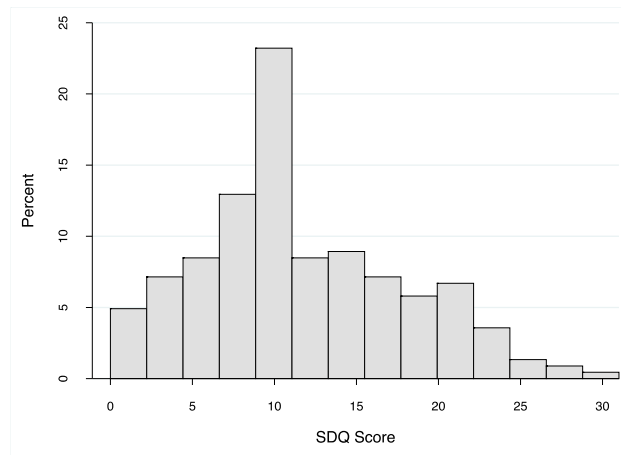


Figure 34: SDQ Score by Percentage of Study Population (note total possible SDQ score = 40)

Impact on Engagement

From a theoretical perspective, it has been noted by various scholars that students with special educational needs such as those identified by the SDQ, are at increased risk of experiencing difficulties which tend to lower engagement. The reasons for such a relationship are both broad and abundant. For example, there has been a tendency both globally and in Australian classrooms to segregate students who experience such difficulties, with obvious consequences for various aspects of Affective Engagement (Demirdag, 2014). However, whilst these practices are slowly (and thankfully) becoming confined to the dustbin of history, this is not to suggest the alternatives are perfect either, as there are also questions surrounding whether the traditional school and classroom environment suitable for the needs of typical students, is adequate for the needs of students who fall outside the behavioural norms. Furthermore, there are questions surrounding whether the range of additional supports which can help students of this nature to overcome some of the practical obstacles related to participation in the classroom, actually help or hinder some of the more emotional and participatory forms

of engagement. For example, regardless of the level of inclusion practiced within the classroom, these children are inevitably distinguished from their peers through formal and informal processes such as identification, assessment, and other special arrangements which often impact on various forms of peer interactions and participation in the more social (and occasionally academic) aspects of the educational process (Cambra & Silvestre, 2003; McCoy & Banks, 2012; Rangvid, 2018). As a consequence, the constant differentiation that comes with various forms of inclusion leave these children acutely aware of their differences, which in turn can lead to diminished friendship qualities, support from peers and various forms of disengagement (Davis & Watson, 2001). In summary, the vast majority of theory and literature highlights the way in which a consistent reinforcement of difference and subsequent rejection from peers (and at times educators) “takes away a sense of belonging at school, hinders access to social experiences, and is devastating for motivation and school performance” (McCoy & Banks, 2012, p. 84).

With regard to the research literature, although it is relatively limited, there are a number of recent studies (many of which may be considered ‘large-scale’) which support this hypothesis. For example, in a longitudinal study of 8,578 primary school children, McCoy and Banks (2012) found that behavioural and learning disabilities had a significant impact on Affective Engagement. They noted that students who fell into this category were twice as likely to indicate a strong and consistent dislike towards school. Similar results have also been found in relation to broader conceptualisations of engagement. For example, in a study of 9,330 students across 200 hundred schools,

Rangvid (2018) noted significant differences in various forms of engagement¹⁶².

Perhaps most pressing of these differences, was the finding that children who experienced behavioural and/or emotional difficulties or psychosocial issues scored between 0.35 and 0.5 standard deviations lower than average across all measures of engagement. These differences remained, even when controlling for a number of other factors known to impact on student engagement.

Impact on Educational Outcomes

From a theoretical perspective, the relationship between behavioural and emotional difficulties and educational outcomes is very clear – there is a significant impact. However, the vast majority of the scholarship in the area points towards a relationship mediated by motivation, self-efficacy, peer interactions and academic pressure amongst other things. Naturally, this poses questions surrounding whether a direct relationship would be appropriate to specify in the model employed by the present study. The answer here is yes and no. It is possible that there are direct effects. However, identification of these effects would involve exploring the neuro-biological literature, which is beyond the scope of the present study. It is also possible that there are no direct effects, and instead, all influence passes through a number of factors similar to those above. Bearing this uncertainty in mind, it would be inappropriate to specify a direct relationship if the main goal of the present study was to estimate this relationship.

¹⁶² The study employed ‘participation in learning activities’ (participates in the classroom, responds to questions, works with peers, etc); ‘participation in social activities’ (participates in extracurricular activities, spends time with peers outside of class, etc); ‘academic acknowledgement’ (peers ask student for help in class, teachers compliment student, etc); and, ‘student-teacher relations’ (student likes their teacher, students feel they are treated fairly, etc). As discussed in Chapter 5 which dealt with the operationalisation of engagement, these concepts are closely linked, or have been employed by various studies exploring aspects of Behavioural and Affective forms of engagement.

However, it is not. As a consequence, the mechanism of action is of far less importance. What is important is that the total influence of such difficulties on educational outcomes is captured. From this perspective, a direct relationship is perhaps the best way in which to specify this particular variable.

In terms of the available research, it must be noted that it suffers from the same issues as the theory. However, it is worth noting the findings of some of the larger-scale studies which have explored the relationship between behavioural and emotional difficulties and academic outcomes. For example, Walker and Berthelsen (2007), in a study of 2315 Australian Kindergarten children, found strong and statistically significant negative correlations between SDQ scores, Literacy (-.44) and Numeracy (-.38). Similar results have been found more recently in a sample of 1173 early primary students, where Mundy et al. (2017) identified that even when controlling from a range of demographic factors, boys who scored outside the 'normal' range on any parameter of the SDQ, were approximately twelve months behind in academic performance on NAPLAN by their third year of formal schooling, and were three times as likely to be rated as having poor English or mathematical skills. Finally, a limited number of studies have explored whether differences exist in the influence that engagement has on the educational outcomes of students who experience psychosocial difficulties. For example, the study by Rangvid (2018), discussed previously in relation to differences in engagement, also explored whether the presence of such difficulties had a moderating effect on the relationships between engagement; reading; numeracy; self-confidence; motivation; and, well-being. Fortunately, from a methodological perspective¹⁶³, the general consensus is that this is not the case.

¹⁶³ Whilst such a relationship can certainly be specified in SEM, it can become very complex very quickly.

Remoteness

The final control variable to enter the model was remoteness operationalised from Level of Relative Isolation (LORI). As has been discussed previously within the methodology when assessing the impact of delimitation of the demographics of the research population, LORI is a means of assessing an individual's remoteness in terms of their home address, in relation to the relative distance to population centres of various sizes. LORI has five categories: None (urban); low; moderate; high; and, extreme, with the last two measures being combined within Footprints in Time due to low numbers. As noted by Department of Social Services (2017), whilst other more common means of assessing remoteness are available (e.g. ARIA+), level of relative isolation is a more appropriate measure for Indigenous people, as it has been designed to take into account Indigenous languages and other culturally specific geographic characteristics.

Descriptive Statistics

In relation to the data employed by the present study, the mean value for LORI was 1.9, and the standard deviation was 0.77. These figures suggest that close to 70% of the participants lived in areas of low or no isolation. With regard to data normality, as can be seen in (*Fig. 35*), the distribution was relatively normal, a conclusion supported by both the value for skewness (0.54) and the value for kurtosis (3.0).

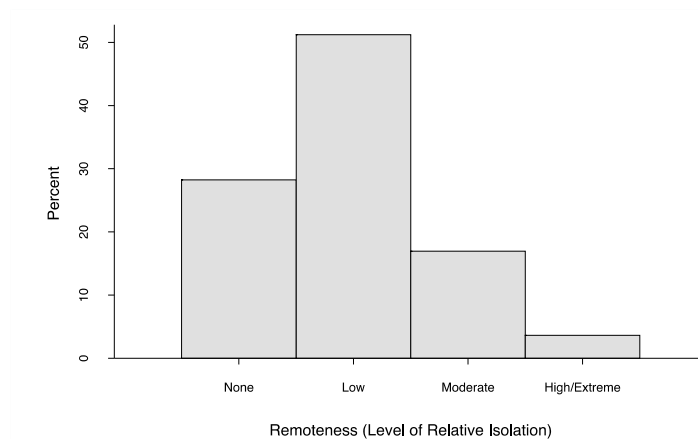


Figure 35: Remoteness by Percentage of Study Population

Impact on Engagement and Educational Outcomes

In regard to its use as a control variable within the present study, remoteness is somewhat unique. Unlike age and SDQ, which relate to specific characteristics of the child, remoteness was incorporated as a ‘proxy’ for a range of differences in individual and community factors based on remoteness, which are known to influence the educational process. In essence, by incorporating remoteness within the model, we are not suggesting that the simple act of living in a particular location influences educational outcomes, but rather that educational outcomes may be influenced by a range of factors unique to specific types of location – many of which are further pronounced within rural and remote Indigenous communities. For example, in relation to education, it has been noted that smaller schools and student cohorts tend to characterise rural and remote education. Whilst this may mean that students are provided with higher levels of individual attention due to inevitably smaller class sizes, it is also likely that the school will have fewer resources, fewer support staff, difficulties in attracting experienced teachers, and fewer opportunities for teachers to engage in professional development, all

of which have been shown to negatively impact on engagement, student outcomes and success (Lamb, Glover, & Walstab, 2014). There is also evidence to suggest that community factors may come into play. For example, it has been noted that communities in rural and remote areas are often characterised by lower levels of educational attainment, and fewer opportunities for employment, an issue which has been linked to various forms of cyclic disadvantage which negatively impact upon various aspects of the educational process¹⁶⁴. Finally, it is worth noting that there may be different conceptualisations of ‘success’, and the role that formal education may play in this as locations become more remote.

As should be evident, this range of factors has the potential to influence both educational outcomes and various forms of student engagement. A detailed treatment of the theoretical underpinnings or research literature regarding these issues is beyond the scope of the present study. However, there is no shortage of literature available for the interested reader to explore. Instead, the present study relies on the wealth of national data which is available in relation to the relationships that exist between remoteness, educational outcomes and student engagement. For example, when looking at the results of Australian standardized testing (NAPLAN), the relationship between geographic location and literacy and numeracy is considerable. As can be seen in both *Fig. 36* and *Fig. 37*, there is a gradual increase in children who have failed to meet the national minimum standard as geographic location shifts from major cities. Perhaps of most concern, is the fact that this figure rises sharply to over a third of all children in very-remote areas.

¹⁶⁴ For example, Cartwright and Allen (2002) found that lower levels of educational attainment in rural and remote areas were linked to lower educational aspirations, and, that low levels of educational attainment impacted on the ability of parents and carers to support the childrens’ educational development.

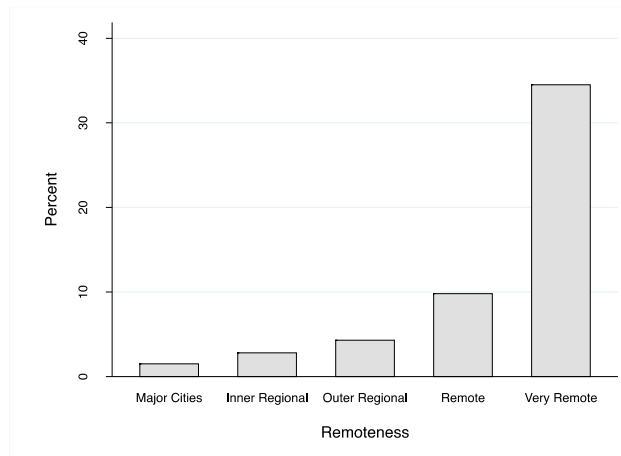


Figure 36: Percentage of Year 3 Children below the National Minimum Standard for Reading by Remoteness (NAPLAN)

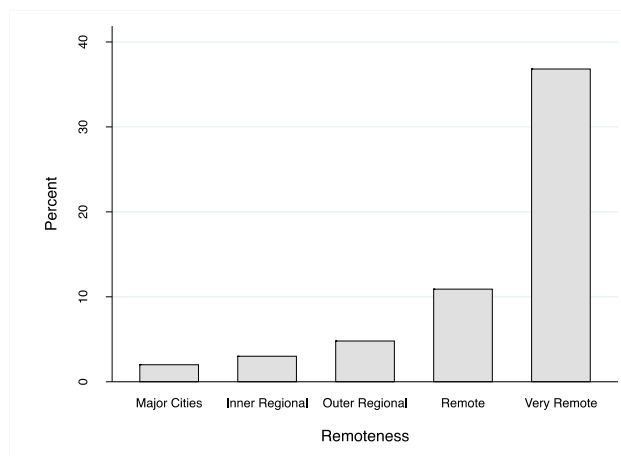


Figure 37: Percentage of Year 3 Children below the National Minimum Standard for Numeracy by Remoteness (NAPLAN)

Although data is somewhat more difficult to obtain, there is also strong evidence that similar trends appear in relation to the various dimensions of engagement. For

example, the most recent round of PISA¹⁶⁵ testing demonstrated a geographically based decrease in agreement towards statements regarding whether students felt a ‘sense of belonging’ (*Fig. 38*), which as discussed in Chapter 5, is a key component of Affective Engagement. Furthermore, there are marked differences in attendance levels based upon geographic location (*Fig.39*), which yet again, has considerable ties to various aspects of Behavioural Engagement.

