

**HOW DO SCHOOL RESOURCES AND LEARNING  
ENVIRONMENTS DIFFER ACROSS AUSTRALIAN RURAL,  
REGIONAL AND METROPOLITAN COMMUNITIES?**

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This thesis is presented for the degree of

**Doctor of Philosophy**

**Murdoch University**

2018

School of Education

Murdoch University

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I declare that:

- The thesis is my own account of my research, except where other sources are acknowledged.
- The extent to which the work of others has been used is clearly stated in each chapter and certified by my supervisors.
- The thesis contains as its main content work that has not been previously submitted for a degree at any other university.

Kevin Sullivan

### **A note on formatting and style**

This PhD thesis comprises three research papers, two of which have been published and one which is under review. These formatted documents are incorporated into the thesis along with additional text that has been provided to introduce and link the published work. It is hoped that the final amalgamation allows for the development of a cohesive body of research that can be easily followed.

The thesis has continuous pagination, which can be seen at the top right corner of each page. For published documents, the original journal page numbers are also visible. References and appendices have been amalgamated and placed at the end of the thesis.

The three papers have undergone double blind peer-review. I co-authored these papers with my supervisors, as is common in the social and natural sciences. As the first author, I conducted the analyses and wrote the papers. My supervisors provided guidance and thorough feedback on all aspects of the papers, including editorial assistance.

## **Acknowledgements**

A thesis is more than words, numbers, and characters on a page. The dimensional components of a study may not expose the hopes and sacrifices of an individual, nor adequately express an author's appreciation for generous mentors and love for patient family who have invested time, energy, support and understanding without personal gain, but they are symbolic of a pathway and journey through time which whilst often infertile sustain a richness that will forever yield.

To my supervisors, Associate Professors Laura Perry and Andrew McConney, I am deeply indebted to you for the level of expertise, support and guidance that you have given me. I hope that I can inspire others in the way that you have inspired me. To those that care I say, "Thank you!" And to onlookers who dare, I say, "Dream!"

Dr Perry and Dr McConney have been amazing mentors and guides. I value the time, effort, dedication, and leadership that they have shown me. I could not have asked for more patient or experienced researchers to act as my supervisors. I not only value the working relationship that we have forged but marvel at the achievements that we have made publishing two articles of significant merit with an Australian education journal, and a pending publication with an international journal.

## **Dedication**

This research would not have been possible without the love and support of my family. To my beautiful wife, Sharon and amazing children Andrew and Olivia, "Thanks guys!"



## **Abstract**

Despite recent emphasis on improved government funding and advances in technology that reduce the isolation of rural communities, research continues to highlight that Australian students attending rural schools, on average, achieve poorer academic outcomes than their urban peers. It is plausible that these lower academic outcomes are associated with the characteristics of rural schools. Little is known, however, about the nature and degree to which schools differ between rural and metropolitan communities in Australia. The aim of this study is to compare school characteristics across a range of rural and metropolitan settings, using a large-scale and nationally representative dataset.

The study comprised three investigations that examined how student achievement, school resources and school learning environments vary across urban, regional, rural, and remote communities using data from the *Programme for International Student Assessment* (PISA). PISA is an international assessment created by the Organization for Economic Cooperation and Development (OECD) that assesses the reading, mathematics and science literacies of 15-year-old students. PISA also collects data from school principals and students about a range of student and school related variables that may be related to student literacy in the three subject domains. The three investigations used data from the 2009 cycle of PISA, which comprised approximately 470,000 students from 65 countries and economies, including over 14,000 Australian students attending 353 schools. Descriptive statistics were used to compare student and school principal perspectives about a range of school resources and learning environments.

The initial paper investigated school resource variables across eight rural-urban community categories in Australia. The school resource variables included computers for education, the ratio of computers to students, computers with internet access, and principals' perspectives of the degree to which shortages of teaching personnel and teaching materials and

resources hinder student learning. On average, principals of schools in rural communities were more likely than their counterparts in larger communities to perceive that instruction was hindered by shortages of teaching personnel and to a lesser extent by shortages of teaching resources. Principals in larger towns and very large towns (ranging in size from 15,000 to 50,000 residents) reported that shortages of mathematics teachers were a hindrance to a similar degree as school principals in small rural communities.

The second paper examined differences in school learning environments across eight rural-urban community categories in Australia. Learning environments were measured by the following: principals' perceptions of teacher and student behaviour, student attitudes towards school, and student perceptions of their classroom disciplinary climate and relationships with teachers. The findings show that regardless of location, most Australian students believed that schooling is worthwhile and reported positive relationships with their teachers. However, both student and principal perceptions of disciplinary climate and learning environments were more positive in urban communities than in rural communities.

The third paper compared school community differences at an international level, contrasting two economic, culturally, and socially similar nations, Canada and New Zealand, with Australia. Research focused on: average student reading performance, socioeconomic status and parent education, principals' perceptions about their school's resources, and student perceptions of classroom disciplinary climate, teacher-student relations, and teacher instructional strategies. The findings showed that across Canada, New Zealand and Australia reading literacy performance and school learning environments are less positive in rural communities than in urban communities. However, these inequalities between rural and urban school communities are greater in Australia than in the other two countries. Of the three countries, rural school principals in Australia are the most likely to report that shortages of teaching personnel hinder learning.

The findings show that school learning environments and school resources vary substantially across Australian school communities. Given the patterning of student performance favouring urban over rural school communities, it may very well be that elements such as rural school shortage of resources and relations between student and teacher negatively impact the academic performance of students. The three studies highlight that much still needs to be learned about: (1) recruiting and retaining teachers in large regional Australian towns; (2) the degree to which shortages of instructional material and equipment are associated with geographic location; and, (3) the reasons underlying students' and principals' views of school learning environments in large regional towns (up to 50,000 residence) are less positive than their counterparts' views in rural and remote communities. The findings also suggest that education policies and structures can play a role in ameliorating or exacerbating rural educational disadvantage.

**Key words:** School resources, school learning environments, educational opportunities, educational experiences, educational outcomes, geographic location, rural education, PISA

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## Publications

1. Sullivan, K., Perry, L., & McConney, A. (2013). How do school resources and academic performance differ across Australia's rural, regional, and metropolitan communities? *Australian Educational Researcher*, 40(3), 353-372.
2. Sullivan, K., Perry, L. B., & McConney, A. (2014). How do school learning environments differ across Australia's rural, regional and metropolitan communities? *Australian Educational Researcher*, 41(5), 521-540. DOI: 10.1007/s13384-014-0144-1.
3. Sullivan, K., McConney, A., & Perry, L. B. (2018). A Comparison of Rural Educational Disadvantage in Australia, Canada, and New Zealand using OECD's PISA. *Sage Open Journal of Educational Research*, 8(4), 1-12. DOI: 10.1177/2158244018805791

## **Chapter 1:**

### **Introduction**

This chapter provides background information, describes the study structure, problem statement, purpose and research questions, and concludes with a reflection on the potential significance of the findings.

#### **Purpose**

The disparity between rural and urban education in Australia is a strong driver behind my investigation into school resources and learning environments. Results from the Programme of International Student Assessment (PISA), an international assessment designed to assess the reading, mathematics and science literacy of 15-year-old students, have shown that students in rural communities consistently have lower reading, mathematics and science literacy performance than students in urban school community areas in Australia (Cresswell & Underwood, 2004; Thomson & De Bortoli, 2010). These results from PISA are consistent with other measures of educational outcomes; for example, Australian students in rural communities are less likely than their urban peers to complete secondary school or university (James, 2001). They also have, on average, lower scores on Australia's National Assessment Program-Literacy and Numeracy (Lamb, Glover, & Walstab, 2014). The reasons why rural students have on average lower educational outcomes is undoubtedly complex, and it is likely due to a range of factors related to students, communities and schools. It is plausible that rural students' lower outcomes are related to inequalities of resources and learning environments between rural and urban schools. Not much is known, however, about the nature and extent of these inequalities between schools. The purpose of this study, therefore, is to investigate how schools that are geographically distributed across Australia's rural, remote and metropolitan communities vary in terms of school resources and learning environments.

Using a large nationally representative dataset like PISA, which is designed and administered by the Organization for Economic Cooperation and Development (OECD), provides researchers with the opportunity to undertake descriptive mapping of school characteristics: for example, in this study school resource inputs, such as qualified teachers and curricula are viewed as a constructs of education opportunity whilst variables that reflect the school learning environment, like student and teacher interpersonal interactions are deemed education experience. The level of student literacies attained are determined by the PISA 2009 assessment outcomes in reading, mathematics and science. Identifying patterns within this data set can be useful for understanding inequalities in educational opportunities, experiences and outcomes for Australian students in rural communities. Moreover, understanding how schools vary across geographic locations is important as learning resources and learning environments are educational ends in themselves and not just predictors of academic outcomes.

My research is intended to uncover patterns, drawn from PISA (2009) literacy scores in reading, mathematics and science, and school characteristic variables derived from student and principal questionnaires, about the nature and extent of rural educational disadvantage in Australia. Also, international data are sourced from two economically and culturally similar countries, Canada and New Zealand, to provide comparison data. By contrasting the Australian findings with school communities across Canada and New Zealand, patterns may be identified that could help to gauge how unique Australian school communities are and whether insights can be gained from other similar countries.

This study has enabled me to examine how school characteristics vary across urban-rural contexts and settings in Australia. I utilised information from the OECD website to conduct secondary analyses of PISA, downloading PISA 2009 data, which included principal and school questionnaires and the student and school data files. During this process, I

discovered that PISA is not a perfect tool for evaluating educational systems and student outcomes. A disadvantage is that like other cross-national tests of student achievement, PISA is not longitudinal (Hopmann, Brinek & Retzl, 2008) and therefore cannot be used to establish causality. Some academics highlight the complications that surround the collection, assessment and reporting of large-scale educational data (Cresswell, Schwantner & Waters, 2015; Rutkowski, Gonzalez, Joncas & Davier, 2010). Rutkowski and Rutkowski (2010) raised issues about PISA's treatment of missing data and questioned the reliability of its student questionnaire, whilst Stewart (2013) regarded as problematic PISA's potential to act as global arbiter to the world's schooling systems. There is also growing concern that PISA is overly valued and politicised (Sellar, Rutkowski & Thompson, 2017). While these critiques are valid, PISA nevertheless has many advantages. It is nationally representative, and the number of participating countries and students is very large, with 65 participating countries and over 470,000 students included in the PISA 2009 sample.

Through my research I have gained knowledge on possible reasons why rural students across Australia, on average, have lower educational outcomes in reading, mathematics and science literacy performance in PISA 2009 assessments. Whilst no single factor can be attributed with causing urban-rural school community assessment trends, I have discovered that more research needs to be undertaken to increase understanding of the significance of school resources' and learning environments' inequity across Australian school communities. The purpose of this study is to investigate how schools that are geographically distributed across Australia's rural, remote and metropolitan communities vary in terms of school resources and learning environments. However, my goal as a researcher is to understand the significance, inter-connectedness and impact of these trends on student experience and learning outcomes and better understand the cause of inequality of education across urban-rural school communities.

## Background

Learning is fundamental to human evolution. Nelson Mandela (2003) referred to education in a speech as, "...the most powerful weapon, which you can use to change the world." At the most basic level education provides individuals within a society the opportunity to maximize their ability to think, problem-solve and communicate. It is my belief that education can help people overcome adversity and maximize their opportunity to learn, teach others, secure employment and make a positive contribution to society.

However, due to inequality based on racial, social, economic or gendered prejudice education opportunities are often not distributed evenly. The topic of education inequality within the Australian context has been relevant for many years. Arguably Australia's greatest education reform occurred during Prime Minister Gough Whitlam's tenure of office (1972-1975). A driving force behind 'The Karmel Report and special education in Australia' issued by the Whitlam government was a desire to minimize inequality in education (Andrews, 1973). However, decades later the Australian Human Rights and Equal Opportunities Commission (2000) determined that students from rural school communities fared worse than their urban counterparts. Today, there is an increased focus on national education standards and assessment programmes, such as National Assessment Programme Literacy and Numeracy (NAPLAN) and PISA. These assessments, while sometimes controversial, are useful for uncovering the magnitude of educational inequalities and their trajectories over time: for example, data from PISA has shown that educational inequalities between socially advantaged and disadvantaged students is large and stable. As noted by Sue Thompson from the Australian Council for Educational Research,

The difference between advantaged and disadvantaged students [in Australia] is around three years of schooling. That's not changed in 16 years of [PISA] testing (for reading). That's the critical thing. We're still not attending to those gaps.  
(<http://www.teachforaustralia.org/2016/12/07/australias->

pisa-results-show-educational-disadvantage-gap-remains/)

Whilst assessment programmes may not in themselves be a solution to rectify inequality, they provide comparable data at state, national and international levels, uncover or highlight education trends, increase community awareness and ensure people, organisations and governments with responsibility for appropriate provision in education are held accountable.

My vocation as a teacher is to support young learners and help them to recognize the importance and value of education. Empowering students to learn how to learn will hopefully maximize their opportunity and success in life. In following my calling, I have discovered inequities within Australia's education system. I have made it my responsibility to attempt to understand the complexity of education disadvantage and direct my own learning towards ameliorating the disparity faced by educationally underserved groups, such as students from lower socioeconomic (SES) backgrounds, students in rural and remote communities, and Indigenous students within Australia.

This study was conducted as part of an Australian Research Council (ARC) grant awarded to my principal supervisor, Laura Perry, in 2010. At the time that Dr Perry was awarded the ARC grant I was working full-time as a primary school teacher and tutoring a first-year School of Education unit at Murdoch University. Having taught in the Australian education system for 16-years I was endeavouring to expand my contribution to the profession of teaching by educating future teachers. Whilst I was tutoring an undergraduate educational unit I gained a real interest in the value of research. I discovered that research could extend my scope to make a positive impact on future teachers. So, when the opportunity arose I immediately saw the value and understood the privilege I had been provided to work with Dr Perry and Dr McConney on a cross-national investigation into school resources and school learning environments.

Through discussions with Dr Perry I learned the educational significance of conducting descriptive research that could establish a better understanding of the school characteristics that may influence students' educational outcomes. I also became aware that not much was known about the ways in which schools vary across rural and urban communities in Australia. Recognising how schools vary across communities could help us identify why rural students often have lower outcomes than their urban peers, which in turn could highlight possible strategies for remedying their lower outcomes. Importantly, I discovered the significance of recognising that educational experiences in schools are an important end in themselves.

The PISA dataset provides researchers with an extensive range of student and school predictor variables to analyse. The PISA 'school community' variable contains data that provides information relating to school community. I was particularly interested in school community predictor variables as reported by students and principals, as they could provide clues as to how school communities vary. I concentrated my research on the most recent PISA dataset at this time, and committed to using the PISA 2009 data, for the entirety of my research.

A possible correlation exists between school resources, school learning environments and student achievement. Willms (2010) showed that learning environment characteristics are highly correlated with school mean socioeconomic status (SES). Similarly, the main PISA 2009 report published by the OECD showed that 13% of the variation in student achievement is associated with school learning environment, however, much of this effect is linked with student and school SES (OECD, 2010b, p. 107). The PISA report concludes that learning environments do matter for student outcomes and learning environments conducive to academic achievement are more easily realized in schools that enroll students from middle and upper-class backgrounds.



### **Positionality of the researcher**

During my 23-year education career, I have fulfilled many roles and taught across a broad spectrum of learning environments, spanning from early childhood, primary and senior school through to tertiary education. Positions of leadership that I have undertaken at the school level include assistant principal, senior teacher, information communication and technology coordinator, learning area coordinator, and administration team leadership member. Leadership roles that I have held at the tertiary level include being employed as the leader of a faculty learning engagement team and serving as a member on a teaching and learning committee. With many years of involvement across a range of education contexts, I have gathered a unique insight into the role that education opportunities and experiences can play in mediating the relationships between students and their education outcome. As such, I believe there is a possible correlation between school resources, learning environments and academic outcomes.

Like most of my colleagues I am committed to building connected relationships with the school community and improving the education outcomes and welfare of students. I utilise my pastoral care and class management skills to ensure I maintain optimal learning conditions for the students I teach. This enables me to maximise the benefit of education resources and supports my ability to integrate digital literacy skills with the Australian Curriculum.

I recognise the importance that student background, teaching strategies, learning environment and learning resources have on student academic performance. To learn more, I have undertaken research to investigate how schools that are geographically distributed across Australia's rural, remote and metropolitan communities vary in terms of school resources and learning environments. Gathering knowledge in the way school communities across Australia vary by school characteristics and student learning is of vital importance as it will lead me to better understand the role of education experience and opportunities and influence of inequity of learning and education disadvantage in Australia. My goal as a researcher is to understand

the significance, inter-connectedness and impact of these trends on student experience and learning outcomes and better understand the cause of inequality of education across urban-rural school communities. However, my main objective as an educator is to connect, support, engage and inspire students to achieve their very best and endeavour to mentor less experienced educators following this same approach

### **Problem statement**

Australian students' literacy performance in PISA reading, mathematics and science assessments, since 2000, has highlighted that education disadvantage exists in rural school communities across Australia. While it is likely that the characteristics of students explain some of the achievement gap between rural and urban students, it is plausible that the characteristics of schools also play a role. Generally, researchers are unable to identify the exact cause of the disparity between the educational outcomes of Australian urban-rural school communities. As with many social phenomena, multiple causes are likely.

Rural students in Australia typically have, on average, lower socioeconomic status than their urban counterparts (Welch, Helme & Lamb, 2007). As suggested by Young (1998), this lower socioeconomic status could explain why rural students typically have lower outcomes than their urban peers. While the relationship between socioeconomic status (SES) and student academic achievement is well documented (Caro, McDonald & Willms, 2009; White, 1982), however, the degree to which SES is associated with student learning is debatable. What is known is that the relationship between family SES and academic achievement is complex, as illustrated in an Australian study by Considine and Zappalà (2002) which examined SES in the context of variables such as gender, family structure, household income, parental educational attainment, type, and geographical location of school. Considine and Zappalà's (2002) findings suggest that the social and economic components SES may have distinct and separate influences on educational outcomes.

As suggested earlier, school characteristics may also explain why rural students have on average lower educational outcomes than their urban peers. While rural schools often have difficulties attracting and retaining experienced teachers (Halsey, 2018), the degree to which their resources and learning environments are comparable to other schools is less well known. Understanding how rural and urban schools vary can therefore shed light on the causes of rural educational disadvantage, as well as possible solutions. At the same time, however, positive learning environments are ends in themselves, not just a means for fostering academic outcomes. Uncovering inequalities of educational resources, opportunities and experiences between rural and urban schools is just as important as identifying and explaining inequalities of educational outcomes.

## **Research questions**

This study investigates how school resources and learning environments vary by geographical location of school communities across Australia, and how these variations correlate with students' academic literacy. The characteristics of school communities have also been examined to uncover more knowledge about education opportunities and experiences of students and the variation between rural-urban schools, within Australia and contrasted against Canada and New Zealand. Through analysing a range of school community variables, it is possible to gain an understanding of school resources, learning environments, academic literacy, SES, and parent education levels. It is through the analysis of these constructs that possible correlations between education opportunities, education experiences and education outcomes can be uncovered.

School characteristics refer amongst other things to the general school environment, class milieu, teaching practices, learning resources, relationships between students, teachers, administrators and parent. They are influenced by internal and external school factors, such as socio-economic status, geographic location, school type and school leadership. Academics often interchangeably use school characteristics, culture, community, and climate. According to Nias, the nature of school culture is "...often applied to school with a wilful lack of precision" (1989, p. 143). Kaplan and Owings (2013) believe many school reform efforts do not succeed because a school's culture is not considered. Whether it be school characteristics, culture, community, or school climate, these terms are broad, and according to Hoy, are based upon "...teachers' perceptions of their general work environment; it is influenced by the formal organization, informal organization, personalities of participants, and the leadership of the school" (1990, p. 151). In this study, school characteristics are reflected through the response of student and principal PISA 2009 questionnaire data.

The purpose of this thesis is to focus on PISA 2009 data relating to school community and academic outcomes with the objective of discovering to what extent principal and student perspectives on school resource and school learning environment variables differ across Australian school communities. I endeavoured to find patterns within PISA 2009 questionnaire responses, from students and principals, that highlight the association between school community and academic achievement across Australia's urban-rural school communities. International trends associated with school characteristics provide new perspectives on Australian school communities and enable each Australian school community to be compared with 'like' school communities at an international level. The following research questions have guided my study:

- How do school resources vary by geographic (urban-rural) location in Australia?
- How do school learning environments vary by geographic (urban-rural) location in Australia?
- To what extent do inequalities in educational opportunities (resources), experiences (learning environments) and outcomes (PISA scores) exist for Australian students in rural communities in comparison to other school communities distributed across rural-urban regions?
- To what extent is there rural disadvantage in educational opportunities, experiences and outcomes in Australia?
- How does rural disadvantage in educational opportunities, experiences and outcomes in Australia compare with two like countries, such as Canada and New Zealand?

