



School culture, socioeconomic disadvantage, and academic attainment in an Australian state: A Mixed Methods Study

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MSc Comparative and International Education, 2018

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Abstract

Schools make a difference. An effective school is characterised by quality and equity. This study aims to investigate school culture and its link with academic attainment particularly with regard to socioeconomically disadvantaged students in New South Wales (NSW). The study will justify the use of mixed methods research (MMR) to investigate school culture as an element of educational effectiveness. This study analyses PISA 2015 quantitative data by completing Exploratory Factor Analysis (EFA) to define specific school culture factors of leadership, teachers, student engagement and resourcing. These factors are placed into a linear regression model to determine their link to academic attainment in mathematical, reading and scientific literacy. The qualitative database is derived from interviews with active principals to determine their perception of the link between school culture factors and academic attainment. A particular focus in these interviews is the influence of socioeconomic disadvantage on the principal's perceptions of school cultural change. It is found that leadership and student engagement have a significant link to academic attainment and that principals agree that leading with vision is vital but believe that developing teacher capacity is the strategy used to improve school culture. The results indicate that students who are from disadvantaged backgrounds do have improved academic attainment in positive school cultures and this relationship should be further investigated.

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List of Abbreviations

ACARA	Australian Curriculum and Reporting Authority
ACT	Australian Capital Territory (Australian Territory)
ATSI	Aboriginal and Torres Strait Islanders
EER	Educational Effectiveness Research
EFA	Exploratory Factor Analysis
ESCS	Economic, Social and Cultural Status index
HSC	Higher School Certificate
IEA	International Association for the Evaluation of Educational Achievement
IRT	Item Response Theory
MMR	Mixed Methods Research
N	Population size
NSW	New South Wales (Australian State)
NT	Northern Territory (Australian Territory)
OECD	Organisation of Economic Co-operation and Development
PIRLS	Progress in International Reading Literacy Study
PISA	Programme of International Student Achievement
PV	Plausible Values
QLD	Queensland (Australian State)
QUAL	Qualitative data
QUAN	Quantitative data
RQ	Research question
SA	South Australia (Australian State)
s.d.	Standard Deviation
s.e.	Standard Error
SES	Socioeconomic Status
TAS	Tasmania (Australian State)
TIMSS	Trends in Mathematics and Science Study
VIC	Victoria (Australian State)
WA	Western Australia (Australian State)

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CHAPTER 1 - Introduction

Every child should be able to benefit from an education no matter their ethnicity, gender or socioeconomic background. Excellence and equity are key features of an effective education system. The Organisation of Economic Co-operation and Development (OECD) Equity report states that

The evidence is conclusive: equity in education pays off. The highest performing education systems across OECD countries are those that combine high quality and equity. In such education systems, the vast majority of students can attain high level skills and knowledge that depend on their ability and drive, more than on their socioeconomic background. (OECD, 2012, p. 14)

In Australia, there is an educational outcome gap between those from a low socioeconomic background and those from a higher socioeconomic background. The Programme of International Students Assessment (PISA) 2015 results show that Australian students from disadvantaged backgrounds fell 92 points below their peers (OECD average shows an 88 point discrepancy) (Thomson, De Bortoli, & Underwood, 2017, p. 205). The Gonski report (Gonski et al., 2011) was commissioned by the Australian government to analyse the funding structure nationally. It included recommendations to reduce the “unacceptable link between low levels of achievement and educational disadvantage, particularly among students from low socioeconomic and Indigenous backgrounds” (p. xiii).

Research has demonstrated that students who are enrolled in a school with a high average socioeconomic background tend to outperform their counterparts enrolled at a low socioeconomic background school, regardless of the student’s level of disadvantage. This demonstrates the impact that a school, in particular school culture, can have on educational attainment (Perry & McConney, 2010). The PISA 2015 results confirmed this research with the Australian results report stating that

After the student’s family’s socioeconomic status was taken into account, the student in the disadvantaged school was four times more likely to be a low performer. This indicates that the social composition of schools has just as strong an impact on the likelihood of being a low achiever as a student’s own family background. (Thomson et al., 2017, p. 207)

Research into how Australian schools can decrease the equity gap is essential for policy-makers, practitioners and those engaged in the academic field of educational effectiveness and most importantly, for the students being served by the education system. This study will focus on the relationship between school culture and educational inequality in terms of academic outcomes. This could provide useful insight into how school culture could be used as a means to decrease

educational inequality for socioeconomically disadvantaged students in New South Wales (NSW), Australia.

This study intends to undertake a preliminary investigation of PISA 2015 questionnaire items to generate factors of school culture and to investigate the correlation of these factors with academic attainment. Combining these results with interview data, the primary goal is to explore perceptions of school principals in regard to how they understand school culture, their role in developing this culture and whether improving school culture can overcome disadvantage. Comparison of the two data sets is an integral part of this research.

1.1 RESEARCH QUESTIONS

There is a significant amount of research in the field of educational effectiveness and improvement that examines the impact of various features on educational attainment (Reynolds et al., 2014; Sammons, 1999; Townsend, 2007). School culture¹ is defined as a feature that can influence educational effectiveness (Muijs, Harris, Chapman, Stoll & Russ, 2004; Sammons, 2012; Reynolds & Teddlie, 2002). The complexity of school culture is recognised. This study will investigate particular factors of school culture that can be extracted from PISA data.

The overarching aim of this research is to investigate the links between school culture and academic attainment for socioeconomically disadvantaged students in New South Wales, Australia and explore principals' perceptions of these links. This study is framed by three separate research questions:

RQ1: What are the links between principal-reported school culture factors and academic attainment for students in NSW according to PISA 2015 data?

RQ2: a) What are principals' perceptions of the relationship between these school culture factors and academic and non-academic attainment?

b) What is the association with socioeconomic disadvantage and these perceptions?

RQ3: Is there an alignment between the PISA 2015 data and the principals' perceptions of school culture and attainment and how do these perceptions illuminate the associations found in RQ1?

¹ This study defines the particular meaning of school culture in Section 2.3.

1.2 EDUCATIONAL CONTEXT – WHY NEW SOUTH WALES?

This research is investigating data that is related to one state of Australia, New South Wales (NSW). It is essential to understand the context of the Australian education landscape and consider the appropriateness of examining NSW.

Australia’s education system is split into 8 regions that are run by the eight individual states and territories with the federal government having some jurisdiction over funding. Education is provided by government and non-government schools (made up of independent catholic schools and independent private schools). In 2017, Australia had 3,849,225 enrolled students across all institutions with 14.5% of those students in private schools, 19.9% in catholic schools and 65.6% in government schools (Australian Bureau of Statistics, 2018). This was across 9,444 institutions. The percentage of students enrolled in each type of school in each jurisdiction is presented in Table 1.

TABLE 1: School Enrolment in each Jurisdiction in Australia, 2017

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Each jurisdiction has an independent education department in charge of policy development and implementation, different compulsory schooling ages and its own school completion examinations. While there are organisations that work to co-ordinate all of the jurisdictions at the federal level, there is still a lack of consistency across regions. Thus, care must be taken when researching education on a national level because such large-scale jurisdictional studies may obscure local variations in relationships between variables due to the distinct nature of each

educational region (Bonnet, 2002). Gonski et al. (2011) supports this by stating that there are challenges when it comes to responding to equity and excellence policy concerns because “there are significant differences in the way Australian schools are organised across sectors, as well as differences in the demographics of the student bodies and the challenges faced by sectors and states” (p. xiii).

So then, why NSW? NSW is responsible for the largest proportion of enrolled students in Australia (31.4%, Table 1). This means that there is more data compared to the other jurisdictions. NSW is also representative of the equity gap seen in Australia. Figure A (Thomson et al., 2017, p. 209) shows the relationship between the strength and impact of socioeconomic background comparing international systems to Australia, in green, with the separate jurisdictions shown in red.

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The ACT, NT and TAS jurisdictions show a strong link between the strength and impact of socioeconomic background, while the link is weaker for VIC and SA. WA, NSW and QLD are close to the Australian average and thus are more representative of the issues associated with equity in Australian society. As this study is framed to investigate how school culture is related to academic attainment, particularly in disadvantaged schools, the NSW system is an appropriate context to study. It is likely that the model of this research could be applicable to other states in Australia when care is taken to analyse the data contextually.

Another reason for the choice of NSW as the focus of this study is the researcher's personal background (Section 3.5) that provides a deep contextual understanding of a complex educational

system. This is particularly helpful when it comes to interviewing members of the school jurisdiction as a common language is shared and can be used without participants feeling the need to explain contextual details.

1.3 OUTLINE OF DISSERTATION

This study is organised as follows. Chapter 2 covers the existing literature starting from the broad field of educational effectiveness and exploring school culture as a key part of this field. It discusses issues of equity and focuses on how school culture is related to educational attainment for those from socioeconomically disadvantaged backgrounds (low Economic, Social and Cultural Status index (ESCS)). Chapter 3 outlines the methodology of the research including a discussion of mixed method research (MMR) design, the quantitative and qualitative approaches and the limitations of this study. Chapter 4 presents the findings from the linear regression and principal interviews. The data is combined to understand the principals' perceptions of the link between school culture factors and academic attainment. Finally, Chapter 5 discusses the findings and places this study into the context that has been examined. It will outline the key findings of this study and suggest areas of future research.

CHAPTER 2 - Literature Review

This study examines how school culture is linked to the effectiveness of an educational system. It is essential to describe this research within the educational effectiveness field and to describe the breadth of work already completed which helps to situate school culture as an important factor of effectiveness. This chapter expands upon the term school culture and defines the use of the term for the purpose of this study. Finally, this chapter will investigate school culture and educational attainment through the lens of socioeconomic disadvantage.

2.1 EDUCATIONAL EFFECTIVENESS

Educational effectiveness research (EER) describes the research field that investigates the achievement of excellence and equity through education in many settings including pre-schools, schools and higher education contexts (Sammons, 2012). The field encompasses studies that investigate effectiveness at classroom, school, and system levels (Townsend, 2007). This study will examine secondary schools in NSW, Australia and thus will refer to the term 'school effectiveness' as a synonym for educational effectiveness. School Effectiveness is concerned with the achievement of educational goals measured by student progress towards them (Sammons, 1999). It seeks "to empower practitioners by...understanding the way school and classroom organisation and teaching behaviour can influence both student attainment and progress (*towards*) social and affective outcomes valued by society" (Sammons, 1999, p. xi). The fundamental assumption of the field is that schools *do* make a difference (Reynolds et al., 2014). The question then becomes, how can we measure the difference they make? School effectiveness research attempts to show the "appropriate ways to compare and evaluate the impact of schools on their students' achievements" (Sammons, 1999, p. 74) rather than relying on league table snapshots of immediate student achievement from national or international level assessments.

The complexity in EER arises when determining what the goals of education are within a system and how student progress towards these goals can be measured. It is generally agreed that educational goals can be split into academic and non-academic goals (Creemers & Kyriakidēs, 2010; Sammons, 1999). Much EER (Muijs et al., 2004; Santibañez & Fagioli, 2016) is based on the measurement of academic attainment focused on numeracy and/or literacy skills (Creemers & Kyriakidēs, 2011). However, there is agreement in the field that an effective educational system will increase academic attainment while at the same time increasing non-academic skills including citizenship, sociobehavioural skills, wellbeing and so on (Van Der Wal & Waslander, 2007). Research that is able to investigate both academic and non-academic effectiveness in education

would make a valuable contribution to the field (Scheerans & Bosker, 1997). When measuring student progress towards these goals there is a reliance on quantitative data in the research with value-added, longitudinal data being considered the gold standard in terms of measuring effectiveness (Muijs, 2012; Sammons, 2012). There are calls for mixed methodology to be used in the field to be able to get a deeper understanding of effectiveness (Muijs, 2012; Sammons, 2012). This study will add to the field by using mixed methodology to investigate one aspect of educational effectiveness.

Further complexity arises when determining what level of the system should be investigated to determine its effectiveness: the individual school, district, state or the national or international level. In the last decade, researchers have increasingly relied on data produced by large-scale assessments. These include the PISA from the OECD as well as Trends in Mathematics and Science Study (TIMSS) and Progress in International Reading Literacy Study (PIRLS) produced by the International Association for the Evaluation of Educational Achievement (IEA). These large-scale assessments are useful when looking at state, national or international levels of school effectiveness as they are more reliable than comparing countries by using country level assessment tasks which are context specific (Bonnet, 2002). However, care must be taken in analysing data from a single-point-of-time assessment when determining educational effectiveness. Further analysis of the benefits and limitations when using international large-scale assessments will be outlined in Section 3.6.1.

There are additional complexities that must be taken into account even if consensus is reached as to what educational goals are and how they can be validly measured. Sammons (1999) helpfully outlines some of these complexities including questioning the size and significance of the school effects, whether schools perform consistently or inconsistently on different outcomes, how stable the school effects are and what time scale is appropriate for determining effectiveness. Sammons (1999) also describes factors that must be considered when assessing educational effectiveness, such as student prior attainment.

Despite the complexity of EER, there is general recognition that a positive school culture is an essential element of an effective school (Chapman, 2012; Sammons, 2012). There is a need for studies that dissect the intricacies of this link in NSW, Australia and this study will endeavour to explore the association and perception of the association between school culture and effectiveness.

2.1.1 History of educational effectiveness research

To fully understand the underpinnings of this research it is useful to look at how the field of educational effectiveness has evolved. Reynolds et al. (2014) and Sammons (1999) briefly outline the history of the field explaining that EER developed in the early 1970's in a research environment that claimed that schools could not compensate for societal effects (Coleman et al., 1966; Jencks et al., 1972). This meant that early research aimed to demonstrate what effects, if any, schools had on their students. By the mid 1980's multilevel regression methods had been used to demonstrate that schools *do* have an effect on student outcomes when intake factors are considered (Reynolds et al., 2014). Quantitative methods became the preferred mode of analysis as they were able to clearly demonstrate the impact of factors on students. The third phase began in the mid 1990's and included reviews of how schools have differential effects (Reynolds et al., 2014). It showed the importance of the classroom effects over and above the school effects as being a useful effectiveness lever (Teddle & Stringfield, 1993).

Phase four of EER was characterised by the internationalisation of the field with comparisons widening and the realisation that a 'one-size-fits-all' approach does not take into account contextual factors (Reynolds et al., 2014). This phase emphasised the importance of longitudinal data. Additionally, school effectiveness and school improvement research began to merge, becoming one related field (Christopher Chapman, 2012). The theoretical traditions of school improvement increased the value of qualitative data (Reynolds et al., 2014). However, the absence of a theoretical underpinning has drawn some criticism that educational effectiveness was just a by-product of other more rigorous research (Reynolds et al., 2014). Researchers responded to this by suggesting multiple theoretical frameworks (Muijs et al., 2004) that could be used to ground the body of collected evidence, however there was very little consensus at this time.

By the late 2000's, educational effectiveness was seen as dynamic, based on multiple features that interacted at various levels within the organisation. This was reflected in the research where the empirical evidence became more nuanced and there was a move towards mixed method studies to both identify effective schools *and* to explain the relationship between the factors and their effects. The dynamic model of educational effectiveness was developed (Creemers & Kyriakides, 2011) which is used to structure current research.

2.1.2 Educational effectiveness research current developments

As the field of educational effectiveness has evolved and developed, researchers have clarified the fundamental, core goals of research as to determine :

“1) what makes a ‘good’ school? And

2) How do we make more ‘good’ schools?” (Reynolds et al., 2014, p.1)

The word ‘good’ refers to both quality and equity in goal attainment (Creemers & Kyriakidēs, 2011; Reynolds et al., 2014). Similarly, Stoll and Mortimore (1997) define an effective school as one in which students progress further than expected based on their input characteristics (including socioeconomic background and level of parental education). While confirming these overarching goals of the field, Sammons (2012) also concludes that effectiveness must be seen “as a dynamic, retrospective and relative concept that is time and outcome dependent and influenced by the sample and predictors and the adequacy of statistical models” (p. 24).

EER seems to have matured to a position where it is assumed that effective schools do make a difference. The challenge now is to more accurately and reliably measure these differences to be able to advise those at the ‘coal-face’. There are calls for research that implements mixed methodology (Muijs, 2012; Sammons, 2012) and uses reliable, value-added approaches as well as the use of more valid measurement devices such as Item-Response Theory (IRT) (Fox, 2004; Muijs, 2012).