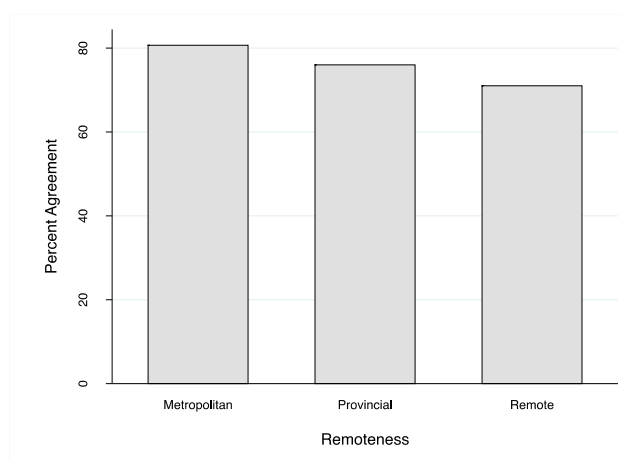


Figure 38: Affective Engagement (operationalised as sense of belonging) by Remoteness (PISA Australia)

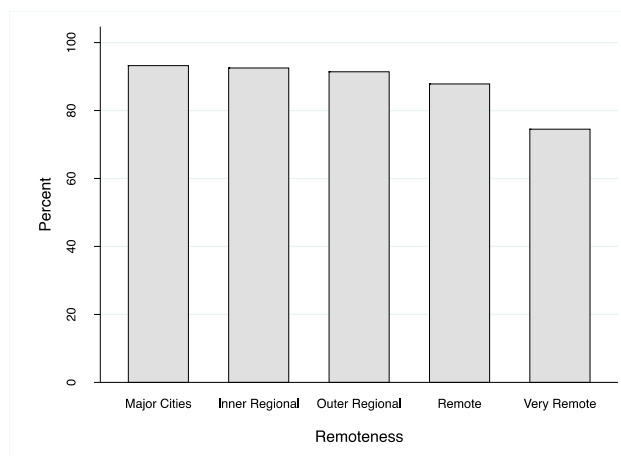


Figure 39: Attendance Rate (percent) by Remoteness (ACARA)

¹⁶⁵ PISA or ‘Programme for International Student Assessment’ is an international standardized testing regime developed by the OECD. More information regarding this can be found at: <https://www.oecd.org/pisa/>

Specification (the Model)

As should be evident at this point, the influence of the control variables is clear. In relation to potential relationships between age and engagement, both theory and the findings of the research suggest that both Affective and Behavioural Engagement tend to decrease with age. As a result, paths were specified from both AGE to AFFECTIVE and AGE to BEHAVIOURAL. In relation to the potential relationships between age and the latent variables that were employed to operationalise educational outcomes, there is a case grounded in theory, research, and the nature of formal education, that skills in literacy and numeracy increase as a student progresses through the years of schooling. Accordingly, paths were specified from AGE to LITERACY and AGE to NUMERACY. With regard to the potential influence of behavioural difficulties on the analysis (operationalised via the SDQ), it has been established that these are likely to influence both engagement and educational outcomes. Whilst the mechanism of action is somewhat unclear, by specifying paths from SDQ to AFFECTIVE, BEHAVIOURAL, LITERACY and NUMERACY, both direct and mediated effects are captured and controlled for. Finally, in relation to remoteness, a case has been presented to argue that a range of factors which may be present in rural and remote communities, have the potential to influence both engagement and educational outcomes. Furthermore, this has been supported by data at a national and global level. As a result, paths were specified from REMOTENESS to AFFECTIVE, BEHAVIOURAL, LITERACY and NUMERACY, thus capturing and controlling for both direct and mediated effects. This is displayed in *Fig. 40*, which represents the Full Structural Model that was tested by the study.

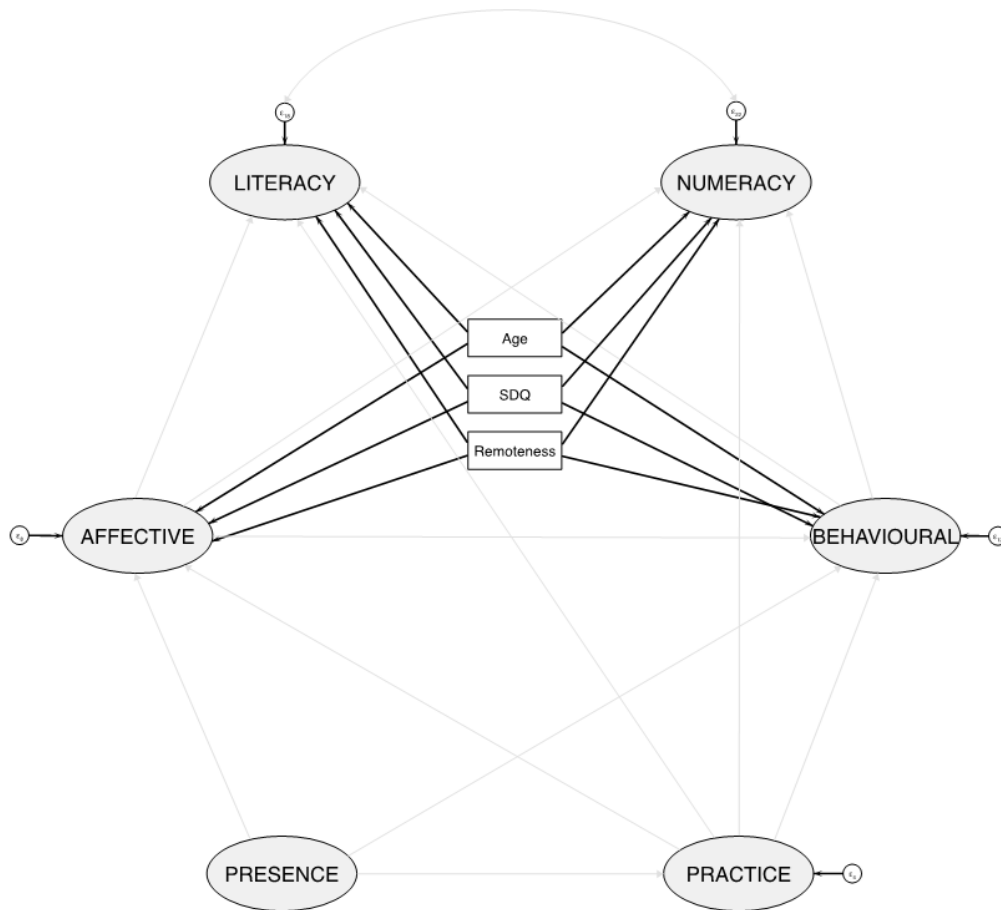


Figure 40: Full Structural Model Demonstrating Paths between Control Variables and Latent Variables (paths between Latent Variables are included by greyed out to aid in interpretation)

Section C

Analysis, Discussion and Conclusion.

Within this section of the thesis the full model is estimated, the results of this process provided and discussed, and their implications for a range of stakeholders in the education of Indigenous Australians identified. It is comprised of two distinct but interconnected chapters. The first of these combines the presentation of results and their discussion. It begins by presenting the results obtained from the estimation of the full model and the values obtained for RMSEA, CFI and TLI (model fit). The focus then turns to the relationships that were identified between the latent variables, their interpretations, and their relevance to the research questions addressed by the thesis. The chapter then concludes with a discussion of the various limitations of the analysis and their impacts on the conclusions which could be drawn.

The second chapter of this section (and the final chapter of the thesis) in many ways picks up where the previous chapter left off. It begins with a brief summary of the thesis and the research which was conducted. Drawing on the limitations identified prior, it then provides a series of recommendations for Researchers, for Teachers engaging with Indigenous students, for Principals, and for Policy Makers. The chapter concludes with a brief discussion of the contribution to the field which has been made by the thesis.

Chapter 8

Results and Discussion

Introduction

The nature of the research questions and the methodological requirements of SEM make for a somewhat unique discussion of the results for the present study. Firstly, as has been covered at multiple points throughout the thesis, the research surrounding the influence of CRE on educational outcomes is limited. The empirical research is even more so, and the empirical research in the context of Indigenous Australians is for all intents and purposes non-existent. As a consequence, there is no literature with which to compare the overall results of the present study to in any meaningful manner, let alone a body of literature. Secondly, as discussed in some detail throughout both the introduction and the methodology of the thesis, SEM is a theoretically driven method where all relationships tested must be justified prior to estimation – a process which was engaged in extensively throughout the preceding section of the thesis. As a result, there is very little left to say that has not already been said in terms of why the relationships may exist, beyond those which were unexpected. As a consequence, whilst the results of the model and the limitations of these are certainly discussed in light of the literature, the main focus of the present chapter lays in the interpretation of these results, in particular the practical significance of the results to students, educators and policy makers. To achieve this, the chapter is divided into four sections: a presentation and discussion of the results in relation to model fit; a

presentation and discussion of the results in relation to each research question; and, a discussion of the limitations of the present study and their implications.

Results

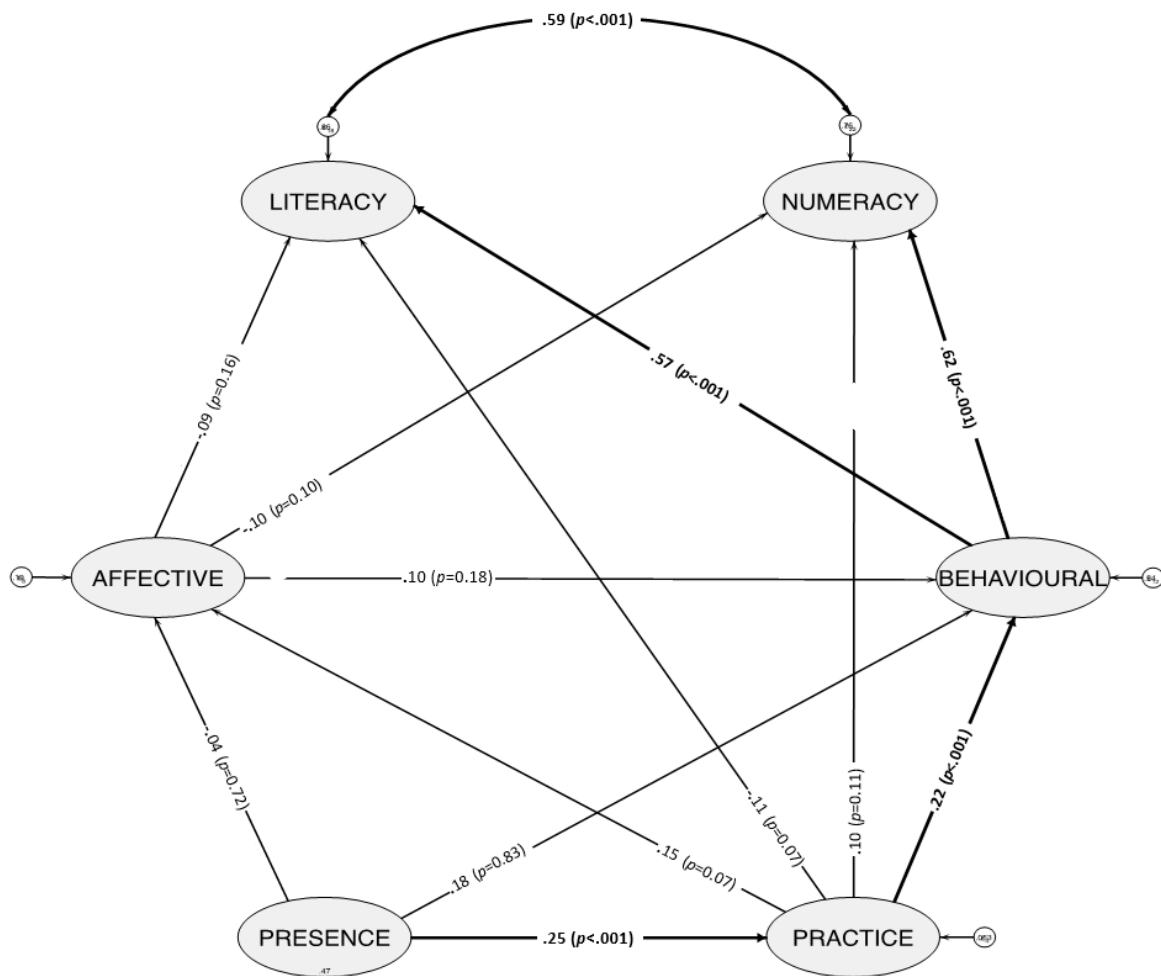


Figure 41: Path Diagram of the Full Model with Parameter Estimates and Significance Values¹⁶⁶, Significant Paths are displayed in bold.

¹⁶⁶ Note: Neither the control variables, nor the observed variables employed to operationalise the latent variables, are displayed in the path model. This is common practice in SEM (especially where more complex models are concerned), as it allows the results to be more easily displayed and interpreted. A full table of model results is provided in Appendix F, which includes these.