## **Significance of study**

Government funding, like the New South Wales (NSW) government's 'Rural and remote education blueprint' which is designed to improve learning across rural and regional NSW public schools, is an example of the Australian public's desire to improve equity for Australian rural school community students. However, the problem is complex. A diverse number of elements influence education outcomes, such as student and family SES, community type and school resources. To ensure that the Australian public are not shielded from the deeper issues affecting education outcome in rural Australia it is important to consider the strengths and weaknesses of rural education and understand that rural outcomes will only improve once the problem is understood.

There is extensive international research regarding rural education, but it is hard to find research that disentangles the effects of rurality from other variables, such as Indigeneity and SES or compares how learning environments and learning resource vary between rural and urban schools. However, research in this field is steadily growing with committed researchers such as Cuervo (2016), Goodwin and Kosnik (2013), Pini and Bhopal (2017) and White (2015) exploring Indigenous, social and cultural issues along with other important rural matters in the Australian education context. Previous research from Australia has shown that rural schools have difficulties attracting and retaining experienced teachers, as found by Lock, Reid, Green, Hastings, Cooper and White (2009), Thomson and De Bortoli (2008) and Welch et al. (2007). Strategies to improve student outcomes and learning experiences need to be prioritised to ensure funding and other resources are distributed appropriately and inroads are made to reduce rural-urban education disparity.

It is essential for researchers to gain a better understanding of the interconnectedness of school characteristics and the role they can play on student education experiences and the possible correlations between school resources, learning environments and academic outcomes.

This is particularly important if we are to 'bridge the gap' for students within Australia who consistently have lower educational outcomes than their peers: students from lower SES backgrounds, students in rural and remote communities, and Indigenous students (Connell et al., 2007; De Bortoli & Thomson, 2010; Lokan, Greenwood, & Cresswell, 2001; Thomson & De Bortoli, 2008). While it is well known that rural schools in Australia have difficulty attracting and retaining experienced teachers, the ways in which rural schools vary from schools in other communities, to a large extent, has not been extensively explored.

A significant aspect of my study is that it utilises PISA 2009 data to examine how schools in different geographic communities differ. There is a growing body of work that utilises international assessment programmes like PISA to highlight the performance of Australian students on the international stage, including Cresswell and Underwood (2004), De Bortoli and Thomson (2010), Hattie (2009), Haycock (2001), Lokan, et al. (2001), and Thomson, De Bortoli, Nicholas, Hillman and Buckley (2010). Having access to PISA's large, well-established and respected dataset helps to legitimise this research whilst also providing an internationally accepted way of classifying school communities across urban and rural school geographic regions. The school community classifications, outlined by PISA 2009, provides researchers with the opportunity to contrast 470,000 students across 65 countries using a common framework. Commonality of a significant number of school communities at an international level is the reason PISA was embraced as the foundation for this investigation into rurality in Australia and contrasted across Canada and New Zealand.

My study is designed to provide information about the nature and extent of rural-urban difference in Australian school communities, better understand the correlation between school community characteristics, geographic location and the academic performance of students, and raise questions for future research. International comparisons of principal and student perspectives on school characteristics are used to help gain new knowledge on the nature and

possible impact of similarities and differences of school characteristics on student experience and academic outcomes. Seeing how Australian school community characteristics compare to similar countries, such as Canada and New Zealand, is important as it enables us to better understand the significance of school characteristic and other variables, such as SES and parent education, on the student experience and their literacy performance across PISA. It also will provide an indicator to the extent of rural disadvantage in Australia and highlight inequality of educational opportunities and experiences and outcomes for Australian students schooled in rural communities.

The research I have undertaken provides a measure of how schools vary in terms of resources and environments by geographic location and size (school community). My study aims to investigate whether socioeconomic status plays a lone hand in determining academic performance. And identify how school opportunities, experiences and outcomes vary across rural communities, from similar countries such as Canada and New Zealand. The information gathered through my research will provide teachers, principals and rural communities with a clear understanding of the inequity that exists across Australian urban-rural school communities. By highlighting inequity across school community in Australia I aim to encourage policy-makers in Australia to diminish the school characteristic variable disparities that exist between Australia's school communities, particularly in rural communities.

### **Structure of thesis**

My study is structured as 'thesis by publication' comprising three separate analyses, each co-authored with my supervisors and submitted to or published in a peer-reviewed educational research journal. The analyses used data from PISA 2009 to examine how school resources and learning environments vary across rural, regional and metropolitan communities. The first two studies examined school characteristics in Australia, and the



third study compared Australia with two economically, culturally and socially similar countries, Canada and New Zealand. The titles of the three studies are as follows:

1. How do school resources and academic performance differ across Australia's rural, regional and metropolitan communities?
2. How do school learning environments differ across Australia's rural, regional, and metropolitan communities?
3. Comparing rural educational disadvantage in Australia with two similar countries: Canada and New Zealand.

These three articles are introduced and explored in detail in subsequent chapters within this thesis. Background information is presented prior to each paper to provide context and 'significance of study' concludes each chapter, helping to provide better understanding of the issues being examined. References for all three papers are included at the end of the thesis rather than at the end of each paper.

The thesis comprises seven chapters. Chapter One introduces the thesis, Chapter Two provides an overarching review of the literature, Chapter 3 provides a general description of the method and approach, Chapter 4 presents paper #1, Chapter 5 presents paper #2, and Chapter 6 presents paper #3. Chapter 7 concludes the thesis and revisits key points, summarises findings, underlines the significance and limitations of the study and makes recommendations for policy, practice and future research.

## **Chapter 2:**

### **Literature Review**

#### **Overview**

In this chapter I provide a brief overview of the research literature that underpins my study. I examine literature that looks at the implication of SES and conceptualisations of rural education. Literature from Australia as well as other economically developed countries has been gathered to analyse the differences between rural and urban schooling, as they relate to education opportunities, experience and outcomes. These dimensions of educational equity are characterised in my research as educational opportunities (school resources, such as learning materials, teachers and facilities), educational experiences (learning environment, such as instructional practices and relationships between teachers and students), and education outcomes (i.e., student achievement scores on PISA 2009). The influence of positive school factors, such as abundant school resources and engaging learning environment on student achievement, is supported by a growing number of researchers (Leithwood et al., 2010; Lonsdale, 2003; Teddlie & Reynolds, 2000; Vignoles, Levacic, Walker, Machin & Reynolds, 2000). More focused and in-depth reviews of relevant literature is provided in each of the three papers, which are presented in the ensuing chapters.

Secondary analyses of PISA about rural-urban educational inequalities have been conducted in other countries. Lounkaew (2013) utilized PISA 2009 data to examine the education achievement of urban-rural students from Thailand. Lounkaew suggests that a one-size fits all solution to education reform is not possible and resources alone do not guarantee that education disadvantage can be overcome. There is also a body of evidence that suggests school resources bear little to no significance in educational outcomes. Amini and Nivorozhkin (2015) used PISA 2000-2009 data to investigate rural-urban divide in educational outcomes

and conclude that higher SES is associated with higher achievement. They suggest that school resources do not play a significant role in education outcomes. Williams (2005) reported an inconsistent urban-rural difference exists for the countries in his analysis and indicates that whilst SES can be a predictor of student outcomes there is little evidence for a systematic gap. He found that the learning environment was a determinant of student ambition and achievement, even when SES was controlled and suggests the usefulness of exploring the characteristics of schools.

### **Significance of socioeconomic status**

Socioeconomic status (SES) is a predictor of academic performance (OECD, 2010a; Reardon, 2011; Sirin, 2005). In fact, SES has long been established as a major factor, external to school, that is a precursor to academic success (Coleman et al., 1966; Mullis, Martin, Foy & Arora, 2012; Sirin, 2005). Researchers have identified that educational resources (Chiu & Khoo, 2005; OECD, 2005; Vignoles et al., 2000), experiences (Akiba, LeTendre, & Scribner, 2007; Camburn & Han, 2011; Hanushek & Rivkin, 2006) and opportunities, both at home and at school, are influenced by SES (Bourdieu & Passeron, 1990; Coley, 2002; Nash & Harker, 2006; Orr, 2003; Yeung, Linver, & Brooks-Gunn, 2002). However, it is difficult to disentangle variables associated with SES because they are inter-related: for example, compared to their less advantaged peers, higher expectations are thought to be placed on students who come from higher SES backgrounds (Rumberger & Palardy, 2005), who in turn are often provided more rigorous academic curriculum (Lamb, Hogan, & Johnson, 2001; Oakes, 2000). Thus, it is likely that socioeconomic status is related to academic achievement through both family, home and school related factors.

Factors external to school may impact more significantly on student achievement than school inputs (Chudgar & Luschei, 2009; Konstantopoulos & Borman, 2011; Woessmann, 2016). Ramos, Duque, and Nieto (2012) utilised PISA 2006 and 2009 data to examine

Colombian rural school communities. Their research suggests the nucleus of the home rather than the school community is the key to improving student academic outcomes. Tayyaba (2011) utilized a Pakistan national assessment survey in her investigation. She found the availability of academic resources made little difference to student achievement across rural-urban schools. Collectively these studies highlight the need for the interconnectedness of SES, home factors, school resources and school environment variables to be better understood.

The dangers of using large scale international assessments, like PISA, to link academic achievement to SES, is uncovered by Schmidt and Burroughs (2013). They explored the role of introducing 'opportunity to learn' (OTL) indicators to discover the impact of school factors on student achievement at a deeper level. White (1982) considered the correlation between student SES and academic achievement weak. However, statistically students from high SES backgrounds typically enjoy more positive learning environments and better educational resources than low SES counterparts (OECD, 2005; Orr 2003; Thomson, 2002).

In the Australian context, students in rural environments have been found to be less economically advantaged than their urban peers (Lamb, 1994). Low SES in both the school and home are predictors of educational outcomes (Noel & de Broucker, 2001; Rothman & McMillan, 2003). And compared to their more privileged peers, low SES students often experience at home fewer learning opportunities that are aligned with success at school (Nash & Harker, 2006; Yeung et al., 2002). Perhaps this is due to a lack of resources, such as time. Coley (2002) suggests the parents of low SES students are less likely to read to their children. Given this scenario the importance of maintaining high quality school resources and learning environments is imperative. A sub-Saharan study by Zhang (2006) is one of many international studies, like Opoku-Asare and Siaw (2015) and Ramos et al., (2012), which support the notion that school resources are important determinants of rural-urban gaps in student achievement.

## **Educational opportunities**

The Coleman Report is a, "...model of equality of educational opportunity focused on student outcomes" (Jacobs, 2016, p. 319). PISA establishes opportunity to learn variables that can be used to link school effectiveness based on PISA student performance across reading, mathematics and science to equitable resource distribution (OECD, 2010). Shields, Newman and Satz (2017) express:

Educational opportunities are those opportunities that aim to enable individuals to acquire knowledge and certain skills, and to cultivate certain capacities... we associate the goals that constitute educational opportunities with access to educational institutions such as schools... (3.1 What is Educational Opportunity? section, para. 4).

In this study, the term 'education opportunity' supports the views of (OECD, 2010) and Shields, Newman and Satz (2017) and is measured through analysis of PISA questionnaire school resource variables, including learning materials, education equipment, infrastructure and teachers. In this way my research supports the philosophy of Shields (2015), who states, "...equality of opportunity can offer guidance and assessment of the design of educational institutions" (p. 54).

It is well-known that the quality of school resources plays a role in the development of the learner (Chiu & Khoo, 2005; OECD, 2005; Vignoles et al., 2000). Instructional material and qualified and experienced teachers are associated with student achievement (Chiu & Khoo, 2005; Haycock, 2001; Wenglinsky, 2002). Lower SES schools around the world, on average, are less resourced than higher SES schools (Bowles & Levin, 1968; Centra & Potter, 1980; Chiu & Khoo, 2005). However, whilst it may seem like a simple problem to solve, the solution to over-come resource inequity is complex. Some researchers have questioned whether establishing resource equality across low and high SES school

communities is enough to overcome outcome inequities as it is difficult to compensate for limited access to resources outside the school (Minguez & Ballesteros, 2008).

McMorrow (2011) believes school funding reform is vital. At the political level the trend toward improving the educational opportunities for Australian students has been pursued through the introduction of an Australian Curriculum in 2008, a commitment that is supported by the 2008 Melbourne Declaration on Educational Goals for Young Australians Ministerial Council on Education, Employment, Training, and Youth Affairs (Barr et al., 2008), the Gonski Report (Gonski, Boston, Greiner, Scales & Tannock, 2011), an increased focus on national and international testing, and emphasis on school accountability via the My Schools website. However, whilst the government is committed to ensuring the next generation of working Australians is well placed in a global economy, the government's ability to provide a clear understanding of urban-rural opportunity divide is less defined.

Young (1998) led an Australian rural education investigation that determined that whilst school effect, associated with educational opportunities, on student learning is small, there is a great deal of variance left unexplained. For instance, 'shortage of teachers' is believed to impact on learning. Vinson, Esson and Johnston (2002) and Welch et al. (2007) found that some Australian rural schools face teacher shortages. Teacher shortage is associated with the disparity between education opportunities in rural and urban schools (Clotfelter, Ladd, Vigdor & Wheeler, 2007; Darling-Hammond & Ball, 1997; Darling-Hammond, Holtzman, Gatlin & Vasquez Heilig, 2005; Haberman, 2006; Hanushek, 2007; Hattie, 2009; Ofsted, 2000). Issues raised by Akiba et al. (2007) emphasize the importance of ensuring equality of access to qualified teachers across low and high SES school communities. Cresswell and Underwood (2004) and Thomson and De Bortoli (2008) utilised PISA data to show that Australian rural schools have difficulties attracting and retaining experienced teachers.

Student learning and achievement are associated with school resources, such as qualified and experienced teachers (Greenwald, Hedges & Laine, 1996; Haycock, 2001; Wenglinsky, 2002) and positive learning environments (Aultman, Williams-Johnson & Schultz, 2009; Frempong, Ma & Mensah, 2012; McHugh, Horner, Colditz & Wallace, 2013; National Research Council, 2003; Newberry, 2010; Spilt, Hughes, Wu & Kwok, 2012). Teachers' knowledge positively predicted student academic gains (Hill, Rowan & Loewenberg Ball, 2005) and a larger teacher effect variance was found in low SES schools than high SES school (Nye, Konstantopoulos & Hedges, 2004).

### **Education experiences**

School learning environment, as used in this research, includes a range of student and teacher relationships, behaviours, attitudes and expectations. It can include associations between teachers and students, school climate, and classroom disciplinary climate. In the context of my investigation it includes classroom and school disciplinary climate, student and staff communication, expectations and absenteeism. The data utilised in this research are based upon principal and student perceptions of their school's learning environment. The data were gathered via principal and student PISA 2009 questionnaires. Principals' and students' perception is based upon their responses to survey questions relating to school, teachers, students and the classroom. Although interconnected these constructs can be broken into three categories: school learning environment, student and teacher behaviours and the classroom learning environment.

A strong interplay between school climate, learning resources and educational policies is suggested to exist in Australian schools (Angus, 1993; Connell, Ashenden, Kessler, & Dowsett, 1982; Human Rights and Equal Opportunity Commission, 2000; Smyth, McInerney, & Hattam, 2003). The characteristics and motivations of rural high school students has been researched by Hardré, Sullivan and Crowson (2009), who found that a student's perceived

scholastic confidence most strongly predicted interest and achievement. The relationship between student and teacher, particularly a student's attitude towards teachers as a measure of academic self-concept, was explored by Haslett (1976). She found student interpersonal effectiveness to be the most significant overall predictor of high school students' attitudes towards teachers. Nussbaum (1992) examined literature relating to effective teacher behaviours, highlighting that effective teaching practices and instructional processes made a difference. High quality instructional practices have been shown to engage students and promote student outcomes (Akiba et al., 2007; Hanushek, 2007; Hogebe & Tate IV, 2010; Winheller, Hattie, & Brown, 2013). However, despite analysis on students, learning, relationships and teaching practices, little is known about the degree to which the learning environments in rural schools differ from other schools in Australia.

Student learning is seen to be promoted by supportive and caring teachers who have high expectations (Auwarter & Aruguete, 2008; Hardré & Reeves, 2003; National Research Council, 2003; Rosenfeld, Richman, & Bowe, 2000), and inspiring teachers (Hardré & Reeves, 2003). Positive, supportive and caring relationships between teachers and students have been shown to improve students' outcomes because they increase students' motivation and engagement with learning (Aultman et al., 2009; McHugh et al., 2013; National Research Council, 2003; Newberry 2010; Spilt et al., 2012). Many researchers, such as Diseth (2007), Hoy, Tarter and Hoy (2006) and Stewart (2008), believe that a positive and cohesive school learning community promotes high academic expectations.

It is clear that school-related factors, such as student and teacher professional relationships, can also provide greater understanding of the inequity associated with the geographic divide in academic outcomes across Australian school communities. At the heart of teacher and student interactions in the classroom is the management skills of the teacher. Classroom disciplinary climate is viewed by many researchers as a strong predictor of student



outcomes (Schleicher, 2009). Randhawa and Michayluk found that Canadian urban classrooms “...meet the needs of the learner in such a way that they perceive their learning experiences sufficiently satisfying” (1975 p. 277). What is largely agreed upon is classrooms that have fewer distractions promote more opportunities for teaching and learning (Frempong et al., 2012; OECD, 2005; Shin, Lee, & Kim, 2009). Moreover, high quality instructional practices can promote student outcomes (Akiba et al., 2007; Hanushek, 2007; Hogebe & Tate IV, 2010; Winheller et al., 2013).

### **Education outcomes**

Education outcomes include scores on standardized tests, grades on school-based assessments, and school completion rates, among other measures. The Australian government uses national and international testing to gather information on the performance of students. These various tests have shown that Australian students in rural and remote regions do not achieve at the same level as their city peers (Cresswell & Underwood, 2004; Thomson, Cresswell & De Bortoli, 2004). Studies of students from lower socioeconomic backgrounds, which include many Indigenous and rural and remote students, have shown that these students typically achieve lower educational outcomes than their more privileged peers in Australia and elsewhere (Noel & de Broucker, 2001; OECD, 2010a; Sirin, 2005; Teese & Polesel, 2003).

Students from rural school communities, on average, achieve lower results on standardized tests of academic performance (Cresswell & Underwood, 2004) and compared to urban schools, the administration of rural schools have expressed difficulty recruiting and retaining teachers (Ministerial Council on Education, Employment, Training and Youth Affairs, 2003; Vinson, Esson, & Johnston, 2002; Yarrow, Ballantyne, Hansford, Herschell, & Millwater, 1999). In Australia, Young (1998) led an Australian rural education investigation that determined, classroom learning environment has a strong effect on student

self-concept, which links to student ambition. She also identified that SES has a positive effect on ambition but not self-concept. However, self-concept was found to affect both ambition and achievement. This research helps educators better understand how to work towards lowering retention rates, which in rural high schools are lower than their city counterparts (Godden, 2007; Marks & Fleming, 1999), and reverse the trend where rural high school students are less likely to graduate and attend university (Alston & Kent, 2006; James, 2001; Marks, Fleming, Long, & McMillan, 2000). Collectively, this research highlights the need for school characteristics to be better understood to help prevent inequity in learning experience for rural school communities.

### **Rurality in the Australian context**

Whilst it is difficult to establish a shared definition for the term ‘rural education’, either in Australia or amongst international researchers, it is common to examine rurality in terms of population size, population density and distance from a major city. Black (2005, cited in Alston, 2007), highlights the need for a unified view of what it means to be a rural student. The Australian Bureau of Statistics, 1998 (ABS), defines a rural community as a location where people live in clusters of less than 1,000 people. Like the ABS, the Organisation for Economic Cooperation and Development (OECD), which coordinates PISA, utilises population size to distinguish geographic regions.

An insight into education disadvantage in rural school communities in Australia was gained through exploring the Australian Human Rights and Equal Opportunity Commission’s Report into Education in Regional and Rural Australia (Human Rights and Equal Opportunity Commission, 2000). The report found that rural schooling in Australia was inferior on every indicator included in their study. Webster and Fisher (2000) highlight the need for a better understanding of school community types across the urban-rural continuum,

...research in the area of rural and urban differences  
should take into account more categories of location

which would include remote, semi-rural, outer suburban and inner-city as all these locations have characteristics which are specific to the very location (p. 358).

Attracting teachers to rural areas is an ongoing concern for many governments. In

Australia there has been a push to have rural education incorporated into teaching degrees to better prepare graduate teachers for rural placement. Beutel, Adie and Hudson (2011) found that preservice teachers' perceptions of teaching in rural communities can be better informed through the introduction of a structured rural teaching experience. A similar education reform is promoted by White (2008), who sees the value of fostering well-trained teachers who are personally and professionally equipped to address the educational needs of rural communities.

### **Conclusion**

This literature review has summarised the significance of education opportunities, experiences and outcomes, especially in the rural-urban context. It is well established in Australia that students who attend schools in rural areas have lower educational outcomes than their urban peers. It is also well established that rural schools in Australia have difficulty attracting and retaining experienced teachers, although the degree to which this is different from urban contexts is not clear. Much less is known about the differences between rural-urban schools, especially regarding school resources and learning environments. The PISA dataset provides rich information about school resources and learning environments across Australia's school communities. As such, it is very useful for mapping how schools in rural and urban contexts differ.