Many researchers have attempted to define features of effective schools (Muijs et al., 2004; Townsend, 1997). This can be a helpful approach but it can lead to a misunderstanding of the importance of context (Sammons, 2012), both within school variation (Sammons, Thomas, & Mortimore, 1997) and by not taking into account differences in student background and external factors. Indeed, Reynolds (1995) cautioned school effectiveness researchers to “avoid peddling simplistic school effectiveness snake oil as a cure-all” (p. 19 as referenced in Sammons, 1999, p. 219). There are no easy ways out. However, when care is taken and contextual factors are accounted for, some general features of an effective school can be helpful when looking to analyse individual schools or groups of schools with similar external and cultural contexts.

General features of effective schools serving disadvantaged students were identified by Muijs et al. (2004) through a review of research. They confirm that there is no ‘quick fix’ particularly for schools in disadvantaged areas and the challenge of sustaining improvement is significant. It is clear from the literature that for disadvantaged schools “teaching and learning should be at the

heart of the school, driving its daily efforts” (Muijs et al., 2004, p. 170). They conclude that effectiveness for these schools can be characterised by the following factors:

- *Focus on teaching and learning:* using real-life contexts with an emphasis on building basic skills with high expectations and limited curriculum narrowing.
- *Democratic leadership:* leaders who are initiators (not just managers). These leaders increase the involvement of staff, students and parents in decision-making for the school building a sense of belonging and ownership of the school itself.
- *Data-led decisions:* An information rich environment where data is used to drive and evaluate decision-making.
- *Positive school culture:* that has the features of open communication, coherence, low staff turnover, high expectations and a general belief amongst staff in the effectiveness of the implemented interventions.
- *A learning community:* open to change, engaged in continuous improvement and reflective dialogue. This will be demonstrated by effective teamwork, collegiality, supportive leadership and has appropriate accountability strategies.
- *Professional development:* Built-in and continuous professional development that allows for effective mentoring relationships between experts and novices.
- *Involvement of parents/carers:* this factor is dependent on the community and how the involvement occurs. For some communities, this involvement is actually unhelpful and Muijs et al. (2004) emphasize that at this point it is particularly important to take context into consideration.
- *Access to external support services:* co-ordinated by the school to allow effective connection between those that need the services and the service providers, including disability services, medical care and other social services.
- *Resources:* including physical spaces and essential equipment, technology systems and software programs and resources for students to use such as textbooks, computers and specific subject resources.

The factors listed above are recognised to be interrelated and influenced by internal and external factors of the school community (explored in Section 2.2 using the dynamic model of educational effectiveness from Creemers and Kyriakidēs; 2011). The unique nature of an individual school and its effectiveness is now recognised by those working in the field (Kyriakidēs, 2012). The factors are general in nature. Rather than specifying particular policy or practice they give the general concept of characteristics of an effective school. Understanding the unique nature of a school and its effectiveness is informed by prominent educational psychologists including Bronfenbrenner who

developed the Ecological Systems Theory (Bronfenbrenner, 2005; Fox, 2005). This theory shows that learning takes place in a social situation that consists in various levels of interaction with the external world. This builds on the work of relativists like Sadler who believed that education is impacted by “the things outside the school...(that) govern and interpret the things inside” (Bereday, 1964, p. 310). Bronfenbrenner (1986) also states that “the best way to counteract alienation is through creation of connections or links throughout our culture...schools can build such links” (Bronfenbrenner, 1986, p. 430). An effective school is built and influenced by the community that it exists within and, in turn, the school will have influence and impact on the community. Thus, school factors, such a culture, are important when aiming to improve effectiveness.

Much of EER summarised above has been completed in a European or American context² and there is a call to increase the internationalisation of the field (Sammons, 2010). Thus, it is important to investigate the movement within the EER field in Australia. Research has followed a similar trajectory with Townsend’s (1997) research investigating perceptions of effective schools in Victoria. He found that dedicated and qualified staff were perceived to be the most influential factor in developing an effective school. Caldwell (2007) noted that the movement in the research field in Australia was towards a stage of ‘alignment’ where the aim is to achieve coherence and quality at a system-wide level rather than looking at the school level. The conclusion was that alignment of work from researchers, policy-makers and practitioners was vital for system-wide change to occur.

2.2 THE THEORETICAL FOUNDATION OF EDUCATIONAL EFFECTIVENESS

Throughout EER there have been many approaches to understanding the theoretical foundations of the field. For instance, Muijs et al. (2004) proposed that EER could come under one of three theoretical frameworks: contingency, compensatory or additivity theory. The contingency theory states that both internal and external situational factors such as socioeconomic background and the complexity of the organisation influences its effectiveness (Creemers, Scheerens, & Reynolds, 2000). The compensatory model states that schools need to compensate for a lack of resources at home before long term needs can be tackled. This links to the idea that schools need to have a safe and orderly environment with high expectations if basic needs are to be met. The additivity theory

² It is important to note that internationalization of the EER field is currently occurring. Teddlie and Reynolds (2002) *International Handbook of Educational Effectiveness* and Chapman et al. (Eds.) (2012) *School Effectiveness and Improvement Research, Policy and Practice* both include a wide range of international perspectives.

asserts that after controlling for student background factors, disadvantaged students will continue to perform worse than advantaged students. Indeed, Reynolds and Teddlie (2002) state that educational effectiveness will continue to show that schools actually reinforce educational disadvantage. Each theory has an element of truth but none fully conceptualises educational effectiveness as a whole. One model that aims to encompass the field of educational effectiveness is the dynamic model (Creemers & Kyriakidēs, 2011).

2.2.1 The dynamic model of educational effectiveness

The conceptual model of EER used in this study is the dynamic model of educational effectiveness (Creemers & Kyriakidēs, 2011). Figure B (next page) presents a visual representation of this model showing the interaction between student background effects, teacher and classroom factors and school/educational environmental policy. It aims to present education as a dynamic and complex system where the stakeholders are impacted by multiple features that also have an impact on other features.

The dynamic model is a comprehensive way to situate and understand EER because it starts from the perspective that there are multiple levels of influence on student achievement (Creemers & Kyriakidēs, 2011). This supersedes the previous theoretical frameworks suggested by Muijs et al. (2004) as it incorporates the influences from student, classroom, school and environmental factors. Each of these levels of influence impact each other and have both “direct and indirect effects on student achievement” (Creemers & Kyriakidēs, 2010, p. 264). This model describes different features that impact student outcomes such as socioeconomic status, classroom learning environment and school policies. The model also includes five dimensions that can be used to define and measure these effectiveness features: frequency, focus, stage, quality and differentiation. Frequency is the quantitative measure. Focus refers to how specific a feature is and the number of purposes it is intended for. Stage has to do with how much time is required for the feature to have an effect (direct and/or indirect). Quality refers to the properties of the feature itself. Finally, differentiation has to do with the applicability of the feature across subject areas. The final part of the Dynamic Model that links to school culture is the evaluation of school policies (Creemers & Kyriakidēs, 2010). This is based on the idea that successful organisations strive to improve and undertake evaluation that leads to changing practice and generating a vision (Hopkins, 2001).

The figure originally presented here cannot be made freely available via ORA because of copyright. The figure was sourced at Kyriakides, L., & Creemers, B. P. M. (2012). School policy on teaching and school learning environment: Direct and indirect effects upon student outcome measures. *Educational Research and Evaluation*, 18(5), 403–424. <https://doi.org/10.1080/13803611.2012.689716>

Creemers and Kyriakides (2010) confirm that while classroom level effects are linked most significantly to educational outcomes, school level effects have both direct and indirect effects on outcomes. For example, increasing the amount of instructional time in a school will directly improve student outcomes, whereas a good professional development program builds teacher capacity which will have an indirect effect on the classroom. Thus, school factors including culture can be seen as vital for improving educational outcomes.

Two areas of focus are given in this dynamic model with “school policy on teaching *and* the school learning environment” (Kyriakides & Creemers, 2012, p. 403, emphasis provided). However, it is important to realise that the word ‘policy’ here does not refer to formal processes but to both the vision and actions that flow from understanding clearly what is important in the school. It also links to the amount of support given to teaching staff to improve the classroom level effects (Kyriakides, 2012). Thus, this dynamic model confirms that school culture is an area that does influence educational effectiveness.

2.3 SCHOOL CULTURE

School culture is an important factor impacting educational effectiveness (Muijs et al., 2004; Sammons, 2012; Teddlie & Reynolds, 2002). Sammons (2012) asserts that “schools improve most by focusing on the quality of learning and teaching while also addressing their culture and internal conditions” (p. 25). She emphasises that the evidence we currently have “suggests that school effects vary and are more important for disadvantaged groups” (Sammons, 2012, p. 23).

There is significant debate between researchers about how to define school culture. Indeed, even in the recent call for conceptual clarity (Hoy, Tarter & Bliss, 1990; Schoen & Teddlie, 2008; Van Houtte & Van Maele, 2011) there are two competing domains of thought: school culture as a dimension of school climate (Van Houtte, 2005) or school culture as the overarching level with school climate existing as the ‘espoused beliefs’ of school culture (Schoen & Teddlie, 2008). While an agreed definition of school culture has not emerged, it is clear that the investigation of the impact of particular aspects of school culture on student outcomes could be a valuable addition to the research field.

For this study, the researcher will follow the Schoen and Teddlie (2008) understanding of school culture being the foundational level of the school as an organisation. Schoen and Teddlie (2008) link the anthropological model of culture (Schein, 1992) into school effectiveness research shown in Figure C.

The figure originally presented here cannot be made freely available via ORA because of copyright. The figure was sourced at Schoen, L. T., & Teddlie, C. (2008). A new model of school culture: A response to a call for conceptual clarity. *School Effectiveness and School Improvement*, 19(2), 129–153.
<https://doi.org/10.1080/09243450802095278>

From this conception, school culture can be broadly defined as being made up of “unwritten rules and traditions, norms and expectations that permeate everything” (Deal & Peterson, 1999, p. 2). These ‘norms’ are understood by students, teachers, staff, parents and leaders that make up the school community (Stolpe, 1994). A positive school culture is one where there is a shared vision,

orderly climate, high expectations, positive reinforcement and high levels of professionalism from teachers (Cleveland, Chambers, Mainus, Powell, & Skepple, 2011; Reynolds & Teddlie, 2002). It is one which “promotes high academic standards, has appropriate leadership and collegiality among staff to provide a climate that is more conducive to student success and achievement” (MacNeil, Prater, & Busch, 2009, p.75). The concept of a positive school culture involves “safety, relationships, teaching and learning, and the institutional environment” (Thapa, Cohen, Guffey, & Higgins-D’Alessandro, 2013, p. 371) which includes the physical classroom space. These descriptions of a positive school culture are by no means exhaustive. While there are broad common features of a positive school culture, each school is unique and thus terms like ‘shared vision’ need to be understood in the particular context of the school before action is taken towards changing the culture (Thapa et al., 2013).

The final part of Teddlie and Schoen’s (2008) definition of school culture is that school culture is comprised of four dimensions:

1. Professional orientation: activities and attitudes linked to level of professionalism of staff
2. Organizational structure: leadership style, communication and processes that frame day-to-day business of the school
3. Quality of the learning environment: academic nature of student activities
4. Student-centred focus: programs to support student achievement.

These four levels link directly to the general conceptions of the features of school culture (Hoy et al., 1990; Muijs et al., 2004; Reynolds & Teddlie, 2002; Thapa et al., 2013) and seem to parallel the features of the dynamic model of educational effectiveness (Creemers & Kyriakidēs, 2011). The general categories that can be used to conceptualise school culture are: leadership (Deal & Peterson, 1999; MacNeil et al., 2009; Stolpe, 1994), high academic standards (Reynolds & Teddlie, 2002; Schoen & Teddlie, 2008), positive reinforcement and student behaviour (Muijs et al., 2004; Reynolds & Teddlie, 2002), safe and orderly environment (Townsend, 1997), student participation/engagement (Schoen & Teddlie, 2008), collegiality amongst staff (Cleveland et al., 2011) and resourcing³ (Thapa et al. 2013).

PISA generates its own construct of school culture (named school climate) (OECD, 2017). The items that make up this construct are drawn from the school questionnaire and are split into student-

³ Resourcing refers to the PISA items of education materials (e.g. textbooks, IT equipment, lab material) and physical infrastructure (e.g. building, grounds, heating/cooling).

related factors affecting school climate (Table 2) and teacher-related factors affecting school climate (Table 3).

TABLE 2: Student-related factors affecting school climate



TABLE 3: Teacher-related factors affecting school climate



These PISA-defined constructs (Table 2 and 3) are useful in that they do cover some parts of student behaviour and engagement and teacher attitudes. However, they do not cover other essential school culture factors such as leadership, high academic standards and environmental features. Deeper analysis of the questionnaire data provided by PISA may allow the examination of a broader construct of school culture by including more items that relate to school culture factors.

This study investigates school leaders’⁴ perceptions of the influence of school culture on educational attainment because to their potential ability to influence and affect change in the culture (Deal & Peterson, 1999; Hoy, Tarter, & Hoy, 2006; MacNeil et al., 2009). Future research is suggested (Section 5.4) to investigate other stakeholders’ perceptions of school culture to add to a deeper understanding of this topic.

⁴ Called principals in Australia.

2.3.1 School Culture for socioeconomically disadvantaged students

Many researchers discuss the significant impact that school culture has on improving educational outcomes for students from socioeconomically disadvantaged backgrounds (Cleveland et al., 2011; Muijs et al., 2004; Scheurich, 1998). Research shows that when controlling for individual background factors, school factors can become influential (Hattie, 2018b; Hattie & Yates, 2013; Hoy et al., 2006).

The development of an effective school culture for socioeconomically disadvantaged students is hypothesised as being one potential way to improve academic outcomes (Muijs et al., 2004; OECD, 2012). It is considered to be a difficult process with sustaining improvement in disadvantaged schools being a particular challenge (Muijs et al., 2004). The OECD Equity and Excellence report (OECD, 2012) recommends that to improve educational outcomes for the socioeconomically disadvantaged, policy-makers should focus on the five factors: Improving school leadership training to allow transformational leaders to be developed, having a school culture that is supportive, safe and focused on learning, attracting and retaining high quality teachers, developing a classroom culture that has high academic expectations for all and linking schools to parents and their communities. Thus, when investigating how to improve the effectiveness for a national education system, school culture is a worthy and valuable area to investigate.

2.4 EQUITY IN AUSTRALIAN EDUCATION

Equity is of particular concern for Australian education policy-makers. The Australian education system is of high quality (PWC, 2014; Thomson et al., 2017). The concern is that in such a high-performing system, Australia's lowest performing students have lower educational attainment compared to other similar nations (Thomson et al., 2017) and there is a "significant underperformance of students from lower socioeconomic and Indigenous backgrounds" (Gonski et al., 2011, p. 34).

Equity gaps have been demonstrated regularly in both state-level and international assessments (Gonski et al., 2011). Lower levels of equity were indicated in PISA 2015 which showed that "the slope of the gradient line for Australia for scientific literacy was 44, which was significantly higher than the OECD average of 38" (Thomson et al., 2017, p. 209). That means that in Australia, the effect of SES on performance in scientific literacy was higher than the average across the participating countries of the OECD. The PISA results also showed that the difference between advantaged and disadvantaged students was 88 points on average across the OECD and 92 points in Australia. This is equivalent to three years of schooling (Thomson et al., 2017, p. 205).

In the Australian context, there is a high proportion of Aboriginal and Torres Strait Islander (ATSI) students who are socioeconomically disadvantaged (Anaya, 2010; De Bortoli & Thomson, 2010; Department of Prime Minister and Cabinet, 2017). PISA 2015 demonstrated that “half of the Indigenous students sampled were classified in the lowest socioeconomic quartile” (Thomson et al., 2017, p. 11) compared to 24% of their Non-Indigenous peers. De Bortoli and Thomson (2010) state that educational disadvantages compound over time and result in lower educational attainment with continued lower attendance rates leading to “lower levels of self-confidence and self-efficacy, which...can hinder academic achievement” (p. iii). Thus, it is essential that school effectiveness studies work to investigate factors that can positively influence socioeconomically disadvantaged students.