The model (*Fig. 41*) was an excellent fit to the data, with all of the indices employed to assess this considerably exceeding the ‘cut-off’ values for acceptable fit. In regard to the measure of ‘absolute-fit’, the value for RMSEA was .057, which suggested the model was a ‘good’ to ‘excellent’ fit to the data. As noted within Chapter 3, the 90% confidence interval and pclose value were also calculated in order to obtain more information surrounding this. In regard to these, the lower bound was .047, the upper bound was .066, and the pclose value was .119. This suggested that, although the value for RMSEA approached the cut off value for ‘excellent fit’, it was more appropriate to claim that it demonstrated the model was a ‘good’ fit to the data. In regard to the comparative fit indices employed by the present study, the value for both CFI (.95) and TLI (.94) suggested that the model was an ‘excellent’ fit to the data. As a consequence, it seemed acceptable to claim that overall, the model was an ‘excellent’ fit – in essence, that the relationships that were specified aligned very well with what was observed in the data, or perhaps to be more colloquial, they ‘made sense’ from a statistical perspective. In regard to model identification, the model was run with both suggested starting values and user specified starting values. In both instances, the model converged and a log-likelihood value of -7176.54 was ascertained which suggested that the model was identified. Finally, it is worth noting that the model was also estimated with ‘bootstrapped’ standard errors, as this was a necessity for the calculation of the statistical significance of the indirect effects between the various latent variables¹⁶⁷. The path diagram relevant to this model can be found in Appendix G. However, at this point it is worth noting within the present chapter, that there were no changes in model fit, and

¹⁶⁷ This is covered in the subsequent section of the present chapter.

changes in either parameter estimates or statistical significance were minimal and of no practical concern.

In terms of the research questions that were posed by the present study, both practically and statistically significant paths (in bold) were present between PRACTICE and PRESENCE; PRESENCE and BEHAVIOURAL; BEHAVIOURAL and LITERACY; and, BEHAVIOURAL and NUMERACY. Based on such results, it would be appropriate to argue that in the context of the present study: (a) CRE influences educational outcomes, and (b) this process is mediated by behavioural but not affective engagement. Furthermore, the lack of statistical significance in the direct paths specified between PRACTICE, LITERACY and NUMERACY suggests that not only is the relationship between CRE and educational outcomes mediated by engagement, but it is fully mediated by engagement. In essence, the influence of CRE on educational outcomes runs entirely through engagement. There is however, considerably more which could be uncovered from the relationships identified within the model beyond the answers to the broad research questions posed by the present study. Furthermore, there is a level of nuance surrounding the interpretation of the results in relation to the research questions that must be discussed. To achieve this, the following discussion looks specifically at each research question, the relevant results and their interpretations (both statistical and theoretical), and finally, the limitations of the study which must be considered in relation to these. It is worth remembering however, that due to the nature of SEM and the research questions it was employed to address, this separation is somewhat artificial as the arguments presented to address one question could be equally as easily employed to address the other (at least to some extent). The difference here lies in the detail that the various results and interpretations of these can provide.

Question 1 – Culture and Outcomes

As has been discussed at various points throughout the thesis, whilst policy and discourse in Indigenous education points towards CRE as means by which the educational outcomes for Indigenous students may be improved, the empirical evidence of such a relationship is minimal in the broader context and non-existent in the Australian context. As a result, the first research question that the present study chose to explore was a relatively simple one, but of considerable importance to the field:

Does the incorporation of culture within the learning process influence educational outcomes for Indigenous students?

The study divided CRE into two separate but related dimensions, with their specification within the model based upon different hypotheses surrounding their potential mechanism of influence on educational outcomes. As a consequence, it makes sense to approach the discussion of the results in relation to each of these from different theoretical and to some extent statistical positions. Accordingly, the following discussion is divided into two distinct but related sections: an interpretation and discussion of the results in regard to the relationships emanating from PRACTICE, and, an interpretation and discussion of the results in regard to the relationships emanating from PRESENCE.

PRACTICE

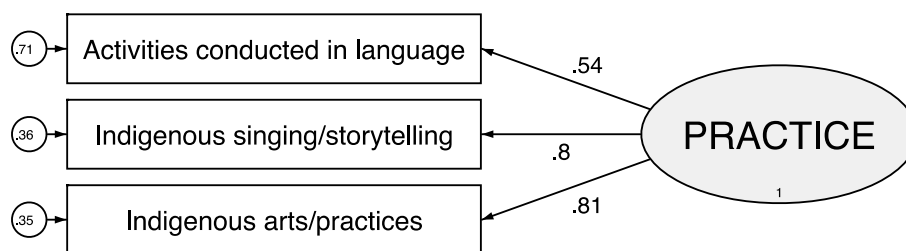


Figure 42: CFA Model for PRACTICE

The latent variable PRACTICE was employed by the present study as a means to measure the extent to which culture was incorporated within the educational environment. As can be seen in *Fig. 42*, it was operationalised with three observed variables relating largely to the extent to which Indigenous knowledges and practices were part of the day to day learning in the classroom – in essence the core tenet of CRE, regardless of the theoretical orientation one chooses to employ. Consequently, as noted previously, the pathway of statistically significant relationships identified between PRACTICE, BEHAVIOURAL, LITERACY, and NUMERACY could be employed as a means to address the research question. From these alone it would not be unreasonable to conclude that the incorporation of Indigenous knowledges and practices positively influence the educational outcomes for Indigenous students. However, such a conclusion would not be particularly useful for policy makers, educators, or their students. Whilst viewing these relationships within the path diagram alongside the exemplarily fit indices that the model achieved provides some evidence for this relationship, these are of little use without interpreting the magnitude of the effect. To this end, there are a number of ways in which such a quality can be explored that lie in

the nature of the relationship we are aiming to assess. In this particular instance, it makes sense to begin this process by exploring the indirect effect of PRACTICE on the latent variables which were employed to measure educational outcomes – in essence, the influence that PRACTICE exerts on LITERACY and NUMERACY through its influence on BEHAVIOURAL.

To obtain the value of an indirect effect, it is common practice¹⁶⁸ to calculate the product of the standardized path coefficients that lie between the latent variables (Bollen & Long, 1993). Employing this method in the context of the current model, the standardized path coefficient between PRACTICE and BEHAVIOURAL was .22, the standardized path coefficient between BEHAVIOURAL and NUMERACY was .62, and the standardized path coefficient between BEHAVIOURAL and LITERACY was .57. Therefore, the standardized indirect effect of PRACTICE on NUMERACY was .14 and the standardized indirect effect of PRACTICE on LITERACY was .13. Both demonstrated statistical significance ($P < .05$) when applying both parametric and non-parametric approaches¹⁶⁹. As discussed in Chapter 3, these coefficients are interpreted in standard deviations. Thus it would be appropriate to suggest that an increase in the value of PRACTICE by one standard deviation equates to an increase of .14 standard deviations in the value of NUMERACY, and .13 standard deviations in the value of LITERACY. As the commonly employed heuristics originally proposed by Cohen

¹⁶⁸ This is the most common approach. However, it is worth noting there are other methods.

¹⁶⁹ Both the Delta Method and Bootstrapping Method (50 replications) for calculating the of indirect effects were employed. The Delta method provided a p value of .012 for the indirect effect of PRACTICE on LITERACY, and the same for the indirect effect of PRACTICE on NUMERACY. The Bootstrapping method provided a p value of .045 for the indirect effect of PRACTICE on LITERACY and a p value of .049 for the indirect effect of PRACTICE on NUMERACY. These methods for calculating statistical significance were not discussed in the methodology, as its aim was to provide an approachable introduction into the world of SEM. For the interested reader, the Delta method (or Sobel test) is a means of estimating an approximate standard error or p value. The method is articulated in (Sobel, 1982). Bootstrapping on the other hand is a non-parametric method which involves numerous resampling iterations from which the indirect effect, the standard error or p value can be computed. The method is articulated in Bollen and Stine (1990).

(1988), surrounding the interpretation of standardised path coefficients, would suggest, these would be considered ‘small effects’. However, there is a little more to this that needs to be discussed.

Firstly, it is relatively rare in SEM to identify what may be heuristically considered ‘strong’ or even ‘medium’ indirect effects, due to the way in which these are calculated. To this end, it has been noted in the scholarship on numerous occasions that the common ‘cut-off’ points should be modified in such situations. For example, Kenny, Korchmaros, and Bolger (2003) have suggested that, given that the value of indirect effects are calculated by multiplying the path coefficients between the variables of interest, it would be more appropriate to raise the original heuristics proposed by Cohen (1988)¹⁷⁰ to the power of the number of paths included within the calculation. Drawing on such a premise, it would be appropriate to square the original heuristics, and subsequently claim that PRACTICE has a ‘medium’ to ‘strong’ effect on LITERACY and NUMERACY.

Secondly, given the centrality of this relationship to theory, future research and indeed the research questions of the present study, it appears to be of some importance to consider what these results may mean in ‘real’ terms. This is because, whilst a result can be statistically significant and display considerable magnitude, it is of little use unless it is relevant and important in the context of the relationships in question. For example, if we were to explore the correlation between the time displayed on two watches, we would expect a perfect correlation (or very close thereto). Conversely, in instances where small deviations mean large departures from the norm, a tiny correlation may

¹⁷⁰ That is, a standardized path coefficient of below .3 could be considered a small effect, below .5 a medium effect and above .5 a large effect.

change the world. Assessing this quality is particularly important in the context of the present study, as without practical significance, CRE is unlikely to be adopted willingly by educators, as the time spent in training and implementation would outweigh the potential benefits – a sad but true reality given the ever increasing demands which are being placed on the nations’ teachers. As a result, we need to explore what Kirk (1996) defined as practical – a quality which cannot be achieved through subjective words such as ‘weak’ or ‘strong’, nor one that can truly be identified on the basis of the shifts in standard deviations alone, as what constitutes one standard deviation in one latent variable is not the same as what constitutes one standard deviation in another. Instead, an attempt must be made to determine what the indirect effects identified between PRACTICE, LITERACY, and NUMERACY actually mean for those on the ground namely, Indigenous students and their teachers. As the model employed numerous observed variables measured on differing scales to operationalise numerous latent variables, this is a complex process. It is far less robust than the previous calculation of the indirect effects, and there are certain caveats surrounding the way it must be interpreted, as there is a need to extrapolate from the standard-deviations of the latent variables.

Obtaining the standard deviation of a latent variable can be achieved by calculating the square root of their variances¹⁷¹. These were displayed within the ‘small’ circles connected to each latent variable in the model and are also displayed below in *Table 25*.

¹⁷¹ It is important to note that these values for standard deviation are not the same as those calculated throughout the previous section of the thesis. This is because latent variables are not simply a sum of observed variables.

Table 25:
Variance and Standard Deviations for Latent Variables

Latent Variable	Variance	Std. Dev
Presence	.468	.684
Practice	.061	.247
Behavioural	.544	.738
Literacy	.896	.947
Numeracy	.790	.889

From this juncture, it is possible to employ the standardised indirect effects between PRACTICE, LITERACY and NUMERACY as a multiplier (*i.e. standardised indirect effect x standard deviation*) to argue/estimate that an increase of .247 from the mean value for PRACTICE equates to an increase of .114 from the mean value for LITERACY, and an increase of .116 for NUMERACY. Or, to convert this into somewhat more ‘friendly’ numbers, an increase of 1 from the mean value for PRACTICE equates to an increase of .462 from the mean value of LITERACY, and .470 for NUMERACY. It is important to note however that, due to the nature of latent variables (*i.e. the measurement of unobserved phenomena*), such figures cannot be directly interpreted in relation to the observed variables themselves¹⁷², although they can certainly be employed as a ‘rough’ estimate of the relationship in ‘real terms’.

Thirdly, it is important to contextualise these results in theory and prior research.

In particular, the nature of engagement as a construct and within this, the reciprocal

¹⁷² To restate this another way: it is important to note that this does ***not*** mean that an increase by 1 in the variables employed to operationalise PRACTICE equates to an increase of .462 or .470 in the variables employed to operationalise LITERACY and NUMERACY.

relationships between engagement and educational outcomes that have been both hypothesised in theory and identified in the research, such as that of Appleton et al. (2008) noting the ‘rich-get-richer’ quality of the construct. For example, discussed prior, at the core of the seminal ‘participation – identification’ model of engagement proposed by Finn (1989), was a cycle whereby participation in school activities lead to successful performance outcomes, which lead to identification with the school, which in turn lead back to further participation in school activities – a relationship which has emerged from the data of numerous studies.