Understanding how school resources and learning environments vary across school communities is an important first step for identifying how schools can be improved. These improvements may help reduce inequalities of outcomes between students in rural and urban contexts. It is just as important, however, to map the nature and extent of rural-urban inequalities of educational opportunities and experiences because they are an end in themselves and not just as a predictor of academic outcomes. All students deserve the right

to enjoy orderly classrooms or positive relationships with their teachers, regardless of where they live. It is also plausible that students in rural contexts experience more positive school experiences compared to their urban peers. Understanding how schools in different rural-urban contexts vary can not only highlight how schools can be improved, but also showcase the strengths of rural schools, which in turn could enhance their ability to attract and retain experienced teachers.

## **Chapter 3:**

### **Methodology**

This thesis investigates how school resources and learning environments vary across rural, regional and metropolitan school communities within Australia, and contrasts findings with two countries of similar historic, economic and cultural diversity: Canada and New Zealand. In this chapter, I describe the general methodological approach, discussing the research design, data source and analytical strategy. More specific methodological detail is provided in each of the papers that comprise the next three chapters.

#### **Research design**

I used a descriptive research design to examine quantitatively how schools vary across rural-urban communities, from the perspective of school principals and students. My aim was to produce a detailed and comprehensive mapping of the differences between schools, focusing on the nature and extent of these differences. By using a large and nationally representative dataset, I was able to create a more comprehensive and accurate mapping of rural-urban school differences than has been available to date. My mapping of differences between school communities will be useful for uncovering educational inequalities and for identifying areas for further research.

#### **Data source**

I used data from PISA to answer the study's research questions. PISA was launched by the OECD in 1997, with the aim of examining the reading, mathematical and scientific literacy of 15-year-old students within the OECD member and partner countries. PISA "...examines how well students are prepared to meet the challenges of the future, rather than how well they master particular curricula" (OECD, 2012, p. 3). PISA also includes a wide range of variables about students, classrooms and schools that may be related to student performance. The aim of PISA is to provide researchers and policy-makers with an

internationally comparative evidence base for guiding educational reform and uncovering different ways of organizing schools and learning.

Through its rich collection of data across many countries, PISA can be used to identify educational structures and practices for enhancing the educational outcomes of students from disadvantaged backgrounds (Thomson, et al., 2010). Measuring student literacies (academic performance) on a regular basis is designed to ascertain the opportunity for students to learn. The OECD Assessment Framework (2010, p. 168) states,

A central pre-occupation of PISA is that of fairness or justice in access to education and the opportunity to learn... The second concern is that of how to measure equity. Equity can be assessed in terms of the distribution of access to schooling, learning resources and opportunities, and educational outcomes.

PISA questionnaires are designed to gather information on school resources and learning environments and present data to highlight equity in the distribution of learning opportunities and show what is possible in terms of education outcomes in reading, mathematics and science.

PISA is administered every three years to a nationally representative sample of 15-year-old students and schools in all OECD member countries and a growing number of voluntary non-member countries. Each cycle measures student literacies in all three subject domains. In addition, each cycle measures one of the domains in-depth, with the focused domain alternating between cycles. I used data from the 2009 cycle since this was the most recent cycle when I commenced my studies. The subject of focus in the 2009 cycle was reading. Reading is useful for measuring educational inequalities because it is a fundamental competency that undergirds all learning.

PISA is a very large dataset. Approximately 470,000 15-year-old students from 65 countries and economies participated in PISA 2009. Between 5,000 and 10,000 15-year-old students, from at least 150 schools, were typically tested in each country. The number of

Australian students included just over 14,000 from 353 schools (Thomson et al, 2010). In Canada, the approximate number of participating 15-year-olds was 23,000 students from 1,000 schools spanning across the ten provinces (Knighton, Brochu & Gluszynski, 2010). New Zealand's sample comprised 4,643 students from 163 schools (Telford & May, 2010).

PISA comprises data from students and school principals. In addition to the cognitive literacy assessment, students complete a 30-minute questionnaire about their individual characteristics, parents' backgrounds and characteristics, home resources, and attitudes to school. The 2009 cycle also asked students questions that are specific to reading engagement and instruction, such as their individual engagement with reading, classroom and school climate, views on their native speaking language lessons, teachers' instructional strategies, access to and use of libraries and strategies in reading and understanding text (OECD, 2012). Principals from schools selected in the survey also answered a 30-minute questionnaire. This questionnaire is designed to gain an understanding of the level of school resources and provides information on the school environment and qualifications of staff (Thomson et al., 2010). The School Questionnaire contains questions on the structure and organisation of the school, the student and teacher body, the school's resources, the school's instruction, curriculum and assessment, the school climate, the school policies and practices and the characteristics of the principal or designate (OECD, 2012).

### **Variables**

The PISA 2009 dataset utilised in this thesis comprises 470,000 students across 65 countries. Most countries typically sample between 5000-10,000 students, but to allow for comparisons between jurisdictions (states and territories), Australia sampled a larger number of students. The large sample size ensures that there is a wide cross-section of students, representative of each of Australia's states, important groups within the population (e.g., Indigenous Australians), and distinct school communities.

PISA 2009 geographically categorises the geographic communities from which schools and students derive as follows:

- i) villages, hamlets or rural areas with fewer than 3,000 people;
- ii) small towns with 3,000 to 15,000 people;
- iii) towns with 15,000 to 100,000 people;
- iv) cities with 100,000 to one million people; and
- v) large cities with over a million people.

(OECD, 2011, p. 56)

The five geo-location categories used in OECD's PISA 2009 reports differed from those utilized by the Australian Council for Educational Research (ACER), which administers PISA in Australia. Rather than five categories, ACER subdivided some of the categories, to make a total of eight community categories. I made contact with ACER and requested the geographic location coding for School Community that ACER had applied to the Australian PISA 2009 dataset. Once permission and access were granted to this dataset, I imported school characteristic variables into an ACER version of the PISA 2009 source file. This allowed me to conduct secondary analyses using the same geographic communities used by ACER.

Table 1 above outlines the distinctions in school community population size present in the Australian PISA 2009 data as utilized by ACER and the Programme for International Student Assessment. I used the eight community categories for papers 1 and 2. I used the five community categories for paper 3 so that comparisons could be made with Canada and New Zealand.



**Table 1.** Overview of ACER and PISA classification of school community

ACER Filtered PISA 2009 data		Raw PISA 2009 data	
School Community	Population size	School Community	Population size
Small rural community	< 1,000	Village	< 3,000
A small country town	1,000 to about 3,000		
A medium-sized country town	3,000 to about 15,000	Small town	3,000 to about 15,000
A larger town	15,000 to about 50,000	Town	15,000 to about 100,000
A very large town	50,000 to about 100,000		
A city	100,000 to about 1,000,000	City	100,000 to about 1,000,000
Elsewhere in a very large city	> 1,000,000	Large City	> 1,000,000
Close to the centre of a very large city	> 1,000,000		

The variables used to provide information on school resources and learning environments across urban-rural school communities stem from PISA 2009 student and principal questionnaire data whilst student outcomes are measured against reading, mathematics and science mean literacy performance in PISA 2009. Other interesting PISA data are incorporated into my study to increase understanding of student, school and family, including SES, Indigeneity and highest parent education level attained.

When investigating school resources, I utilised the principal questionnaire survey. To gain an appreciation for school community resource availability I accessed the information pertaining to the ratio of student numbers to computers. To gain a stronger appreciation for the distribution of school resources across school communities I examined the principal questionnaire survey response to: shortages of teaching resources (science laboratory equipment, instructional material, computers, Internet, computer software, library materials

and audio-visual materials). This information was supplemented by principal responses to questions focused on staff, including: lack of teaching personnel (science teachers, mathematics teachers, English teachers, qualified teachers, library staff and other personnel).

When identifying school learning environment, principal and student questionnaire data were utilised. Principals' perceptions of school learning environment are based on their responses to the following questions: To what extent is learning of students hindered by such things as teacher's low expectations; student absenteeism; student teacher relations; student disruptions; student's needs not met; and teacher absenteeism? To better understand school learning environment, students were asked to respond to the following: school has done little to prepare me for adult life; school has been a waste of time; school has helped give me confidence to make decisions; and school has taught me things that could be useful in a job.

To gather information on the school environment I utilised PISA student questionnaire data that measured student and teacher relationships. Students were asked to indicate their level of agreement with items like: I get along well with most of my teachers; most of my teachers are interested in my well-being; most of my teachers really listen to what I have to say; if I need extra help I will receive it from my teachers; and, most of my teachers treat me fairly.

In my research, student attitudes towards the classroom environment was determined through analysis of student questionnaire responses to classroom disciplinary climate. Students were asked to indicate their agreement with these five items: students don't listen to what the teacher says; there is noise and disorder; the teacher has to wait a long time for the class to quiet down; students cannot work well; and students don't start working for a long time after the lesson begins.

The PISA 2009 dataset includes a SES measure for each student, which PISA calls ESCS (economic, social and cultural status). I created a new variable for each participating

school to represent an average of the student-level ESCS scores, from that school: for example, if 30 students completed PISA 2009 at school X, the students' ESCS scores were averaged to create a 'mean school SES' variable. Next, the school SES variable was used to divide the participating schools in each country into quintiles arranged from lowest to highest school SES.

### **Analytical strategy**

My aim in all three papers was to compare school characteristics across school communities. To this end, I used descriptive statistics such as means, standard deviation and frequencies. Means and frequencies were compared across the Australian school communities in papers 1 and 2. In paper 3, means were compared across school communities within and between Australia, Canada and New Zealand.

Questionnaire items in PISA typically have four responses. The four responses vary by item. Some items have four responses that range from "strongly agree" to "strongly disagree"; another variation is four responses that range from "every lesson" to "never/hardly ever". A third variation is as follows:

- 1: Not at all;
- 2: Very little;
- 3: To some extent; and
- 4: A lot.

For some items, I calculated means and frequencies for each of the four responses: for example, I calculated the proportion of students that responded, "to some extent" compared to the proportion of students that responded, "a lot". In other instances, I collapsed response categories into two larger categories (e.g., strongly agree and agree, vs strongly disagree and disagree) and then reported frequencies for those larger categories. In other instances, PISA creates a numeric index that is comprised of multiple items: for example, "classroom

disciplinary climate” is an index that is comprised of five separate items. I calculated and compared means for some of these index variables as well, especially in the third study. Specific details about the variables and analytical strategy used in each study is described in the relevant paper.

For the Australian context, I calculated frequencies of the school-level variables for the eight different school communities as utilized by ACER for papers 1 and 2. This comparison provided a comparison of school learning environment and resource characteristics by geographic location (e.g., percentage of schools that experience teacher shortages in remote locations versus urban locations). In addition to the comparisons of school learning environment and resource characteristics, I also compared mean PISA achievement across these different school contexts.

### **Clarification of terms**

This thesis utilises language contained within the OECD (2009) data analysis manual, focusing on two key subsets of school community: school resources and school learning environments. During my research I came to realise that the classification for seemingly simple terms, such as rural education, school resources and learning environments within educational research varies considerably. I utilised the OECD’s Glossary of Statistical Terms (OECD, 2007) to provide a clear understanding of variables utilised in my investigation.

Index of economic, social and cultural status (defined as SES in this research) is created using the following variables: the highest level of education of the student’s parents, the PISA index of family wealth, the PISA index of home educational resources, and the PISA index of possessions related to classical culture in the family home.

School location refers to the community in which the school is located, such as a village, hamlet or rural area (fewer than 3,000 people), a small town (3,000 to about 15,000

people), a town (15,000 to about 100,000 people), a city (100,000 to about 1,000,000 people), close to the centre of a city with over 1,000,000 people.

School resources includes instructional materials such as the school library, calculators, computers, the internet, and laboratories. It also includes teaching and other instructional staff.

Learning environment, as classified by PISA, includes: teacher and student behaviours that affect learning, the disciplinary climate, teacher-student relations, how teachers stimulate students' engagement in reading, parents' involvement in and expectation of schooling, and school principals' leadership. (OECD, 2010b, p.56)

In this chapter, through the analysis of methodological approach, research design, data source and analytical strategy I have endeavoured to highlight the thoroughness of my thesis research, the relationship between investigations and the complexity of this task.

## Chapter 4:

### Paper 1: **How do school resources and academic performance differ across Australia's rural, regional and metropolitan communities?**

#### **Background**

Focused within the Australian context, my first article, titled “How do school resources and academic performance differ across Australia’s rural, regional and metropolitan communities?” was published in the *Australian Educational Researcher* (AER) in April 2013. The AER is the flagship journal of the Australian Association for Research in Education. My initial analysis of PISA 2009 student data raised awareness that some of the status categories my research wanted to encapsulate, such as student Indigenous status, were not available for public viewing in the OECD PISA 2009 dataset. Consequently, I requested access to Indigeneity data from ACER. I then integrated the data into the database that I was utilising. The endeavour for my first paper was to gain a better understanding of three groups of Australian students (those from Indigenous, rural, and low socioeconomic backgrounds) performing at significantly lower academic levels in comparison to their peers in PISA 2009 reading, mathematics and science. Analyses of PISA 2009 data provided information on school resources that helped to contextualize academic achievement across Australian school communities.

When investigating school resources, I utilised the PISA 2009 principal questionnaire which seeks perceptions from principals of their school community’s learning resources. To gain an appreciation for school community resource availability I accessed the information pertaining to student numbers to computers ratio. To gather a more detailed understanding of the distribution of school resources across school communities I examined the principal questionnaire survey response to shortages of teaching resources. This information incorporated the following areas: science laboratory equipment; instructional material;

computers; Internet; computer software; library materials; and audio-visual materials. These data were supplemented by principal responses to questions focused on staff, including: lack of teaching personnel by school community. Principals provided information on: science teachers; mathematics teachers; English teachers; qualified teachers; library staff; and other personnel.

To support my findings, I researched current literature on the significance of learning resources and gained a better understanding of the inter-relatedness of learning resources with other variables and the possible implications for learning outcomes. My research of the PISA 2009 Australian principal questionnaire dataset revealed that principals of schools in small towns indicate that their school communities have fewer resources than schools in very large cities. I discovered that many principals, especially those in less populated school communities, report instruction that occurs within their school is hindered to some extent by 'a lack of resources', in particular, 'shortages of teaching personnel'. By utilising the PISA SES variable, I also learned that there appears to be a positive association with school SES and students' academic performance in reading, mathematics and science.

## How do school resources and academic performance differ across Australia's rural, regional and metropolitan communities?

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Received: 28 November 2012 / Accepted: 11 June 2013 / Published online: 21 June 2013  
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**Abstract** This study uses data from the Programme for International Student Assessment (PISA) to gain a better understanding of how academic performance and resources vary across rural–urban school communities in Australia. While it is well known that schools in rural areas have difficulty recruiting and retaining teachers, the degree to which schools in larger sized communities across Australia also face this problem is less understood. Moreover, very little is known about the degree to which shortages of instructional materials and equipment are associated with rural–urban location. The analysis includes 353 schools across eight community types that range in size of <1,000 people in small country towns to more than a million people in large capital cities. School principals reported the degree to which instruction in their school is hindered by a shortage of resources, which include qualified teaching staff and instructional materials and equipment. The findings highlight the extent to which school resources vary across geographic location, as reported by school principals. Principals of schools in the centre of large cities were the least likely to report that shortages of teaching staff or instructional materials hinder learning, while principals in rural and remote communities were the most likely to report that such shortages hinder instruction. These differences closely mirror student PISA academic performance and school socioeconomic composition. PISA data indicates that schools located in small rural communities have the lowest

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socioeconomic profiles, the lowest academic performance and the largest shortages of teaching staff and instructional materials, while schools in central neighborhoods of large cities enjoy the highest socioeconomic profiles, the highest academic performance and the fewest shortages.

**Keywords** Geographic location · School resources · Rural education · Academic performance · PISA

## Introduction

This study adds to our understanding about the shortage of school resources in rural communities by comparing rural, regional and urban school principals' responses on the *Programme for International Student Assessment* (PISA), an international assessment created by the Organization for Economic Cooperation and Development (OECD). PISA is an international assessment of reading, mathematics and science literacy designed for 15-year-old students. The performance of Australian students taking part in PISA 2009 has been characterized by the OECD as high performing and equitable compared to other countries (Thomson et al. 2010). However, a recent report for the Review of Funding for Schooling in Australia by the Nous Group (2011) suggests Australian students' performance in recent international tests:

...masks a wide degree of variability within our education system. That variability relates to educational outcomes, and to equity—that is, the degree to which people from all backgrounds are able to realise their potential in school. (p. 5)

So whilst Australian students on average display positive educational outcomes, PISA data also indicate that three groups of students in Australia consistently have lower academic performance than their peers: students with lower socioeconomic status (SES), students in rural and remote communities, and Indigenous students (De Bortoli and Thomson 2010; Lokan et al. 2001; Thomson and De Bortoli 2008). Our focus in this paper is on analysing PISA questionnaire data concerning students and schools in rural and remote communities, including data provided by school principals.

According to an Australian government document (Baxter et al. 2011), Australia's population in 2009 was just <22 million people living in the following community types:

Over two-thirds (69 %) of Australians live in major cities, one in five (20 %) live in inner regional areas, one in ten (9 %) in outer regional areas and around. one in forty (2.3 %) live in remote or very remote areas (1.5 % remote and 0.8 % very remote). (p. 1)

Educational opportunities and outcomes are limited in many rural and remote communities. In terms of educational opportunities, the Australian Human Rights and Equal Opportunity Commission (2000) states:

State and Territory education departments provide primary schools in rural and remote locations once there is a critical mass of primary aged children. A remote community of fewer than 1,000 people is unlikely to be provided with a secondary school. Some 'primary' schools extend their provision beyond year 6 or 7 to year 8 or 9 and sometimes to year 10. Secondary provision to year 12 is almost non-existent in remote communities. (p. 11)

Australian students who attend schools in rural and remote communities experience lower educational outcomes than their peers in the cities (Human Rights and Equal Opportunity Commission 2000). They are less likely to attend university (James 2001), less likely to finish secondary school (Lamb et al. 2004), and have poorer performance on achievement tests (Williams 2005). In their analysis of PISA 2000 data, Cresswell and Underwood (2004) found that:

...students in remote areas are not achieving at the same level as their city counterparts...It was found that 27 per cent of students from remote areas were achieving at the two lowest levels, compared to 12 per cent of students from major cities. At the other end of the scale, 18 per cent of remote students achieved at the two highest levels, compared to 46 per cent of the city students. (p. 33)

Cresswell and Underwood (2004) found similar patterns in their analysis of PISA 2003 data for Australia.

The reasons why students in rural and remote communities have lower educational outcomes than other students are complex and varied. Family background is a strong predictor of educational outcomes. Numerous studies have shown that students from lower socioeconomic backgrounds, which include many Indigenous and rural and remote students, typically achieve lower educational outcomes than their more privileged peers (Noel and de Broucker 2001; OECD 2010; Sirin 2005; Teese and Polesel 2003). Although international and Australian research has consistently shown that individual level factors such as socioeconomic status and home environment are the largest predictors of educational outcomes (Noel and de Broucker 2001), school resources are also important (Chiu and Khoo 2005; OECD 2005; Vignoles et al. 2000).

Rural and urban funding equity issues have come to the fore in Australia partly due to the Gonski Review (Gonski et al. 2011), a major education funding review commissioned recently by the federal government. The review proposes a more balanced and equitable funding formula to reduce large resource inequalities between schools and to ensure that all schools receive adequate funding to meet the needs of their students. The need for school funding reform in Australia is vital as explained by McMorro (2011): "Constructing national recurrent target resource standards for schools...would be a major step towards the development of a funding model for schools that has integrity, rationality and sustainability" (p. 15).

It is indeed the case that rural schools often receive higher per-pupil funding than urban schools because they are more expensive to operate due to their small size, and because they often enrol a larger proportion of at-risk students who receive higher funding (e.g., Indigenous students). For example, the federal government's



My School website (Australian Curriculum Assessment and 2013) shows that Narrogin Primary School, located in a small rural community of ~4,200 people, has a net recurrent income of \$14,139 per student, while Mandurah Primary School, located in a city of more than 83,000 people, receives \$12,359 per student. The larger per-pupil funding in rural schools is not necessarily sufficient to provide an equitable distribution of school resources, however. It may be the case that rural schools need an even higher per-pupil funding in order to have a comparable level of teaching and learning resources.

In this study, we use questionnaire data from PISA 2009 to gain a better understanding of the extent to which school resources, vary according to where schools are geographically located. The school resource variables included in PISA 2009 relate to shortages of teaching staff, materials and equipment, as reported by school principals. Our primary aim is to examine differences in school resources across rural–urban locations as reported by school principals. Although it is well known that schools in rural and remote communities routinely experience high turnover of teachers and principals (Vinson et al. 2002), much less is known about how shortages of teaching staff, materials and equipment may vary across different types of communities in Australia.