The general equity issue was demonstrated by the fact that, regardless of their own socioeconomic background, students enrolled in a school with a high average socioeconomic background tended to perform at a higher level than students enrolled in a school with a low average socioeconomic background (Thomson et al., 2017, p. 205). This suggests that there is a likelihood that school level factors do have an impact on equity in Australian schools. This study will be investigating the relationship between school culture factors and academic attainment as well as the principals’ perceptions of this relationship.

2.5 EDUCATIONAL ATTAINMENT

Measurement of educational attainment is complex. By definition it can be measured through academic and non-academic measures (Sammons, 1999). Academic attainment refers to cognitive outcomes that are usually associated with key learning areas like numeracy and literacy. Non-academic attainment refers to non-cognitive outcomes that are important in education like socioemotional skills, citizenship and wellbeing (Van Der Wal & Waslander, 2007). PISA investigates both academic and non-academic outcomes (Hopfenbeck & Maul, 2011). This study uses the plausible values (PV) for mathematical, scientific and reading literacy⁵ (OECD, 2018) as measures for academic attainment. The school questionnaire is used to measure school culture factors and the student questionnaire is used to obtain student background factors (Section 3.3.1).

⁵ Note the term ‘literacy’ is used by PISA to define the academic outcomes in the domains of mathematics, science and reading. The term ‘literacy’ will be used throughout to refer to mathematical, scientific and reading literacies.

2.6 SUMMARY

This literature review demonstrates that a positive school culture is *one* feature that can increase the effectiveness of a school, particularly for disadvantaged students. It is important when investigating school culture that the complexity of what creates a positive culture is kept in the analysis. Breaking the concept into broad categories (Section 2.3) helps to specify and guide this study. Finally, academic attainment is used in the quantitative part of this study utilising PISA 2015 mathematical, scientific and reading literacy scores. This study is contributing a preliminary understanding of the principals' perceptions of the link between individual school culture factors and academic attainment. The analysis will investigate the link and attempt to give reasons why this link exists using current NSW principals' perceptions.

CHAPTER 3 - Methodology

This chapter will outline the aims and research questions addressed in this study and justify the mixed methods research (MMR) design that was undertaken. It will then describe the quantitative approach including the data sources utilised and the analytical approaches of exploratory factor analysis (EFA) and linear regression. The qualitative approach will then be described looking at the data sources and the approach of semi-structured interviews and thematic coding. Finally, the chapter will outline the researcher's positioning, limitations to this research and the ethical considerations that were taken into account.

3.1 AIMS AND RESEARCH QUESTIONS

The overarching aim of this research is to investigate the links between school culture and academic attainment for socioeconomically disadvantaged students in New South Wales, Australia and explore principal perceptions of these links. This study is framed by three separate research questions:

RQ1: What are the links between principal-reported school culture factors and academic attainment for students in NSW according to PISA 2015 data?

RQ2: a) What are principals' perceptions of the relationship between these school culture factors and academic and non-academic attainment?

b) What is the association with socioeconomic disadvantage and these perceptions?

RQ3: Is there an alignment between the PISA 2015 data and the principals' perceptions of school culture and attainment and how do these perceptions illuminate the associations found in RQ1?

3.2 MIXED METHODS RESEARCH DESIGN

Mixed methods research (MMR) design can be defined as:

The type of research in which a researcher...combines elements of qualitative and quantitative research approaches (e.g., use of qualitative and quantitative viewpoints, data collection, analysis, inference techniques) for the broad purposes of breadth and depth of understanding and corroboration. (Johnson, Onwuegbuzie, & Turner, 2007, p. 123)

MMR has been developed as a pragmatic approach to research. Its proponents arguing that both quantitative (QUAN) and qualitative (QUAL) methodological approaches are "compatible and can be fruitfully used in conjunction with one another" (Teddlie & Tashakkori, 2011, p. 285). In this definition, MMR is more than just combining QUAN and QUAL data. This design selects and integrates methods that address the specific research question using the most appropriate

methodology (QUAN or QUAL) (Cohen, Manion, & Morrison, 2011; Creswell, 2014; Teddlie & Tashakkori, 2011). Creswell (2014) asserts that MMR means that there is an increased diversity of data collected producing a more complete understanding of the problem. Teddlie and Tashakkori (2011) helpfully explain that MMR emphasises the continuum of methodological approaches rather than a dichotomy between QUAL and QUAN traditions. The data collected and methods used are subsidiary to the research questions rather than being dictated to by specific epistemological or research-field beliefs.

There are multiple critiques of the MMR tradition. These include the idea that QUAN and QUAL approaches “derive from different, mutually exclusive epistemological and ontological assumptions about the nature of research and society” (Rossman & Wilson, 1985, p. 629) meaning that QUAN and QUAL methods are incompatible due to their foundational constraints. Teddlie and Tashakkori (2011) argue that philosophically allowing methodological eclecticism means that the best method is chosen for each part of the research question. Thus, the distinction between QUAN and QUAL is not necessary, it is artificial and unhelpful. Another criticism of MMR is the tendency to value QUAN above QUAL data within the research tradition (Teddlie & Tashakkori, 2011). In this study, this is not the case. Both the QUAN and QUAL databases are used to inform, confirm and support a deeper level of understanding than just one alone would be able to achieve. Logistical concerns of timing and/or resource constraints can become a factor that could decrease the feasibility of MMR studies but this concern applies to all research methodology.

3.2.1 Justification of Mixed Methods for this research

Many researchers (Kyriakidēs, 2012; Muijs, 2012; Teddlie & Sammons, 2010; Teddlie & Tashakkori, 2011) have called for the use of MMR in the educational effectiveness field due to its flexibility and reactivity where cyclical QUAL/QUAN data collection and analysis feed into each other. This makes sense when investigating schools which are a dynamic equilibrium. While there is a consistency in teaching and learning goals the people, policies and practices are being constantly renewed. MMR design fits cohesively into the educational effectiveness field and could be used to strengthen our understanding (Teddlie & Sammons, 2010).

Teddlie and Tashakkori (2009) present a rationale for using MMR design stating that research using this methodology:

- Addresses exploratory and confirmatory questions by both checking and generating theory
- Provides stronger inferences to be made and thus conclusions to be drawn
- Allows increased opportunities for divergent views to be found

All three reasons were utilised in this study with the opportunity of strengthening and deepening the conclusions drawn as well as determining both convergent and divergent views about the links between academic attainment and school culture factors. Thus, MMR design was chosen as an appropriate way forward in designing this study.

3.2.2 Overview of research design

An explanatory sequential MMR design (Creswell, 2014) was employed to determine the link between school culture factors and educational attainment and to investigate principal perceptions of this link. The QUAN data was processed before the QUAL data collection occurred. Both datasets were then integrated and analysed concurrently.

The first stage of the research was to find a data source that included cognitive and non-cognitive items that link to school culture. PISA 2015 suited this requirement (OECD, 2018). The second stage of the research was Exploratory Factor Analysis (EFA) which was conducted to extract school culture factors. EFA is appropriate because it reduces the amount of data from a large data source into variables that have a shared variance (Costello & Osborne, 2005). EFA as a method “tries to uncover complex patterns by exploring the dataset and testing predictions” (Child, 2006). It is a useful method when there are “a-priori conceptual beliefs about the number of underlying dimensions” (Green & Salkind, 2012, p. 315). Investigation of the PISA 2015 questionnaires led to the choice of using school questionnaire data items that linked to school culture theory. The researcher categorised items into the broad culture themes of leadership, high academic standards, positive reinforcement or general behavioural characteristics, orderly and safe environment, student participation and engagement, collegiality amongst staff and resources (discussed in Section 2.3). The descriptive information for the NSW data was investigated to ensure the appropriateness for inclusion in the EFA. Once appropriate items were determined, EFA factor loadings led to four school culture factors being extracted.

The third stage was to complete a linear regression with the PV's of literacy attainment from PISA 2015 being the dependent variable and the extracted school culture factors and student background factors set as the independent variables. This allowed the relationship between the school culture factors and academic attainment to be analysed. Student background factors including PISA's measure for socioeconomic disadvantage (ESCS), gender, language spoken at home and country of birth were selected for Model 1 of the regression based on a breadth of research that shows that these factors are significant to educational outcomes (Bradley & Corwyn, 2002; Fraillon, Ainley, Schulz, Friedman, & Gebhardt, 2014). Model 2 includes the school culture

factors from the EFA to determine their contribution to each type of literacy (justified in Section 2.3).

Stage four was to conduct semi-structured interviews of principals to determine their perceptions about the link between culture and educational attainment. A semi-structured interview is when

...the interviewer has a series of questions that are in the general form of an interview guide but is able to vary the sequence of the questions... the interviewer usually has some latitude to ask further questions in response to what are seen as significant replies. (Bryman, 2016, p. 201)

Semi-structured interviews were chosen for the QUAL methodology because the researcher wanted to ask some specific conceptual questions that were developed from the QUAN data collection but required the interviewees to have the freedom to explain their own perceptions and not feel constrained by the interview guide. Follow up questions to determine further meaning were used to get deeper data that could then be analysed to provide richer information (Cohen, Manion, & Morrison, 2011). The intention was to understand individual principal perceptions of the broader school culture themes, particularly in regard to disadvantaged students and to compare this to what is seen in PISA.

The final stage of research was to combine and integrate the QUAN and QUAL databases to allow effective analysis of the links between school culture factors and educational attainment. Integration allows a comparison between the QUAL and QUAN databases as well as an exploration of how principals perceive the impact of socioeconomic disadvantage on these links.

3.3 QUANTITATIVE APPROACH

The following sections outline the quantitative data source and the analytical approaches of exploratory factor analysis and linear regression that was undertaken.

3.3.1 Secondary data

The data used in this study was drawn from the 2015 PISA test that was administered by the OECD (Bernbaum & Schuh Moore, 2013). Preliminary analysis of the academic results and the school level questionnaire data was conducted for NSW data. The data are collected from students aged between 15 years and 3 months and 16 years and 2 months old (Thomson et al., 2017, p. 7). In this cycle of PISA, scientific literacy was the major domain with mathematical and reading literacy as the minor domains (Thomson et al., 2017). PISA data was chosen because it includes both cognitive and non-cognitive items and the questionnaire for the school had items that linked directly to school culture factors. While the PISA data source is rich, it is limited (discussed in Section 3.6.1)

and its comparison with the interview dataset provides a useful preliminary understanding of the links between school culture factors and academic attainment. Significant care must be taken to ensure that the generalisability of this study is not overstated.

The data used include items from the PISA 2015 student questionnaire and cognitive questionnaire (completed by individual students from the surveyed schools) and items from the PISA 2015 school questionnaire (completed by the principal) (OECD, 2018). EFA requires a common set of respondents to ensure that correlations can be determined (Beavers et al., 2013), thus the defined school culture factors needed to come from either the student, teacher *or* school questionnaire. All items in the questionnaires were investigated for appropriateness in relation to the broad concept of school culture (Section 2.3). Only the school level questionnaire was used for input into the EFA because it had more items related to school culture factors. Also, principal perceptions of school culture are of particular interest as research shows that the principal could be instrumental in developing, maintaining and promoting the school culture (Deal & Peterson, 1999; Robinson, 2007). The final reason for using school level data was the time and resource constraints on this study. Separate analysis of the information from the teacher level and the information from the student level would be beneficial as an area for further research (Section 5.4).

3.3.2 Data selection process

Student background factors are known to influence educational attainment (Bradley & Corwyn, 2002; Fraillon et al., 2014) and must be controlled for to ensure that the relationship between school culture factors and academic attainment can be evaluated. The student questionnaire was used to define student background. The factors chosen were the Economic, Social and Cultural Status index (ESCS), gender, language spoken at home, and student country of birth. The ESCS covers parental education levels which is also known to be an important factor in educational outcomes of students (Bradley & Corwyn, 2002). The student country of birth was used to represent the immigrant status of students and language spoken at home was used to try to account for language background other than English (Bradley & Corwyn, 2002).

School culture factors were defined by the literature under seven broad categories (Section 2.3): leadership, high academic standards, positive reinforcement/general behavioural characteristics, orderly and safe environment, collegiality amongst staff, student participation and engagement and resources. The descriptive data from the school level questionnaire was examined at the NSW level to determine if it had a high enough N statistic ($N > 150 = 85\%$ of sample), showed a normal distribution (looking at the kurtosis and skew values) including a reasonable variance (Field, 2018).

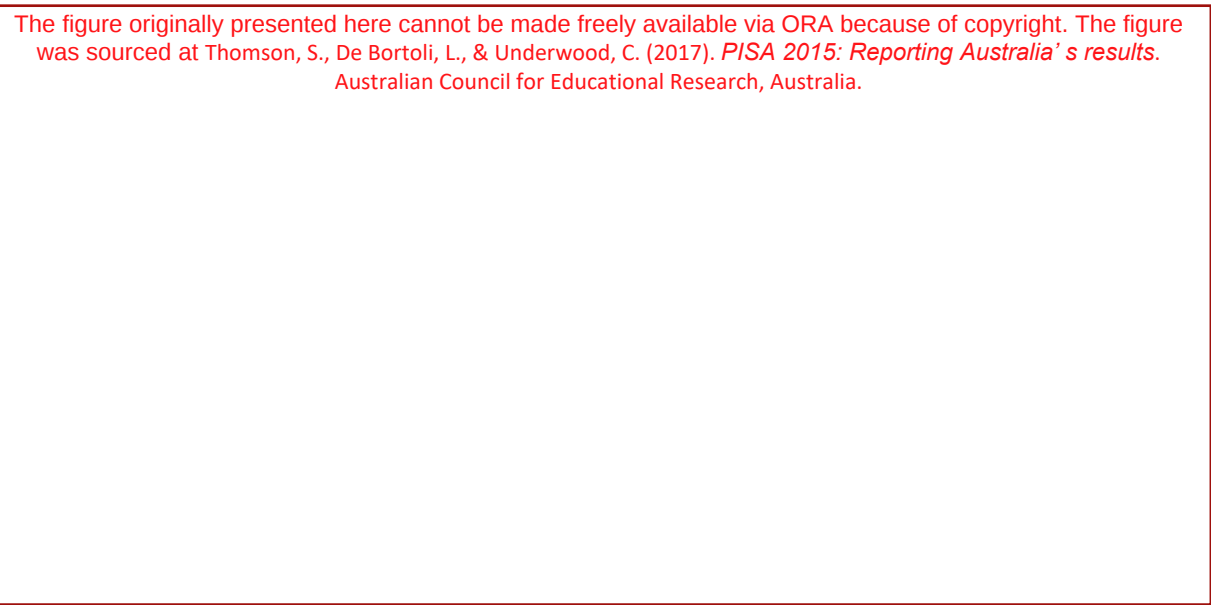
If these conditions were not met then the items were excluded. Full descriptive information of each item is given in Appendix 1.

EFA was then conducted on the items. All eight items from the PISA construct of school climate (Section 2.3) were investigated in the EFA with 6 being used in the final analysis. Two of the items that were used in the PISA construct were removed from the final factor analysis (reasoned in Section 3.3.5.1).

3.3.3 Sample sizes

758 Australian schools participated in PISA 2015 (Thomson et al., 2017, p. xix). Table 4 shows the number of schools that were surveyed by PISA 2015 for each jurisdiction in Australia. The sample of the NSW school level data was 177. The total number of Australian students sampled was 14,530 with 3,373 students from NSW (Weighted N’s Australia 256,330 and NSW 80,200) (Thomson et al., 2017, p. xx). This study uses the NSW student sample.