It is also likely that CRE may feed into this cycle. For example, if we look at the work of Skinner and Belmont (1993), there is strong evidence to suggest that not only is there a reciprocal relationship between student engagement and academic outcomes, but a reciprocal relationship between teacher behaviour and student engagement. In essence, there is evidence to suggest that policy and practice not only boosts student engagement, but boosts the relationship between student engagement and academic outcomes. To assist in conceptualising such a phenomenon, it may be useful to think of it as somewhat akin to pushing a child on a swing. Whilst the child can move under their own momentum (engagement and outcomes), each push (CRE) is likely to add further momentum that the child could not have created on their own. It is also useful in this respect to consider the broader models of these relationships which delve deeper into the psychological literature such as the ‘Self-processes model’ developed by Appleton et al. (2008) from the earlier work of Connell and Wellborn (1991); Skinner et al. (1990); Skinner et al. (2008); and, Appleton et al. (2006), which identifies the social context of the home, community and the classroom in such a relationship – a particularly salient point when we consider the theory and literature surrounding the incorporation of

culture, and the need to re-shape the classroom context if this is to be undertaken in a meaningful manner.

Finally, it is worth noting that in comparison to global norms, the relationship identified between engagement and outcomes by the present study could only be described as extraordinary. For example, in a meta-analysis of the empirical literature with a combined sample of 196,473 participants, Lei, Cui, and Zhou (2018) found that the standardized coefficient for the relationship between Behavioural Engagement and academic outcomes was .350 ($p < .001$), whereas the present study identified standardized coefficients of .57 ($p < .001$) and .62 ($p < .001$) between the latent variable employed to measure Behavioural Engagement, Literacy and Numeracy. On average, this represents (approximately) a 70% increase from the norm. This suggests that Behavioural Engagement is likely to contribute considerably more to the academic outcomes of Indigenous children than could normally be expected. Accordingly, anything that contributes to the Behavioural Engagement of Indigenous children is likely to be a very worthwhile exercise, as long as it has been well thought through, and any negative consequences mitigated.

In conclusion, on these results alone, the first research question has been answered – the incorporation of Indigenous knowledges and practices in the day to day activities of the classroom had a ‘medium’ to ‘strong’ positive effect on the educational outcomes of the participants in the present study. Therefore, it would be reasonable to suggest that, as this is the core tenet of CRE where Indigenous students are concerned, there is now (subject to the limitations of the present study) empirical evidence to suggest that CRE improves the educational outcomes of Indigenous students. There is

however more to be discussed, in particular the role of the second latent variable employed to measure CRE – PRESENCE.

PRESENCE

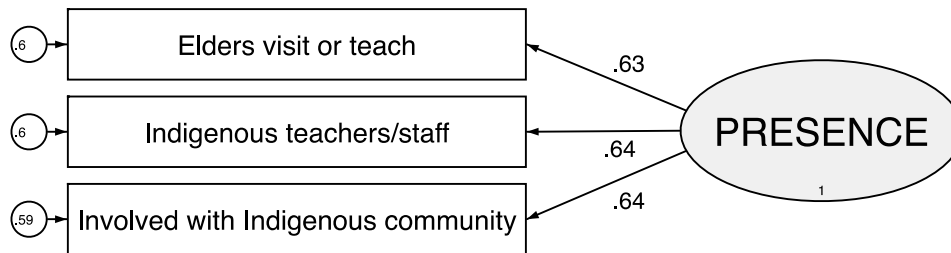


Figure 43: CFA Model for PRESENCE

The latent variable PRESENCE was employed by the present study as a means to measure the extent to which Indigenous people were present in the educational environment. As can be seen in *Fig. 43*, it was operationalised with three observed variables relating to a broad range of factors implicated in the theoretical literature, as a means by which Indigenous people and hypothetically, Indigenous input and voice, may enter formal education. As discussed in Chapter 6, both in regard to the operationalisation of the variable and the specification of the variable within the model, it was hypothesized that the presence of Indigenous people in the educational environment was very unlikely to directly influence the educational outcomes of Indigenous children. It was also hypothesised that, whilst it was possible that it may directly influence the engagement of Indigenous children, it was more likely that it would act as a facilitator of CRE. That is to say, the presence of Indigenous people in

the educational environment was most likely to influence the degree to which culture was incorporated as a method of instruction within the classroom. The results of the model largely confirmed these hypotheses through the absence of statistically significant paths from PRESENCE to AFFECTIVE, and PRESENCE to BEHAVIOURAL, but a statistically significant path ($p < .01$) with what could be heuristically considered a ‘medium’ effect (.25) from PRESENCE to PRACTICE. In essence, this result suggests that an increase by one standard deviation in the value of PRESENCE equates to an increase of .25 standard deviations in the value of PRACTICE. Using the same method that was employed previously in relation to PRACTICE, we can also calculate the standardized indirect effect of PRESENCE on the latent variables employed to measure Behavioural Engagement and educational outcomes, by obtaining the product of the path coefficients between PRESENCE, BEHAVIOURAL, LITERACY and NUMERACY. In doing so, we can ascertain that PRESENCE has a heuristically ‘small’ and statistically significant ($p < .05$) indirect effect on BEHAVIOURAL. However, its indirect effects on LITERACY (.031) and NUMERACY (.034), whilst of a ‘medium’ strength, were not statistically significant. Whilst this runs somewhat counter to the notion that the presence of Indigenous people in the educational environment influences educational outcomes, a non-significant path this far down the chain from the outcome variables is not exactly uncommon in SEM (Bollen & Long, 1993). Furthermore, this does not mean that there is no practical significance to the findings in relation to PRESENCE, especially in regard to the role it appears to play in the overall process (hence, why this discussion is located within the current section of the present chapter). In particular, a form of ‘resistance’ towards incorporating Indigenous knowledge and content in the

classroom has been noted by various scholars in relation pre-service teachers¹⁷³, and furthermore, although the research is relatively scant, there have also been significant concerns raised in regard to the ability and willingness of in-service teachers to do the same. For example, in a large scale qualitative study of 233 non-Indigenous teachers of Indigenous students, Allan Luke et al. (2011) found that the data was characterised by frequent statements of self-doubt, and a lack of knowledge about the local cultural and historical context of their schools, with only 46% of the sample able to identify simple cultural details, such as the traditional owners of the land on which their school was situated. From another perspective, another large scale qualitative study (32 interviews, 4 group interviews, 3 meetings) conducted by Ma Rhea, Anderson, and Atkinson (2012) found that some of the main issues surrounding a lack of implementation of Indigenous content in the classroom were a lack of understanding; not knowing where to start; not wanting to get it wrong; a lack of community consensus concerning resources; and, differences of opinion between various Indigenous communities surrounding what the incorporation of knowledges and histories should ‘look like’. As should be evident, this is a significant issue in the context of the study, as whilst we have ascertained that CRE is likely to be a valuable means by which to improve the educational outcomes of Indigenous students, it is of little use if the nation’s teachers are unable or unwilling to engage in it.

This is where the results in relation to PRESENCE are of considerable importance to students, educators and policy makers alike. As a consequence, it would be prudent to suggest that we should not focus our entire attention on the indirect effect of PRESENCE on BEHAVIOURAL, LITERACY and NUMERACY, but rather the

¹⁷³ For example: Nakata (2006); Aveling (2006); Aveling (2010); Craven, Halse, Marsh, Mooney, & Wilson-Miller (2005); and, Hart, Whatman, McLaughlin, & Sharma-Brymer (2012) amongst others.

statistically significant direct effect of the variable on PRACTICE. In essence, the evidence that suggests the presence of Indigenous people in the educational environment increases the amount to which Indigenous knowledges and practices are engaged with in the classroom.

In conclusion, such a result points to the sheer importance (from an empirical perspective) of schools engaging with Indigenous peoples and communities surrounding the education of their children if CRE is to be effectively implemented in a manner that is likely to improve educational outcomes. However, unlike the interpretation and discussion of the results surrounding PRACTICE, there are some important caveats to state beyond those discussed later in regard to the limitations of the present study.

Firstly, from a methodological perspective, it is important to note that whilst under certain conditions (which were achieved) the latent variable could be considered both reliable and valid, the AVE did not reach the heuristic threshold of .5. Accordingly, it would be reasonable to assume that there is an amount of error related to this variable that cannot be ignored. As stated within the chapter which dealt with this, it should be interpreted with caution. However, given the statistical significance of the path coefficient ($p < .01$), it may be argued that some caution may be relaxed. Secondly, although a considerable attempt has been made to circumvent this through various discussions within the thesis (including the present one), it is perhaps tempting for some, due to the nature of the variable, to interpret its meaning as the presence of Indigenous educators as opposed to the presence of Indigenous people. Yet again, although a variable surrounding the presence of Indigenous teachers was employed in its operationalisation, *this is not the case*, or at least we *cannot claim that this is the case*. Finally, and somewhat linked to the previous caveat, although the most likely

interpretation of the relationship based on the scholarship is that the presence of Indigenous people aids, and perhaps in some instances, facilitates the transmission of Indigenous knowledge into classroom practice, this is not a certainty, the nature of the analysis does not allow for such a conclusion to be drawn. The results must be interpreted for exactly what they are.

Question 2 - Mediation

As discussed throughout the thesis, not only was there a lack of empirical evidence in the literature surrounding the efficacy of CRE to improve the educational outcomes of Indigenous children, but there was considerable disagreement regarding the mechanism by which this may occur. Arising largely from prevalence of two competing theories (discussed at length throughout Chapter 2), from one perspective, the scholarship points to a direct relationship grounded in the notion that the process of learning is culturally situated. From the other perspective, the scholarship points to a complex process of resistance and alienation, and subsequently implies that the relationship between CRE and educational outcomes is likely to be mediated by engagement. From these two perspectives and differing propositions surrounding the way in which the incorporation of culture is likely to improve the educational outcomes of Indigenous students, arose the second research question:

If this is the case (in relation to the first research question), is this relationship direct or is it mediated by engagement?

As stated in the introductory passages of this chapter, both practically and statistically significant paths were present between PRACTICE and PRESENCE, PRESENCE and BEHAVIOURAL, BEHAVIOURAL and LITERACY, and BEHAVIOURAL and NUMERACY, whereas the direct paths between PRACTICE and LITERACY and PRACTICE and NUMERACY were both statistically non-significant. Returning to the Conceptual Model (*Fig. 44*) that was presented and discussed throughout the initial chapters of the thesis, it is quite clear that such a result aligns most closely with the relationships between *CULTURE*, *ENGAGEMENT* and *OUTCOMES* that were hypothesised in relation to the latter of the competing theoretical perspectives - the theoretical orientation of Indigenous education grounded in the Marxist/Post-Colonial paradigm, and more specifically, in the argument that various forms of resistance and alienation play a role in the educational outcomes of Indigenous children.

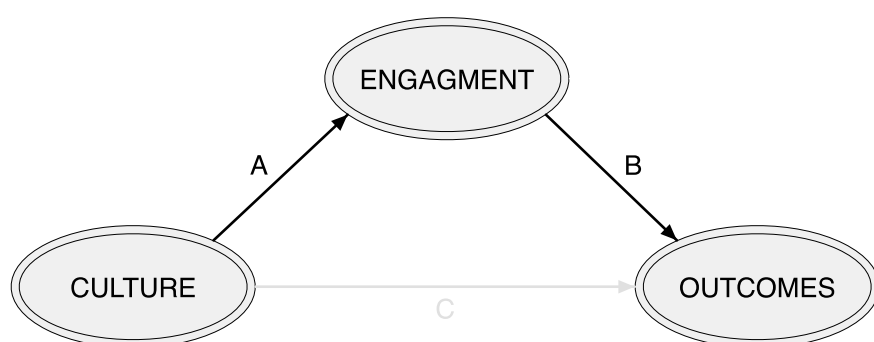


Figure 44: Conceptual Model for Resistance/Alienation Hypothesis (non-significant paths in grey).

This is certainly a finding of interest. Perhaps most importantly in regard to policy and practice in Indigenous education, it refutes the argument that the process of learning itself is culturally situated - the key assumption of the culturalist paradigm. However, whilst it provides support for the alternative perspective grounded in Marxist

and Post-colonial theory, such support is not absolute. In particular, it must be noted (or indeed re-stated) that the study has not specifically measured either resistance or alienation, but rather hypothesised that if this was the case, then it is likely that both resistance and alienation would create disengagement. Furthermore, it must be noted, that both resistance and alienation are, at their core, emotionally driven – a quality which is somewhat at odds with the relationships (or indeed, lack thereof) that were identified between PRESENCE and AFFECTIVE, PRACTICE and AFFECTIVE, AFFECTIVE and BEHAVIOURAL, AFFECTIVE and LITERACY, and AFFECTIVE and NUMERACY. This poses some questions from both theoretical and methodological points of view. As a consequence, this unexpected result is the central focus of the following discussion.

AFFECTIVE

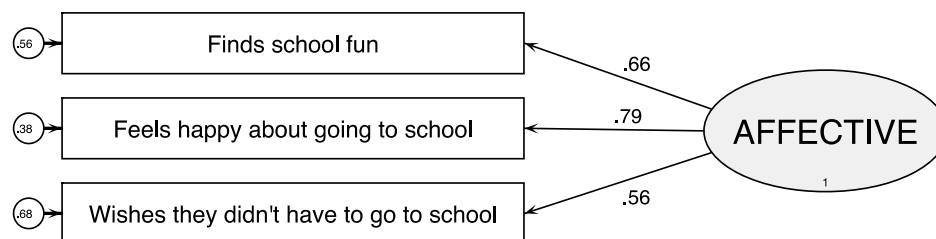


Figure 45: CFA Model for AFFECTIVE

The latent variable AFFECTIVE was employed by the present study as a means to measure Affective Engagement. As can be seen in *Fig. 45*, it was operationalised with three observed variables relating to the emotional responses of the participants

towards school. As discussed in Chapter 5, this conceptualisation of Affective Engagement is largely in line with the seminal literature such as Skinner et al. (1990) and Skinner and Belmont (1993). Furthermore, it also aligns closely with the scholarship surrounding Affective Engagement in the context of Indigenous Australians, such as that of Biddle (2015) and Dunstan et al. (2017).