Regardless of whether school resources are significantly related to students' educational outcomes or not, resources amongst Australian schools must be distributed across schools in a manner that ensures equality of access and opportunity for all students, in accordance with the National Declaration On Educational Goals For Young Australians (Ministerial Council on Education, Employment, Training and Youth Affairs 2008). All Australian students (Barr et al. 2008) have the right to:

...equality of opportunity to access and participate in high-quality schooling that is free from discrimination based on gender, language, sexual orientation, pregnancy, culture, ethnicity, religion or disability, and differences arising from students' socioeconomic background or geographic location. (p. 6)

A secondary, related objective of this study is to examine how academic performance (as measured by PISA) varies across a wide range of rural–urban locations in Australia. Again, although it is well established that students in rural communities tend to perform less well than their urban peers, less is known about how the overall academic performance of schools varies by location. Is the relationship between school academic performance and community size, type or urbanicity consistently positive, or not? And, how do these relationships look when school and student socioeconomic composition are added to the mix?

## Background

Educational outcomes are influenced and mediated by a complex web of factors derived from multiple sources, including the student, family, peers, community, school and the dominant culture within a society. A particular set of factors, namely those reflective of a school's resources, is the focus of this study. School resources

include instructional materials, infrastructure and teaching staff. Previous research has reported that school resources and learning environments are strongly associated with educational outcomes (Chiu and Khoo 2005). Of all school resources, most researchers agree that qualified teachers are the most important for student learning (Akiba et al. 2007; Darling-Hammond and Ball 1997; Darling-Hammond et al. 2005; Hanushek 2007; Hattie 2009).

Researchers for decades have noted that school resources are strongly correlated with both school and student SES, which leaves open the possibility that the importance of school resources is underestimated (Bowles and Levin 1968; Centra and Potter 1980). Chiu and Khoo (2005), among many others, have reported that higher SES schools are, on average, better resourced than lower SES schools in most countries, including Australia. Compared to schools that enroll students with mainly higher SES backgrounds, schools with large concentrations of students from low SES backgrounds have fewer teaching resources (Chiu and Khoo 2005; Tate 1997), have more difficulty recruiting and retaining teachers (Darling-Hammond 2009; Haberman 2006), and have fewer certified teachers (Clotfelter et al. 2007; Hanushek 2007; Ofsted 2000).

Within Australia and across the world the term ‘rural’ is defined in different ways. Black (2005, cited in Alston 2007), notes that “‘Rural’ is a highly contested term in Australia because of the diversity of population and geography” (p. 196). Many people question the rurality of Australia’s lush coastal regions in comparison to the sparse Australian outback. PISA categorises school communities based on geographic location, taking account of the population size of the community and its distance from the nearest city. The context by which PISA classifies a school community’s geographic location is not reflective of the community’s proximity to the ocean, the quality of infrastructure or economic development.

In Australia, schools in rural and remote locations face many challenges, especially regarding teaching staff. Vinson et al. (2002) and Welch et al. (2007) have found that rural schools in New South Wales face teacher shortages. Analyses of PISA data indicate that rural schools in Australia have difficulties attracting and retaining experienced teachers (Cresswell and Underwood 2004; Thomson and De Bortoli 2008). None of these studies, however, has shown in detail how resources vary across schools in different locations. This study adds to our understanding about the shortage of school resources in rural communities by comparing principals’ responses from rural, regional and urban communities.

While student factors are probably more important than school-level factors in predicting academic performance, the latter are nonetheless important. For example, Rothman and McMillan (2003) report, “Approximately less than one-sixth of the variation in scores on tests of reading comprehension and mathematics [tertiary entrance scores] could be attributed to differences between schools...” (p. 30). Student background characteristics do not explain all of the differences in educational outcomes between students in different geographic locations, however. Young (1998) found that students who attend rural and remote schools in Western Australia, a sparsely populated state, have lower academic performance than their peers in the cities even after controlling for student socioeconomic status (SES). Similarly, Welch et al. (2007) found in New South Wales that students in rural and



remote communities were less likely to complete year 12 than their peers in larger cities, even after controlling for student SES. Welch et al. (2007) also found that school completion rates varied after controlling for concentrations of Indigenous students and school size. These studies suggest that school characteristics (other than school size) may vary by rural–urban location, and that these differences may help explain performance gaps between rural and urban students. This conclusion is also strongly supported by analyses of PISA data that demonstrate that school resources mediate the relationship between school and student socioeconomic status and academic performance (Chiu and Khoo 2005).

## Method

This study examines data from PISA 2009. PISA is a large international student performance assessment of 15-year-olds. Since 2000 PISA has conducted assessments every 3 years. Each participating country's sample is drawn to be statistically representative of the total number of students enrolled in different types of schools (e.g., private or public), communities and geographical locations. The latest publicly available PISA assessment was conducted during 2009, with over 65 countries and nearly 470,000 students taking part (data from the last round of PISA, conducted in 2012, has yet to be released). The Australian PISA 2009 sample includes 353 schools and 14,251 students (Thomson et al. 2010). The PISA 2009 dataset includes responses to two main questionnaires: one completed by students and the other by school principals.

PISA is not a perfect tool for evaluating educational systems and student outcomes (Hopmann et al. 2008). Like all cross-sectional datasets, PISA does not allow researchers to show causal relationships among student or school characteristics and student performance. However, its advantage is that the number of participating countries and students is very large, and that it includes an extensive range of student and school variables. Another potential limitation of PISA data is many of the variables relating to school resources and learning environments are reported by the questionnaire respondents (i.e., either students or principals).

The Australian PISA 2009 dataset sourced from the Australian Council for Educational Research (ACER) groups participating schools into eight geographic categories based on the population size of the community; this variable is called 'School Community'. The eight categories range from communities with less than 1,000 inhabitants (the most 'rural' of the eight categories) to communities with more than 1,000,000 inhabitants (the most 'urban' category). ACER has redefined the five categories utilised within the original PISA data into eight geographic categories to better characterise the broad geographic variation of Australian communities. For Australia, the distribution of students and schools in these eight geographic categories is shown in Table 1.

In this investigation we calculated two additional contextual variables for each school community: (1) the average school SES; and (2) the ratio of Indigenous to non Indigenous students. We calculated these variables because, in the Australian case, they tend to be strongly associated with rurality and in Australian school

communities the Indigenous to non Indigenous ratio is a strong indicator of cultural dynamics. Each variable was calculated from individual student records in the PISA 2009 sample. Table 2 provides the ratios of Indigenous to non Indigenous students by community type and school SES. It should also be noted that Australia over-samples Indigenous students in PISA to gain a better understanding of the complexity of issues that affect this group of students.

Table 2 shows that the density of Indigenous students in rural school communities in Australia is greater than in school communities close to the centre of very large cities. There is the option for rural Australian students to transfer to city school communities or attend boarding school. However, as is highlighted by the mean SES variable and explained by the Human Rights and Equal Opportunity Commission (2000) "...for many Indigenous students each of these options violates cultural expectations and needs and is therefore unrealistic" (p. 14).

**Table 1** Distribution of students and schools by school community

School community	Population	Number of students	Number of schools
Small rural community	<1,000	182 (1 %)	6
A small country town	1,000 to about 3,000	467 (3 %)	15
A medium-sized country town	3,000 to about 15,000	1,811 (13 %)	45
A larger town	15,000 to about 50,000	1,571 (11 %)	39
A very large town	50,000 to about 100,000	1,236 (9 %)	29
A city	100,000 to about 1 million	4,538 (32 %)	108
Elsewhere in a very large city	>1 million	2,297 (16 %)	59
Close to the centre of a very large city	>1 million	2,148 (15 %)	52
Total		14,250 (100 %)	353

**Table 2** Indigeneity of school communities

School community	Population	Ratio of indigenous to non indigenous students	Mean school SES
Small rural community	<1,000	1:10.4	-0.02
A small country town	1,000 to about 3,000	1:7.6	-0.01
A medium-sized country town	3,000 to about 15,000	1:7.1	0.11
A larger town	15,000 to about 50,000	1:6.6	0.15
A very large town	50,000 to about 100,000	1:6.1	0.22
A city	100,000 to about 1 million	1:12.6	0.47
Elsewhere in a very large city	>1 million	1:25.7	0.35
Close to the centre of a very large city	>1 million	1:31.5	0.52
Average		1:11.5	0.34

Our study utilises PISA questionnaire data provided by school principals about students, teachers and resources within individual schools. PISA collects such information because previous studies have reported that school resources are associated with student educational outcomes (Diseth 2007; Hoy et al. 2006; Schleicher 2009; Stewart 2008).

Principal responses to questions of teaching personnel shortages stem from the following questionnaire questions: Question 10, “The goal of the following set of three questions is to gather information about the student-computer ratio in your school” and Question 11, “Is your school’s capacity to provide instruction hindered by any of the following issues?” Question 11 contains 13 ‘issues’ that relate to the question stem: six issues concerning shortages of qualified teaching staff and seven issues about shortages of teaching materials and equipment. The response categories to the 13 issues comprise the following: ‘not at all’ (coded 1), ‘very little’ (coded 2), ‘to some extent’ (coded 3), and ‘a lot’ (coded 4). In keeping with the questionnaire format, we have kept principals’ responses about shortages of teaching materials and personnel together in our analysis. We acknowledge, however, that these two domains are likely to have different impacts on student experiences and outcomes.

We calculated descriptive statistics (means, standard deviations, and frequencies) for principal responses to each item, across all eight school communities. Our purpose was to gather information from school principals about the degree to which shortages of teaching staff, materials and equipment vary across the eight rural–urban locations.

## Findings

As reported in Table 2, the proportion of Indigenous to non Indigenous students is highest in school communities with 100,000 residents or less. Mean school SES is lowest in small rural communities and highest in school communities close to the centre of a very large city. Patterns in Table 2 indicate that school SES increases with the size of the community, with one exception. The average school SES is reported higher in smaller cities (<1,000,000 residents) than in the ‘fringe suburbs’ elsewhere in a very large city (more than 1,000,000 residents).

As noted above, we also calculated students’ average literacy performance for the three subjects (mathematics, reading and science) assessed in PISA, for each of the eight school communities. These results are presented in Table 3.

Australia’s PISA 2009 literacy performance outlined in Table 3 shows that students who attend school in a city centre achieve, on average, considerably higher mean scores than their peers in rural communities. This pattern supports research by Cresswell and Underwood (2004) who reported that Australian students who attended schools in close proximity to major cities and inner regional locations had stronger performance in the PISA 2000 Reading Assessment than students in regional and remote geographic locations. Indeed, student academic performance scores in PISA 2009 mathematics, reading and science appear positively related to community size, wherein increases in the size of the community are generally associated with higher literacy performance average scores. The apparent



**Table 3** Mean mathematics, reading and science literacy performance scores by geographic location

School community	Population	Mathematics M (SD)	Reading M (SD)	Science M (SD)
Small rural community	<1,000	469.2 (80.3)	472.0 (91.4)	483.6 (84.8)
A small country town	1,000 to about 3,000	480.6 (87.8)	475.8 (97.0)	501.1 (97.3)
A medium-sized country town	3,000 to about 15,000	491.4 (82.2)	489.8 (93.1)	506.5 (93.2)
A larger town	15,000 to about 50,000	486.3 (84.9)	485.4 (93.8)	501.2 (95.3)
A very large town	50,000 to about 100,000	502.9 (87.7)	503.0 (94.6)	517.0 (96.6)
A city	100,000 to about 1 million	525.8 (88.8)	528.0 (93.6)	540.5 (96.8)
Elsewhere in a very large city	>1 million	514.8 (86.8)	516.2 (92.8)	524.6 (95.0)
Closer to the centre of a very large city	>1 million	541.3 (89.9)	541.7 (94.9)	550.8 (97.8)
Average		514.3 (89.4)	514.9 (96.0)	527.3 (97.6)

relationship between literacy performance and school community size is not completely linear, however. Average scores in all subjects were higher in medium-sized country towns than in larger towns. Another exception is that average scores are higher in smaller cities than “elsewhere in a very large city”; in other words, student literacy performance is higher in large regional cities than in the outer suburbs of the large capital cities. This pattern closely mirrors the pattern between mean school SES and community type reported in Table 2.

Figure 1 highlights the relationships among school community, school SES, indigeneity and student literacy performance in reading, mathematics and science, as assessed in PISA 2009.

Figure 1 illustrates that schools in small rural communities and small country towns enroll students with lower SES backgrounds, whereas schools close to the centre of very large cities tend to enroll students with higher SES backgrounds. Figure 1 reflects the strong association that exists between mean school SES and mathematics, reading and science literacy performance. There are a few exceptions to this pattern and for this reason the performance of students from larger towns (15,000–50,000 residents) is of interest. Likewise, the Indigenous to non Indigenous student ratio represented in Fig. 1 suggests that higher ratios are linked to weaker academic performance in mathematics, reading and science.

Table 4 summarizes principals’ responses to questions about student-computer ratios across the eight school communities. Principals were asked to report on the number of computers that are available to 15 year-olds in their school and to identify the number of computers that have Internet access.

Table 4 suggests that, according to school principals, the mean number of computers available to 15-year-old students within year 10, across school communities, closely matches the mean number of students within this range. Similarly these data indicate that almost all school computers have Internet access.



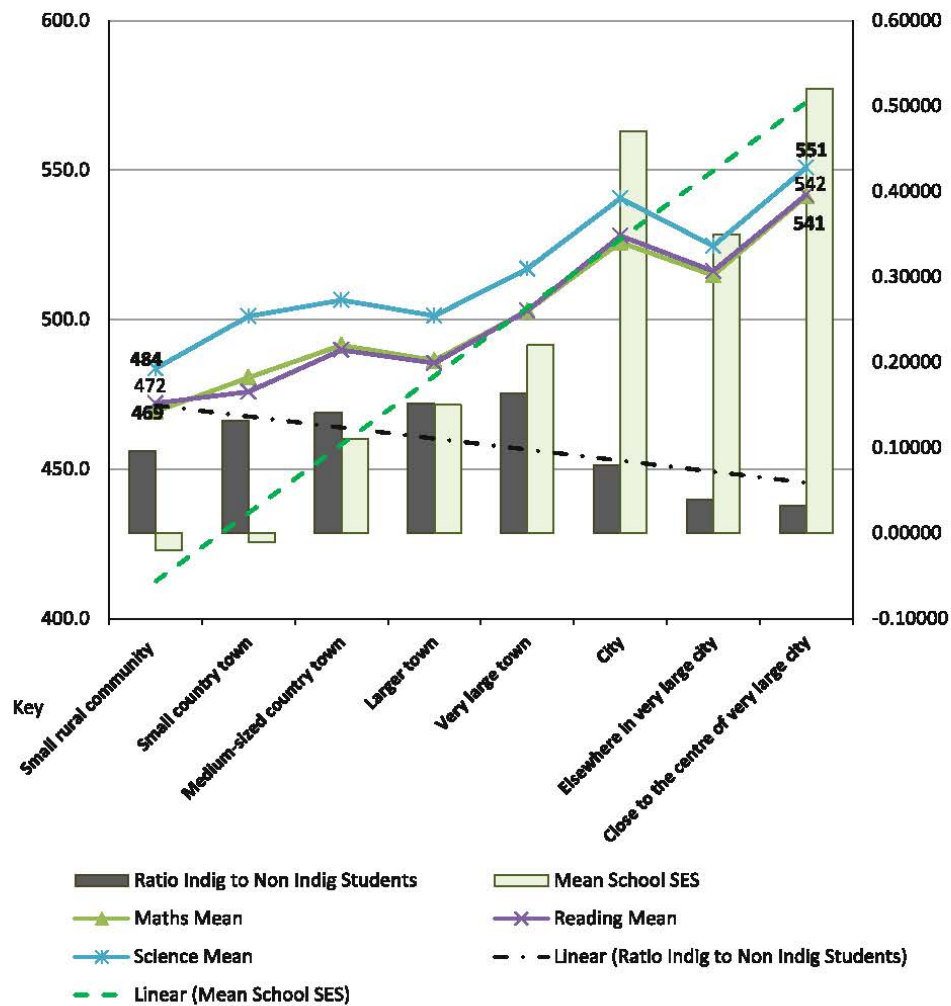


Fig. 1 Mathematics, reading and science academic performance in PISA 2009 by mean school SES and geographic location

Thus, the data show that the student to computer ratio is very similar across the eight school communities, ranging from 0.9 to 1.1. The data provided by principals reports the ratio of computers to students, is largest in both the smallest rural communities and the most urban school communities. This is perhaps the result of the Labour government's education revolution, which included a policy of providing computers to every school (Buchanan 2011; Rudd et al. 2007).

A school's capacity to provide instruction can be hindered in many ways. Tables 5 and 6 report principals' responses to questions about their school's resources, which includes teaching staff, materials and equipment. Principals were asked about the degree to which their school's capacity to provide instruction is hindered by a lack of teaching personnel (Table 5) and teaching resources (Table 6).

**Table 4** Ratio of student numbers to computers by school community

School community	Total number of students in modal grade for 15-year-olds (Mean)	Computers for education in modal grade (Mean)	Ratio of computers to students	Computers in modal grade with internet access (Mean)
Small rural community	34.7	38.7	1.1	38.7
A small country town	54.7	57.8	1.1	57.8
A medium-sized country town	119.3	108.4	0.9	107.9
A larger town	160.8	140.7	0.9	140.7
A very large town	196.9	172.5	0.9	171.9
A city	173.4	171.9	1.0	171.3
Elsewhere in a very large city	165.0	180.7	1.1	179.8
Close to the centre of a very large city	188.3	202.4	1.1	201.6
Average	160.4	159.3	1.0	158.3

According to the responses provided by school principals, shortages in teaching personnel vary moderately across the school communities, with principals in the smallest, most rural communities more likely to report that shortages hinder instruction in their schools compared to principals in more urban areas. The general trend shown in Table 5 is that shortages of teaching personnel become less pronounced, as the size of the school community increases, although there are a few exceptions as is evident in a larger town and a very large town data. The largest differences, according to location, in the degree to which teacher shortages were perceived by principals as hindering instruction were seen in mathematics. On average, school principals in small rural communities reported this a problem to some extent (mean = 2.7), whereas principals in urban schools reported maths teacher shortages a hindrance only to a very little extent (mean = 1.7). Somewhat surprisingly, we found that principals' reported that teaching personnel shortages were also a hindrance in towns ranging in size from 15,000 to 50,000 residents (a larger town). This suggests that shortages of teaching personnel are not limited to the most rural or remote communities. The number of principals who responded that their school is 'to some extent' affected by teacher shortages varies substantially across the school communities. For example, 83 % of principals in small rural communities report that a lack of mathematics teachers hinders instruction to some extent or a lot, compared to only 17 % of principals in communities close to the centre of a very large city. Further, one-half of principals in small rural communities report that a shortage of qualified teachers hinders instruction in their school to some

**Table 5** Lack of teaching personnel by school community as reported by principals

My school's capacity to provide instruction is hindered by a lack of						
School community	Science teachers	Mathematics teachers	English teachers	Qualified teachers	Library staff	Other personnel
<b>Small rural community</b>						
M	2.3	2.7	2.5	2.5	1.5	2.5
% 'to some extent'	50	83.3	33.3	50	16.7	33.3
% 'a lot'	0	0	16.7	16.7	0	16.7
<b>A small country town</b>						
M	2.1	2.5	1.9	2.1	2.2	2.3
% 'to some extent'	20	46.7	20	46.7	26.7	33.3
% 'a lot'	13.3	13.3	6.7	0	20	6.7
<b>A medium-sized country town</b>						
M	1.8	1.9	1.6	2.2	1.4	1.9
% 'to some extent'	28.9	22.2	15.6	40	4.4	24.4
% 'a lot'	0	8.9	0	2.2	2.2	2.2
<b>A larger town</b>						
M	2.2	2.3	1.9	2.2	1.2	1.9
% 'to some extent'	43.6	56.4	30.8	30.8	2.6	20.5
% 'a lot'	2.6	2.6	0	0	0	7.7
<b>A very large town</b>						
M	2.1	2.1	1.7	2.0	1.5	1.8
% 'to some extent'	34.5	34.5	24.1	27.6	13.8	20.7
% 'a lot'	6.9	6.9	0	3.4	3.4	6.9
<b>A city</b>						
M	1.8	1.9	1.6	1.9	1.4	1.8
% 'to some extent'	19.4	22.2	18.5	32.4	7.4	21.3
% 'a lot'	2.8	6.5	0	0	0	2.8
<b>Elsewhere in a very large city</b>						
M	1.7	1.9	1.5	1.8	1.3	1.5
% 'to some extent'	27.1	27.1	5.1	20.3	5.1	8.5
% 'a lot'	1.7	5.1	1.7	5.1	0	3.4
<b>Close to the centre of a very large city</b>						
M	1.5	1.7	1.5	1.7	1.3	1.8
% 'to some extent'	11.5	15.4	17.3	19.2	9.6	21.2
% 'a lot'	1.9	1.9	0	1.9	0	7.7
Mean	1.9	2.1	1.8	2.0	1.5	1.9

Principal questionnaire response categories for question 11 coded as: 1: not at all, 2: very little, 3: to some extent and 4: a lot

**Table 6** Shortages of teaching resources

My school's capacity to provide instruction is hindered by a lack or shortage of:							
School community	Science laboratory equipment	Instructional material	Computers	Internet	Computer software	Library materials	Audio-visual materials
Small rural community							
M	1.8	2.2	2.3	1.7	1.7	1.7	2.3
% 'to some extent'	33.3	50	16.7	16.7	0	16.7	50
% 'a lot'	0	0	16.7	0	0	0	0
A small country town							
M	2.1	2.1	2.0	1.7	2.3	2.3	2.4
% 'to some extent'	33.3	40	20	6.7	40	33.3	40
% 'a lot'	6.7	0	6.7	0	6.7	6.7	6.7
A medium-sized country town							
M	2.0	1.7	2.2	2.0	2.0	1.9	2.0
% 'to some extent'	35.6	17.8	37.8	22.2	28.9	17.8	24.4
% 'a lot'	2.2	0	6.7	4.4	4.4	4.4	2.2
A larger town							
M	1.7	1.7	2.1	2.0	1.9	1.7	2.0
% 'to some extent'	10.3	15.4	25.6	10.3	15.4	12.8	25.6
% 'a lot'	2.6	2.6	5.1	12.8	2.6	0	0
A very large town							
M	1.9	1.5	2.1	2.0	2.0	1.8	1.8
% 'to some extent'	31	17.2	34.5	37.9	24.1	24.1	24.1
% 'a lot'	3.4	0	3.4	0	3.4	0	0
A city							
M	1.9	1.6	1.9	1.7	1.9	1.7	1.8
% 'to some extent'	20.4	14.8	20.4	14.8	17.6	7.4	13
% 'a lot'	4.6	0.9	3.7	3.7	3.7	2.8	2.8
Elsewhere in a very large city							
M	1.8	1.6	1.9	1.7	1.7	1.6	1.8
% 'to some extent'	15.3	10.2	18.6	13.6	15.3	5.1	18.6
% 'a lot'	6.8	5.1	8.5	5.1	3.4	5.1	3.4
Close to the centre of a very large city							
M	1.61	1.4	1.7	1.6	1.5	1.3	1.4
% 'to some extent'	13.5	7.7	17.3	11.5	9.6	3.8	3.8
% 'a lot'	3.8	0	3.8	3.8	0	0	1.9
Mean	1.8	1.6	2.0	1.8	1.8	1.7	1.8

Principal questionnaire response categories for question 11 coded as: 1: not at all, 2: very little, 3: to some extent and 4: a lot

extent and another 17 % reported a lot. By comparison, 19 % of principals close the centre of a very large city report that a shortage of qualified teachers hinders instruction to some extent and 2 % reported a lot. Across all school communities,

principals reported a greater lack of mathematics, science and qualified teachers than shortages of English teachers or library staff.