TABLE 4: Australian sampling of schools in PISA 2015



3.3.4 Operational definition of variables

TABLE 5: Operational Definition of Variables

VARIABLE NAME	DEFINITION
<i>STUDENT BACKGROUND FACTORS</i>	
Economic, Social and Cultural Status index (ESCS)	OECD measure of socioeconomic status. It is based on three indices: highest occupational status of parents (HISEI); highest educational level of parents in years of education (PARED); and home possessions (HOMEPOS). The home possessions index is based on family wealth, cultural resources and access to educational and cultural resources and books in the home. NSW ESCS range: -4.0631 to 2.6552.
Gender of student	Standardized gender 1 = female, 2 = male
Language spoken at home	Measure of language background other than English (LBOTE) 1 = English 2= non-English
Country of Birth	Measure of immigration status of student 1= Australia 2 = not Australia
<i>EDUCATIONAL ATTAINMENT</i>	
MATHEMATICAL LITERACY	Plausible values of mathematical literacy (PV1MATH – PV10MATH)
READING LITERACY	Plausible values of reading literacy (PV1READ – PV10READ)
SCIENTIFIC LITERACY	Plausible values of scientific literacy (PV1SCIE – PV10SCIE)
<i>SCHOOL CULTURE MEASURES</i>	
TEACHER FACTOR	Combination of 5 items that describe the impact of teacher commitment to teaching and learning and classroom effects. Items include: Inadequate or poorly qualified teaching staff, Teachers not meeting individual students' needs, Teacher absenteeism, Staff resisting change, Teachers being too strict with students, Teachers not being well prepared for class
LEADERSHIP FACTOR	Combination of 4 items that describe how a leader sets vision and works with their staff: Items include frequency that leaders: Use student performance results to develop the school's educational goals, Ensure that teachers work according to the school's educational goals, Provide staff with opportunities to participate in school decision-making, Discuss the school's academic goals with teachers at faculty meetings
STUDENT ENGAGEMENT FACTOR	Combination of 3 items that describe how students are engaged with the learning process. Items include extent to which student learning is hindered by: Student truancy, students skipping class and students lacking respect for teachers.
RESOURCES FACTOR	Combination of 4 items that described whether school instruction was hindered by lack of OR poor quality: Educational material (e.g. Textbooks, IT equipment, library of lab equipment) and Physical infrastructure (e.g. building, grounds, heating/cooling).

3.3.5 Quantitative methods

3.3.5.1 Exploratory Factor Analysis

EFA was deemed appropriate for determining the school culture factors from the school level data (Section 3.2.2, Child, 2006; Green & Salkind, 2012). Initially, the factorability of 20 items from the PISA 2015 school survey was examined. Multiple loading tables were analysed after rotation, all items were checked for suitability including meeting the following criteria as set out by Costello and Osbourne (2005): the items must load to at least one factor at or above a level of 0.3, the items must not cross-load (that is have 0.30 or more on two or more factors) and each factor must have a minimum of 3 items. Two items were removed due to their cross-loading between factors 1: Teacher factor and 3: Student Engagement factor. A final item 'Teaching staff in your school has attended a programme of professional development? All teaching staff' was removed due to lack of correlation above 0.3 to any factor (Costello & Osbourne, 2005). During analysis it was shown that 19 of the 20 items showed correlation with at least one factor above 0.3 (Table 6, Section 3.3.5.2), suggesting reasonable correlation (Costello & Osbourne, 2005). The EFA was completed with 19 items and then with 17 items (due to two cross-loading items) and the rotations were compared. The rotation that demonstrated the best fit to the data, as set out above, was chosen (Table 6, Section 3.3.5.2).

The final factor analysis used the maximum likelihood method (Tabachnick & Fidell, 2007) with an orthogonal (varimax) rotation as it was assumed that the factors were uncorrelated (Beavers et al., 2013). The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy of the final 17 items used in the EFA was 0.781 which was in the "middling" range (between 0.70 and 0.79) (Beavers et al., 2013). Additionally, the Bartlett's Test of Sphericity was significant ($\chi^2_{(136)} = 1,288.838, p < 0.001$) indicating that the data is factorable (Beavers et al., 2013). The communalities of the items showed 16 of the 17 items above 0.3 with the 17th item having a communality of 0.299 (Appendix 2). This suggests that the items do have some level of correlation (Yong & Pearce, 2013). Given these overall measures, the final factor analysis with 17 items was deemed suitable for the data analysed. Note that one of the items that cross-loaded was kept in the EFA. The item 'Extent to which student learning is hindered by: Students lacking respect for teachers' correlated with factor 1 (0.320) and factor 3 (0.564). As there was a difference above 0.2 and it correlated above 0.5 with factor 3 it was included in the analysis for factor 3 (Costello & Osbourne, 2005).

3.3.5.2 Exploratory Factor Analysis findings

The final EFA used 142 principal records (80.2% of sample) and 17 items with results given in Table 6. All correlations are given with those above 0.3 in bold (Costello & Osborne, 2005). The items have been organised into the blocks of factors that were extracted. The four school culture factors extracted were labelled for clarity as shown:

- FACTOR 1 - Teacher: items linked to staff behaviour both in the classroom, levels of absenteeism and how they deal with change
- FACTOR 2 - Leadership: items linked to personal statements from the principal's point of view particularly looking at goal setting
- FACTOR 3 - Student Engagement: items look at student behaviour in relationship to attendance and respect for teachers which is related to engagement with school
- FACTOR 4 - Resources: items linked to education or infrastructure resource requirements

TABLE 6: Rotated Factor Matrix

QUESTION	FACTOR			
	TEACH	RES	STU	LEAD
School instruction hindered by: Inadequate or poorly qualified teaching staff.	0.330	0.124	0.232	0.091
Extent to which student learning is hindered by: Teachers not meeting individual students' needs	0.581	0.146	0.272	0.152
Extent to which student learning is hindered by: Teacher absenteeism	0.625	0.216	0.230	0.124
Extent to which student learning is hindered by: Staff resisting change	0.702	0.138	0.047	0.045
Extent to which student learning is hindered by: Teachers being too strict with students	0.662	0.130	0.093	-0.108
Extent to which student learning is hindered by: Teachers not being well prepared for classes	0.733	0.130	0.160	0.017
Frequency of <the last academic year>. I use student performance results to develop the school's educational goal	0.089	0.054	-0.012	0.680
Frequency of <the last academic year>. I ensure that teachers work according to the school's educational goals.	-0.024	0.022	0.081	0.801
Frequency of <the last academic year>. I provide staff with opportunities to participate in school decision-making	0.079	-0.051	-0.097	0.530
Frequency of <the last academic year>. I discuss the school's academic goals with teachers at faculty meetings.	0.000	-0.038	0.018	0.685
Extent to which student learning is hindered by: Student truancy	0.207	0.171	0.894	-0.107
Extent to which student learning is hindered by: Students skipping classes	0.270	0.257	0.797	-0.044
Extent to which student learning is hindered by: Students lacking respect for teachers	0.320	0.293	0.564	0.053
School instruction hindered by: Lack of educational material (e.g. textbooks, IT equipment, library or lab material).	0.136	0.923	0.181	-0.045
School instruction hindered by: Lack of physical infrastructure (building, grounds, heating\cooling, lighting).	0.250	0.563	0.165	0.009
School instruction hindered by: Inadequate or poor quality educational material (e.g. textbooks, IT equipment).	0.128	0.930	0.172	-0.026
School instruction hindered by: Inadequate\poor quality physical infrastructure (building, grounds, heating\cooling).	0.226	0.565	0.136	0.011

3.3.5.3 Linear regression

A regression model shows that the outcome or dependent variable (e.g. scientific literacy) can be predicted from a model that includes the predictor variables (e.g. leadership or gender) and some error associated with that prediction (A. Field, 2013). When there are multiple predictor variables, the linear model takes the form of Figure D:

The figure originally presented here cannot be made freely available via ORA because of copyright. The figure was sourced at Field, A. (2013). Introducing the Linear Model What is Correlational Research ? The linear model with several predictors. [PDF document] Retrieved from <https://www.discoveringstatistics.com/repository/linearmodels.pdf>

FIGURE D: The general equation for the linear regression model with two predictor variables (Source: Field, 2013, p. 2)

It is known that student background characteristics influence academic outcomes (Bradley & Corwyn, 2002). Theobald and Freeman (2014) showed that linear regressions allow researchers to control for such characteristics and enables researchers to observe the impact of other factors. For this study, the ability to control for various student background factors is essential. These factors are put into the regression and presented as Model 1 for each literacy. Model 2 includes the school culture factors and it enables the determination of how much of the variance can be explained by the school culture factors alone. The coefficients that are produced by the regression model show weak, moderate or strong correlation. The significance shows whether or not the coefficient is likely to be attributable to chance.

Care must be taken when analysing and using the results from a linear regression. Linear regression is not used to explain causality but instead is limited to looking at associations (Gelman & Hill, 2006). Thus, inferences drawn should ensure that there are no statements of explanation. When using multiple variables in a regression model it is important to understand that the “interpretation for any given coefficient is, in part, contingent on the other variables in the model” (Gelman & Hill, 2006, p. 32). Thus, it is important to ensure that any interpretation of the regression takes into account conceptual links between variables and keeps in mind the limitations, especially the impact of any unobserved variables on the dependent variable.

The academic attainment results used in this study are given as plausible values (PV) in PISA 2015. The PISA test uses a rotated test format using IRT (Section 3.3.1) (OECD, 2017). This means that each individual student does not answer every cognitive item. Instead, they answer a sample of items and plausible scores for the items that they do not receive are imputed as though they were a missing value. This means that each student will have plausible scores for every item even though they only answered a small percentage of questions (Berezner & Adams, 2017). These rotated test forms may, for example, only include science and mathematics and no reading items however each student will have imputed data for all three areas of literacy. For each literacy area, there are 10 PVs. These values are not intended to be used for 'individual' scores. Therefore, averaging the PV for mathematical literacy for a student is incorrect as it will severely underestimate the group level variability (von Davier, Gonzalez, & Mislevy, 2009). Thus, when performing statistical analysis with PV's the population statistics should be estimated using each PV separately (e.g. PV1MATH, PV2MATH etc.) and then averages from these results can be found (von Davier, Gonzalez & Mislevy, 2009). In this study, the computer program IEA IDB Analyzer⁶ (IEA, 2013) was used to complete this process. This program was developed to be able to process PVs. It completes the analysis of the PVs and then produces an SPSS output of the results to be analysed. Thus, errors in variance and standard errors are reported correctly (IEA, 2013).

The other statistical approach that could be conducted in this study is a multilevel regression model. This accounts for the fact that groups within schools will have contextual variables in common (Gelman & Hill, 2006). This model allows you to group variables at the individual level *and* at the group level accounting for these clustering effects. Compared to single-level regressions, the standard error will decrease making the explanatory power stronger (Snijders & Bosker, 2012). It is likely that this regression would yield less biased standard errors than the linear regression model. The time-bound nature of this MMR and the limited resources available for this study led to the pragmatic decision to do a single-level regression model rather than the multilevel regression. The single-level regression is able to give a preliminary understanding of the links between school culture factors and attainment. However, the results must be interpreted with caution because clustering effects are not specifically accounted for. An area for future research would be to complete multilevel regression models to account for clustering and facilitate partitioning of variance between pupil, classroom and school levels (Section 5.4).

⁶ IDB Analyzer downloaded from <https://www.iea.nl/data> (retrieved 11th June 2018).

3.4 QUALITATIVE APPROACH

3.4.1 Sampling

Convenience sampling was employed in a fixed and a-priori manner (Bryman, 2016). The research questions meant that active principals in NSW were the most suitable. The principals must have 10+ years' experience at the executive level (as head teachers, deputy principals or principals) though time as principal was not specified. The researcher's own network was used to identify cases that were appropriate and the complete sample was drawn from this group. Baker and Edwards (2012) explain that when individual experiences are being investigated, fewer in depth interviews are appropriate. Timing constraints also meant that further sampling was not undertaken.

3.4.2 Participants

Three semi-structured interviews were held with principals in government schools in NSW. All identifying nouns were changed to pseudonyms to ensure confidentiality. The principals interviewed had the following characteristics:

TABLE 7: Interview participant information

	NAME	CURRENT POSITION	TIME AS PRINCIPAL	TIME IN EXECUTIVE
1	Greta	Principal, Cherwell River College NSW	3 years	14 years
2	Rodney	Principal, New Inn High School, NSW	2.5 years	18.5 years
3	Stephanie	Principal, Folly Bridge High School, NSW	18 years	32 years

Further information about participants is given in Appendix 4.

3.4.3 Qualitative methods

The interviews followed the interview guide (Appendix 3) that was developed with four main sections of questions: introductory questions; principals' perceptions of school culture and educational attainment; the role of the principal in changing school culture and a final section regarding equity and school culture. This interview was developed and piloted with one NSW resident who is aware of the NSW education system but not working within it. Interviews were expected to take 30 – 45 minutes. The average interview time was 33 minutes. All interviews were audio recorded and fully transcribed.

Analysis of the interview data collected followed the Miles and Huberman (1994) framework as it is widely seen as a foundational guide to qualitative analysis and is suggested as an appropriate method for interviews (Punch, 2009; Punch & Oancea, 2014). Full transcription was deemed necessary as the data was thematically coded to determine patterns. The transcripts of each interview were carefully read with 'marginal remarks' made. The coding process began by using codes that were set up using concepts suggested by the literature review and the QUAN analysis. This was seen as good practice as it helped to focus the interview analysis and give structure to the first round of coding (Miles & Huberman, 1994). The second level of interpretive coding was completed with general descriptive coding keys being added which helped to refine the understanding of the seminal ideas (Newby, 2014). Finally a third round of coding took place to specify patterns or themes (Bryman, 2016; Miles & Huberman, 1994). At this phase, abstraction of the ideas presented by the interviewees was the goal and this was led by the clusters of second level codes in the data (Punch, 2009). Finally, this data was used to explain the links between particular school culture factors and educational attainment and give a foundational understanding of the principal's experience and perception of their role in this relationship.

3.5 RESEARCHER POSITIONING

The researcher worked as a secondary school teacher in NSW for 8.5 years. This both informs the study and is a source of potential bias particularly when investigating the factors that are used in the EFA (Costello & Osborne, 2005). This experience means that the context of NSW schooling was very well understood. The researcher has an extensive personal network of teachers and principals working in the area which benefitted the study, particularly regarding access to interviewees. However, potential negatives include bias when conducting and analysing interviews due to the personal relationship with the interviewees and having a clear hypothesis based on experience that may generate 'blind-spots' when developing methodology (Chenail, 2011). Steps to minimize the impact of bias were undertaken by completing the QUAN analysis before setting up the QUAL interview guide. Thus, the interviews were guided by the data. Questions were designed to be open-ended and focused on individual perceptions. The use of EFA helped to challenge bias as the correlation between items was investigated. This meant that some items that the researcher thought would be highly correlated did not show in the EFA. However, there is some researcher judgement required particularly in determining what the factors 'mean' (Beavers et al., 2013) which is acknowledged in this study (Section 3.6.2).

3.6 LIMITATIONS

The limitations of this study include limitations from the PISA data itself both from the structure and questions of the test and the statistical limitations, the limitations of the quantitative approach and the limitations caused by timing constraints.

3.6.1 PISA data

PISA data analysis has both benefits and limitations (Rutkowski, Gonzalez, Joncas, & von Davier, 2010; Torney-Purta & Amadeo, 2013). This section will describe the impact of the significant limitations that are relevant to this study.

The first limitation is that PISA is given at a single time point and cannot quantify longitudinal effects for individual students/schools. The benefits of a longitudinal study of school culture effects on academic attainment are numerous. Kyriakidēs (2012) explains that “it is expected that the factors need to take place over a long period of time to ensure that they have a continuous direct or indirect effect on student learning” (p. 51). Thus, longitudinal data is likely to be able to make tentative causal claims (Kyriakidēs, 2012) that PISA cannot. Further, measuring effectiveness of schooling would ideally look at the value-added to the individual by school effects (Sammons, 2012). In this study, an attempt was made to account for this by controlling for student background factors such as ESCS. However, there are still some unaccounted-for variables that would be able to be ‘controlled for’ in a value-added longitudinal study. Thus, the PISA 2015 database gives useful data but does not show longitudinal effects.

The use of individual items in this analysis also has limitations. The combination of items to generate a ‘factor’ is often viewed as ‘operationalizing’ a concept (Caro et al., 2014) which is then used in the regression analysis. This misses out on the importance of ‘why?’ such relationships exist and can oversimplify the complexity of such links (Caro et al., 2014). This is one reason why MMR was chosen so that complexity was retained by using conceptual understanding of school culture. Additionally, some individual items used in this study are more appropriately measured on a continuous scale rather than a nominal scale. This causes a forced-choice error where survey participants are forced to choose the ‘best’ option that may not fully represent complexity (Bryman, 2016). Items utilised that may suffer from this include the language background other than English that are given as a nominal choice and may miss some of the nuances. Students may speak both English and another language at home and are forced to say English or not English. Similarly, principals asked to state the effects of a certain teacher behaviour (such as staff resisting

change) on student learning may reply on the basis of the average of teacher behaviour or by reflecting on the extreme examples of teachers in their schools. These 'item difficulties' are recognised as being a limitation in this study with care taken at each level to investigate any statistical bias and to assess the impact of such limitations.