To re-state from previous discussions, in regard to both the theoretical and research literature surrounding engagement, it has been noted by Deci and Ryan (1985) (and numerous others), that engaged emotions such as enjoyment, interest and enthusiasm tend to fuel behaviours such as persistence and effort. In regard to the theoretical and research literature surrounding CRE, as noted previously in the present chapter, from a perspective grounded in the Marxist/Post-colonial paradigm, due to the emotionally grounded nature of resistance and/or alienation, it would not be unreasonable to expect Affective Engagement to be the first port of call in the chain of causality between the incorporation of culture and educational outcomes. Finally, in regard to the control variables employed by the present study, due to the closeness of the concepts, one would expect to see statistically significant relationships emerge between Affective Engagement and SDQ. None of these occurred. Every path to and from AFFECTIVE, with the exception of the control variable ‘remoteness’, was statistically non-significant – in essence, a result that runs counter to almost all theory and prior research. There are however, a range of reasons why this may have occurred.

Firstly, although such a finding runs counter to the vast majority of the research in the field, there is a precedent for similar results. For example, Goodenow (1993) in the process of developing and establishing the validity of a measure of the Psychological Sense of School Membership (PSSM) scale, found that Affective Engagement can shift

on the basis of a schools' racial and ethnic demographics, with members of the dominant group demonstrating significantly higher levels than those of minorities¹⁷⁴. Furthermore, there is some evidence to suggest that Affective Engagement may be conceptualised differently by different racial/ethnic groups. For example, Booker (2004) in a study of 51 African American high school students, found that Affective Engagement (operationalised as a sense of belonging) was not correlated to academic outcomes, but perhaps more pertinently to the present study, noted that the participants generally did not see it this way either, a point which is perhaps best summed from statements from the study's qualitative component, such as the following:

“How is my achievement [related]? ... don't think it really matters about that [belongingness] ... the majority of people here are cool and all ...but the main thing I'm trying to do is keep my grades up and do better ... that really has nothing to do with anyone else.”

However, whilst there is certainly a precedent for such a result in relation to the absence of a relationship between Affective Engagement and educational outcomes, it is important to remember that the research evidence is limited, with the inverse being a far more common finding. Furthermore, it does not account for the absence of significant relationships between the latent variables employed to measure CRE, and perhaps more pressing from a theoretical perspective, the absence of a significant relationship between Affective and Behavioural forms of Engagement. As a consequence, whilst

¹⁷⁴ It is important to note that this work was conducted in a predominantly Hispanic school, and it was the Hispanic students which demonstrated higher levels of Affective Engagement, thus suggesting that it was not the broader minority status of students that influenced Affective Engagement, but rather whether or not they constituted a minority demographic within the school.

plausible, a decision was made to ‘dig a little deeper’ under the premise of a somewhat more likely conclusion, given the difficulties encountered when operationalising the variable – in essence, the possibility that the study had not measured what it thought it had, a point that was alluded to in the closing passages of Chapter 5, when assessing discriminant validity.

Before the present study arrived at the final composition of the latent variable that would be employed to measure Affective Engagement, a search of the data set and subsequent Exploratory Factor Analysis resulted in the identification of two possibilities: AFFECTIVE which generally related to the emotional responses of the participants towards school, and AFFECTIVE_1 which largely related to the participants’ perceptions of relationships with people within the school, in particular their peers. The results of the Confirmatory Factor Analysis (re-presented in *Fig. 46*) suggested these were two qualitatively different, but moderately to strongly correlated dimensions of the same phenomena.

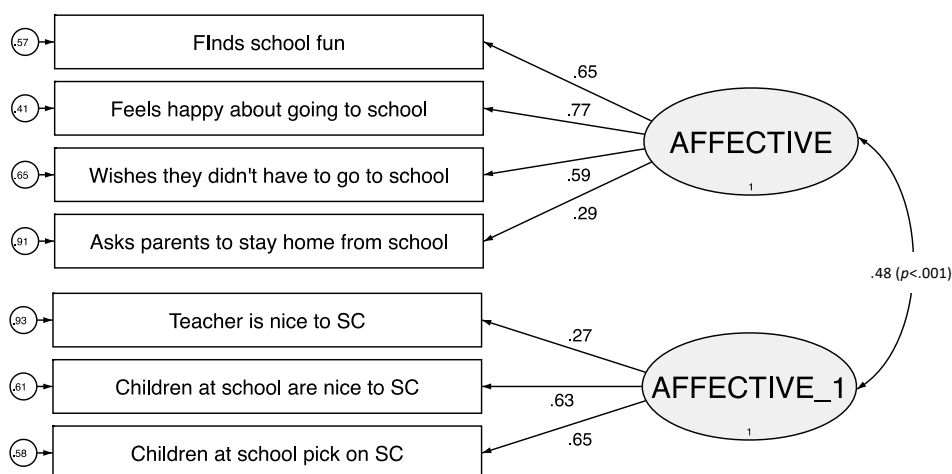


Figure 46: Two Factor CFA Model for Measures of Affective Engagement.

Whilst a correlation between these variables was certainly not un-expected, given the similar theoretical origins (indeed many would consider each to be a sub-dimension of Affective Engagement), its strength was of some concern. This was largely because the correlation was both statistically significant and strong, despite the presence of factor loadings within each variable well below the accepted cut-off point, and AVE values (AFFECTIVE = .36, AFFECTIVE_1 = .29), which failed to reach the accepted threshold to claim Convergent validity. Furthermore, there is a clear indication from the strength of the factor loadings, that AFFECTIVE_1 was largely measuring peer relationships¹⁷⁵.

Taken together, although a conclusion cannot be drawn with any certainty, given the conditions under which it was achieved, it would not be unreasonable to suggest that (a) the strength of the correlation between AFFECTIVE and AFFECTIVE_1 would be likely to increase if it was possible to remove the variable 'Teacher is nice to SC' from the model, without encountering measurement/identification issues, and (b), given this possibility, it would not be unreasonable to suggest that the variable that was employed in the Full Model may be measuring whether students enjoy school on the basis of the peer interactions it provides. This conclusion becomes more possible to draw, when the questions in the study surrounding those employed to operationalise the construct are taken into consideration. However, the arguments above come dangerously close to pure speculation, as there is simply not enough information in the model to determine the reasons underpinning the lack of significant paths, both to and from AFFECTIVE, with any level of certainty. Consequently, in regard to the second research question, the conclusion which must be drawn is somewhat mixed – the influence of CRE on

¹⁷⁵ Note: The variable 'Children at school pick on SC' was reverse coded.

educational outcomes is certainly mediated by engagement. Indeed, it is fully mediated by engagement, BUT it is only mediated by engagement's behavioural form, a point which is discussed in the following chapter in regard to the potential directions that future research in the area may take.

Limitations

We have reached that part of the discussion in the chapter which one may imagine that very few researchers enjoy namely, the part where we must curb our enthusiasm surrounding the results that we have achieved, and note the limitations of our work, so that we can ground our recommendations in reality. In this respect, the thesis has taken what may be best described as a somewhat unique approach as a result of its structure. In essence, a concerted effort has been made to outline the various limitations of the methodology and method at various points throughout the various discussions which have been presented to this point. For example, before the thesis formally began it was noted that work which has been undertaken originates from the lived reality of the researcher – it stems from my values, my understandings, and what I see as an important step forward in the field. This was followed by Chapter 1 where the limitations of the literature body surrounding CRE were noted; Chapter 2 where these were translated into the competing theoretical positions which currently underpin Indigenous education in Australia; and, Chapter 3 where the methodological limitations surrounding aspects such as sampling and missing data, alongside the broader limitations of the paradigm itself, were noted. From here, as the thesis worked its way through the operationalisation of the various latent variables, it noted limitations in the measurement of educational

outcomes, such as the narrow conceptualisation of the construct and the measures employed to operationalise it; a range of limitations posed by the data surrounding the dimensions of engagement which were possible to be captured; and finally, the limitations of PRACTICE and PRESENCE in relation to the available literature, and the nature of the variables themselves. However, whilst the limitations of the present study have received considerable discussion at various junctures throughout the thesis, there are a number of limitations which are yet to be mentioned, largely due to their overarching nature and their potential to influence either, a number of the latent variables or, the relationships between them. These are now discussed.

Age

As noted in the Chapter 7, which dealt with the control variables employed by the study, both engagement and educational outcomes are inextricably linked to human development. That is to say, educational outcomes increase with age, and engagement tends to shift with age, and furthermore and as a result, so does the relationship between engagement and educational outcomes. Accordingly, whilst age was controlled for within the model, it is particularly important to take into account the age group of the participants within the present study – between roughly 6 and 8 years of age.

To re-iterate from prior discussion, it has been noted by various scholars, and identified in various studies, that cognition increases with age and thus do educational outcomes. However, engagement has a tendency to start ‘high’ but decline over the years. This is perhaps the most important aspect of the limitation to consider. In essence, that the study has most likely captured the participants at what is, or is close to,

the highest level of engagement they are likely to have with education. Bearing this in mind, it is possible that the relationships between CRE, engagement and educational outcomes identified by the present study will shift over time. For example, it is well established in the literature, that transitions between the various levels of schooling that operate in Australia are some of the most difficult times in respect to student engagement and outcomes. To put this somewhat broadly, it is the transitions between primary and high-school and high-school and college/pre-tertiary when students appear to become most at risk of disengagement, disaffection and drop-out. Furthermore, if the premises of resistance and alienation theory are correct, as individuals age, they become more acutely aware of the structural and social inequalities that they may face within the classroom and broader society, and if we are to draw upon some of the key literature in this space such as Ogbu (1991), they become more aware of their possible and even probable futures. In essence, such theory proposes that as a student progresses through the grades, feelings of alienation or the manifestation of active resistance is likely to increase.

Therefore, it is important to remember that the present study has captured these students at the beginning of their educational and life trajectories. As a result, it would be incredibly naïve to assume that the findings can be generalised to all Indigenous students. However, there are very few studies which have specifically targeted and explored CRE in the context of this age group, despite the overwhelming amount of evidence in both theory and research that has identified early childhood as the most vital period of an individual's life in regard to social, emotional, behavioural, and academic

development¹⁷⁶. As a consequence, in many ways such a limitation adds, rather than detracts from the significance of the present study.

Content Validity

As part of the present study's limitations, it is important to briefly return to some of the aspects of the various constructs that were not measured, or in some instances, not measured as fully as would have been possible, if the study was not reliant on an already established data set with no option to develop instruments. Furthermore, it is perhaps a useful exercise to provide at least some discussion surrounding the impact this may have had on the analysis. However, before such a discussion begins, it is important to note that, despite the title of this section and the points made within, only the most simplistic of studies could hope to achieve content validity as it is formally defined, and accordingly the arguments presented are not intended, nor should they be interpreted, as calling this into question. Rather, it is an attempt to achieve what all studies can and should do in regard to content validity - be honest about what has been measured and the potential implications this may pose.

With regard to the measurement of educational outcomes, as noted in Chapter 4, whilst they are central to educational policy both globally and locally, there is considerably more to educational outcomes than proficiency in literacy and numeracy. Furthermore, whilst knowing whether a student can perform the skills required is immensely useful in ascertaining whether they have grasped the material that has been

¹⁷⁶ Over the years, this has become almost an educational truism, with theory and literature covering almost every conceivable domain from mental health to environmental sustainability.

taught, it is widely recognised in the literature that there is also a cognitive component that must be mastered, if students are to be proficient within these disciplines¹⁷⁷. In essence, they must be able to not only ‘do’, but ‘understand’, and more importantly still, be able to apply their understandings across different contexts. This is something the present study did not and could not capture from the available data. This means that it has captured what the students can do, not what they might be able to do if given the opportunity to do so. This is a point worth bearing in mind whilst reading the discussion of response bias that follows shortly.