When we placed school principals' responses into two categories, favourable (not at all and very little) and unfavourable (to some extent and a lot), the distribution of responses is noticeable. Sixty-six percent of principals of schools in small rural communities responded unfavourably regarding a shortage of qualified teachers as opposed to only 21 % of school principals close to the centre of a very large city.

Table 6 reports principals' responses about shortages of seven types of teaching resources. As portrayed in Table 6, on average, across all geographic regions of Australia school principals report that teaching resource shortages have very little negative effect on their schools' capacity to provide instruction. However, a more detailed examination of the frequencies of responses for each variable identifies that a small percentage of principals indicate that their school's capacity to provide instruction is indeed hindered, and that these trends are patterned by school location. For example, Table 6 reports considerable difference in the distribution of principals' response to, "My school's capacity to provide instruction is hindered by a lack or shortage of: computers". The largest proportion of principals who reported that a shortage of computers affects instruction to some extent or a lot, is found in small country towns (45 % of principals), while the smallest proportion is found in schools near a very large city centre (21 %). This may suggest that computers are especially useful for supporting learning in rural communities, where access to other materials such as instructional and audio-visual materials may be limited. Understanding the value each resource provides individual school communities has the potential to make a difference to how schools are resourced. Teese (2006) argues that "They [disadvantaged students] should be funded as vehicles of system renovation, aimed at delivering benefits to the school system as a whole" (p. 9).

Additionally, the range in principals' responses to shortages of instructional materials and audio-visual materials across school communities is substantial. Overall, school principals in the two smallest community groups report much higher shortages than their peers in larger communities. One-half of principals in small rural communities and 40 % of principals in small country towns report that a shortage of instructional materials hinders instruction in their school to some extent. This number drops substantially in larger communities, from 18 % in schools located in medium size country towns to <8 % in schools close to the centre of very large cities.

A comparison of Tables 5 and 6 indicates that school principals in small rural communities are more likely to respond that their school's capacity to provide instruction is hindered more by shortages of teaching personnel than by shortages of teaching resources, as shown by the higher mean values in Table 5. The findings presented in Tables 5 and 6 indicate that principal questionnaire responses to questions about teaching resources do vary by school community. For instance, school principals located in very large cities tend to suggest that their schools have sufficient resources, on average, in comparison to schools in small rural communities, for which principals on average tend to report resource shortages. The pattern is not completely linear, however, with principals of schools in very



large towns reporting larger shortages of teaching resources than principals of schools in larger towns, for example. Nevertheless, there is a very strong pattern in the data that shows that instruction is perceived, by school principals to be hindered substantially more in smaller communities than in the larger, most urban communities. While this finding is not surprising, our analysis is able to show in detail the extent to which the availability of resources is patterned according to school community.

## Discussion

Our analysis of PISA 2009 data for Australia details principals' views and responses about their school's resources, according to eight types of geographic community. Our analysis found the following:

- i. Principals' responses indicate that shortages of resources are associated with school community; overall, principals of schools in small towns report that their schools have fewer resources compared to principals of schools in very large cities.
- ii. Many principals, especially those in less populated school communities, report that within their school instruction is hindered to some extent by a lack of resources, in particular shortages of teaching personnel.
- iii. Principals' responses suggest that the relationship between school resources and school community size is generally strong. However, some principals of schools in large towns report fewer resources than the principals of schools in smaller communities, and some principals of schools in non-central communities of very large cities (more than 1 million residents) report similar levels of resources as compared to schools in smaller communities.
- iv. The differences in principals' responses to shortages of teaching personnel are more pronounced across the school communities than are principals' responses to differences in shortages of teaching materials. This is particularly noticeable in the areas of mathematics, science and qualified teachers.
- v. Trends in the availability of resources across school communities are associated with trends in both school SES and average school literacy performance on PISA.

The trends displayed in Fig. 1 highlight that school SES has a strong positive association with students' academic performance in mathematics, reading and science. Our analysis also reports that principals of schools in rural communities believe their school experiences substantial shortages of resources. While this is perhaps not surprising, it should not be taken for granted as normal or natural. We argue that policymakers should expend more effort on understanding the values and needs of school communities and reduce the resource gap between rural and urban schools. We base this argument on the responses of school principals themselves, as reported in this study, as well as by research by Chiu and Khoo (2005), that suggests inequality in the distribution of resources lowers the performance of disadvantaged

students. Policy makers can certainly address some of the resource inequalities found in our analysis, especially those related to instructional materials.

Student access to computers and the Internet, as alluded to previously, has emerged as a significant issue in recent times. In Australia the issue of high speed broadband being rolled out to rural communities became one important focus of the 2007 and 2010 federal election campaigns. As noted by Fehring (2010), Labor "...policy initiatives were designed to achieve equity of access to information and communication technologies for all students, regardless of socioeconomic status or geographic location" (p. 181). Ilomäki and Kankaanranta (2009) have noted, "The same trend regarding heavy ICT investment in education has become evident in many developing countries..." (p. 101).

As reported in Table 6, principals' responses about the distribution of computer and information communication technology varies, whereas, there is very little difference between principals' responses to questions on school community resources. Reassuringly, principals of regional school communities reflect the most appealing ratio of student numbers to computers. This suggests that recent government education policy has made a difference to digital technology resources in Australia's rural school community sector. However, PISA does not collect information about many other important aspects, such as the speed of Internet access, availability of technical support, the impact of such resources on learning or the quality of resources used within each school community. The extent to which computers are used and valued as an instructional teaching tool is also unclear. Mínguez and Ballesteros (2008) state, "According to the PISA Report 2005 report ... [it is unknown if] school-based access [to computers] has an effect strong enough to compensate for the effect of lacking a computer at home" (p. 433).

One limitation of this study is the small number of participating principals of schools in some school communities. Caution should therefore be exercised when generalizing; at the same time, however, the strength of using the PISA dataset is that it is a nationally representative sample. Our analysis is also limited by the unavailability of a variable about teacher experience. It is well known that rural schools often have large numbers of recent teacher graduates and less experienced school principals. Further, although these data reflect the views of school principals rather than an objective measure of these aspects of school resourcing, asking principals about the degree to which instruction in their school is hindered by a shortage of experienced teachers would be highly relevant for the Australian context.

## Conclusion

Our analysis of PISA 2009 examines in fine-grained detail principals' responses to questions concerning school resources. The findings of our analysis suggest an unequal distribution of resources (teaching materials and personnel) between rural and urban schools. The analysis provided in this paper is unable to explain why student performance is higher in larger communities, nor does it establish how school resources could mediate the relationship between geographic status and



education outcomes. However, this study has unearthed patterns as reported by school principals about the distribution of school resources across Australia's eight school communities. Whilst the trends examined in this paper cannot be used to assess the degree to which school resources relate to learning outcomes, previous studies from a range of international contexts support the claim that they are important for learning outcomes. Moreover, shortages of teaching materials and personnel also affect the learning experiences of students. We agree with Gordon and Monastiriotis (2006) that more research should be centred on, socioeconomic status and school constructs such as school resources and learning environments on educational opportunities, experiences and outcomes.

The findings of this study can be useful for a wide audience, including education researchers, practitioners and policymakers. One policy recommendation that could stem from the feedback of principals would be to increase the availability of instructional materials for schools in rural and remote communities. Addressing teaching shortages in rural communities is difficult, but providing sufficient instructional materials should be a routine matter for a wealthy country such as Australia. The findings of our study could also be useful for graduate teachers from capital cities who are preparing for work in rural communities as it will heighten their awareness of the contrasts that exist between school communities across Australia. Finally, it may also help researchers and policy makers understand how schools in particular settings can be better supported.

Our findings show that the distribution of resources across school communities as reported by principals closely mirrors school academic performance and school socioeconomic status. Our findings suggest that rural schools are more affected by shortages of teaching materials and personnel than are schools in larger towns and cities. Rural schools have lower performance scores and higher levels of social disadvantage. To reduce the performance gap between rural and urban schools, we would argue that schools in rural communities should have the opportunity to have resources distributed according to community needs. This could equate to the same or even more resources than their urban counterparts, not less.

**Acknowledgments** This study was supported by a Grant from the Australian Research Council's *Discovery Projects* funding scheme (Project number 1097057) awarded to Laura Perry.



## **Significance of study**

The analyses of school resources provided in the first research paper helps to contextualize the academic achievement findings in PISA 2009 within an Australian geographical context: for example, how does the average achievement of rural schools in Australia compare with those near a large city? The research and review of literature that was completed in the first paper of my thesis highlights the complexity of the interrelatedness of Australia's three groups of students performing at significantly lower academic levels than their peers. The paper presents data that provide analysis of reading, mathematics and science mean literacy performance in PISA 2009 by mean school social economic status and school community (location).

Study 1 is focused upon the Australian school context. Prior to undertaking research for the first paper I had envisaged a dramatic difference in principals' responses to questions relating to school resources across Australia's school communities. However, that difference was not as distinct as I had imagined. The data did suggest, however, that school resources within Australia varied according to school community. For instance, principals of schools in small towns, compared to principals of schools in very large cities, reported that their schools have fewer resources. Many principals, especially those in less populated school communities, also reported that instruction that occurs within their school is hindered to some extent by 'a lack of resources', in particular, 'shortages of teaching personnel'.

The findings of my research suggest that Australia's school communities need to be better recognized and understood. For instance, some principals of schools in large towns report fewer resources than the principals of schools in smaller communities and some principals of schools in non-central communities of very large cities (more than 1 million residents) reported similar levels of resources as schools in smaller communities. This could suggest that strategies need to be put in place to ensure school community allocated funding is

closely monitored as factors such as geographic location and population may have greater implications in some communities than others.

Overall, the trends that I analysed in the first research paper highlight that school SES appears to have a positive association with students' academic performance in reading, mathematics and science and that principals of schools in rural communities believed their schools suffer from shortages of resources. I hope this paper can assist education policy-makers and researchers to gain a clearer understanding of the needs of school communities. Ultimately, I hope that the research I have conducted enables Australian rural school communities to become better resourced.

## Chapter 5:

### Paper 2: **How do school learning environments differ across Australia's rural, regional and metropolitan communities?**

#### **Background**

My second paper, "How do school learning environments differ across Australia's rural, regional and metropolitan communities?" was published in the *Australian Educational Researcher* (AER) in July of 2014 and received the accolade of being among five articles nominated by the Australian Association for Research in Education (AARE) as the best papers published in *Australian Educational Researcher* in 2014. This article was also awarded the "Top Article by a Post-Graduate Student in 2014" by the School of Education at Murdoch University.

Utilising the PISA classification of learning environment, which includes teacher expectations, teacher morale and relationships between students and teachers, I set out to discover to what extent these variables are associated with educational outcomes. My literature review, consistent with earlier findings, suggested that the strength of the relationship between learning environments and student achievement is inconclusive.

Unlike previous PISA questionnaire datasets, PISA 2009 did not ask students about their sense of belonging to school and their perceptions of their school's climate. However, students were asked about their attitudes towards school and their perceptions of their learning environments, classroom disciplinary climate and relations with teachers. One area of interest that my second research paper investigated is the construct of 'classroom discipline', a key component of the learning environment. Data from PISA 2009 showed that schools that have a better school disciplinary climate (e.g., fewer interruptions and distractions in the classroom) have higher academic achievement (OECD, 2010b). However, neither the OECD report nor the Australian national report for PISA 2009 examined how school disciplinary climate varies

across schools in different locations or with different cohorts of students. It was this stimulus that lead my investigation into PISA 2009 for the second article.

## How do school learning environments differ across Australia's rural, regional and metropolitan communities?

Kevin Sullivan · Laura B. Perry · Andrew McConney

Received: 22 November 2013 / Accepted: 14 February 2014 / Published online: 1 March 2014  
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**Abstract** This study uses data from the Programme for International Student Assessment, a large and nationally representative dataset, to examine how learning environments vary across metropolitan, rural and regional schools in Australia. Research has shown that school climate and learning environments are related to student academic performance, but little is known about the degree to which they differ across school communities in Australia. We examined principals' perceptions of teacher and student behaviour related to school climate and students' perceptions of teacher support, classroom disciplinary climate, and the relevance of education. The findings show that regardless of where they live, most students believe that schooling is worthwhile, and report positive relationships with their teachers. Perceptions of classroom disciplinary climate vary more across school communities, however, with students reporting less positive disciplinary climate in rural communities than in very large cities. Principals' perceptions of teacher and student behavior related to school climate varied; with urban schools having much more positive results than schools in towns and rural communities. Finally, our findings show that students' and principals' perceptions of their school climate and learning environments are more positive in urban communities than in rural communities, but that the least positive environments are generally found in country towns rather than remote communities. Our findings suggest that attention should be paid to improving learning environments not just in the most rural/remote communities, but also in largish regional towns of up to 50,000 residents.

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**Keywords** School learning environments · Communities · Geographic location · Rural education · PISA · Australia

## Introduction

The term ‘school learning environment’ is a broad construct that includes a range of student and teacher relationships, behaviours, attitudes and expectations. It can include, among others, relationships between teachers and students, school climate, and classroom disciplinary climate. In the context of this paper school learning environment is not exclusive to but includes classroom and school disciplinary climate, student and staff communication, expectations and absenteeism. Research has shown that positive student perceptions of learning environments can promote positive student outcomes such as achievement and attainment (Allen and Fraser 2007; Patrick et al. 2011). At the same time, however, a positive learning environment is an outcome in itself, not just a means to another end. Whether related to academic outcomes or not, all students deserve to be treated equitably by their teachers and to learn in orderly, well-resourced classrooms that are conducive to learning.

While it is well known that students who attend rural schools in Australia have lower educational outcomes than their peers in urban communities, much less is known about how rural and metropolitan schools differ from each other. Research has shown that compared to students in urban areas, rural students have lower high school retention rates (Godden 2007; Marks and Fleming 1999), are less likely to complete Year 12 (Alston and Kent 2006; Marks et al. 2000), are less likely to attend university (James 2001), and have lower results on standardized tests of academic performance (Cresswell and Underwood 2004). Research has also shown that compared to urban schools, rural schools have difficulty recruiting and retaining teachers (Ministerial Council on Education et al. 2003; Vinson et al. 2002; Yarrow et al. 1999), have fewer instructional resources (Cresswell and Underwood 2004; Sullivan et al. 2013), and offer fewer academic and vocational courses (Human Rights and Equal Opportunity Commission 2000). Very little is known, however, about how learning environments differ between rural and urban schools in Australia.

In this study we examine how school learning environments, as perceived by students and principals, vary across rural and metropolitan communities in Australia. We use a large, nationally representative dataset—the *Programme for International Student Assessment*—to conduct secondary analyses of school learning environments. Our approach is primarily descriptive and exploratory, which is appropriate since very little is known about the degree to which learning environments vary across rural, regional and urban contexts. The findings of our study may serve as a foundation for further research about how and why differences in perceptions of school learning environments exist, based on school location. Understanding the degree to which perceptions vary by geographic location and community size can provide insight about ways to improve student educational



outcomes and experiences. It can also shed light on ways to improve the working conditions of teachers and school principals.

Our rationale for this study which sets out to examine principals' and students' perceptions about school learning environment across a range of differently sized and located Australian school communities is threefold. First, from PISA data we have learned that students in rural communities have, on average, lower educational outcomes than students in metropolitan communities (Cresswell and Underwood 2004; De Bortoli and Thomson 2010). While many rural students also have socioeconomically disadvantaged family backgrounds, it is plausible that some of the variation in student outcomes is due to differences in school learning environments (OECD 2004). Second, understanding how perceptions of learning environments vary across rural and metropolitan schools can be useful for stakeholders who are seeking to develop and promote rural schools and rural communities more generally. Third, we are committed to ensuring that all students are able to enjoy positive learning environments, regardless of where they live. If substantial differences are found across metropolitan and rural schools, our findings can highlight to educational policy makers what aspects of school learning environments need to be improved to ensure that a more equitable education learning environment exists across all Australian school communities.

## Background

Perceptions of learning environments can enrich our understanding of learning outcome variance (Marton 1981; Fraser and Fisher 1982; Lizzo et al. 2002).

This research paper uses questionnaire data, sourced from PISA 2009, to build on research that shows school learning environments can positively contribute to students' educational outcomes. School learning environments are shaped by teachers, including teacher expectations, teacher morale, and relationships between students and teachers. Research indicates that student learning is enhanced by a positive school learning environment that is cohesive and promotes high academic expectations (Diseth 2007; Hoy et al. 2006; Stewart 2008), orderly classrooms (Ma and Willms 2004; Shin et al. 2009; Willms 2010) and adequate educational resources (Orr 2003; Portes 2005). Research has also shown that in terms of teaching, student learning is promoted by supportive and caring teachers who have high expectations (Auwarter and Aruguete 2008; Hardré and Reeves 2003; National Research Council 2003; Rosenfeld et al. 2000), qualified and experienced teachers (Crofford et al. 2011; Nye et al. 2004) and inspiring teachers (Hardré and Reeves 2003).

While ethnographic studies of Australian schools (see, for example, Angus 1993; Connell et al. 1982; Smyth et al. 2003) have suggested strong interplay between school learning environment, learning resources and policies, very little is known about the degree to which the learning environments in rural schools differ from other schools in Australia. To our knowledge only a few studies have examined how school learning environments vary across geographic contexts and community size. The most comprehensive study of this topic is by Cresswell and Underwood (2004).

Using data from the 2000 cycle of PISA, Cresswell and Underwood (2004) compared principals' responses about a range of school characteristics across rural and metropolitan communities in Australia. They found that neither teacher qualifications nor teacher morale differed substantially across geographic context. They did find, however, that principals' perceptions of teacher factors related to school learning environment were less positive in remote communities than in large cities. Waldrup and Fisher (2007) found very small differences in students' perceptions of teacher-student interpersonal behaviour in remote, regional and urban schools in Western Australia and Queensland. Young (1998) found small but statistically significant differences in student perceptions of the support that they received from their teachers in Western Australia. Students in regional, rural and remote communities reported higher levels of support from their teachers than did students in Perth. None of these three studies examined students' perceptions of classroom disciplinary climate, and none of them reported their findings about school differences in much detail. Understanding how classroom disciplinary climates vary is important since studies have shown it is strongly related with positive student outcomes (see, for example, Frempong et al. 2012; Ma and Willms 2004; Schleicher 2009; Shin et al. 2009).