Many items from PISA are scaled using item response theory (IRT). This allows comparisons between different groups on the same scale regardless of sample distribution. It also means that the cognitive achievement data is imputed so that it can be used to make predictions on a group scale (Fox, 2004). IRT assumes that the items are unidimensional and have local independence (Kline, 2000). Studies that investigate particular concerns such as multi-dimensionality of science items requiring high level language (El Masri, Baird, & Graesser, 2016; Hopfenbeck & Maul, 2011)) and bias of items across country or language groups (Ercikan & Koh, 2005) show the potential issues when using PISA data to generate sweeping generalisations.

The PISA data itself has limitations. For instance, cultural bias impacts the reliability of the data (Nardi, 2008). This can have a positive or negative effect on student outcomes. For students in Australia who sit the test in English, there are items that are significantly more complex or simple than those in different languages (El Masri et al., 2016). The cultural context of each student would influence how they understand the item and how best to respond to it, thus influencing their academic results (Bonnet, 2002). This could be relevant in student self-reporting background questionnaire where there is a lack of evidence about how students interpret these questions. Caro, Sandoval-Hernandez and Ludtke (2014) conclude that even when looking at a single country, the constructs derived from questionnaires, particularly the sociological ones, were not reflected in the model set up in the study across all schools. Gorur and Wu (2015) comment that when a subject is in the minor domain of PISA it will have fewer test items thus increasing the influence of each individual item on the overall values given for those domains which could influence the reliability of the overall literacy scores. Finally, student motivation levels also impact the reliability of the final results (Gorur & Wu, 2015). These limitations with the PISA data must be taken into account when using it to make conclusions. Using MMR and interviews to understand the relationships seen in the PISA data is one way of constraining the potential limitations (Teddle & Tashakkori, 2009).

3.6.2 EFA and single-level regression

The EFA output is limited by the data that it is reducing (Costello & Osborne, 2005). If this same method were to take place with a different dataset, the 'factors' produced would vary. Having said this, the purpose of this study was not to contribute to the definition of the school culture factors. Rather, the literature about the constituent parts of school culture and the concepts of the field were used to select items that were used in the EFA. In this way, it is essential to understand that the school culture factors in this study are constrained by the items from PISA 2015 which will limit the generalisability of results. However, if care is taken to understand the underlying items for each concept, then analysis and interpretation of the EFA and regression results will help to inform an understanding of the relationship between school culture factors and attainment. Additionally, patterns or unexpected results from the EFA and regression can then be illuminated by the principals in-depth interview responses.

The use of the single-level regression model is acknowledged to be a limitation to this study. Students are grouped in classes in each school under each individual principal. This grouping means that students in a school or class are likely to be more similar to each other than students in a different context. Thus the assumption of independence of data points is not met (Muijs, 2012). While timing and resource constraints meant that the more complex multilevel regression could not be included in this research, the single-level model that was used yields a preliminary understanding of the significant school culture factors that may link to academic attainment. This points to possible fruitful areas of research utilizing multilevel regression in this space (Section 5.4).

3.7 ETHICAL CONSIDERATIONS

The interview participants were employed by the Department of Education and Training, thus the requirements of both the University of Oxford Central University Research Ethics Committee (CUREC) and the NSW State Education Research Applications Process (SERAP) were satisfied to ensure that the British Educational Research Association guidelines (BERA, 2011) were followed. CUREC approval was received on Friday 2nd February 2018 (Appendix 5) and SERAP approval was received on Wednesday 20th June 2018 (Appendix 6).

The interviews were transcribed and identifying nouns were changed for pseudonyms to ensure confidentiality. All participants agreed to be audio recorded and understood that the data and transcriptions were going to be stored on an encrypted USB (Appendix 7a. and 7b.). Finally,

participants were made aware that they could skip questions or withdraw consent (during or after the interview) with no repercussions. This information was disclosed before the interviews began to ensure that participants understood their rights before and during the interviews.

CHAPTER 4 – Findings

This chapter describes the overall findings from the quantitative analysis by presenting the regression results for mathematical, reading and scientific literacies. It will then outline the general themes presented in the qualitative analysis. Finally, evidence from both datasets will be integrated to investigate each of the school culture factors individually to give an expanded picture of the principal perceptions of the links between specific school culture factors and attainment.

4.1 QUANTITATIVE FINDINGS

4.1.1 Descriptive information for regression items

Descriptive information of continuous variables (both student background and school culture factors) including range, mean and standard deviation is given in Table 8:

TABLE 8: Descriptive Information for regression continuous independent variables (from SPSS-24)

	N	Range	Min.	Max.	Mean	Mean (s.e.)	Std. Dev.
ESCS	3276	6.7183	-4.0631	2.6552	0.2234	0.0141	0.8065
Leadership with vision	2780	4.8142	-3.3025	1.5117	-0.0104	0.0186	0.9785
Teacher	2780	4.6697	-2.4703	2.1994	-0.0377	0.0166	0.8758
Student Engagement	2780	4.2896	-2.5870	1.7026	-0.0584	0.0186	0.9813
Resourcing	2780	3.7013	-1.6950	2.0063	-0.0146	0.0169	0.8932
Valid (N)	2650						

Descriptive information of nominal variables (student background factors) including frequency, mean and standard deviation is given in Table 9:

TABLE 9: Descriptive Information for regression nominal independent variables

	N	Coding	Frequency	Mean	Mean (s.e.)	Std. Dev.
Gender	3373	1= Female	1686	1.5000	0.0090	0.5000
		2= Male	1687			
Language at Home	3297	1= English	2895	1.1200	0.0060	0.3270
		2= non English	402			
Country of Birth	3248	1= Australia	2877	1.1100	0.0060	0.3180
		2= not Australia	371			
Valid (N)	3248					

Descriptive information of dependent variables (plausible values of mathematical, scientific and reading literacies) including variation, mean and standard deviation is given in Table 10. Note here that the standard errors are calculated based on group level statistics due to the PVs rather than the individual level to ensure standard error estimates for the PV are accurate and unbiased (von Davier, Gonzalez, & Mislevy, 2009).

TABLE 10: Descriptive information for regression dependent variables (from IEA-IDB Analyzer output)

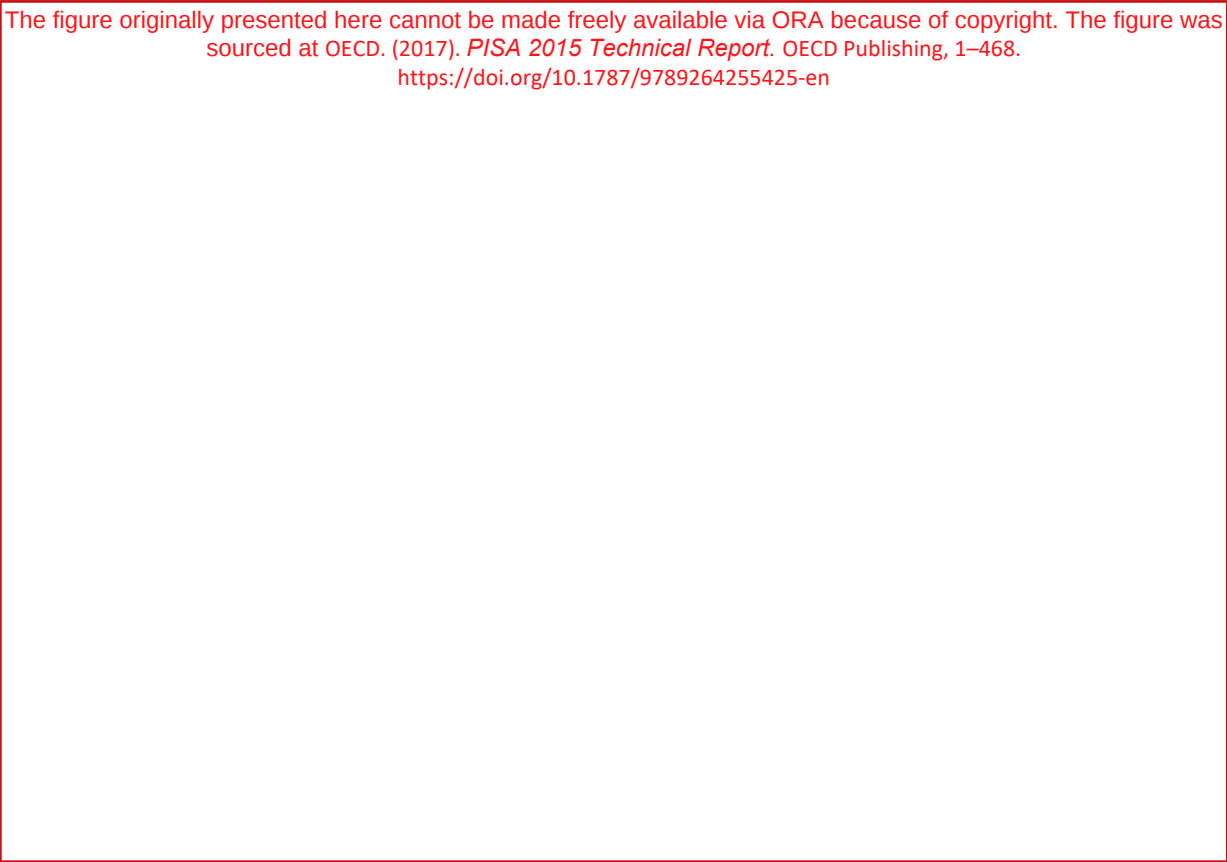
	N	Mean	Mean (s.e.)	Std. Dev.
Mathematical Literacy Attainment (PVMATH)	2650	497.54	3.75	97.78
Reading Literacy Attainment (PVREAD)	2650	505.95	3.87	108.60
Scientific Literacy Attainment (PVSCIE)	2650	511.86	3.79	107.33
Valid (N)	2650			

4.1.2 Mathematical literacy regression results

For each literacy, two single-level regression models are set up. Model 1 contains only student background factors and Model 2 contains these background factors as well as the school culture factors extracted using EFA. Results from each model show the variance explained by the particular block of predictors entered into the model (via R^2 value) and the extent to which the literacy can be predicted by each independent variable.

The regressions were run to determine how well these factors predicted students' mathematical literacy results (dependent variable, measured using PV1MATH – PV10MATH). The two models are compared to analyse the explanatory power of the school culture effects when controlling for student background factors. This is shown as the change in R squared (ΔR^2). Table 11 presents the results of the two regression models to show the association between student background factors and school culture factors to the mathematical literacy attainment of NSW students.

TABLE 11: Student background & school culture factors predicting mathematical literacy PISA 2015



Considering Model 1 from Table 11, student background factors alone predict just 12% ($F_{(4,3200)}=109.0$; $p< 0.001$) of the variance in mathematical literacy with only ESCS showing a significant association. When student background factors and school culture factors are considered (Model 2) the overall variance explained increases to 18% ($F_{(8,2640)} = 64.39$; $p< 0.001$) indicating that school culture factors explain the variance of mathematical literacy results by an additional 6% ($F_{(8,2640)} = 44.70$; $p<0.001$).

The standardized regression coefficients⁷ (β) from Model 2 can be used to generate a regression equation to show the relative association between each factor and the mathematical literacy attainment (Richards, 1982):

The figure originally presented here cannot be made freely available via ORA because of copyright. The figure was sourced at Richards, J. M. (1982). Standardized versus Unstandardized Regression Weights. *Applied Psychological Measurement*, 6(2), 201–212.

The results suggest that a higher ESCS ($\beta = 0.28$; $p < 0.001$) is linked to a higher attainment in mathematical literacy as measured by PISA 2015. The two other factors significantly positively associated with mathematical attainment are student engagement factor ($\beta = 0.20$; $p < 0.001$) and leadership factor ($\beta = 0.09$; $p = 0.007$). These results indicate that an increase in perceived student engagement predicts an increase in mathematics attainment. Similarly, an improved leadership factor predicts a higher mathematical literacy attainment. The other two factors related to school culture (teacher factor and resourcing factor) do not have a significant link to mathematical literacy attainment. An increase of 1 s.d. in the student engagement factor predicts more than double the change in mathematics attainment predicted by an increase of 1 s.d. in the leadership variable and four times that predicted by an increase of 1 s.d. of the teacher factor.

It is interesting to note here that ESCS is the only student background factor that has a significant predictive effect on mathematical literacy attainment. Thus gender, language spoken at home and country of birth do not have a significant relationship to mathematical literacy. Resourcing is the only factor that appears to have a negative link to mathematical literacy but this result is not significant.

4.1.3 Reading literacy regression results

Model 1 and Model 2 of the linear regressions for reading literacy were set up in the same way as for the mathematical literacy results (Section 4.1.2) with the dependent variable defined as the reading literacy results (measured using PV1READ – PV10READ). The linear regression relationship between school culture factors, student background factors and reading literacy is summarised in Table 12 (next page):

⁷ Standardized regression coefficients are 'metric-free' and standardized by giving each variable a mean of 0 and a variance of 1. This means that you can determine whether a change of 1 s.d. in one variable produces more change to the dependent variable than a change of 1 s.d. in another variable (Williams, 2004).

TABLE 12: Student background & school culture factors predicting reading literacy PISA 2015.

The figure originally presented here cannot be made freely available via ORA because of copyright. The figure was sourced at OECD. (2017). *PISA 2015 Technical Report*. OECD Publishing, 1–468.
<https://doi.org/10.1787/9789264255425-en>

Model 1 shows that the student background factors alone explain 14% ($F_{(4,3200)} = 130.23$, $p < 0.001$) of variation in reading literacy. Model 2 predicts 20% ($F_{(8, 2640)} = 82.18$; $p < 0.001$) of the reading literacy attainment which is an additional 6% ($F_{(8, 2640)} = 48.05$; $p < 0.001$) compared to the student background factors alone (Model 1). Again, the results can be converted into a simple regression relationship using the standardized regression coefficients (β) that shows the relative strength of each of the factors in Model 2 (Richards, 1982):

The figure originally presented here cannot be made freely available via ORA because of copyright. The figure was sourced at Richards, J. M. (1982). Standardized versus Unstandardized Regression Weights. *Applied Psychological Measurement*, 6(2), 201–212.

Model 1 suggests that higher ESCS ($\beta = 0.27$; $p < 0.001$) is significantly associated with a higher reading literacy attainment and being male⁸ ($\beta = -0.16$; $p < 0.001$) is significantly linked to a lower reading literacy result. The student engagement factor ($\beta = 0.21$; $p < 0.001$) and leadership factor ($\beta = 0.10$; $p = 0.006$) were both significantly positively associated with reading literacy attainment. Similar to the mathematical literacy results, the other two school culture factors did not have a significant

⁸ Coding for gender – 1= female, 2= male (Section 3.3.4)

association with reading literacy attainment. Again, an increase of 1 s.d. in the student engagement factor predicts more than double the change in reading literacy predicted by an increase of 1 s.d. in leadership. The increase of 1 s.d. in the student engagement factor is five times that predicted by an increase of 1 s.d. of the teacher factor.

It is important to note here that both ESCS and gender show a significant relationship to the attainment results for reading literacy. This is the only cognitive item that shows a significant relationship with gender for the NSW PISA 2015 results. Surprisingly, according to this model, language at home and country of birth do not have a significant association with reading literacy.

4.1.4 Scientific literacy regression results

Finally, an identical approach to linear regression analysis (Section 4.1.2) was completed for scientific literacy as the dependent variable (PV1SCIE – PV10SCIE). Table 13 shows the regression results.

TABLE 13: Student background & school culture factors predicting scientific literacy PISA 2015.