With regard to the measurement of engagement, it is worth noting (or indeed re-stating), that the study has drawn on one of a number of theoretical orientations as the basis for the development of the latent variables employed to operationalise the construct. Furthermore, although the theoretical orientation employed originates from the seminal literature, it is somewhat dated, in the fact that it does not enable the exploration of the various sub-components of engagement that have been theorised in the more recent literature. As has been stated previously, this is the nature of working with established data sets – you cannot employ variables that do not exist. Accordingly, as a limitation of the present study, it is important to note that whilst the model has identified a strong and logical pathway of influence from CRE to educational outcomes, in reality, the relationships within the middle section of the model are likely to be far more complex than they appear. In this respect, perhaps the most useful discussions in the context of Australian Indigenous education can be found in (Bodkin-Andrews et al.(2009), who explore the role of self-concept in the academic disengagement of Indigenous youth; Martin (2007), who analysed the relationships between class

¹⁷⁷ And arguably if they are to be proficient in any discipline of learning.

participation, enjoyment of school and educational aspirations; or from a more theoretical perspective, Martin (2015) who argues that identity as an Aboriginal person and a student; academic resilience; failure dynamics; socialisation; and, family connections are all likely to play a role in process. In essence, there are likely to be a number of phenomena that have not been measured that fall before, after or at the same time as Behavioural Engagement in the chain of causality that the current model implies. Furthermore, as noted at various points throughout the thesis, there is a distinct possibility that many of these relationships are reciprocal – something that could not be captured by the present study, due to the need to employ a cross-sectional approach to analysis.

Finally, with regard to the measurement of CRE, it is important to re-state that the study has measured in perhaps the broadest form possible – a combination of the presence of Indigenous people in the educational environment, and the extent to which Indigenous knowledge enters the classroom. As should be evident from various discussions throughout the thesis, it is a multidimensional and multifaceted approach, and within this, there is the potential that the emphasis placed on each of these may shift from educator to educator and school to school. For example, it is possible that a teacher may place significant emphasis on the incorporation of Indigenous knowledges in the classroom, but may not consider the need to adapt other areas of the curriculum such as history. Although there is no literature or research that has explored the importance of each dimension of CRE, it is common sense (at least to the me) that some will be more important than others, and these relationships are likely to shift based on student age, social background and the content that is being taught through CRE. Finally, it is also important to note that, many frameworks of practice in CRE (especially those originating

from the work of Gloria Ladson-Billings) incorporate a component of political and social awareness. This is something that could not be captured by the present study, although it is perhaps of questionable relevance in the early childhood context.

Response Bias

Finally, it is important to note and discuss the sources from which the data was obtained, and discuss the impact this may have had on their measurement and subsequently the analysis – in essence the potential difference between what appeared in the data set, and what occurred in reality. In this respect, there is quite a large body of literature emanating from the methodological, psychological and philosophical disciplines that can be drawn upon. However, of most interest and importance in the context of the present study's limitations is that surrounding the role that various forms of bias may have played. Although the thesis has already covered this issue in some detail in regard to the choices which were made surrounding the data which was drawn on to measure CRE¹⁷⁸, similar discussions were largely absent in relation to the other latent variables employed by the study. This was not an oversight. Rather, it was a structural decision to avoid repetition, as the forms of bias which were most likely to influence the data employed to measure these variables manifest from the same issues, and were thus likely to influence the data in the same manner, in particular the use of

¹⁷⁸ In particular, it was noted that culture and social desirability bias may be present if the study were to draw on the perspectives of teachers, as opposed to the perspectives of parents, in regard to the presence of Indigenous people, and within this the extent to which the school engaged with the Indigenous community.

teacher-report for the measurement of Behavioural Engagement, Literacy and Numeracy and thus the potential for racial and social desirability bias to influence this.

With regard to racial bias, it is well established in the scholarship emanating from disciplines such as critical race and whiteness theory, that teachers often hold low expectations for students from minority backgrounds. The reasons for this are diverse, ranging from overt-racism to an understanding of the realities that these students may face, which may or may not be shaped by the deficit-discourses that often typify educational policy, and to a lesser extent the research literature. The impacts of this on the students themselves are wide and varied, but almost always damaging. For example, it has been noted that teachers may hold skewed perceptions of student ability and lower their standards or ‘teach-down’ on the basis of these (Kulnieks, Longboat, & Young, 2013). Furthermore, there is a strong body of evidence¹⁷⁹ which suggests that educators tend to be more attentive to the misbehaviour of students from racial and ethnic minorities, and employ different (and generally more severe) forms of student discipline to manage this. Contextualising this within the confines of response bias, it is highly likely that teachers will rate Indigenous students lower than their non-Indigenous counterparts across Literacy, Numeracy and Behavioural Engagement, regardless of their ability and the level to which they conform to the norms of the classroom.

Conversely, as the thesis has noted previously in relation to the measurement of CRE, it is a very real possibility that the answers of teachers in regard to what occurs in the classroom are likely to be influenced by social desirability bias, or to put it more succinctly, teachers are likely to answer questions in a manner that either conforms to

¹⁷⁹ See: Fenning & Rose (2007); McFadden, Marsh, Price, & Hwang (1992); Shaw & Braden (1990); Skiba et al. (2011); Skiba, Michael, Nardo, & Peterson (2002); Townsend (2000); Lewis, Butler, Bonner III, & Joubert (2010); and, Okonofua & Eberhardt (2015).

social norms, or in a manner that will be accepted or liked. As noted at this juncture, this was likely to occur in relation to topics which are politically and racially charged. In particular, it was argued that as many of the questions surrounding CRE were linked to current curriculum and teacher standards (which educators must be seen to be following and demonstrating), it was not unreasonable to assume that an educator reporting on the extent to which they comply with government policy may overstate what actually occurs within the school and classroom. Interestingly, the role of social-desirability bias in relation to the measurement of Behavioural Engagement, Literacy and Numeracy are almost identical. In essence, one does not need to stretch their imagination far to realise that there is considerable potential for teachers to overstate the behavioural development of their students, and their proficiency across key areas of the curriculum, when the current climate of teacher accountability; standardized testing; performance based funding; and, a policy mantra that demands equality of outcomes for Indigenous Australians, are taken into account.

Taking both forms of potential bias into account leaves the present study in a somewhat unique position. There is a very real possibility that they may in fact cancel each other out, as one suggests that teachers are likely to over-rate their students, and the other suggests that teachers are likely to under-rate their students. Regardless, it must be noted that such an assumption cannot be tested within the confines of the present study – a point which is addressed in the following chapter in regard to the potential directions that future research may take.

Chapter 9

Conclusion

Summary

The thesis set out to address two key questions at the core of Indigenous education in Australia. Firstly, under the pedagogical and curricular banner of CRE, whether the incorporation of Indigenous knowledges and cultures in the classroom improved the educational outcomes of Indigenous students. Secondly, if this was the case, whether educational outcomes improved as a direct result of this, or whether the relationship between the incorporation of Indigenous knowledges and cultures was mediated by engagement.

To achieve this, the thesis began by exploring the key theoretical positions in regard to CRE and aligned each of these with the mechanism by which they proposed that pedagogy and practice in the classroom was linked with the performance of Indigenous students. From this juncture, it articulated the relevance of SEM to the research that was conducted and outlined through a series of steps that were taken to conduct the analysis from conception to completion. It then engaged with the literature over a series of chapters to operationalise the six latent variables that were employed by the model to address the research questions, and identify the intricacy of the relationships that existed in the data between CRE, engagement, and educational outcomes. The result of this process was the development and subsequent estimation of a SEM model, the results of which provided evidence that CRE had a ‘medium’ to

‘strong’ positive influence on the educational outcomes of the Indigenous children on which the analysis was conducted. It also confirmed that this influence was fully mediated by engagement, thus providing support to a conceptualisation of CRE grounded more in Post-Colonial theory as opposed to the culturalist paradigm.

Recommendations for Future Research

As has been discussed at considerable length throughout the thesis, the body of literature surrounding CRE has a number of troubling limitations. Interestingly, throughout the final stages of compiling the thesis, this was noted once again in the Australian context in a systematic review of the literature of Aboriginal pedagogies by Burgess et al. (2019), which found that the literature was highly contextualised and generally only applied to Aboriginal education in remote areas. There was a disconnect in the literature between practice and outcomes; where links were made between practice and improved outcomes this was done “by implication rather than evidence”; and, definitions and detail about pedagogies were mostly absent, relying on common understandings of what pedagogy means. In many ways, what has been said by Burgess et al. (2019) flows into the overarching recommendation for future research made by the present study. In essence, there is a dire need to develop a stronger body of evidence surrounding the efficacy of CRE to improve the educational outcomes of Indigenous students in the Australian context. If we as a scholarly community do not achieve this, we run a very real risk that much of the hard work that has been undertaken in the drive towards educational decolonisation will be lost, as pedagogies which recognise and respond to culture are supplanted by those that can provide evidence of the efficacy in

terms that are recognised by policy makers and politicians. This is neither fair, nor is it correct, nor should it happen, but it is reality¹⁸⁰, and there is a duty for those with a vested interest in the approach to push back now, and push back hard. The following are some brief, but more targeted recommendations of what the next steps in doing so may be, from the perspective of the quantitative paradigm. However, it is important to note the vital role that theorists and qualitative researchers must play in this process, both in terms of providing rich descriptions that explore the correlations which are found, and mapping out where the quantitative researchers should head next – without this, we are flying blind.

Demographics

As noted in the previous chapter, there was a need to consider the demographics of the present study in regard to the conclusions that could be drawn. In particular, it was noted that there was the potential, based on the findings of prior research, for both the strengths of the relationships, and the relationships themselves, to shift as children progressed through the years of schooling. Based on this understanding, it was noted that the findings of the present study, whilst important in regard to Indigenous education in Australia, are only relevant within the context of early childhood education. Based on this alone, there is a distinct need to expand the research to explore the role that CRE may play in the educational outcomes of Indigenous Australians across a range of ages

¹⁸⁰ For example, in the United States, the drive to standardize pedagogy and curriculum has driven approaches grounded in cultural responsiveness, multiculturalism and bilingualism out of the political discourse, and largely out of the classroom (Aronson & Laughter, 2016; Sleeter, 2012). In the Australian context we have witnessed the valuable bilingual and ‘two-way’ education programs which operated across the nation suffer a death by a thousand cuts. In their place we are trialling ‘direct instruction’ methods through initiatives such as Noel Pearson’s ‘Good to Greater Schools’.

and educational levels, and indeed other demographical variables such as remoteness. It is hoped that the present study and the relationships that were identified may serve as a starting point for such a process.

Instrument Development

As noted throughout the thesis, there is a dearth of empirical literature surrounding CRE. This has meant that little to no attention has been given to the development of instruments that can be employed to measure its presence. For example, as noted in Chapter 6, to the best of my knowledge, there is one instrument in existence (beyond those developed for the present study) that claims to measure the presence and extent to which CRE is practiced. This is problematic for a number of reasons. Firstly, the provision of CRE is likely to be context specific. Accordingly, an instrument developed in one educational context is unlikely to be reliable and valid in another. Secondly, as a number of scholars across a diverse range of contexts have argued¹⁸¹, the provision of CRE is likely to be (and for that matter should be) culturally specific. Yet again, an instrument designed to measure the presence of CRE in relation to the education of a specific cultural group is unlikely to be reliable, valid, or for that matter culturally appropriate, for another. Finally, there is a need for the incorporation of Indigenous voice in the development of such instruments. As Rigney and Hattam (2018) have argued, it is vital that such instruments capture what is important to Indigenous people in regard to education – a point which extends not only to instruments designed

¹⁸¹ For example: Ladson-Billings (2014), Battiste (2008), Hingangaroa Smith (2000).

to measure CRE, but all instruments that are employed to measure aspects of Indigenous lives and realities in relation to education (and indeed more broadly).

Whilst the present study attempted to capture these requirements through engagement with the literature and the use of a data set emanating from an Indigenous designed and led research project, this is not enough. If the quantitative literature surrounding CRE in Indigenous education is to develop (or in reality, emerge), then there is a need to heed all of the above and perhaps more. In essence, we need detailed, comprehensive, valid and reliable instruments which are grounded in the realities and wishes of the people that they claim to be measuring.

Analysis

As noted at various points throughout the thesis, the analysis, the research questions on which this was based, and the theoretical underpinnings on which these were constructed were inherently broad – the aim was to identify whether CRE influenced educational outcomes, and whether this relationship (if present) was mediated by engagement. The thesis has certainly done this. But, as discussed in the previous chapter, it is likely that the relationships between CRE, Literacy and Numeracy are far more complex than the current model implies. Furthermore, based on the findings of prior research (particularly in regard to engagement), it is likely that a number of these relationships have a reciprocal quality. As a consequence, if future research is to delve beyond what the present study has done, there is a need to develop a far more complex model, and draw on longitudinal data as a means to identify the nature of the relationships within it. As noted, the work of Bodkin-Andrews et al. (2009), Martin

(2007), and Martin (2015), alongside the work of the present study, may be a useful point of departure.

To this end, perhaps the most pressing question relates to the role of Affective Engagement. As discussed at some length within the previous chapter, this was something that the present study was unable to capture – the reasons for this being largely unknown. Naturally, the first port of call here is to return to the drawing board, and look toward a more robust operationalisation of the construct. But beyond this, it would be prudent to consider expanding (or perhaps even substituting) the construct to incorporate aspects of belonging, relationships, identity, and self-efficacy, for this would allow us to drill down (at least to some extent) into the context of the construct – in essence, why Indigenous students do or do not enjoy school.

However, such a recommendation may be difficult to achieve in reality, as there is a dearth of quantitative data of a large enough scale or sample size with which to conduct such an analysis. To circumvent this issue, it may be prudent to work towards a series of interconnected models of Indigenous education, as opposed to attempting to create one ‘all-encompassing’ model. It is of no small bonus, that such a method would also enable future research to capture the diversity of Indigenous realities and experiences in a more appropriate manner than much of the current quantitative research that exists in regard to Indigenous education, or indeed Indigenous Australians more broadly.