Studies from the USA (Reeves 2011) and Australia (Cresswell and Underwood 2004; Young 1998) have shown that inequalities in educational outcomes between metropolitan and rural schools are largely due to student characteristics such as socioeconomic status, ethnicity and poverty rather than school characteristics. It is plausible, however, that real differences between schools, based on geography, may be masked because learning environments tend to be related with social background. For example, it is well known that students from privileged social-economic backgrounds typically enjoy more positive learning environments than their less advantaged peers (OECD 2005; Thomson 2002), and in general, students in rural environments in Australia are less economically advantaged than their urban peers (Lamb 1994).

The PISA 2009 dataset includes a large number of variables that relate to learning environment. The OECD's primary report for PISA 2009 shows that schools with a better school disciplinary climate (e.g., fewer interruptions and distractions in the classroom) have higher academic performance (OECD 2010). Neither the OECD's primary report nor the Australian national report for PISA 2009 examines how disciplinary climate or other aspects of school learning environment vary across schools in different locations. Our study builds on the literature by showing in more detail than has been done so far the degree to which learning environments differ across rural and metropolitan schools in Australia.

## Method

We use data from the 2009 cycle of the *Programme for International Student Assessment* (PISA) to compare learning environments in rural and metropolitan schools in Australia. This was the latest cycle when we conducted the study; the most recent cycle, PISA 2012, was released after we completed the study. PISA



measures the academic literacy of 15 year-old students in maths, science and reading and is organized by the Organisation for Economic Development and Cooperation (OECD). The OECD has administered PISA every 3 years since 2000. The dataset for PISA 2009 includes nearly 470,000 students from 65 countries. The Australian PISA 2009 sample is nationally representative of the total number of students enrolled across all school types (e.g., private or public), communities and geographic locations. It includes 14,251 students from 353 schools (Thomson et al. 2010).

PISA collects data from students and school principals. In addition to measuring students' academic performance, PISA also collects data about a wide range of possible predictor variables, including time spent on learning in the classroom and at home, the use of technology, reading habits and the skills, values, attitudes, experience, practice, and student access to resources at home and school. Of particular interest to this study is the learning environment of the school.

We sourced the PISA 2009 dataset from the Australian Council for Educational Research (ACER). ACER redefines the five categories that are reflective of population size within the original Australian PISA 2009 dataset into eight geographic categories. ACER classifies participating schools into eight geographic categories to better characterise the broad geographic variation of Australian communities; this variable is called 'School Community'. The eight categories range from communities with less than 1,000 inhabitants (the most 'rural' of the eight categories) to communities with more than 1,000,000 inhabitants (the most 'urban' category). Information about the number of schools and students in the sample is presented in Table 1.

Table 1 shows the average student socioeconomic status for each school community group. We calculated this contextual information since research has shown that learning environments are related to socioeconomic status and ethnicity (Camburn and Han 2011; Cresswell and Underwood 2004; De Bortoli and Thomson 2010; Portes 2005). Student socioeconomic status in PISA is represented by an index comprised of multiple items related to parent education, parent occupation, and economic and cultural resources in the home. In PISA it is named the Index of Economic, Social and Cultural Status (ESCS); throughout the paper we refer to this variable as student socioeconomic status (SES). PISA calculates an ESCS value for each student; we calculated the mean SES for all students in each school community, using weighted data. In the Australian dataset, the index ranges from a minimum of  $-3.40$  to a maximum of  $2.98$ , with a mean of  $.34$  and a standard deviation (SD) of  $.754$ .

As can be seen in Table 1, the social context of schools varies across the eight school communities. The average socioeconomic status of students is positively related to school community size, with the smallest school community having the lowest average student SES and inner city communities in very large capital cities having the highest average SES. The relationship is largely linear except for outlying neighbourhoods of very large cities, which have a lower average student SES than regional cities. This relationship is shown more clearly in Table 1.

PISA collects data about learning environments because research indicates that they are associated with student educational outcomes (Diseth 2007; Hoy et al.

**Table 1** Classification of school communities & distribution of students

School community	Population	No. Schools	No. Students	Mean, index of student socioeconomic status
Small rural community	<1,000	6	182	-.021
A small country town	1,000 to about 3,000	15	467	.011
A medium-sized country town	3,000 to about 15,000	45	1,811	.114
A larger town	15,000 to about 50,000	39	1,571	.153
A very large town	50,000 to about 100,000	29	1,236	.234
A city	100,000 to about 1 million	108	4,538	.469
Elsewhere in a very large city	>1 million	59	2,297	.358
Close to the centre of a very large city	>1 million	52	2,148	.533
Mean or total		353	14,250	.344

2006; Schleicher 2009; Stewart 2008). There are a range of learning environment variables included in the student and principal questionnaires. Students are asked questions about their teachers (e.g., “My teachers treat me fairly” and “My teachers are interested in my well-being”) and classroom discipline and environment (e.g., “There is a lot of noise and disorder in my classroom”). Principals are asked questions about teachers at their school (e.g., “Teachers at my school have low expectations of their students”). Each item comprises a string of four Likert-scale response categories.

We examined the principal and student PISA questionnaire items about school learning environments. Principal data come from Question 17, which asks principals about the degree to which learning in their school is hindered by 13 sub-items related to teacher and student behaviour. A full list of all 13 sub-items is included in Table 2. Student data are drawn from Questions 33, 34 and 36. Question 33 comprises four sub-items about students’ attitudes about the relevance of schooling, Question 34 comprises five sub-items about student–teacher relationships, and Question 36 five sub-items about classroom disciplinary climate. Each provides four Likert-scale responses (e.g., strongly agree, agree, disagree and strongly disagree). A full list of all the sub-items is included in Tables 3, 4 and 5.

For each of these principal and student questions, PISA has calculated a numerical index. The indexes from the student questionnaire are named student attitudes toward schooling, student–teacher relations, and classroom disciplinary climate. Principals’ responses from Question 17 are divided into two indexes, one about teacher-related behaviors and the second about student-related behaviors. Using these indexes, we have compared means across the school communities. We also compared the average SES of students in each school community since SES is related to learning environments and geographic location (Camburn and Han 2011; Cresswell and Underwood 2004).

**Table 2** Principals' perceptions of teacher and student behavior related to school learning environment

To what extent is principals' perceptions of the learning of students hindered by the following													
School community	Teacher's low expectations	Student absenteeism	Student-teacher relations	Student disruption	Student's needs not met	Teacher absenteeism	Skipping classes	Students lacking respect	Staff resisting change	Student drug use	Teachers too strict	Students being bullied	Students not encouraged
Small rural community													
% 'to some extent'	33	33	17	17	67	33	17	33	33	0	17	17	17
% 'a lot'	0	0	0	0	0	0	0	0	0	0	0	0	17
A small country town													
% 'to some extent'	40	40	40	60	60	20	47	47	47	7	13	47	27
% 'a lot'	0	40	0	0	0	0	0	0	13	0	0	0	0
A medium-sized country town													
% 'to some extent'	38	51	27	42	47	9	22	42	33	11	7	24	24
% 'a lot'	0	16	2	7	7	0	4	2	4	0	0	2	2
A larger town													
% 'to some extent'	41	62	26	56	59	31	41	38	38	10	3	33	26
% 'a lot'	3	23	0	10	0	0	3	3	5	0	0	0	3
A very large town													
% 'to some extent'	34	41	21	24	28	10	24	14	41	7	7	21	21
% 'a lot'	0	10	3	7	10	0	7	7	0	3	0	3	3
A city													
% 'to some extent'	28	34	7	23	35	14	20	18	32	1	4	13	18
% 'a lot'	3	10	2	3	2	0	6	1	4	1	0	1	1
Elsewhere in a very large city													
% 'to some extent'	34	25	15	25	46	15	17	22	32	2	0	10	19
% 'a lot'	2	14	2	7	0	0	8	0	2	0	0	3	5

**Table 2** continued

To what extent is principals' perceptions of the learning of students hindered by the following

School community	Teacher's low expectations	Student absenteeism	Student-teacher relations	Student disruption	Student's needs not met	Teacher absenteeism	Skipping classes	Students lacking respect	Staff resisting change	Student drug use	Teachers too strict	Students being bullied	Students not encouraged
Close to the centre of a very large city													
% 'to some extent'	19	31	4	10	21	10	8	8	36	0	4	14	17
% 'a lot'	0	8	0	0	2	0	2	0	0	2	0	0	0

Principal questionnaire response category for Question 17 coded as: (1) not at all, (2) very little, (3) to some extent, and (4) a lot. Percentages have been rounded to the nearest even whole number



**Table 3** Indexes of principals' perception of teacher and student behavior related to school learning environment

School community	Index of teacher behaviour <i>N</i> = 353, <i>SD</i> = .923		Index of student behaviour <i>N</i> = 353, <i>SD</i> = .986	
	Mean	SE	Mean	SE
Small rural community	-.7488	.07998	.0186	.23016
A small country town	-.4372	.05691	-.5982	.18668
A medium-sized country town	-.2967	.03855	-.4110	.11770
A larger town	-.7412	.04398	-.6695	.10642
A very large town	-.1329	.07814	-.2398	.15826
A city	.0245	.04741	.1218	.09689
Elsewhere in a very large city	-.3139	.03919	.0588	.13087
Close to the centre of a very large city	.0384	.05161	.4205	.13167
Mean	-.2268	.01931	-.0621	.05140
Gap between lowest and highest mean score, expressed in <i>SD</i> units	.853		1.149	

We use descriptive statistics (means, standard deviations, and frequencies) to compare learning environment response variables across the eight different geographic locations. Our aim is primarily descriptive and exploratory, with the purpose of mapping in detail how learning environments vary by rurality and across different school communities.

## Findings

Before examining how learning environments differ across the eight school communities in Australia, we calculated average academic performance in mathematics, science and reading score on PISA for each community. The academic performance of students who attend school in a city centre, as illustrated in Fig. 1, is considerably higher than their peers in rural communities.

As shown in Fig. 1, academic performance is associated with community size/location, with increases in the size of the community/proximity to a very large city associated with higher student performance. However, the apparent relationship between reading performance and school community size/location is not completely linear. Average performance, across all subjects, is higher in medium-size country towns than in larger towns. Another exception is a higher average performance in smaller cities than elsewhere in a very large city; in other words, student performance is higher in large regional cities than in the outer suburbs of the large capital cities.

Next, we calculated descriptive statistics for the responses to 13 sub-items from Question 17 of the principals' questionnaire, "To what extent is learning hindered in your school by...". These results are presented in Table 2. The 13 sub-items relate to student and teacher behaviours, such as teacher and student absenteeism, teacher

**Table 4** Student attitudes towards school

School community	Population	School has done little to prepare me for adult life	School has been a waste of time	School has helped give me confidence to make decisions	School has taught me things that could be useful in a job
Small rural community					
% 'agree'	<1,000	19	8	62	55
% 'strongly agree'		4	0	25	40
A small country town					
% 'agree'	1,000 to about 3,000	18	7	61	52
% 'strongly agree'		5	5	19	39
A medium-sized country town					
% 'agree'	3,000 to about 15,000	18	8	63	55
% 'strongly agree'		4	3	17	35
A larger town					
% 'agree'	15,000 to about 50,000	16	7	64	53
% 'strongly agree'		3	2	20	40
A very large town					
% 'agree'	50,000 to about 100,000	15	7	65	52
% 'strongly agree'		4	2	18	40
A city					
% 'agree'	100,000 to about 1 million	13	6	63	49
% 'strongly agree'		4	1	22	43
Elsewhere in a very large city					
% 'agree'	>1 million	16	4	62	50
% 'strongly agree'		4	2	22	42
Close to the centre of a very large city					
% 'agree'	>1 million	12	5	62	51
% 'strongly agree'		4	1	22	41

Student questionnaire response category for Question 33 coded as: (1) strongly disagree, (2) disagree, (3) agree, and (4) strongly agree

expectations, student drug use, and bullying. As the table shows, response differences exist between Australia's rural, regional and metropolitan school communities for some of these sub-items. A large number of principals responded in a less than positive manner to questions concerning student learning environments. For clarity's sake, we present the frequencies of these negative responses in Table 2 and subsequent Tables. It is these negative responses that are most instructive for

**Table 5** Student perceptions of their relations with teachers

How much do you disagree or agree with each of the following statements about teachers at your school

School community	I get along well with most of my teachers	Most of my teachers are interested in my well-being	Most of my teachers really listen to what I have to say	If I need extra help, I will receive it from my teachers	Most of my teachers treat me fairly
Small rural community					
% 'agree'	70	68	70	72	71
% 'strongly agree'	16	11	7	14	13
A small country town					
% 'agree'	58	64	54	61	62
% 'strongly agree'	21	9	10	17	14
A medium-sized country town					
% 'agree'	66	62	56	64	68
% 'strongly agree'	16	10	9	14	14
A larger town					
% 'agree'	63	63	57	68	69
% 'strongly agree'	19	10	9	14	13
A very large town					
% 'agree'	67	67	61	66	69
% 'strongly agree'	19	11	10	17	16
A city					
% 'agree'	66	66	62	67	69
% 'strongly agree'	20	14	12	18	16.5
Elsewhere in a very large city					
% 'agree'	65	64	61	66	68
% 'strongly agree'	20	14	12	20	17
Close to the centre of a very large city					
% 'agree'	66	68	64	68	70
% 'strongly agree'	26	14	12	20	17

Student questionnaire response category for Question 34 coded as: (1) strongly disagree, (2) disagree, (3) agree, and (4) strongly agree

understanding where and to what degree learning environments are hindering student learning. Moreover, these less favourable responses tend to be related with community size. Based on the PISA data, principals in 'larger towns' (15,000–50,000 residents), 'medium-sized country towns' (3,000–15,000 residents), and 'small country towns' (1,000–3,000 residents) are substantially more likely to report less favourable responses for most items; principals in schools close to the centre of very large cities are the least likely to report less favourable responses.

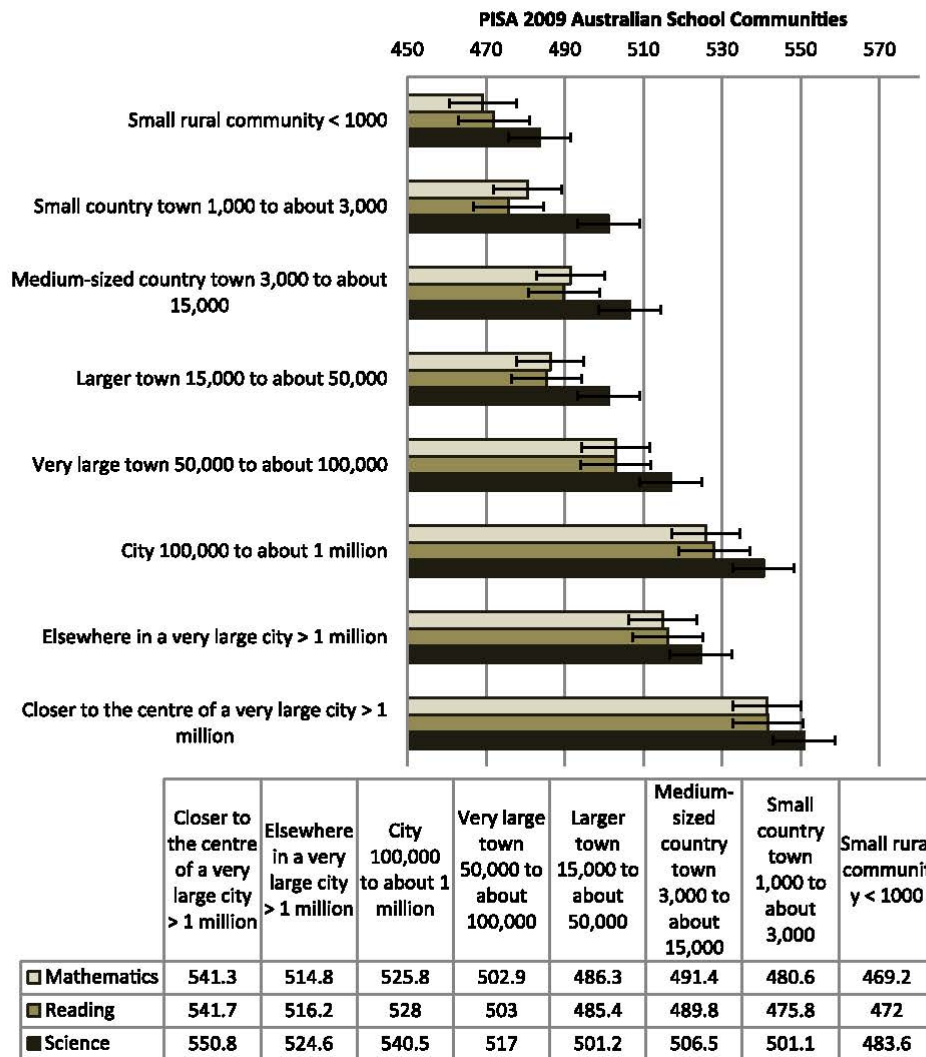
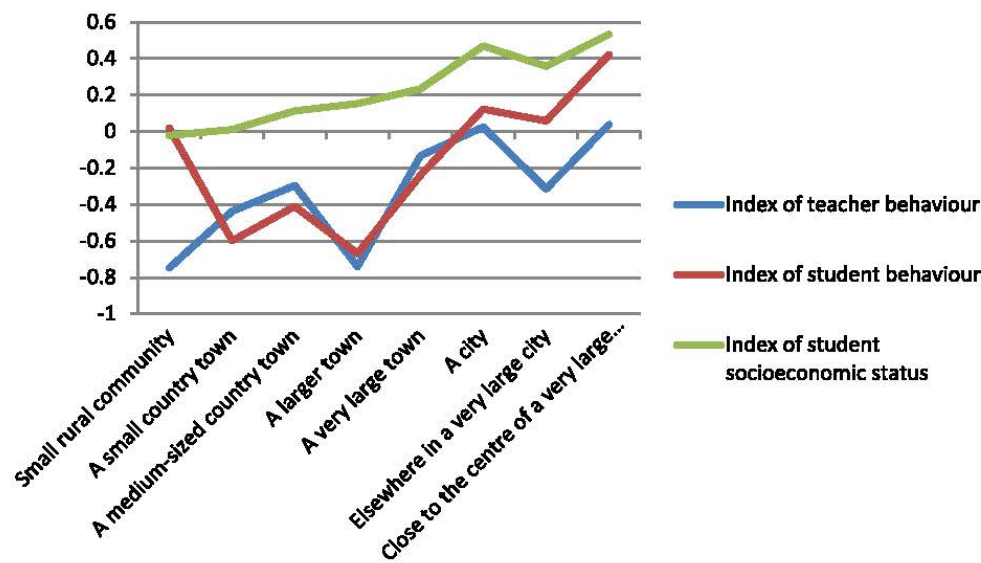


Fig. 1 Distribution of academic performance in PISA 2009 by school community

Student drug use, staff resisting change, and teachers too strict are items within the questionnaire data that reflect relatively small differences in response across school communities. The remaining items vary substantially across school communities, however. For example, up to 60 % of principals in communities with fewer than 50,000 residents report that student disruptions hinder learning in their school either to some extent or a lot, compared to only 12 % of principals from schools located close to the centres of very large cities. The teacher-related behaviors that varied the most are teachers having low expectations of their students, and teachers not adequately addressing the needs of their students.

We also compared means across the eight types of school community for the two indexes representing principals' perceptions of their school's learning environment.