The figure originally presented here cannot be made freely available via ORA because of copyright. The figure was sourced at OECD. (2017). *PISA 2015 Technical Report*. OECD Publishing, 1–468.
<https://doi.org/10.1787/9789264255425-en>

Model 1 shows that student background factors alone explain for 12% ($F_{(4,3200)} = 109.09$, $p < 0.001$) of scientific literacy attainment. Model 2 that includes school culture and student background factors accounts for 18% ($F_{(8,2640)} = 72.16$; $p < 0.001$) of the scientific literacy attainment scores which is 6%

($F_{(8,2640)} = 36.93$; $p < 0.001$) more than just the student background factors alone. The results can be converted into a simple regression relationship that shows the relative strength of each of the factors using the standardized regression coefficients (β) in Model 2 (Richards, 1982), shown below:

The figure originally presented here cannot be made freely available via ORA because of copyright. The figure was sourced at Richards, J. M. (1982). Standardized versus Unstandardized Regression Weights. *Applied Psychological Measurement*, 6(2), 201–212.

The results suggest that a higher ESCS ($\beta = 0.28$; $p < 0.001$) is significantly associated to a higher scientific literacy attainment. The two other factors that are significantly positively linked to scientific literacy attainment are student engagement factor ($\beta = 0.20$; $p < 0.001$) and leadership factor ($\beta = 0.09$; $p = 0.03$). Similarly, to the mathematical and reading literacy attainment results, the other two school culture factors did not have a significant association with scientific literacy attainment. Neither did gender, language background or country of birth. An increase of 1 s.d. of the student engagement factor predicts twice the increase of 1 s.d. of the leadership factor.

4.2 QUALITATIVE DATA: OVERALL FINDINGS

Analysis of the data from the three semi-structured interviews conducted with active principals identified three significant themes. These were:

- 1) The 'ideal' school culture
- 2) Leading with vision, and;
- 3) No silver bullet!

All three principals took personal responsibility for their school culture (indicated through the use of singular personal pronouns when talking about changing school culture and specifically stating the importance of developing school culture in their role). Indeed, they expressed their belief that building teacher capacity and developing an "ideal" school culture was what they were employed to do. All principals expressed both pride and concern about the school culture of the institutions they were currently working in, showing sincere joy when talking about successes and expressing the personal pressure they experienced when managing difficulties in developing culture. All interviewees stated that leadership with a vision that set educational attainment goals as part of school culture was the most important part of developing an 'ideal' school culture.

During the interview, Greta was confident that she was in charge of both developing the school culture and building teacher capacity. She had a firm belief that school culture along with staff and student wellbeing were of utmost importance to improving educational attainment at her school, stating: "I

actually think that school culture and wellbeing is critical to everything. If you've got the two of those then anything that you do will fall into place". When asked to define school culture Greta mentioned that school culture was "really about beliefs and perceptions about what is going on". She said that school culture was the "feeling of the school, it's about the unity of the school...(it's) when the school is humming". Later she talked about culture being like "belonging and once they (*the students*) feel that they belong and they are part of the family, then you get achievement". Greta seemed to view her school as one particular ecosystem or family where relationships between all of the component parts were what was influencing the whole. She was confident that a cultural change process in a school relies on effective relationships and trust and would take 3 – 5 years.

When asked if the main focus of improving school culture is educational attainment, Rodney responded "That's my gig...I want kids to be able to achieve...to achieve their potential...So yes, educational attainment, absolutely crucial but you have loads of spin-offs to having a culture where attainment at your potential is important". He indicated that these spin-offs were linked to student and staff wellbeing which he saw as vital for a positive school culture. When asked to define school culture, Rodney talked about the "aims, goals, (*and*) directions of the school" that could be "formalised but often they are un-formalised". In this, Rodney appeared to be alluding to the NSW school policy for school principals to develop strategic plans every three years (NSW Department of Education, 2018) laying out their 'key areas for improvement'. This is a required document for each school and is formalised though Rodney believed that the vision of the school is more than just this document. Rodney talked about the stakeholders in the school including "support staff, students, parents and the teaching staff" and their role in establishing and working towards the school culture that they want. Collaboration was key to the development of an effective school culture from Rodney's perspective.

Stephanie was the most experienced of the principals interviewed. She had worked as a principal in two schools one of which she defined as "on the cusp" of disadvantage and the other she stated was "the most advantaged of all the schools" in which she has worked. She stated that school culture was "the things that are done and not done in a school" and saw her role as principal as both nurturing and protecting the school culture. Throughout the interview, there was a balance between Stephanie expressing the important role of the leader in establishing the direction and persuading people to follow that vision and that this direction was often led by good ideas from "influential people" in the school. She often referred to these 'core' people as the reason for success in implementing change; "You've got to have a core and that's where the principal and the leaders come in...you've got to go

with the go-ers...you give them your time and your energy and they will influence the others". Stephanie was candid about her belief that she thought there was a link between school culture and educational attainment however she did mention a school that had been reported to her as having a "toxic culture" that "gets the most magnificent HSC⁹ results". She was firm that collegial professional development of teachers that is led by the principal who sets the vision using the core influential people on staff was the most important factor to determine the effectiveness of a school and that this was at the heart of school culture. However, when talking about disadvantaged schools she admitted that despite her efforts in changing school culture at a disadvantaged school, she was unable to influence the teaching and learning. She attributed this to the disadvantage faced by students and the influence that they then have in the classroom. As well as this, Stephanie noted that the teachers at these schools lacked experience, had low morale due to the disadvantage they were having to deal with and felt "jaded" by their experiences. She stated that disadvantaged students are "so far behind" that a "miracle" would be needed to help them to be competitive. To change the culture in a disadvantage school requires "really brilliant teaching, really committed teaching, really passionate teaching" and according to Stephanie most teachers are average (as with all professions) and brilliance was required to effect change in disadvantaged areas.

Greta and Rodney both agreed that school culture was important for disadvantaged students but expressed the idea that while the end result of the culture will be different depending on your student body, the need for school culture including leadership and teachers who care for you is common to students from all socioeconomic background. Greta and Rodney said disadvantaged students need a positive school culture in the same way that other students need it but that extra support structures for the disadvantaged students will be required to allow effective changes to school culture.

All interviewees were optimistic that school culture could change and does have a positive relationship with educational attainment (both academic and non-academic goals). Their descriptions and examples indicated the complexity of the schools that they were leading and the idea that there was no 'silver bullet'. To improve school culture involves "effective relationships" (Greta), "collaboration" and time (Rodney) and "excellent teaching capacity" (Stephanie).

4.3 INTEGRATED FINDINGS ON SCHOOL CULTURE FACTORS

In the following sections, quantitative and qualitative data is integrated to present the findings for each of the school culture factors investigated in this study.

⁹ End of school examinations in NSW

4.3.1 Leadership Factor

As shown in Section 4.1, the leadership factor used in the regression had a significant positive relationship ($p < 0.01$) for all three cognitive literacies tested. It had approximately the association with mathematical attainment ($\beta = 0.09$; $p < 0.01$), scientific attainment ($\beta = 0.10$; $p < 0.01$) and to reading attainment ($\beta = 0.09$; $p < 0.01$). This factor included four items that linked to academic goals and decision-making which is related to the concept of leadership with vision. This involves communicating educational goals with the stakeholders in the school community and working collegially towards these goals.

The leadership factor was perceived to be the highest importance by all three of the principals interviewed. In fact, Rodney reflected that he felt that the “clarity of his vision” was lacking and that his staff didn’t “see the payoff” of his vision. Rodney concluded that this lack of clarity of vision was impacting his desired change process of the school culture saying: “I’m moving a bit slower than I could have been had it (*his vision*) been clearer”. Rodney explicitly stated that “the concept of leadership with vision is pretty crucial so that everyone knows what it is that we are trying to achieve and if that’s clear, then you start to work on the rest of the culture that sits around it”. He saw that collaboration with all stakeholders was important in the development of a vision for school and believed that effective communication was essential for that development process and the dissemination of the final vision. This links to two of the items included in the leadership factor measured in the regression ‘providing staff with opportunities to participate in school decision-making’ and ‘discussion of the school’s academic goals with teachers’. Later in the interview, when Rodney was reflecting on the role that the principal has in developing school culture he stated that the “principal has to be able to walk the walk”. He referred to getting his executive “on-board” with his vision of school culture which indicates a level of management complexity when it comes to what Rodney saw as essential for the role of a principal.

Stephanie also stated that she believes that the leader’s primary goal was to impact school culture, later stating that the most effective way to do this was to influence and be directly involved with teacher professional development. The idea of setting a vision was brought up continuously throughout the interview. In her mind, she, as principal, was responsible for determining the direction and persuading those with influence to agree that the chosen direction was correct. However, to determine the direction, Stephanie said

my role as someone who is wanting to influence the school is to set the direction but only after listening and sniffing out the great ideas, testing the waters with what else is out there... it came from a lot of discussion with a lot of people.

She also stated that understanding where the school was at through discussions with staff and classroom observations is an essential part of developing an understanding of the vision. Stephanie was the only principal who specifically mentioned the difficulty in 'ensuring that teachers work according to the school's educational goals' indicating that she believed this was an important part of her role.

Greta was very clear that she as the principal set the vision which needed to be clearly communicated to her staff so that there was a "buy-in" effect. As an example of how she managed a specific cultural change, Greta talked about embedding professional learning into the core fabric of the school. When she arrived at Cherwell River College they did not have a culture of regular professional learning. Greta saw this as a problem that impacted teacher capacity which in turn impacted school culture and educational attainment. In her description, Greta talked about her vision in the first person "I focussed on..." and "I got the staff...". This demonstrates that she had a firm grasp of her vision in this instance and used the required professional development plans as a way to show staff why professional learning was important. Once staff were on board with the idea of professional learning, Greta's language in her description used more collective pronouns such as "we put in a professional learning plan" and "we talked about...". In this example, Greta was articulating what she believed leadership with vision looked like in context. She talked about receiving feedback and responding to this while still keeping true to her original vision. In all of this she was adamant that building effective relationships with staff was key to good communication and therefore good leadership. She stated: "Once you've got trust you've got permission to do anything". Again, this collegiality with staff believing in the vision was seen as essential.

Overall, leadership that set a vision for teaching and learning and involved stakeholders in goal setting was shown to be an important factor in both the QUAN and QUAL data. It would be interesting to explore this relationship from the teacher and student point of view to determine if the perceptions align.

4.3.2 Teacher Factor

The quantitative regression analysis showed that the teacher factor was not found to be a significant predictor of any of the literacies with the standardized coefficients as follows: mathematical literacy ($\beta = 0.05$; $p=0.14$), reading literacy ($\beta = 0.04$; $p=0.19$) and scientific literacy ($\beta = 0.05$; $p=0.15$). This

factor measured the principal perceptions of teacher characteristics in and out of the classroom and how they impact student learning. The 6 items included in the factor were all phrased in the negative such as 'school instruction is hindered by inadequate or poorly qualified teaching staff'.

Interviews with all three principals indicated that they perceived that teacher belief in their ability to improve educational outcomes and the development of effective relationships between teachers and students are both important factors in developing a school culture that translates into educational attainment. This was in contrast to the QUAN analysis. There was a strong belief that as a principal, their ability to influence professional learning and improve teacher capacity were the best ways to improve school culture. Rodney commented that the "attitude of the teaching staff...influences culture and that is influenced by experience, enthusiasm (and) whether or not they feel they can make a difference". Indeed, Rodney stated that he thought that "professional learning is possibly more important than school culture" in terms of impact on educational attainment but conceded that attitude to professional learning is likely to fall under the umbrella of school culture. Greta and Stephanie also emphasised professional learning that linked to vision was the key way to improve the educational attainment.

The other item that was brought up by all interviewees was the idea of 'staff resisting change'. All principals mentioned that there would always be a proportion of staff that did not like change with Greta articulating clearly that "you can't stop believing in what you believe so you move forward and you take along the people that you know are going to support you. And eventually the other people come along".

The importance of the teacher factor would seem to be rated by these principals as having more influence on educational outcomes than the quantitative analysis of the data would support. However, it is clear that in the experience of principals there is a complex interrelationship between teacher quality and their own ability to cast and execute a vision for the school.

4.3.3 Student Engagement Factor

There is a significant association with the student engagement factor and attainment in all three literacy areas. In mathematical literacy ($\beta = 0.20$; $p < 0.001$), reading literacy ($\beta = 0.21$; $p < 0.001$) and scientific literacy ($\beta = 0.20$; $p < 0.001$). These results strongly support the principals' perceptions that a school culture that supports educational attainment must lead to students feeling safe, valued and respected. Greta refers to this as "wellbeing" and "belonging" and "being part of the family".

Meanwhile Rodney talked about “disengagement” versus a culture where students and teachers are encouraged to reach their “level of potential”. Stephanie did not explicitly mention student engagement but in all of her examples of programs and professional learning there was a teaching-and-learning focus with her stating “we want to impact on teacher pedagogy... so that learning is more student-focused and student-centred”.

The principals did not talk about particular issues with students impacting on school culture (for example truancy or students skipping class). Indeed, they ranked “a safe and orderly environment with students invested in their learning” as below leadership and teaching and saw student engagement more as a result of a positive culture compared to something that could be actively developed. All three principals emphasised their roles as influencing the executive staff who then influenced teachers who were “at the coal face” (Stephanie) in influencing students. Stephanie also mentioned that student engagement could be linked to peer effects stating that “if you’re (*a Physics student*) interested in learning... you’re so disadvantaged by being the only physics student or in a class where the ten other physics students are really naughty and really disengaged”.

If student engagement is indeed a product of the other factors rather than a factor that develops school culture, then further investigation of other data sources that break down classroom effects may align the perceptions of the principals and the QUAN data which, at this stage, are divergent.

4.3.4 Resourcing Factor

The regression results (Section 4.1) indicate that perceptions of amount of resources at the school has no significant association with literacy attainment in mathematics, reading or science. The resourcing factor produced the standardized regression coefficients for mathematical literacy ($\beta = -0.06$; $p=0.12$), reading literacy ($\beta = -0.03$; $p=0.44$) and scientific literacy ($\beta = -0.06$; $p=0.11$). All coefficients are negative with the reading literacy result showing that the link between resourcing and reading literacy is half as strong as the relative link with the other literacies. The negative coefficients showed that when principals stated that resourcing was having less impact on student learning (increasing resourcing factor number), students received lower academic attainment in all areas of literacy.

Greta and Stephanie ranked resources (both educational and infrastructure) in the lower end of factors that impact on school culture. Rodney’s perception was quite different. He mentioned “systemic constraints” as a hindrance to developing a good culture and said that “resources are pretty important in the school that I’m currently in. I think it needs some love in terms of the environment”.

He believed that a change in the environment would lead to a change in student behaviour, engagement and appreciation of their educational opportunities. Stephanie, in contrast, talked about infrastructure improvements as a good thing to do but not something that would impact the learning of students. She recalled that at her first school as principal “The school was completely run down, filthy, graffitied ... So, we painted it, all the classrooms looked beautiful in the end, we tarted up the uniform, we did all of those symbolic things but of course, they are the easy things to do”.

The interviewees revealed a varied perception of the importance of resources in developing school culture. Further research into the correlation of resourcing and academic attainment is required to clarify and determine the relationship between these variables.

CHAPTER 5: Discussion and Implications

This chapter will discuss the key findings of this study. It will present these findings as responses to each research question in turn. The findings are placed into the context of the foundational work in EER in particular the studies that investigate the impact of school culture on effectiveness. This analysis is based on the framework of Creemers and Kyriakidēs (2011) dynamic model of educational effectiveness. The limitations of this study are recognised and care is taken when making generalisations based on the findings. The chapter will outline implications for future research and discuss the overall contributions of this study.

5.1 RQ1: ASSOCIATION BETWEEN SCHOOL CULTURE FACTORS AND ACADEMIC ATTAINMENT

From analysis of the QUAN results, there are some school culture factors (Leadership and Student engagement) that are associated with literacy attainment for students in NSW measured by PISA 2015. The regression analyses presented in Section 4.1 suggest that the leadership factor and student engagement factor both have a significant association with the academic attainment results. The results of the study also suggest that the teacher factor and resourcing factor do not have significant links to attainment. In terms of student background factors, socioeconomic disadvantage has a significant relationship with academic attainment across all three areas, with gender showing a significant negative relationship for males in reading literacy only.

When investigating these relationships, it is essential to remember that each factor is constrained by the items that were used in the EFA. Thus, it is important to analyse the reasons why these associations were found in the regression analyses by looking at the constituent items.