Recommendations for Practice

The thesis has explored not only whether CRE influences the educational outcomes of Indigenous students but also the process by which this is likely to occur. Furthermore, in doing so it has divided both CRE and Engagement into separate but related dimensions and explored the relationships which do and do not exist between these. In essence, it has moved beyond simply addressing the question of whether CRE improves the educational outcomes of Indigenous students and began to explore how and why this may be the case. In doing so, it has kept in mind the holistic nature of CRE and in particular, the notion that it is not an isolated action or pedagogy but rather an ‘attitude towards students, a concept of learning, a whole way of life within the classroom and throughout the school’ (Gilliland, 1995, p.43). As a consequence, the results of the analysis lend themselves well to various recommendations for practice across various levels of the educational process with implications for teachers, principals and policy makers alike. The most pertinent of these are now addressed.

For Teachers

As covered within the proceeding chapter, the incorporation of Indigenous cultures, knowledges and practices in the classroom had what may be considered a strong positive effect¹⁸² on the educational outcomes of Indigenous children who participated within the present study. Furthermore, given the age group of the children

¹⁸² Especially when interpreted in light of the theory research surrounding the reciprocal relationships between teacher practice, engagement and educational outcomes.

on which the analysis was conducted it would seem that this strong positive effect appears at a particularly important time in the educational trajectory¹⁸³. Based on this alone, there is one overarching recommendation that the thesis can provide for teachers – do it. This stated, whilst the analysis conducted by the thesis was inherently broad, CRE is a nuanced educational practice thus there are a number of caveats that must be addressed.

Firstly, it is important that what has been measured and how it has been measured is clearly understood and not stripped of the theoretical methodological principles which underlie this. For example, the study did not measure the influence of conducting activities in language, teaching Indigenous singing and storytelling, **or** teaching Indigenous arts and practices on educational outcomes; it measured the driving force behind the incorporation of these practices in the classroom, in essence the extent to which a framework of practice which incorporates Indigenous knowledges and practices influences the educational outcomes of Indigenous students. This largely aligns with the theoretical literature surrounding CRE which overwhelmingly position it as a holistic practice. To draw yet again on Gilliland (1995), CRE is not something that is practiced in isolation from the ‘mainstream’ curriculum but rather something that is embedded within it. Furthermore, it is not a single action but rather the sum of a series of actions which form a coherent whole. As noted by M Rose (2012) this is something that Australia is largely yet to achieve in regard to the education of and about its Indigenous population.

¹⁸³ As noted previously, early childhood is widely recognised as the most vital period of an individual’s life in regard to social, emotional, behavioural and academic development.

Secondly, given the inherently broad nature of CRE it is important to remember what the study has explored and what the study has not. To this end, it is possible to recommend from the results of the analysis that teachers incorporate Indigenous knowledges and practices in their classrooms but other aspects of CRE such as the need to incorporate Indigenous histories and perspectives can only be recommended by implication. In essence, we can assume based on theory (and perhaps common sense) that Indigenous histories and perspectives are inextricably linked to Indigenous knowledges and practices and thus form an important part of the process identified by the model however as these have not been explicitly measured to do so would be an exercise in speculation. For the moment, where the role of Indigenous histories and perspectives are concerned, it is perhaps best for educators to look to the qualitative research which has come prior. For example, as discussed in Chapter 2, some of the earlier work in the field such as Keefe (1988) have noted that their absence in the classroom and curricula has the potential to create various forms of resistance to and withdrawal from education. Furthermore, others such as Groome and Hamilton (1995) have noted a connection between their absence and what in many ways may be considered affective and or cognitive engagement with education¹⁸⁴.

Thirdly, it must be recognised that such approaches should be place based. That is, the Indigenous knowledges and practices which enter the classroom should at a minimum be relevant to the local Indigenous community and where possible grounded in their knowledges, histories and experiences. To be blunt, in most instances¹⁸⁵ making dot paintings and didgeridoos in the classroom does not count as CRE. Furthermore, the

¹⁸⁴ Groome and Hamilton (1995) identified a climate of anti-intellectualism where achievement may become seen as of little value or even something to be ashamed of.

¹⁸⁵ The exception of course is when dot paintings and didgeridoos ARE relevant to the local Indigenous community.

literature has identified that approaching practice in this manner has the potential to create unintended and problematic consequences. For example, it has been argued by Mark Rose (2012) that whilst such practices often come with good intentions it simply acts to push Indigenous knowledges and cultures further into the margins of the educational (and national) landscape. Furthermore, it has been noted by scholars such as McNaughton and Davis (2001) that pedagogy and practice which homogenises Indigenous cultures simply reinforces negative stereotypes of Indigenous people.

Finally, it is important for teachers to recognise the role that Indigenous Elders, Communities and Educators can play in facilitating this approach – a point supported both in the literature surrounding CRE and by the analysis conducted by the present study. This stated, it is yet again important to note the holistic approach to this practice. As theory suggests and the analysis has captured, it is not simply about engaging with parents, bringing in an Elder, engaging with the community or drawing on the knowledge of Indigenous educators but rather the sum of all.

For Principals

In regard to recommendations for Principals and others involved in the various aspects of school leadership there is yet again one overarching recommendation - teachers need support to do this. They need time to plan lessons and engage in professional development; they need scope to adapt the curriculum where necessary and they need guidance and time to plan for continuity between classrooms. In essence, they need support if they are going to incorporate Indigenous knowledges and cultures into their classrooms in meaningful and respectful ways.

As the results of the present study attest, part of this support must include the facilitation of genuine partnerships between communities, families and the school as these have a significant role to play in the transference of Indigenous knowledges, languages and cultures into the classroom. In this respect, perhaps the most important ‘take-home’ message that can be gleaned from the thesis surrounds the need to adopt a holistic approach to achieving this. In essence, that it is not enough to simply employ an Indigenous education worker and expect them to take on the role of dealing with ‘all things indigenous’. Indeed, as discussed at some length throughout Chapter 6, this is not only ineffectual but inappropriate. Furthermore, although such positions are certainly of considerable importance, it is worth remembering that the observed variable employed to measure their presence was dropped from the analysis to improve measures of convergent validity – in essence the presence of Indigenous Education Workers had the ‘least in common’ with other measures of Indigenous presence. Instead, it is about creating genuine community partnerships grounded in two-way communication between a range of stakeholders, it is about Indigenous voices entering the school not just through Indigenous staff but through the presence of Indigenous elders and the broader community, and it is about creating an environment where Indigenous people are not only visually present but discursively present. Overall, it is about creating an environment where the community feels both welcomed and valued, are comfortable expressing their views, have a means to contribute their views and can be assured that their views will be recognised, respected and where necessary, acted upon.

For Policy Makers

With regard to recommendations for policy, the present study finds itself in a somewhat unique position where its findings largely support what is currently occurring. For example, the current Australian Curriculum effectively mandates the incorporation of Indigenous knowledges, histories and perspectives in Australian classrooms, as does the National Aboriginal and Torres Strait Islander Education Strategy and the various state-based policies regarding Indigenous education. Consequently, it is tempting to suggest that there is little need for change. Policy makers can continue in the same vein, and educators can keep doing what they are currently doing. In essence, to maintain business as usual. This would be a mistake. However, to articulate why this is the case, it is a necessity to yet again bend the rules and present some brief arguments which fall ever so slightly beyond, but are inherently linked, to what the thesis has addressed.

Firstly, whilst the scholarship surrounding CRE has championed the incorporation of Indigenous knowledges across various discursive spaces as a form of decolonisation, it has been overwhelmingly quiet in regard to what counts as Indigenous knowledge or Indigenous perspectives (Hart et al., 2012). Consequently, whilst such scholarship has made recent progress possible, it is not particularly useful to those at the coal face who wish to engage in the process of decolonisation for the benefit of future generations. As Nakata (2012) notes, teachers are familiar with the concept of Indigenous knowledges and perspectives, but questions surrounding the ways in which this could and should flow into the classroom remain. Such questions need to be addressed between all stakeholders, before the process of embedding such knowledges can be truly achieved (McLaughlin & Whatman, 2011).

Secondly, whilst the demands of the current curriculum can be seen as a step towards social justice, in reality, a gap remains between intention and implementation. As Nakata (2012) has argued, the inherent broadness of a descriptive curriculum has left important questions unanswered. Consequently, teachers are left to work out the details. This is particularly problematic when contextualised by the historical absence of the discipline from both the school curriculum and those employed by teacher training institutions. In essence, teachers with little knowledge of content and pedagogy relevant to the area are now placed in a position where the impartation of such content is a requirement of their practice. Whilst universities and other institutions charged with training future educators are beginning to catch up, the research tells us that there is little support for those currently working within the educational system, with professional learning described as ‘patchy’ and ‘ad-hoc’, and largely concerned with developing cultural awareness, as opposed to exploring the mechanics of actually incorporating Indigenous knowledges and perspectives in the classroom (Ma Rhea, 2013). If current teachers are to engage in pedagogy and practice that meaningfully draws upon Indigenous knowledges and perspectives, then there is a clear need for help. This requires both the development of professional learning that addresses the needs of teachers, and support from schools and educational bodies to attend to this.

Thirdly, it must be remembered that Australia is a settler colonial society, and as such, it comes complete with distinct narratives and national mythologies which aim to exclude or assimilate the Indigenous other within the nation’s identity (Strakosch & Macoun, 2012; Wolfe, 2006). As Moreton-Robinson (2015) implies, to challenge such narratives and mythologies is to challenge the nation’s identity, and indeed to some extent, to challenge the identities of those within. Consequently, there is a distinct

possibility that advocating for the accurate and meaningful incorporation of Indigenous knowledges and perspectives in Australian classrooms, means expressing demands which may be seen by some as negative, political or perhaps even aggressive – a possibility which strikes fear into the hearts of many teachers. How we move beyond this is complex, largely unknown, and largely beyond the scope of the present study. However, a more formal treatment of the issue within the various educational policies would certainly provide educators with much needed support.

Finally, as both the present study and numerous others have identified engagement as a powerful predictor of educational outcomes, it would be remiss to conclude the thesis without at least a cursory discussion of the ways in which these findings may help to inform policy in Indigenous education. Much of what needs to be said here can be condensed into one key point: it would be wise for policy makers to focus less on what occurs outside the school, and more on what occurs within it. To provide some context for such a statement, it is important to note that the core focus of educational policy in regard to engagement is not to promote engagement, but rather to manage disengagement. Furthermore, there is a distinct tendency for both formal and more informal documentation to focus on the behavioural consequences of disengagement, as opposed to disengagement itself. In essence, policy makers are concerned largely with whether or not students turn up to school, as opposed to why this may be the case. This is not a particularly helpful way of conceptualising the issue, as it leaves little scope for the development of useful solutions. Furthermore, such simplistic conceptualisations of the issue work as a means to shift responsibility away from policy makers, and onto the people for whom the policy is made. This is an issue that becomes even more pronounced in the context of Indigenous education, where we are yet to move

beyond the identification of simple demographic variables, such as parent's education levels, occupation and employment status, as a reason for disparate outcomes and patchy attendance¹⁸⁶.

Contribution to the Field

To get to this point, the thesis has crossed disciplines, theoretical traditions and to some extent philosophical paradigms – this is the nature of working in this space whilst bearing in mind the harm that quantitative methodologies have caused in the past. As a result, it would be fair to suggest that the contributions that the thesis makes to the field are as wide and varied as the approach it has taken. For example, it has aligned quantitative analysis with theory and research originating out of the Indigenous scholarship through the application of SEM. In doing so, it has called into question the efficacy of the culturalist paradigm and provided some evidence that an interpretation of Indigenous education grounded in principles of the broader principles of post-colonial theory may be more appropriate. From another perspective, it has developed a set of broad but valid and reliable instruments (in the context of the study) that can be employed as a starting point for the future measurement of aspects of CRE in education, and in many ways provided further validation of the instruments that were employed to

¹⁸⁶ It should be noted that these were drawn from the most recent 'Closing the Gap' report where the following reasons were noted as potential factors implicated in poor attendance: Parent's education levels; occupation; employment status; where students live; socio-economic status; mobility; care giver expectations towards education; family functioning; and, health problems. As should be evident from this list, no consideration is given to the role of the school. Instead, blame and responsibility for poor attendance is placed solely on parents and families.

measure Behavioural Engagement, Literacy and Numeracy. In doing so, it has also contributed to both the theoretical and research literature in regard to the contested nature of the constructs employed by the study, through the provision of empirical evidence which points to both their multidimensionality and complexity. However, there is perhaps one overarching contribution which outweighs all of the above – the thesis has brought together the competing worlds of policy and scholarship in Indigenous education. It has shown that we do not need to choose between improving educational outcomes or making the classroom more pleasant, the curriculum more palatable and education more meaningful for Indigenous Australians...

They are two sides of the same coin.

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Appendix A:

Changes in Data (sample).