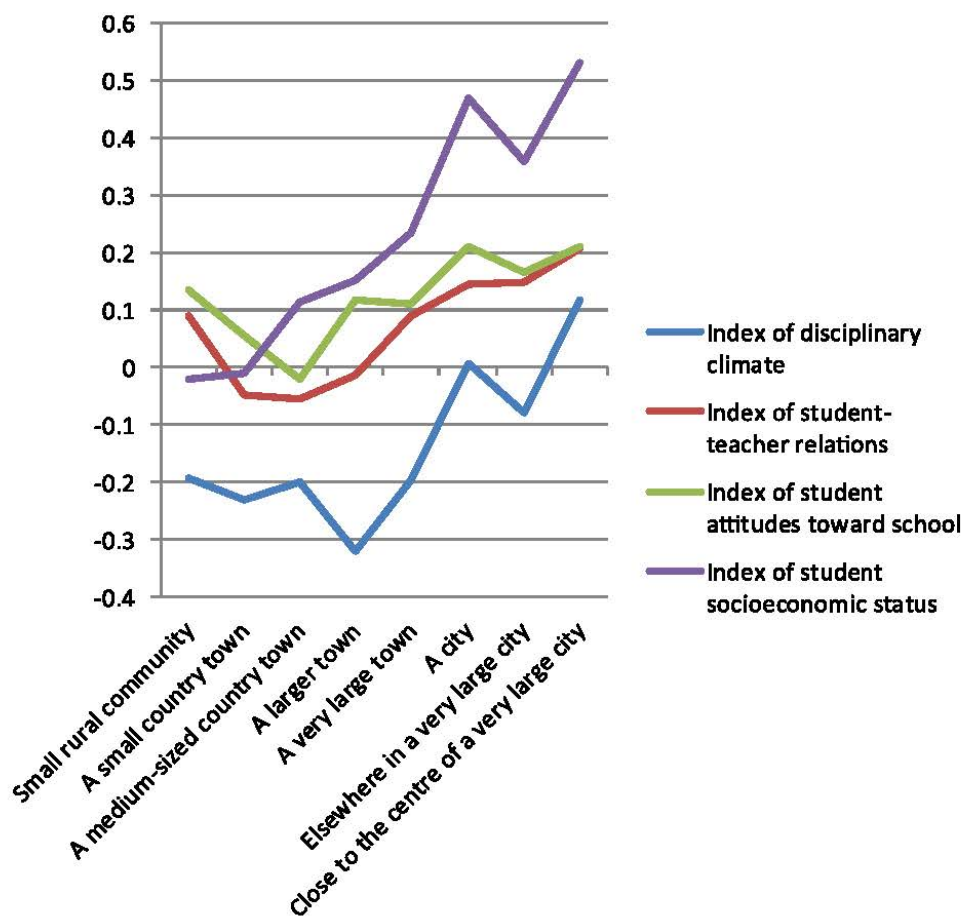


**Fig. 2** School principals' perceptions of teacher and student behavior by community type, in comparison to students' socioeconomic status

The results are shown in Table 3 and Fig. 2. As noted earlier, these two indexes are created by PISA and are based on the 13 items about school learning environment shown in Table 2.

As shown in Table 3, principals' perceptions of the teacher and student related behaviour that hinders learning varies substantially across the eight school communities. On both indexes, the lowest values are found not in the smallest, most rural communities but rather in larger towns of 15,000–50,000 residents. Principals' from schools located in central areas of very large cities (more than 1 million people) have the most positive perceptions. Principals' perceptions of both teaching and student behaviour are more negative in outlying areas of very large cities than in cities with fewer than 1 million residents. The difference between the highest and lowest values is very large on both indexes: .853 and 1.149 standard deviations for the teacher and student behavior index respectively. Slavin and Fashola (1998) define differences of .25 standard deviations as educationally significant.

We then plotted the means from Table 3, along with the means for student socioeconomic status, in Fig. 3. Although a line graph has been utilized to illustrate the trends it is important to note that the values that have been recorded are categorical and not continuous data. The figure illustrates graphically the large differences that are reported in Table 3. By plotting student socioeconomic status, we can also see that differences in principals' perceptions across the school communities do not correspond perfectly to the average socioeconomic status of students. Another interesting finding is the large difference between the two scales in small rural communities. Principals' perceptions in this school community indicate that student learning is hindered much more by teacher behavior than by student behavior.



**Fig. 3** Students' perceptions of school learning environments and socioeconomic status

Next we examined students' responses about their school learning environment. The data show students' perceptions across the eight school communities about the relevance of education (Table 4), student and teacher relationships (Table 5) and classroom disciplinary climate (Table 6).

Table 4 presents students' attitudes toward school. The table comprises four items about the relevance and value of schooling. The analysis shows no large differences in student attitudes across the eight school communities. Overall, students in all eight school communities report favorable attitudes towards school. This is a very positive finding that contradicts commonly held assumptions that students in rural and remote communities often perceive school to be irrelevant.

Table 5 reports student perceptions of their relationships with their teachers. As shown in the table, most students across all eight school communities report positive relationships with their teachers. Differences in perceived student-teacher relationships between school communities, as shown in Table 5, are very small. The findings suggest that most students across all school communities perceive that their teachers treat them with respect and provide them with adequate support.

Table 6 reports students' perceptions of their classroom disciplinary climate. As can be seen, students' views of classroom disciplinary climate are not ideal in most school communities. For example, 25 % of students in schools close to the centre of a very large city report that students do not listen to their teachers in most or every lesson, as do approximately 40 % students in communities that have between 3,000 and 100,000 residents. When combining the frequencies for 'most lessons' and 'every lesson', students in schools close to the centre of a very large city were the least likely to report negative responses, and students in larger towns

**Table 6** Student perceptions of classroom disciplinary climate

School community	Students don't listen to what the teachers says	There is noise and disorder	The teacher has to wait a long time for the class to quiet down	Students cannot work well	Students don't start working for a long time after the lesson begins
Small rural community					
% 'most lessons'	26	37	30	19	20
% 'every lesson'	6	9	3	1	2
A small country town					
% 'most lessons'	26	32	25	17	20
% 'every lesson'	9	14	8	5	7
A medium-sized country town					
% 'most lessons'	29	34	25	16	19
% 'every lesson'	9	12	9	6	9
A larger town					
% 'most lessons'	28	34	26	18	21
% 'every lesson'	12	16	13	7	11
A very large town					
% 'most lessons'	28	32	24	14	20
% 'every lesson'	11	12	9	5	7
A city					
% 'most lessons'	22	25	19	12	15
% 'every lesson'	7	11	7	5	7
Elsewhere in a very large city					
% 'most lessons'	23	27	19	13	17
% 'every lesson'	9	12	9	5	7
Close to the centre of a very large city					
% 'most lessons'	19	23	16	10	13
% 'every lesson'	6	9	7	3	5

Student questionnaire response category for Question 36 coded as: (1) never/hardly ever, (2) some lessons, (3) most lessons, and (4) every lesson

(15,000–50,000 residents) were the most likely to report negative responses, on all five items.

Finally, we compared means for these three groups of student questionnaire items across the school communities. We used the indexes of student attitudes toward schooling, teacher-student relations, and classroom disciplinary climate. As noted earlier, these indexes comprise all of the sub-questions reported in Tables 4, 5 and 6. Table 7 shows that the means on each index vary across the school communities, with differences in classroom disciplinary climate being the strongest. The table also shows that students in large and very large cities report the most positive responses on all three indexes. The most negative responses are in medium and large sized towns, not the smallest communities. While Table 7 and Fig. 3 show that the means on these three indexes vary across the school communities, the difference between the lowest and highest means as expressed in standard deviation units is not educationally significant as defined by Slavin and Fashola (1998).

We plotted the means of these three indexes, along with the average student SES for each school community, to show visually how these indexes vary by school community and average student SES. A line graph illustrates the trends, however, it is important to note that the values recorded are categorical and not continuous data. As seen in Fig. 3, student perceptions of their school learning environments vary by school community, with the least positive experiences occurring in towns ranging from 3,000 to 50,000 people. On all three indexes, students that attend schools in larger towns (15,000–50,000 residents) report more negative responses than their peers in smaller communities, even though their average SES is higher.

**Table 7** Student perceptions of their school learning environments

School community	Index of attitudes towards school <i>N</i> = 13,455 SD = 1.016		Index of teacher-student relations <i>N</i> = 13,966 SD = .986		Index of classroom disciplinary climate <i>N</i> = 13,961 SD = 1.010	
	Mean	SE	Mean	SE	Mean	SE
Small rural community	.133	.01990	.092	.01761	-.194	.01504
A small country town	.056	.01389	-.047	.01241	-.230	.01164
A medium-sized country town	-.021	.00608	-.054	.00599	-.200	.00602
A larger town	.117	.00662	-.014	.00635	-.320	.00679
A very large town	.110	.00716	.090	.00686	-.196	.00691
A city	.211	.00419	.146	.00395	.009	.00406
Elsewhere in a very large city	.165	.00469	.150	.00456	-.081	.00458
Close to the centre of a very large city	.212	.00481	.209	.00445	.117	.00457
Mean	.151	.00213	.107	.00203	-.074	.00207
Gap between lowest and highest mean score, expressed SD units	.188		.157		.201	



## Discussion

Most students in Australia, regardless of where they live, report very positive attitudes toward schooling. Similarly, most students report positive relationships with their teachers, regardless of the size of the community where they live. By contrast, students' perceptions of their classroom disciplinary climate vary more substantially across school communities and are, on average, less positive in rural communities than in very large cities. For example, 40 % of the students in towns with 15,000–50,000 residents reported that students in their classroom do not listen to their teacher, compared to 25 % of students who attend schools close to the centre of capital cities. When we examined how classroom disciplinary climate across all five questionnaire items varied, however, we found that differences between school communities are not educationally significant. In general, students' responses suggest that classroom disciplinary climate is not ideal in any of the school communities. This finding deserves further examination by educators and policy makers since an orderly classroom with minimal disruptions is one of the most significant predictors of student learning (Schleicher, 2009; Shin et al. 2009).

While students' perceptions do not vary substantially across the school communities, principals' perceptions do. Principals' perceptions of both teacher and student related behavior is considerably more negative in rural communities and country towns than in cities. The difference between the least and most positive school communities is large and educationally significant. The principals' responses suggest that particular attention should be paid to improving rural and regional teachers' expectations of their students, and their ability to manage student behavior and tailor instruction to meet their students' needs.

Students and principals from inner-city schools in very large cities report the most positive learning environments of any of the eight school communities. These students often come from advantaged backgrounds, as shown in Fig. 2. Most schools in inner city areas are either high fee/high status independent schools or public schools in communities with expensive housing. Decades of research has shown that students from privileged social backgrounds typically experience more positive learning environments than socially disadvantaged students (Akiba et al. 2007; Camburn and Han 2011). While our findings are therefore unsurprising, they are nevertheless a matter of concern.

Our findings also show that attention should be paid to improving learning environments not just in the most rural/remote communities, but also in largish towns of up to 50,000 residents. While the relationship between students' academic performance on PISA and community size and location is fairly consistent (as is shown by the range of academic performance in Fig. 1), students' and principals' perceptions of their school learning environments are not. On all of the indexes that we compared, students' and principals' perceptions are the most negative in larger regional towns than in smaller rural communities. This finding cannot be explained solely by student characteristics such as socioeconomic status, since student SES is, on average, higher in these larger towns than in smaller communities. Once the nature and extent to which school learning environments vary across rural and

metropolitan schools is understood, future research will be able to examine in more depth the factors that shape school learning environments in these communities.

This study includes some limitations. First, the number of schools in the smallest school community is only six. It is possible that our findings for this school community would be different if more schools were included. Second, our findings are based on students' and principals' self-reported perceptions. Further research that uses observational techniques could assess the accuracy of these perceptions.

## Conclusion

This study has used a nationally representative dataset to show the degree to which students' and principals' perceptions of their school's learning environment vary across rural and urban communities in Australia. Our findings show that students' attitudes toward school and their perceptions of their relationships with their teachers are largely positive and do not vary much across the eight school communities. Students' perceptions of their classroom disciplinary climate were more negative, with some larger differences across the school communities. Taken as a whole, however, these differences are not educationally significant. By contrast, principals' perceptions of teacher and student behaviour varied substantially across the eight school communities.

Overall, students' and principals' perceptions are less positive in rural communities and towns than in cities. Somewhat surprisingly, however, the relationship between community size/location and perceptions of school learning environments is not linear, with the most negative responses occurring in larger towns rather than the smallest rural communities.

While our analysis is not intended to examine definitively how school learning environments mediate the relationship between geographic location and academic performance, our detailed findings may provide a foundation for future research. Understanding the extent to which school environments vary across rural–urban locations can be helpful for policymakers, school leaders and teachers who seek to improve the learning experiences and outcomes of their students. Our findings suggest that particular attention should be paid to improving teachers' expectations of students and teachers' ability to manage their classroom and meet the needs of their students.

## **Significance of study**

As an experienced teacher, I have come to the realisation that personal qualities and the social fabric, such as teacher and student relationships, have a greater capacity to impact on student learning outcomes than physical resources. This is not to suggest that environment is more important than resources but highlights the value I place on human relationships in the profession of teaching. Consequently, I was excited to explore an essential component of teaching and learning, like perspectives of school learning environment. However, prior to delving into the second research paper, I was more realistic about the outcomes that I hoped to discover than I had been at the start of my research journey. Knowing that my earlier research had found principals in different communities' report 'shortages of resources' hinder learning to different degrees, I expected a similar trend to continue regarding questionnaire response to learning environments questions. Consequently, the extent to which patterns mirrored findings from paper 1 across Australia's school communities was of keen interest to me.

The findings showed that many Australian students, across all school communities, believe that schooling is worthwhile and experience positive relationships with teachers. Although I value the quality of education within Australia, this was not the outcome I was expecting. While this positive finding was surprising, it became apparent that, like paper 1, I needed to explore the PISA 2009 questionnaire data at a deeper level. This meant examining the frequencies of responses of the two most negative or positive response categories separately rather than collapsing them.

Analysis of the disciplinary climate and learning environment variables varied more considerably when I reported the frequencies of the negative responses (disagree and strongly disagree) separately. Students and principals in rural communities reported less positive responses than counterparts from large cities. Analysing the data in this way highlighted that student and principal perceptions of disciplinary climate and learning environments do vary

across Australia's school communities. Comparing data across school communities identified that large regional towns (up to 50,000 residents) and rural school communities trailed behind the more positive responses of city school communities.

The findings suggest that attention should be paid to improving teachers' expectations of students and teachers' ability to manage their classroom and meet the needs of their students. This information could lead to rigorous discussion of the benefits of adapting teaching strategies according to geographic location of the school community. The findings from paper 2 also show that attention should be paid to improving learning environments not just in the most rural communities, but also in largish towns of up to 50,000 residents. This information is of value to school leaders and teachers, especially those teachers starting their career in a rural or non-metropolitan location. Ultimately the knowledge provided from research paper 2 could be helpful for policy-makers and those who seek to improve the learning experiences and outcomes of rural students.



## Chapter 6:

### Paper 3: A comparison of rural educational disadvantage in Australia, Canada, and New Zealand using OECD's PISA

#### Background

The third article is a complex paper, involving data from three countries. Consequently, the analyses reported in the third paper took longer to conduct and write up than the first two publications. Countries that could provide meaningful comparison were selected. The cross-national analyses compared schools from Australia, Canada and New Zealand. The reasoning behind the selection of Canada and New Zealand for comparison is that they are culturally, demographically, and economically similar to Australia. This allows comparison of like education systems possessing rural and remote school communities, broadly similar student outcomes in PISA 2009, and varying social-economic status suggestive of links to geographic location. For instance, Canada's results on PISA show that it has a very equitable and high performing education system (OECD, 2010a). When socioeconomic status is taken into consideration, New Zealand's students are distributed across school communities slightly less equitably than Australia and Canada. However, literacy performance in PISA 2009 would indicate otherwise as the gap between literacy levels is far more distinct across Australia's school communities.

I conducted a secondary analysis of PISA 2009 in Australia, Canada and New Zealand, comparing how school resources and learning environments varied between urban-rural school communities within each country, as well as between the three countries. In all three countries, students in rural school communities have lower reading performance and report less positive learning environments than their peers in larger towns and urban areas. Rural-urban inequalities of learning environments and academic performance are greater in Australia than in Canada or New Zealand. Moreover, across most school communities, students from Canada and New

Zealand have higher reading performance than their Australian counterparts. Rural students in Australia have lower performance than their rural counterparts in Canada and New Zealand, even though on average, the socioeconomic status of rural Australian students is similar to that in Canada and greater than in New Zealand. The findings suggest that Canadian and New Zealand school communities are better able to support a greater proportion of their students, not just the most economically and socially privileged.

This research was published by *Sage Open Journal of Educational Research*, in October 2018. The publication of my third, and final paper, raised the profile of my research as Sage is a highly-regarded publisher and the journal aims to report research findings of international significance. *Sage Open* publishes peer-reviewed, original research across social and behavioural sciences and the humanities in an open access format.



# A Comparison of Rural Educational Disadvantage in Australia, Canada, and New Zealand Using OECD's PISA

SAGE Open  
 October–December 2018: 1–12  
 © The Author(s) 2018  
 DOI: 10.1177/2158244018805791  
[journals.sagepub.com/home/sgo](http://journals.sagepub.com/home/sgo)

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## Abstract

This study compares rural educational disadvantage across Australia, Canada, and New Zealand using data from the Organisation for Economic Co-operation and Development's Programme for International Student Assessment (PISA). Across the three countries, student reading literacy and school learning environments are less positive in rural communities than in urban. Furthermore, rural disadvantage in educational outcomes (reading) and opportunities is greater in Australia than Canada or New Zealand. This could be seen as surprising as student socioeconomic status (SES), typically a strong predictor of educational outcomes, is similar for rural communities in Australia and Canada, but lower in New Zealand. Rural school principals in Australia are most likely among the three countries to report that shortages of teaching personnel hinder learning. This could suggest that policies and structures can play a role in ameliorating or exacerbating rural educational disadvantage. We conclude with questions and recommendations for future research.

## Keywords

rural educational disadvantage, PISA, school learning environments, school resources

## Introduction

International large-scale assessments and comparative studies are useful for examining cross-national variations in educational outcomes and experiences. More generally, they are useful for broadening perspectives and generating theory about the contexts and conditions that mediate educational phenomena. As such, they are useful for illuminating new lines of thinking that can inform both policy and practice. As described by a founding member of the International Association for the Evaluation of Educational Achievement (IEA), established in 1958 by the United Nations Educational, Scientific and Cultural Organization (UNESCO), "If custom and law define what is educationally allowable within a nation, the educational systems beyond one's national boundaries suggest what is educationally possible" (Foshay, 1962, p. 5). In this spirit, the current study examines education systems in three countries to gain a better understanding of long-standing disparities in outcomes between rural and urban school communities.

Rural educational disadvantage exists in many countries. It includes inequalities in educational outcomes, such as test scores and high school graduation rates, as well as inequalities related to educational opportunities and experiences in schools. Data from the Programme for International Student Assessment (PISA) have shown that among economically

developed countries, the academic performance of 15-year-old students in cities with 100,000 or more residents is, on average, about one-half year of schooling greater than their peers in smaller towns and communities (Organisation for Economic Co-operation and Development [OECD], 2013). Analysis of individual countries has shown, however, that urban/rural achievement differences do not exist in almost half of the developed countries that participate in PISA. This suggests the possibility that national education policies and school practices may play a role in ameliorating or exacerbating rural disadvantage.

Nearly 2 decades ago in Australia, the Human Rights and Equal Opportunity Commission (2000) found that rural schooling was inferior on every indicator included in its study. Indeed, among developed countries, Australia has one of the largest urban/rural achievement gaps in PISA (OECD, 2013), and students in rural Australia have long been identified as educationally disadvantaged (De Bortoli & Thomson, 2010; Lokan, Greenwood, & Cresswell, 2001). Students in

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rural communities in Australia are less likely than their urban peers to complete secondary education (Alston & Kent, 2006) or attend university (James, 2001).

Although some studies from the United States (Reeves, 2011) and Australia (Cresswell & Underwood, 2004; Young, 1998) suggest that rural disadvantage in educational achievement is strongly associated with student socioeconomic status (SES), cross-national research from the OECD (2013) found that rural/urban achievement differences are not fully explained by student SES, and that school characteristics can account for some of the rural/urban differences in academic achievement. Mapping how schools differ across rural/urban settings can, therefore, provide insight about ways to ameliorate rural disadvantage and reduce inequalities in educational opportunities, experiences, and outcomes. Academic achievement is important, but so are experiences in school. Regardless of the degree to which school and classroom experiences are associated with student learning, all students should have the opportunity to enjoy safe classroom environments and positive relations with their teachers.

This article builds on previous research by K. Sullivan, Perry, and McConney (2013, 2014) that describes how schools differ across rural/urban communities in Australia. These studies found that students in urban Australian communities tend to have substantially higher achievement on PISA than their peers in rural settings, and that the achievement advantage is associated with inequitable distributions of school resources and teachers, and, to a lesser extent, unevenness in school learning environments.

In the current study, we compare rural disadvantage in educational outcomes and resources across three countries, namely, Australia, Canada, and New Zealand. We purposefully chose these three countries because they share broadly similar systems of comprehensive secondary schooling, and similar sociocultural histories of English colonization and postcolonial development. Furthermore, the three share similar levels of economic development (all are considered highly developed), and all are among the top 15 countries on the United Nations Development Programme (UNDP) 2016 Human Development Report's (released in March 2017) list of countries with very high human development (Australia is ranked second, Canada is tied 10th, and New Zealand is 13th). All three are members of the Five Eyes (FVEY), a multilateral intelligence alliance between Australia, Canada, New Zealand, the United Kingdom, and the United States that grew out of common security interests and values.

Our aim is to meaningfully contribute to the development of knowledge and understanding of the nature and extent of rural educational disadvantage and possible solutions for remedying it. Although cross-national comparisons of rural educational disadvantage are somewhat rare, they nevertheless offer a potential to deepen our understanding of conditions and contexts that underlie it. Our research questions include:

1. To what extent does student academic performance differ across rural/urban locations within and between the three countries?
2. To what extent do school resources and learning environments differ across rural/urban locations within and between the three countries?
3. Are rural inequalities of educational outcomes, experiences, and opportunities greater in one country than another, and if so, what are some possible reasons why?