The leadership factor contains items that are statements about the frequency of certain activities. Three out of four of the items are associated with the principal's provision of opportunities to be involved in goal setting. The last item is associated with the use of student performance data to inform vision generation. Thus, this factor is dependent on the principal's perception of his/her own actions throughout an academic year and could contain personal bias. Leaders answering questions regarding their own leadership style may overemphasise strengths and underemphasise weakness. Despite this, the analysis from this study shows that there is a significant association between a principal's *belief* in their impact and literacy attainment for NSW students. This is supported by a wide range of literature on educational effectiveness (Muijs et al., 2004). Principals that create a vision for the school culture that is linked to improving teaching and learning, who persuade teachers to believe in their impact and use student data to guide their decision-making are linked to effective educational outcomes.

The student engagement factor was also found to be significantly associated with literacy attainment. Only three items were used in this factor related to the principals' belief of student behaviours that were hindering their learning. Two out of three of these items would be available in data stored at the school (rates of truancy and skipping class) however there is a subjective element when the principal must rate how much these behaviours influence learning. The results indicate that there is a positive relationship between increased student engagement (thus less of these negative behaviours) and academic attainment. This result does not indicate what can be done to engage students more effectively. It would be vital to complete research that looks at student and teacher attitudes about a broader understanding of student engagement, such as student engagement in the classroom, in extracurricular activities and students' perspectives of how engaged they are in their education. Overall, this result indicates that an effective school will have a culture that is made up of students who are engaged and who respect their teachers.

The teacher factor did not show a significant association with attainment. It used the exact items as PISA's 'teacher-related factors effecting school climate' construct (OECD, 2017). According to the results in this study, this construct is not significantly linked to academic attainment for NSW students. One issue with this factor is that the principal must respond to these items about teacher characteristics having a range of teacher characteristics on staff. The principal may respond looking at the 'average' teacher or at the positive or negative extreme of teacher behaviour. This may not correlate with the teaching characteristics of the teachers that have taught the students surveyed which leads to a potentially unreliable measure of teacher quality. Another argument could be that the principal perception of a quality teacher is not a valid measure of true teacher quality. Overall, a vast amount of research (Hattie, 2003, 2018a) suggests that there is a link between improved academic attainment and the level of quality of the teachers of those students. Measurement of teacher quality is known to be complex (Strong, 2011) that could be the reason that these results conflict with some of the evidence from previous research.

Similarly, the resourcing factor was shown to be insignificant. One hypothesis to explain these results is that the relationship of academic attainment to resources is not a linear one. Instead, if the school resources are below a certain point there is a negative link to educational attainment but at a certain point adding more resources will not influence attainment. Therefore, the relationship between school culture factors would be an important area for further research.

Overall, the analysis of the school culture factors drawn from PISA 2015 school level data indicate that Leadership and Student Engagement factors have a relationship with literacy attainment. Interestingly the results also show that the school culture factors investigated in this study increase the regression models predictive power by 6% for each type of literacy. This indicates that investigation of the impact of school culture factors on academic attainment is a valuable and helpful pathway for research. This confirms Perry and McConney's (2010) research that showed that school factors can influence academic attainment above and beyond student background factors. Additionally, each Model 2 analysis shows a decrease in the ESCS standardised coefficient. What this means is that there is a possible interaction between ESCS and one or more of the school culture factors. This is an area that could be explored in future research particularly when investigating disadvantaged students.

5.2 DISCUSSION OF RQ2

5.2.1 RQ2a: Principal perceptions of this relationship

From the interview data, it can be shown that the principals believe that there is an ideal school culture that has a strong link to academic (and non-academic) attainment. They also have the perception that leading with vision is the most important feature of a positive school culture. All three principals voiced the idea that there was no silver bullet when it came to improving culture particularly for disadvantaged students which echoed Creemers and Kyriakidēs (2011) dynamic model of educational effectiveness.

The principals stated that the ideal school culture was developed by the leadership team generating a vision and influencing the teachers and staff to 'buy in' to that vision. Teacher capacity was seen as a vital feature for having good school culture. All three principals linked their ability to change the school culture with the development of effective professional learning which is supported by research (Deal & Peterson, 1999; Robinson, 2007). All principals were able to clearly articulate the features of a school culture but there was a sense that these factors were interrelated and thus hard to analyse separately which clearly reflected the dynamic model of educational effectiveness (Creemers & Kyriakidēs, 2011).

The interviewees referred to the influence of student engagement as student's feeling like part of the family (Greta) and that they belong (Rodney, Greta). This indicated that principals perceive school culture as influencing both attainment and wellbeing which is supported by research (Van Der Wal & Waslander, 2007). This has been shown to be of great importance particularly in Australia for those from low SES (De Bortoli, 2018). Both Greta and Rodney seemed to suggest that student engagement

was a result of good school culture rather than something that produced the culture. The interviewees were confident that leading with vision would directly increase teacher capacity and indirectly influence academic outcomes and therefore student engagement. While Stephanie agreed with this sentiment she cautioned that at a certain point of student disengagement there is a 'knock-on' effect to teacher morale which is then very difficult to shift despite good leadership and professional learning. Muijs et al. (2004) and Hattie (2018) would add a caveat that while student engagement and background factors do have an association with academic achievement, school culture factors can still affect change and improve outcomes.

Each of the principals placed leadership with vision as the most important factor in being able to improve school culture. When justifying this decision, the principals stated that this leadership was able to influence their teaching staff and thus improve teaching and learning. The assumption that was suggested by all interviewees was that a good school culture was one that had teaching and learning at its heart. This confirmed Muijs et al.'s (2004) and the OECD's (2012) findings, particularly relevant to disadvantaged students as well as supporting Hoy et al.'s (1990) understanding of school culture. Resourcing was a more complex factor than the other three factors investigated. Two principals perceived resources as essential to improving student engagement and their evaluation of the importance of education. One acknowledged that while it was important to have appropriate resourcing and 'nice' learning spaces it did not influence academic attainment.

The final general perception was the idea that there is 'no silver bullet'. Throughout the interviews, there was a sense that school culture *does* increase academic attainment but the relationship between what factors have direct or indirect effects and there was an understanding that change management of culture was complex. Indeed, the principals found it easy to define school culture but when asked how to approach measuring it, there was a sense that this was an impossible thing to do. While not impossible, this sentiment reflects both Creemers and Kyriakidēs (2011) dynamic model that demonstrates the interrelated and complex dimensions of measuring educational effectiveness as well as Muijs et al.'s (2004) caution of over-simplifying school effectiveness. This reinforces the conceptual understanding that school culture is complex and therefore any further research into the area must recognise and maintain complexity in its analysis.

5.2.2 RQ2b: Association of socioeconomic disadvantage on these perceptions

Socioeconomic disadvantage does have an impact on academic attainment. This study has shown that the school factors of leadership, teachers, student engagement and resources account for 6% of the

variation in each of the three literacy areas measured in PISA 2015 when controlling for student background characteristics.

For principals, there is a clear understanding of the impact that socioeconomic disadvantage has on the academic level of their students. However, there was a sense that to improve academic attainment the *most* important thing to develop was the school culture. Indeed, culture was seen as the foundation upon which teaching and learning could take place. This was the same for all students, but particularly important for students from low socioeconomic backgrounds. The complexities and challenges that individual students face could be increased for the disadvantaged students thus more support structures to account for gaps in knowledge and potential gaps in wellbeing as well as the provision of the highest quality teachers is required to improve academic attainment. This supports Muijs et al.'s (2004) findings and the concept that there is no 'silver bullet'.

Greta and Rodney were optimistic about the role that school culture could play in allowing all students no matter their SES to reach their potential. They were in their first posting as principals and while they acknowledged that socioeconomic disadvantage would mean that students were likely to be academically disadvantaged they believed that with effective leadership and improved teacher capacity, all students would benefit from their education. Stephanie also believed that schools do make a difference but felt that to overcome socioeconomic disadvantage takes a combination of excellence from leaders and brilliance from teaching staff. However, the perception from all principals was that school culture was of primary importance in increasing educational effectiveness for both academic attainment and student wellbeing and non-academic outcomes (De Bortoli, 2018). It will be vital for future research to be able to examine value-added data to determine if the school culture factors do impact outcomes as much as is suggested by the preliminary data given in this study.

Overall, the perceptions of the relationship between school culture factors and academic attainment did not change substantially when principals were discussing students from low SES. The increased importance of school culture to those students and the complexity of the issues faced by individuals were reported in this study.

5.3 RQ3: ALIGNMENT AND ILLUMINATION BETWEEN DATASETS

Both datasets showed the importance of leadership that sets a vision which is founded on effective teaching and learning. This is expected as we are examining principal perceptions. As Stephanie

articulated “if it (*having a leader with vision*) is not important, then why am I there?”. Thus, it would be intriguing to see if the relationship between leadership and academic attainment would be as clear if taken from teacher or student data.

The impact of the teacher factor was a stark difference between the principal perceptions articulated through interviews and what was shown in the NSW PISA data. This may have to do with the phrasing of individual questions that are included in the factor which indicate that the principal should be answering about all staff at their school and referring to particularly negative teacher behaviours. Instead, during the interviews, the principals expressed their belief that improving teacher capacity was a way to improve school culture and simultaneously improve academic attainment. This is supported by research (Reynolds & Teddlie, 2002) which is an indication that the PISA data may not be a valid measure of teacher quality. Furthermore, Stephanie suggested that the current model of teacher allocation to schools (that is a combination of ‘Transfers’ where the principal has no say and positions that ‘go to interview’, where the principal and a panel can choose their candidate) was one reason why it was hard to improve overall teacher quality.

Finally, the largest difference between the principals’ perceptions as expressed in the interviews compared to the QUAN data was the continued assertion of the complexity of school culture and the interrelation between its factors. This confirmed Creemers and Kyriakidēs (2011) dynamic model of educational effectiveness. Indeed, the perceptions from these principals was that school culture was a holistic way to understand the vision and purpose of the school and that the different component parts fed into each other. They perceived that leadership which developed professional learning and helped teachers to collaborate improved classroom connectedness leading to increased levels of student engagement and safety of the school environment. Schools are dynamic places where each factor has direct and indirect effects on the others. Care must be taken when completing the QUAN analysis to put the results into the context of this complexity and interrelation. This is one reason why MMR is the preferred methodology for this field (Muijs, 2012; Teddlie & Tashakkori, 2011).

This study has shown that it is important to continue to investigate the relationship between school culture factors and academic attainment with the aim of broadening our understanding of why these factors influence attainment.

5.4 AREAS FOR FUTURE RESEARCH

Research that investigates the relationship between school culture factors and attainment would benefit from further MMR including longitudinal, value-added studies in particular contexts. If this data was then modelled using multilevel regression then clearer links between school culture factors and attainment could be determined. Further to this, research that looks to measure the school culture factors from the point of view of all stakeholders (leaders, teachers, students and parents) is likely to give a more holistic view of the association between culture and attainment. It is also recommended that primary data from the school could be gathered that could cover the broader range of school culture factors identified by research (Section 2.3). This primary data could be analysed concurrently with PISA data to investigate any patterns or contradictions.

There is a call for research to investigate school effectiveness in a differentiated way particularly investigating what school culture factors are most influential for students from low SES (Kyriakidēs, 2007). Such differentiated models of EER would allow practical applications for a variety of schools and has the potential to allow ‘best-practice’ policy to be developed to improve equity.

Continued research into the interrelation of the broader school culture factors like Wee’s (1999) study that Caldwell (2007) stated showed how “actions at the school level that had a direct impact on student learning are in the domains of professional development...The impact of resource allocation is indirect, mediated through curriculum, professional development, monitoring and staffing” (p. 315). School culture factors may be interrelated and there could be a hierarchy of factors. This could be a fruitful area of further research that should be pursued.

5.5 CONTRIBUTIONS

The overall results indicate that school culture factors are associated with improving academic attainment. This is true for all students including those from disadvantaged backgrounds thus demonstrating that this a useful area for EER to investigate. This preliminary study suggests that some factors (Leadership and Student Engagement) are significantly associated with attainment while others did not show a significant relationship. Each of these factors must be understood to be limited by the methodology and the secondary data source (PISA) that was used. The interviews cast light on the idea that teachers perceive leadership, that is focused on teaching and learning, as the most important factor to develop and maintain a positive school culture. The interview data also concluded that developing teacher capacity was seen as vitally important in this process. Furthermore, it can be

seen that mixed methodology that investigates a wider range of school culture factors and includes in depth interviews from all stakeholders would be a fruitful path for researchers to follow.

School culture is complex. This study explored four factors of school culture – Leadership, Teachers, Student Engagement and Resourcing and explored principal perceptions about the relationship between school culture and academic attainment. The four culture factors were defined by the items chosen from PISA 2015 based on school culture and educational effectiveness research fields. They are clearly not an exhaustive list of what constitutes school culture nor does this study attempt to define the factors through this analysis. The results of the study indicate that it is important to investigate school culture through individual factors rather than as a ‘whole’ concept due to its complexity. These relationships will be different, depending on how each factor is measured and in what context the study is conducted, however, the idea that school culture is both complex and nuanced in how it influences educational effectiveness is a key finding of this study.

This study shows that school culture does have an effect on academic attainment. Thus, policy-makers must invest resources into developing excellent leaders to help to foster a good school culture. For researchers, there is a continued need to understand what an effective school culture is and how schools can go about improving their own cultures. Finally, for practitioners working in schools that are serving socioeconomically disadvantaged students, this study has demonstrated that the academic attainment of these students can be increased by improving cultural factors. Schools make a difference and developing a positive school culture is one mechanism for improving excellence and equity.

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APPENDIX

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Appendix 1: Descriptive information of 'School Culture' items used in Exploratory Factor Analysis taken from school questionnaire, PISA 2015

	ITEM	N	Range	Mean	Std. Dev.	Variance	Skewness		Kurtosis	
							Statistic	Std. Err.	Statistic	Std. Err.
TEACHER FACTOR	School instruction hindered by: Inadequate or poorly qualified teaching staff.	153	3	3.45	0.648	0.42	-0.917	0.196	0.438	0.39
	Extent to which student learning is hindered by: Teachers not meeting individual students' needs	153	3	2.69	0.599	0.359	-0.133	0.196	-0.113	0.39
	Extent to which student learning is hindered by: Teacher absenteeism	155	3	3.01	0.66	0.435	-0.144	0.195	-0.236	0.387
	Extent to which student learning is hindered by: Staff resisting change	155	3	2.8	0.668	0.447	-0.011	0.195	-0.29	0.387
	Extent to which student learning is hindered by: Teachers being too strict with students	155	2	3.2	0.618	0.382	-0.154	0.195	-0.51	0.387
	Extent to which student learning is hindered by: Teachers not being well prepared for classes	154	2	3.03	0.636	0.405	-0.021	0.195	-0.492	0.389
LEADERSHIP FACTOR	Frequency of <the last academic year>. I use student performance results to develop the school's educational goal	154	4	3.32	1.107	1.225	1.012	0.195	0.546	0.389
	Frequency of <the last academic year>. I ensure that teachers work according to the school's educational goals.	153	4	4.1	1.263	1.594	0.099	0.196	-1.09	0.39
	Frequency of <the last academic year>. I provide staff with opportunities to participate in school decision-making	153	4	4.52	1.046	1.093	-0.324	0.196	-0.605	0.39
	Frequency of <the last academic year>. I discuss the school's academic goals with teachers at faculty meetings.	154	5	3.98	1.174	1.379	0.063	0.195	-0.543	0.389
	<i>Teaching staff in your school has attended a programme of professional development? All teaching staff</i>	<i>152</i>	<i>90</i>	<i>84.06</i>	<i>25.47</i>	<i>648.745</i>	<i>-1.427</i>	<i>0.197</i>	<i>0.585</i>	<i>0.391</i>