The following table provides an overview of the changes which have occurred throughout one set of measures contained within Footprints in Time from waves 4 through 7. To aid in interpretation, apparent changes are marked in orange. Multiple changes to items are reflected by a darker hue. Items which have been removed, introduced, or where the data suggests a change in wording, are denoted by red text. It should be noted that by wave 7, not a single measure remains in its original form and/or order. Two measures have been removed, four have been added, the wording appears to have been changed for one, and the order in which the questions appear in the survey have changed up to three times.

Wave	Item	Order
4	Orientation for students	N/A
	Elders visit or teach	14
	Indigenous studies for all students	N/A
	Indigenous language program	16
	Teachers know Indigenous students	17
	Indigenous education workers	18
	Indigenous teachers / staff	19
	Involved with the Indigenous community	20
5	Orientation for students	N/A
	Elders visit or teach	17
	Indigenous studies for all students	N/A
	Indigenous language program	19
	Teachers know their Indigenous students	20
	Indigenous education workers	21
	Indigenous teachers / staff	22
	Involved with the Indigenous community	23
6	Orientation for students	N/A
	Elders visit or teach	182

Use cross-curriculum priority of Indigenous culture	183
Indigenous studies for all students	N/A
Indigenous language program	184
Teachers know their Indigenous students	185
Teachers develop PLP's	186
Indigenous education workers	187
Indigenous teachers / staff	188
Recognise days of significance	189
School has reconciliation action plan	190
Involved with the Indigenous community	191

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Orientation for students	N/A
Elders visit or teach	161
Use cross-curriculum priority of Indigenous culture	162
Indigenous studies for all students	N/A
Indigenous language program	163
Teachers know their Indigenous students	164
Teachers develop PLP's	165
Indigenous education workers	166
Indigenous teachers / staff	167
Recognise days of significance	168
School has reconciliation action plan	169
Involved with the Indigenous community	170
Other Activities	N/A

Appendix B:

Table of Missing Data.

Percentage of Missing Data by Variable.

Variable	Obsv	Missing	Missing %
Activities conducted in an Indigenous language	283	40	12.38
Typically do Indigenous singing/storytelling	296	27	8.36
Typically do Indigenous arts or practices	297	30	9.29
Typically do child-initiated activities	293	26	8.05
Elders visit/teach	323	0	<.001
Indigenous education workers	317	6	1.86
Indigenous teachers/staff	320	3	0.93
Involved with the Indigenous community	323	0	<.001
Finds school fun	315	8	2.48
Feels happy about going to school	311	12	3.72
Wishes they didn't have to go to school (rev coded)	314	9	2.79
Asks to stay home from school	312	11	3.41
Teacher is nice to child	316	7	2.17
Children are nice to child	313	10	3.10
Children pick on child (rev coded)	315	8	2.48
Keeps belongings organised	321	2	0.62
Shows eagerness to learn new things	320	3	0.93
Works independently	321	2	0.62

Easily adapts to changes in routine	318	5	1.55
Persists in completing tasks	319	4	1.24
Pays attention well	321	2	0.62
Contributes relevant information to classroom discussions	322	1	0.31
Understands and interprets a story or other text read to him/her	322	1	0.31
Reads words with regular vowel sounds	0	0	<.001
Reads words with irregular vowel sounds	0	0	<.001
Reads age appropriate books independently with comprehension	0	0	<.001
Reads age appropriate books fluently	0	0	<.001
Able to write sentences with more than one clause	322	1	0.31
Composes a story with a clear beginning, middle and end	323	0	<.001
Demonstrates an understanding of some of the conventions of print	323	0	<.001
Can continue a pattern using three items	321	2	0.62
Demonstrates an understanding of place value	322	1	0.31
Models, reads, writes and compares whole numbers	323	0	<.001
Counts change with two different types of coins	322	1	0.31
Surveys, collects and organises data into simple graphs	321	2	0.62
Makes reasonable estimates of quantities	323	0	<.001
Measures to the nearest whole number using common instruments	323	0	<.001
Uses a variety of strategies to solve maths problems	323	0	<.001

Appendix C

MCAR Tests (Summary)

Latent Variable	<i>OBSV.</i>	χ^2	DF	<i>p</i>
PRACTICE	299	20.30	17	0.25
PRESENCE	323	4.84	5	0.44
AFFECTIVE	316	41.81	40	0.39
BEHAVIOURAL	322	17.13	18	0.51
LITERACY	323	21.24	24	0.62
NUMERACY	323	37.81	28	0.10
Overall	323	1237.94	1178	0.11

Appendix D

Skewness and Kurtosis

Variable	Skew	<i>p</i>	Kurt	<i>p</i>
Activities conducted in an Indigenous language	2.08	<.001	6.57	<.001
Typically do Indigenous singing/storytelling	1.38	<.001	6.76	<.001
Typically do Indigenous arts or practices	1.11	<.001	6.20	<.001
Typically do child-initiated activities	0.65	<.001	2.83	0.70
Elders visit/teach	-0.20	0.19	1.80	<.001
Indigenous education workers	-0.64	<.001	1.72	<.001
Indigenous teachers / staff	-0.37	0.02	1.36	<.001
Involved with the Indigenous community	-0.23	0.14	1.65	<.001
Finds school fun	-1.65	<.001	4.05	0.01
Feels happy about going to school	-0.70	<.001	1.74	<.001
Wishes they didn't have to go to school (rev coded)	0.14	0.34	1.16	<.001
Asks to stay home from school	-0.27	0.08	1.32	<.001
Teacher is nice to child				
Children are nice to child				
Children pick on child (rev coded)				
Keeps belongings organised	-0.34	0.03	1.80	<.001
Shows eagerness to learn new things	-0.32	0.04	1.81	<.001
Works independently	-0.07	0.63	1.71	<.001

Easily adapts to changes in routine	-0.39	0.01	1.91	<.001
Persists in completing tasks	-0.16	0.28	1.76	<.001
Pays attention well	-0.19	0.21	1.80	<.001
Contributes relevant information to classroom discussions	-0.26	0.09	1.96	<.001
Understands and interprets a story or other text read to him/her	-0.24	0.12	2.02	<.001
Reads words with regular vowel sounds	-0.24	0.11	1.78	<.001
Reads words with irregular vowel sounds	0.28	0.07	1.72	<.001
Reads age appropriate books independently with comprehension	0.05	0.73	1.61	<.001
Reads age appropriate books fluently	0.19	0.21	1.61	<.001
Able to write sentences with more than one clause	0.30	0.05	1.91	<.001
Composes a story with a clear beginning, middle and end	0.30	0.05	1.91	<.001
Demonstrates an understanding of some of the conventions of print	0.26	0.09	1.89	<.001
Can continue a pattern using three items	-0.54	<.001	2.20	<.001
Demonstrates an understanding of place value	-0.09	0.57	1.76	<.001
Models, reads, writes and compares whole numbers	-0.10	0.50	1.78	<.001
Counts change with two different types of coins	0.36	0.02	2.08	<.001
Surveys, collects and organises data into simple graphs	0.05	0.73	2.08	<.001
Makes reasonable estimates of quantities	0.04	0.79	2.06	<.001
Measures to the nearest whole number using common instruments	0.44	0.01	2.35	<.001
Uses a variety of strategies to solve maths problems	0.30	0.05	2.28	<.001

Appendix E

List of Scholars

Name	Discipline
Associate Professor Clair Andersen	Indigenous Education
Professor Mike Corbett	Rural and Regional Education
Dr Kim Beasey	Equity and Multicultural Education
Professor David Kember	Retention and Engagement
Dr Damon Thomas	Literacy Education
Dr Robyn Reaburn	Mathematics Education
Associate Professor Tracey Muir	Mathematics Education

Appendix F

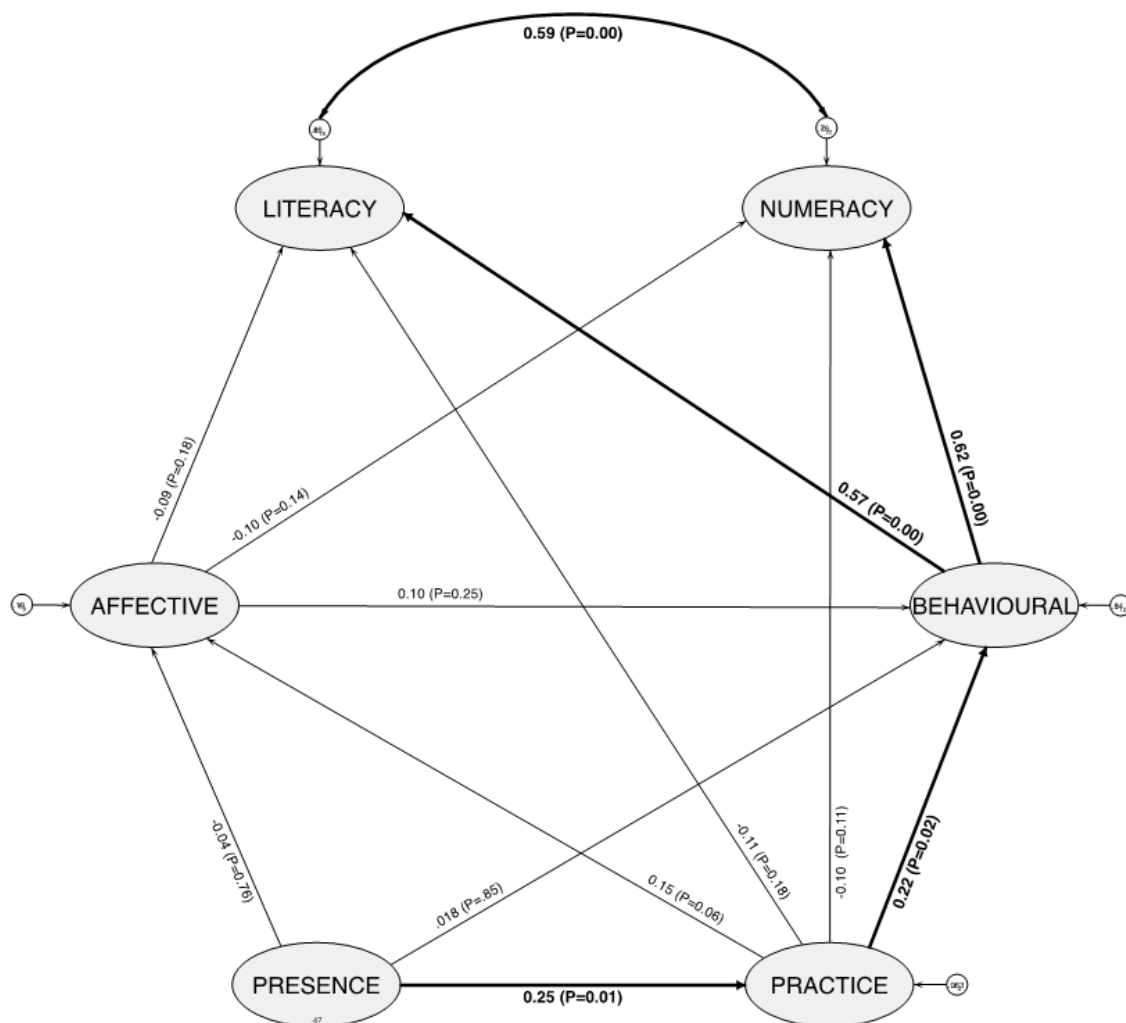
Summary statistics for full model

Summary Statistics					
Structural			Std. Coeff	Std. Err	P
PRESENCE	→	PRACTICE	0.25	0.08	<.001
	→	AFFECTIVE	-0.04	0.10	0.72
	→	BEHAVIOURAL	0.02	0.08	0.83
PRACTICE	→	AFFECTIVE	0.15	0.08	0.07
	→	BEHAVIOURAL	0.22	0.07	<.001
	→	LITERACY	-0.11	0.06	0.07
	→	NUMERACY	-0.10	0.06	0.11
AFFECTIVE	→	BEHAVIOURAL	0.10	0.08	0.18
	→	LITERACY	-0.09	0.06	0.16
	→	NUMERACY	-0.10	0.06	0.10
BEHAVIOURAL	→	LITERACY	0.57	0.05	<.001
	→	NUMERACY	0.62	0.05	<.001
AGE	→	AFFECTIVE	-0.01	0.07	0.91
	→	BEHAVIOURAL	-0.08	0.06	0.22
	→	LITERACY	0.04	0.05	0.40
	→	NUMERACY	0.03	0.05	0.55
SDQ	→	AFFECTIVE	-0.13	0.07	0.07
	→	BEHAVIOURAL	-0.26	0.06	<.001

	→	LITERACY	-0.11	0.06	0.05
	→	NUMERACY	-0.12	0.06	0.04
REMOTENESS	→	AFFECTIVE	0.21	0.07	0.01
	→	BEHAVIOURAL	-0.12	0.07	0.08
	→	LITERACY	-0.26	0.05	<.001
	→	NUMERACY	-0.16	0.05	<.001

Appendix G

Path diagram for model with bootstrapped standard errors



Fit Statistics: RMSEA = .057 (90%CI = .047 - .066, pclose = .199); CFI = .951; TLI = .940