ITEM		N	Range	Mean	Std. Dev.	Variance	Skewness		Kurtosis	
							Statistic	Std. Err.	Statistic	Std. Err.
STUDENT FACTOR	Extent to which student learning is hindered by: Student truancy	155	3	2.94	0.77	0.593	-0.234	0.195	-0.498	0.387
	Extent to which student learning is hindered by: Students skipping classes	154	3	2.96	0.774	0.6	-0.36	0.195	-0.278	0.389
	Extent to which student learning is hindered by: Students lacking respect for teachers	153	3	2.94	0.7	0.49	-0.152	0.196	-0.334	0.39
	<i>Extent to which student learning is hindered by: Student use of alcohol or illegal drugs</i>	<i>154</i>	<i>2</i>	<i>3.29</i>	<i>0.58</i>	<i>0.336</i>	<i>-0.125</i>	<i>0.195</i>	<i>-0.534</i>	<i>0.389</i>
	<i>Extent to which student learning is hindered by: Students intimidating or bullying other students</i>	<i>155</i>	<i>3</i>	<i>2.87</i>	<i>0.611</i>	<i>0.373</i>	<i>-0.273</i>	<i>0.195</i>	<i>0.503</i>	<i>0.387</i>
RESOURCES FACTOR	School instruction hindered by: Lack of educational material (e.g. textbooks, IT equipment, library or lab material).	154	3	3.44	0.722	0.522	-0.982	0.195	-0.013	0.389
	School instruction hindered by: Inadequate or poor quality educational material (e.g. textbooks, IT equipment).	154	3	3.43	0.703	0.495	-0.941	0.195	0.054	0.389
	School instruction hindered by: Lack of physical infrastructure (building, grounds, heating\cooling, lighting).	154	3	2.96	0.892	0.796	-0.427	0.195	-0.68	0.389
	School instruction hindered by: Inadequate\poor quality phys infrastructure (building, grounds, heating\cooling).	154	3	2.95	0.955	0.912	-0.488	0.195	-0.77	0.389
VALID N (listwise)		142								

Appendix 2a: *Communalities of EFA*

Communalities	Initial	Extraction
School instruction hindered by: Inadequate or poorly qualified teaching staff.	0.23	0.187
Extent to which student learning is hindered by: Teachers not meeting individual students' needs	0.496	0.456
Extent to which student learning is hindered by: Teacher absenteeism	0.446	0.505
Extent to which student learning is hindered by: Staff resisting change	0.461	0.516
Extent to which student learning is hindered by: Teachers being too strict with students	0.45	0.475
Extent to which student learning is hindered by: Teachers not being well prepared for classes	0.518	0.58
Frequency of <the last academic year>. I use student performance results to develop the school's educational goal	0.424	0.473
Frequency of <the last academic year>. I ensure that teachers work according to the school's educational goals.	0.469	0.65
Frequency of <the last academic year>. I provide staff with opportunities to participate in school decision-making	0.298	0.299
Frequency of <the last academic year>. I discuss the school's academic goals with teachers at faculty meetings.	0.413	0.471
Extent to which student learning is hindered by: Student truancy	0.739	0.883
Extent to which student learning is hindered by: Students skipping classes	0.76	0.775
Extent to which student learning is hindered by: Students lacking respect for teachers	0.528	0.509
School instruction hindered by: Lack of educational material (e.g. textbooks, IT equipment, library or lab material).	0.852	0.905
School instruction hindered by: Lack of physical infrastructure (building, grounds, heating\cooling, lighting).	0.851	0.912
School instruction hindered by: Inadequate or poor quality educational material (e.g. textbooks, IT equipment).	0.736	0.406
School instruction hindered by: Inadequate\poor quality phys infrastructure (building, grounds, heating\cooling).	0.727	0.39

Appendix 2b: *Total Variance Explained of EFA***Total Variance Explained**

Factor	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	5.411	31.828	31.828	4.467	26.277	26.277	2.687	15.809	15.809
2	2.485	14.618	46.446	1.512	8.895	35.172	2.678	15.752	31.561
3	1.828	10.752	57.198	2.064	12.139	47.311	2.095	12.322	43.883
4	1.357	7.982	65.18	1.352	7.951	55.262	1.934	11.379	55.262
5	0.926	5.446	70.627						
6	0.751	4.416	75.043						
7	0.718	4.222	79.265						
8	0.566	3.33	82.595						
9	0.556	3.268	85.864						
10	0.495	2.911	88.774						
11	0.425	2.499	91.274						
12	0.415	2.442	93.716						
13	0.373	2.192	95.908						
14	0.322	1.893	97.801						
15	0.166	0.977	98.778						
16	0.132	0.777	99.555						
17	0.076	0.445	100						

Extraction Method: Maximum Likelihood.

Appendix 3: Interview Guide

INTERVIEW GUIDE

introductory	1. What schools have you worked in throughout your career?
	2. How long have you been part of a school executive? (And in what schools?)
Perceptions of school culture	3. Based on your own experience, how would you define school culture?
	4. How important do you think school culture is in improving educational attainment? Why? (what other things do you think are equally important)
	5. <i>If not addressed in previous question:</i> (What factors of school culture do you think impact educational attainment?)
	6. If you were to think about splitting school culture into the following 4/5 categories, which would you say linked the most to educational attainment and why? - Leadership with vision, - collegial and conscientious teachers (professional development), - safe and orderly environment with students invested in learning, - resources (educational and infrastructure) - Parental involvement
Role of principal	7. What role do you believe the school principal has in forming/ developing/ impacting on school culture?
	8. Think about a time in your career as senior executive where you were actively trying to change a part of the school culture. Can you tell me about that experience, what you were trying to change, how you went about changing and what the impacts of the changes were?
SES	9. What impact do you believe that school culture has on students from different socioeconomic backgrounds? Why/why not a difference?

Appendix 4: *Participant Profiles*

Principal 1 (Greta) is a female principal at a comprehensive government secondary school in NSW (Cherwell River College). This is Greta's first appointment as a principal but she has previously worked within the senior executive of a school for 11 years (as head teacher and deputy principal). She has worked in NSW for her entire career. During the phone interview Greta was relaxed and joked with the researcher.

Principal 2 (Rodney) is a male principal at a comprehensive government secondary school that teaches year 7-12 (New Inn High School). His first position was in Victoria, Australia. He then moved to the United Kingdom and worked as a teacher, year advisor and head of department. His third position was to a comprehensive secondary school in NSW where he was a teacher, then Head Teacher: Teaching and Learning (5 years) and Deputy Principal (8 years). He has been in his current principal position for 2.5 years. This interview was conducted in person with Rodney requesting to see the interview guide at the beginning of the interview.

Principal 3 (Stephanie) is a female principal who has worked as a principal for 18 years. Her teaching and executive experience has been exclusively spent teaching in government schools in NSW. She is currently in her tenth year as principal at Folly Bridge High school a comprehensive secondary school in NSW, Australia. This interview was conducted via video call with Stephanie receiving the call in her home. Stephanie was relaxed throughout the interview and seemed engaged and curious with the subject matter as she often responded to questions with her own questions regarding educational attainment measurement and culture factors.

Appendix 5: CUREC Approval Letter

UNIVERSITY OF OXFORD
DEPARTMENT OF EDUCATION

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Tel: +44(0)1865 274024 Fax: +44(0)1865 274027
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Director Professor Jo-Anne Baird



February 2018

Dear [REDACTED]

Title: The impact of school culture on disadvantaged students in Australia

The above application (reference number ED-CIA-18-103) has been considered on behalf of the Departmental Research Ethics Committee (DREC) in accordance with the procedures laid down by the University for ethical approval of all research involving human participants.

I am pleased to inform you that, on the basis of the information provided to DREC, the proposed research has been judged as meeting appropriate ethical standards, and accordingly, approval has been granted.

If your research involves participants whose ability to give free and informed consent is in question (this includes those under 18 and vulnerable adults), then it is advisable to read the following NSPCC professional reporting requirements for cases of suspected abuse

http://www.nspcc.org.uk/Inform/research/questions/reporting_child_abuse_wda74908.html

Should there be any subsequent changes to the project which raise ethical issues not covered in the original application you should submit details to research.office@education.ox.ac.uk for consideration.

Good luck with your research study.

Yours sincerely,

Laura Molway

Member of DREC

Laura Molway
PGCE Curriculum Tutor & D.Phil Candidate in Education
University of Oxford, Department of Education
Tel: 01865 611008



Appendix 6: *SERAP Online Approval*



[Home](#)
[Researcher tasks](#)
[Contact](#)
[About](#)
[User Guide](#)
[Welcome](#)

SERAPonline

SERAP Actions

History for SERAP 2018152
SERAP: 2018152 **Approved Stage 2**

2018-06-20 16:52
Status updated
SERAP 2018152 - The impact of school culture on disadvantaged students in Australia Status: Approved

Overview

SERAP number 2018152

Title The impact of school culture on disadvantaged students in Australia

Research type Conduct school research

Field Secondary Education

Précis This research has two aims: 1. To determine how a positive school culture is linked with contextualised value-added results and pupil satisfaction in disadvantaged Australian schools; and 2. To determine school leader perception of the relationship between these factors. I will be using PISA data to create indices for school culture measures (based on factors including interpersonal relations, leadership and class-level environment) to determine if there is a statistically significant relationship between these indices and student achievement and/or satisfaction in disadvantaged schools (defined by the PISA index of economic, social and cultural status (ESCS)). I will then interview 5–10 principals in Australia (via Skype) about their perceptions of the impact of school culture and their ability to influence this factor. The interviews will seek to understand whether the perception of the school leaders matches the results from the PISA analysis and explore the potential areas of improvement for leaders and educational policy in this area. The data will be stored confidentially and analysed with the purpose of completing the dissertation requirements of the MSc in Comparative and International Education at the University of Oxford.

Submission date 2018-04-05

Approval valid until 2019-02-12

Appendix 7a: Interview oral consent form

**Type 1: Oral Consent only**

[Where separate [written participant information](#) has already been read by the participant beforehand, and oral consent is then sought. Record this consent process using a digital recorder (if participant has consented to this) or by using a [Record of Consent Form](#).]

Hello again, I'm [REDACTED] from the University of Oxford and I wanted to talk to you about the project I gave you information about before. To recap, the broad aims of my project are to look at the relationship between school culture and student performance in Australia.

Are you still interested in taking part in the project? *[Await confirmation]*. Now I'd like to confirm some of the details of the project to make sure you understand what's involved for you:

- It's a project about school culture and it's being used for my postgraduate paper
- If you agree to take part, I'll need you to answer the questions in this interview lasting approximately 30 -40 minutes via skype.
- There are no risks involved in taking part.
- You don't have to agree to take part; you can ask me any questions you want before or throughout; you can also withdraw at any stage without giving a reason and without any negative consequences.
- The researcher (me) and my two supervisors ([REDACTED]) will have access to the interview transcripts and recordings via a secure USB. If you choose to withdraw from the process, your data will be deleted and not included in the study.
- To withdraw you will need to inform me via email by July 10th 2018.
- You are aware that an Oxford University Research Ethics committee has approved this research project and how to contact me (in the first instance) or the committee in case of any concerns or complaints. I have given you the project's ethics reference number and relevant contact details. To reiterate: their contact details are ethics@socsci.ox.ac.uk
- I won't use your name or school name (your information will be treated confidentially).
- I will store any information you provide safely and confidentially on an encrypted and secure USB and will keep the research data for 3 years after publication.¹
- I would like to audio record you unless you say that I can't.
- The project will be published in a thesis for the completion of my MSc in Comparative and International Education.

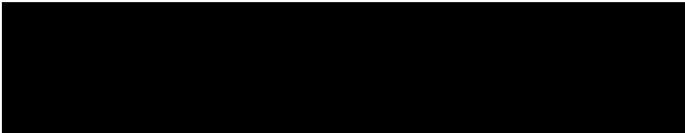
Are you still willing to take part? Do you give your permission for me to interview you? Do you give your permission for me audio record you?

[Await confirmation] So if you're happy with all of that, and have no more questions, let's start.

¹ This should be a minimum of three years after publication according to [University Policy](#), or longer depending on [funder requirements](#).

Appendix 7b: Interview information sheet

University of Oxford
 Department of Education
 15 Norham Gardens, Oxford OX2 6PY



School culture, socioeconomic disadvantage, and academic attainment in an Australian state:

A Mixed Methods Study.

PARTICIPANT INFORMATION SHEET

Ethics Approval Reference: ED-CIA-18-103

1. *What is the purpose of this research?*

According to PISA data (2015) and Close the Gap reports, the Australian education system is above average in many domains but is still struggling to demonstrate equity in education. From my teaching experience and study, it is clear that schools have a powerful impact on their learners. This research is aiming to determine how school culture influences outcomes for disadvantaged students in Australia. I hope that this research will give practical advice to school leaders on what factors of school culture should be focused on and what impact this has on overall student outcomes.

This research has two questions:

1. To determine how the development of a positive school culture is linked with educational performance and pupil satisfaction in disadvantaged Australian schools; and
2. To determine school leader perception of the relationship between these factors.

2. *Why have I been invited to take part?*

You have been invited because as a school leader you have a large impact on school culture and your experience and perception of what is the most effective ways of changing the culture of a school will enhance and deepen the study of the PISA data. Your involvement in the research will help to make the final conclusions more practical and set the quantitative research in a real-world context. I am interested in focussing on schools in Australia and particularly people working in New South Wales government schools that serve a large proportion of the disadvantaged students in that state.

3. *Do I have to take part?*

No, it is completely voluntary. You can ask questions about the study before deciding whether or not to participate. If you do agree to participate, you may withdraw yourself and any data provided so far from the study at any time, without giving a reason and without penalty, by advising the researcher of this decision. If you choose to withdraw at any time, please inform the researcher by telephone or email and the data collected so far will be destroyed accordingly.

4. *What will happen to me if I take part in the research?*

An online skype interview will be co-ordinated at a time of your convenience and will take 30 – 45 minutes with the questions focused on your perceptions of school culture and the impact it can have on student outcomes and with a chance for you to give in-depth information about your perceptions of the impact of school culture. These interviews will be audio-recorded so both email and verbal consent will be requested from you.

5. Are there any potential risks in taking part?

There are no potential risks (physical or emotional) associated with your participation in this study. Your identity, as well as that of your school/organisation will be concealed and anonymised. As a participant, you have every right to ask questions or raise any concerns during any stage of the research process. You can abandon the online survey at any stage, as well as reschedule or cancel the interview if necessary.

6. Are there any benefits in taking part?

The benefits of taking part include gaining a better understanding of the factors of school culture and their influence on educational performance. Your experience and school/system based perceptions will add depth to my analysis that will frame the findings in the real world. In addition, if you request, a confidential summary of the findings of the dissertation will be distributed to you along with a copy of the final dissertation.

7. What happens to the data provided? ¹

Your responses will be stored confidentially on an encrypted and password protected USB-drive that is only accessible to the researcher and her supervisor [REDACTED]. All research data and records will be stored for 3 years after publication or public release of the work of the research.

8. Will the research be published?

The University of Oxford is committed to the dissemination of its research for the benefit of society and the economy and, in support of this commitment, has established an online archive of research materials. This archive includes digital copies of student theses successfully submitted as part of a University of Oxford postgraduate degree programme. Holding the archive online gives easy access for researchers to the full text of freely available theses, thereby increasing the likely impact and use of that research.

The research will be written up as a thesis. On successful submission of the thesis, it will be deposited both in print and online in the University archives, to facilitate its use in future research. The thesis will be openly accessible.

9. Who is organising and funding the research?

This research is organised under the Department of Education, University of Oxford in partial fulfilment of the researcher's MSc in Education (Comparative and International Education)

Who has reviewed this study?

This study has been reviewed by, and received ethics clearance through, the University of Oxford Central University Research Ethics Committee (Reference number: ED-CIA-18-103).

¹ Please refer to [CUREC's Best Practice Guidance on Data Collection and Management](#) (BPG 09)

10. Who do I contact if I have a concern about the study or I wish to complain?

If you have a concern about any aspect of this study, please speak to the researcher [REDACTED] or her supervisor [REDACTED] who will do their best to answer your query. The researcher should acknowledge your concern within 10 working days and give you an indication of how they intend to deal with it.

If you remain unhappy or wish to make a formal complaint, please contact the relevant chair of the Research Ethics Committee at the University of Oxford who will seek to resolve the matter in a reasonably expeditious manner: Chair, **Social Sciences & Humanities Inter-Divisional Research Ethics Committee**; Email: ethics@socsci.ox.ac.uk; Address: Research Services, University of Oxford, Wellington Square, Oxford OX1 2JD

11. Further Information and Contact Details

If you would like to discuss the research with someone beforehand (or if you have questions afterwards), please contact:

[REDACTED]
MSc Education (Comparative and International Education) candidate
Department of Education
15 Norham Gardens, Oxford OX26PY
Tel: [REDACTED]
Email: [REDACTED]