## Context

Rural educational disadvantage exists in many economically developed countries, including Australia, Canada, and New Zealand. High school completion rates, for example, are lower in rural areas than urban areas in Australia (Alston & Kent, 2006; Marks, Fleming, Long, & McMillan, 2000) and Canada (Bowlby, 2005). Academic performance as measured by PISA is lower in rural and regional areas than in larger cities in all three countries (OECD, 2013). The reasons underlying these inequalities of outcomes are likely multiple and varied across contexts.

As previously noted, SES is one of the strongest and most stable predictors of academic performance (OECD, 2010; Reardon, 2011; Sirin, 2005). Student SES is positively associated with educational resources, experiences, and opportunities, both at home and at school, and these in turn are related to academic achievement (Bourdieu & Passeron, 1990). For example, students with higher SES backgrounds typically have more books, computers, and other educational materials in their homes than do peers with lower SES (Orr, 2003). They are also more likely to have parents who read to/with them regularly (Coley, 2002) and to enjoy a stimulating learning environment at home (Nash & Harker, 2006; Yeung, Linver, & Brooks-Gunn, 2002). Educational advantage related to SES also manifests in schools. Students with higher SES backgrounds are more likely than their peers with lower SES to attend well-resourced schools (Chiu & Khoo, 2005; OECD, 2005; Vignoles, Levacic, Walker, Machin, & Reynolds, 2000) and more likely to have experienced and qualified teachers (Akiba, LeTendre, & Scribner, 2007; Hanushek & Rivkin, 2006) with high expectations (Rumberger & Palardy, 2005). Higher SES students also experience more time spent on instruction (Camburn & Han, 2011), and are more likely to have access to a rigorous academic curriculum (Lamb, Hogan, & Johnson, 2001; Oakes, 2000).

SES is also the strongest predictor of rural educational disadvantage in many countries (Williams, 2005). On average, rural students have lower SES than their urban peers, and this is associated with the latter typically having higher academic outcomes. It is not clear, however, whether SES is associated with poorer outcomes because of rural/urban differences in student and family characteristics, rural/urban

**Table 1.** Number and Proportion of Participating Schools and Students.

School community	Population	AUS		CAN		NZL	
		School	Student	School	Student	School	Student
Village	<3,000	21 (6%)	648 (5%)	170 (17%)	3,668 (16%)	11 (7%)	191 (4%)
Small town	3,000 to about 15,000	45 (13%)	1,811 (13%)	210 (22%)	5,467 (24%)	28 (17%)	721 (16%)
Town	15,000 to about 100,000	68 (19%)	2,807 (20%)	219 (23%)	5,114 (22%)	42 (26%)	1,078 (23%)
City	100,000 to about 1,000,000	108 (31%)	4,539 (32%)	254 (26%)	6,125 (27%)	42 (26%)	1,231 (27%)
Large City	>1,000,000	111 (31%)	4,445 (31%)	119 (12%)	2,755 (12%)	40 (25%)	1,422 (31%)
<b>Total</b>		<b>353</b>	<b>14,250</b>	<b>972</b>	<b>23,129</b>	<b>163</b>	<b>4,643</b>

Note. Percentages may exceed 100 due to rounding. AUS = Australia; CAN = Canada; NZL = New Zealand.

differences in schools, or a combination of these factors. It is difficult to disentangle these variables. It seems most likely that SES status is associated with academic achievement via both family/home and school factors.

PISA includes several school variables that are demonstrably related to students' educational outcomes. School resources, for example, including educational resources and instructional materials as well as qualified and experienced teachers, are associated with student learning and achievement (Chiu & Khoo, 2005; Haycock, 2001; Wenglinsky, 2002). Positive, supportive, and caring relationships between teachers and students have been shown to improve students' outcomes because they increase motivation and engagement with learning (Aultman, Williams-Johnson, & Schutz, 2009; McHugh, Horner, Colditz, & Wallace, 2013; National Research Council, 2003; Newberry, 2010; Spilt, Hughes, Wu, & Kwok, 2012). Disciplinary climate is also a strong predictor of student outcomes (Schleicher, 2009). Classrooms that have fewer distractions promote more opportunities for teaching and learning (Frempong, Ma, & Mensah, 2012; OECD, 2005; Shin, Lee, & Kim, 2009). Moreover, high-quality instructional practices can promote positive student outcomes (Akiba et al., 2007; Hanushek, 2007; Hogebe & Tate, 2010; Winheller, Hattie, & Brown, 2013).

As noted earlier, Australia, Canada, and New Zealand were purposively chosen as the comparator countries for this analysis. The three countries share many historical and sociocultural experiences and values. All three enjoy highly developed economies tied to primary resources (agriculture and natural resources). Nevertheless, we also acknowledge that the similarities among the three countries are far from perfect. In physical geography, the distances between rural, remote, and urban settings are clearly much larger in Australia and Canada than in New Zealand. In addition, and importantly, the proportion of indigenous First Nations peoples in the population are notably different—14% for New Zealand compared with 4% for Canada and 2.5% for Australia. Also, New Zealand's GDP is substantially smaller than Australia's or Canada's but New Zealand nevertheless boasts the highest public spending on education as a proportion of its GDP (7.4% compared with 5.6% for Australia and 5.4% for Canada).

## Method

To answer our research questions, we conducted secondary analysis of the OECD's PISA 2009 data for Australia, Canada, and New Zealand. Starting in 2000, the OECD has administered PISA every 3 years. Each cycle assesses 15-year-old students' literacies in reading, mathematics, and science. We intentionally chose the 2009 dataset for two reasons. First, we had used the 2009 data in our previous research, and this allowed us to build on our earlier analyses of rural/urban educational disparities for Australia (K. Sullivan et al., 2013, 2014). Second, PISA 2009 is the most recent publicly available dataset for which Reading was the discipline examined in depth (one of the three subjects is the focus of each round); our use of reading as students' foundational literacy allowed us a high degree of confidence in the cross-national comparability of PISA data. We used descriptive statistics to uncover patterns in the distribution of educational outcomes and experiences across the rural-urban continuum, within and between the three countries. This approach is common when comparing national educational systems and outcomes (see, for example, Carnoy, Khavenson, & Ivanova's, 2015, study of Russia, Estonia, and Latvia using PISA).

PISA 2009 comprised 470,000 students across 65 countries. The numbers of students and schools participating in PISA 2009 from Australia, Canada, and New Zealand is shown in Table 1. The sample for each country is nationally representative in terms of student and school characteristics (Knighton, Brochu, & Gluszynski, 2010; Telford & May, 2010; Thomson, De Bortoli, Nicholas, Hillman, & Buckley, 2010). Most countries sample between 2,000 and 5,000 students, but some including Australia and Canada sample larger numbers of students so that state or provincial comparisons can also be made. The Canadian sample is particularly large because organizers wanted to "... produce reliable estimates representative of each province and for both French and English language school systems ..." (Knighton et al., 2010, p. 10).

Each school selected to participate in PISA is identified according to the size of the community in which it is located. This variable *School Community* comprises the following five categories:

- i. Village, hamlet, or rural area: A population less than 3,000 people;
- ii. Small Town: A population between 3,000 to about 15,000 people;
- iii. Town: A population between 15,000 to about 100,000 people;
- iv. City: A population between 100,000 to about 1,000,000 people;
- v. Large City: A city with more than 1,000,000 people.

Table 1 also shows the number and proportion of students and schools in each school community, for each of the three countries.

As seen in Table 1, the proportion of students in rural areas is greater in Canada than either Australia or New Zealand. In general, students are more evenly distributed across the five types of school community in Canada than in the other two countries, and the distribution of students across the five school communities is roughly comparable in Australia and New Zealand.

The PISA 2009 dataset includes student achievement data across three subject domains, plus a large array of contextual information about schools, students, and their home environments. Data were also collected from school principals (or their deputies) about a range of school characteristics, and from students about their perceptions of their school as well as background information about their parents and home environment. In this investigation, we compared educational outcomes among the five school communities within each country as well as across the three countries. Student reading performance in PISA 2009 was analyzed to identify patterns of rural disadvantage or inequity in educational outcomes. We also used school and student background questionnaire data to gain a deeper understanding of rural disadvantage. For example, we analyzed the following variables: principals' perceptions of shortages of teaching personnel and quality of educational resources, students' perceptions of classroom disciplinary climate, students' perceptions of their teachers' instructional strategies, and students' perceptions about their relationships with teachers.

We also examined how student SES varies across rural/urban locations. We calculated the SES of each school community by averaging the SES status of all participating students in each school community type, for each of the three countries. PISA's measure of SES is known as "economic, social and cultural status" (ESCS) and is an index that comprises three variables: parental educational attainment; parental occupational status; and family material, educational, and cultural resources. The family resources variable is particularly comprehensive and includes information from students about the number of books, musical instruments, computers, and artwork in the home, the number of bedrooms and other material items, as well as the frequency of cultural activities such as attending theatrical performances or visiting museums. The proportion of students in each

school community that has a parent with a bachelor's degree or higher was also incorporated into this study. We provided these data because SES, which includes parental education, is a strong predictor of educational opportunities and outcomes.

We compared rural-urban achievement gaps within and across the three countries to assess rural disadvantage reflected in students' reading literacy. Reading and other literacy performance scores are scaled to a mean of 500 and a standard deviation of 100 score points. We used the International Data Explorer (IDE), available from the U.S. National Center for Education Statistics (NCES), to calculate mean reading performance for each school community category across Australia, Canada, and New Zealand.

PISA uses a two-stage sampling process in which schools are first sampled and then students sampled within participating schools. This approach has the potential to increase the standard errors of population estimates. In this study, therefore, and consistent with PISA's recommendation, all statistics have been generated using the NCES's IDE, via a Balanced Repeated Replication (BRR) procedure to generate unbiased standard errors that take account of clustering in the samples (OECD, 2009). Furthermore, the NCES's IDE uses *t* tests to calculate whether differences between means are statistically significant, and we report the results of these tests in our analyses. While *t* tests are generally not used to compare means from more than two groups because they increase the probability of Type I errors, they are used by the NCES and the OECD for large-scale assessment data including PISA, consistent with these organizations' standards and practice (see the NCES IDE help manual at [https://nces.ed.gov/surveys/international/ide/HelpFiles/PISAIDEHelpGuide508\\_063014.pdf](https://nces.ed.gov/surveys/international/ide/HelpFiles/PISAIDEHelpGuide508_063014.pdf) for more information).

In summary, we calculated means for six composite variables (indexes) in PISA related to school resources and learning environments, for the five school community categories in each country. Four of these index variables are derived from student responses, and the other two are from school principal responses. The four student index variables are "classroom disciplinary climate," "student-teacher relations," "teacher use of structuring and scaffolding strategies," and "teacher stimulation of reading engagement." The two indexes derived from principal questionnaire responses are "quality of educational resources" and "teacher shortage." PISA uses item response theory (IRT) to scale index variables to have a mean of "0" (zero) and a standard deviation of "1" (one; OECD, 2009). We then compared the means across school community types within and between the three countries. We calculated the size of the gap between the highest and lowest scoring community type to measure the extent of rural disadvantage (if any) within each country, in reading literacy. Based on Slavin and Fashola (1998), we considered an effect size of 0.25 standard deviations or greater as educationally significant.



**Table 2.** Mean Student Reading Performance, Socioeconomic Status, and Parental Education, by School Community Type.

School Community	SES (ESCS)			% of students who have a parent with a bachelor's degree or higher <sup>a</sup>			Reading literacy performance			Significance of mean difference
	Australia SD = .76	Canada SD = .82	New Zealand SD = .78	Australia	Canada	New Zealand	Australia	Canada	New Zealand	
	<i>M (SE)</i>	<i>M (SE)</i>	<i>M (SE)</i>				<i>M (SE)</i>	<i>M (SE)</i>	<i>M (SE)</i>	
Village	-.09 (0.028)	.21 (0.013)	-.20 (0.054)	4%	16%	4%	475 (6.2)	501 (3.6)	495 (5.3)	Can > Aus ( $p = .000$ ) NZ > Aus ( $p = .015$ )
Small Town	.08 (0.017)	.31 (0.011)	-.05 (0.028)	13%	23%	16%	490 (4.7)	510 (3.0)	509 (6.9)	Can > Aus ( $p = .000$ ) NZ > Aus ( $p = .021$ )
Town	.16 (0.014)	.51 (0.011)	-.01 (0.023)	19%	22%	22%	493 (5.0)	527 (3.2)	511 (6.8)	Can > Aus ( $p = .000$ ) Can > NZ ( $p = .035$ ) NZ > Aus ( $p = .042$ )
City	.46 (0.011)	.61 (0.011)	.29 (0.022)	32%	27%	27%	528 (4.9)	527 (3.1)	549 (6.4)	NZ > Aus ( $p = .008$ ) NZ > Can ( $p = .002$ )
Large City	.43 (0.012)	.69 (0.017)	.13 (0.022)	31%	12%	30%	528 (5.0)	539 (6.1)	515 (6.7)	Can > NZ ( $p = .009$ )
<b>Country Mean</b>	<b>.32 (0.006)</b>	<b>.46 (0.005)</b>	<b>.10 (0.012)</b>				<b>514 (2.5)</b>	<b>527 (1.6)</b>	<b>519 (2.3)</b>	
<b>Gap</b>	<b>.55 (.72 SD)</b>	<b>.48 (.59 SD)</b>	<b>.49 (.63 SD)</b>				<b>53 points</b>	<b>38 points</b>	<b>54 points</b>	

Note. SES = socioeconomic status; ESCS = economic, social, and cultural status.

<sup>a</sup>Percentages may not add up to 100 due to rounding.

## Findings

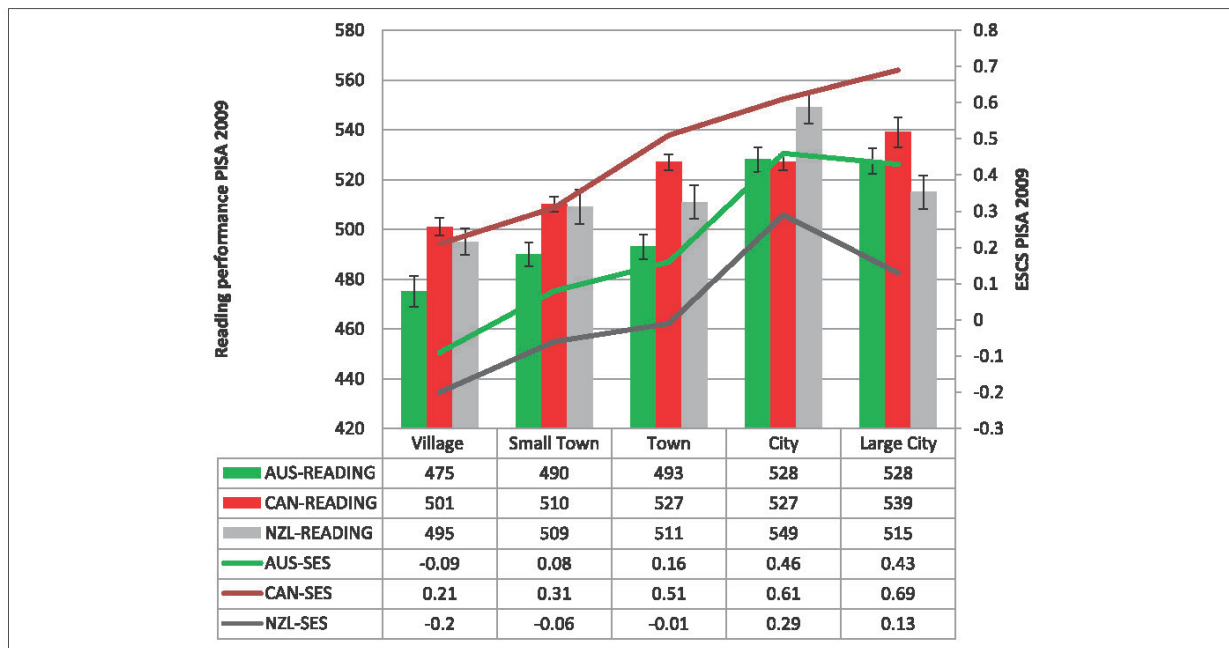
We examined how school communities vary by student SES and parental education. Following this, we calculated the average reading literacy performance for students in each school community type. These findings are shown in Table 2 below and also graphically in Figure 1. We combined these context and performance findings into one table to highlight the degree to which they are related. Table 2 also shows whether between-country differences in reading performance for each school community type are statistically significant as measured by independent *t* tests conducted using the IDE.

As can be seen in Table 2 and graphically in Figure 1, both context variables (mean student SES and proportion of students with a university-educated parent) are generally positively related to school community size in all three countries, notwithstanding the dip in the proportion of parents with bachelor's degrees in "Large City" school communities in Canada and the decline in SES for "Large Cities" in New Zealand. The values for these variables are typically higher in urban settings (cities) and lower in rural areas, and the differences within countries are substantial, especially in Australia and New Zealand. For example, only 4% of Australian and New Zealand students in villages have a university-educated parent, compared with 30% to 31% in large cities in these two countries. Comparison of the two context variables across the three countries shows that mean student SES at the country level is lowest in New Zealand and highest in Canada; this pattern is consistent for all five school community types across the three countries.

Table 2 also shows mean reading literacy performance for each school community. In each of the three countries,

reading performance is positively related with community size/type, with villages showing the lowest reading performance, on average, and cities (New Zealand) and large cities (Australia and Canada) showing the highest. In New Zealand, mean reading literacy is the same in large cities as it is in smaller urban communities with 3,000 to 100,000 residents. The gap between the highest and lowest scoring school community is substantially larger in Australia and New Zealand (53 and 54 points, respectively) than in Canada (38 points). A score of 50 points is roughly equal to 1 year of schooling (Thomson et al., 2010). Student performance in the two smallest (most rural) communities (villages and small towns) is substantially lower in Australia than in Canada or New Zealand. In other words, rural disadvantage is sharper in Australia than in Canada or New Zealand. This can be seen more clearly in Table 3, which shows the score-point gap in reading performance between each country's mean and the means for each of its five school community types.

Cross-nationally, students in the most rural school communities performed substantially worse in Australia than in Canada or New Zealand. New Zealand's reading literacy performance is greater than Australia's in all school communities except large cities. Figure 1 shows very clearly the strong positive relationship between mean SES and reading performance across the school communities within each country. It is also the case, however, that mean reading performance is 20 points higher in rural settings (i.e., villages) in New Zealand compared with Australia despite the fact that average SES and parental educational attainment is similar (in fact, lower for New Zealand). A difference of 20 score points is substantial, representing roughly one-half year of



**Figure 1.** Mean SES and reading performance, disaggregated by school community type in Australia, Canada, and New Zealand.  
 Note. SES = socioeconomic status; PISA = Programme for International Student Assessment; ESCS = economic, social, and cultural status.

**Table 3.** Score Point Differences Between Country Mean and School Community Mean in Reading Literacy Using PISA (2009).

School community	Australia	Canada	New Zealand
Village	-39	-26	-24
Small Town	-24	-17	-10
Town	-21	0	-8
City	+14	0	+30
Large City	+14	+12	-4

Note. PISA = Programme for International Student Assessment.

school (Thomson et al., 2010). As can be seen in Figure 1, New Zealand school communities in general show substantially higher reading performance than might be predicted by their mean student SES. The context variables, however, do not explain *why* rural (and regional) disadvantage is greater in Australia than in New Zealand or Canada. While the observed difference between New Zealand and Australia in rural settings could be seen as a perplexing finding, it may also suggest that educational performance, and underlying opportunity, can be mediated by education policies and practices.

To shed further light on these cross-national differences in reading performance, disaggregated by school community types (urban vs. rural), we compared differences in school learning resources and learning environments across school community types, as perceived by students and principals.

Table 4 shows school principals' perceptions of the degree to which shortages of teaching personnel and educational resources hinder learning in their school. We report the means for these two indexes for each school community type, in each country. We also calculated the difference between the highest and lowest scoring school community type for each country, expressed in standard deviation units to show the magnitude of the difference (effect size).

As can be seen from Table 4, school community size is associated with teacher shortages in all three countries, with school principals in smaller (more rural) communities generally reporting more shortages than principals in larger communities (with a few exceptions, such as large cities in New Zealand and towns in Canada). Shortages of teaching personnel vary to a large degree across the three countries. Principals in Australia are the most likely to report that shortages of teaching personnel hinder learning in their school, and principals in Canada are the least likely. School principals in Australian villages report by a large margin the highest shortages ( $M = .67$ ); this mean is substantially larger than in New Zealand villages ( $M = .32$ ), which in turn is much larger than in Canadian villages ( $M = -.04$ ). Principals in villages and small towns in Canada report shortages that are less than the OECD average, whereas shortages are on average considerably more than the OECD average in Australia and New Zealand. Across all school communities except large cities, principals report higher shortages of teaching personnel in Australia than in New Zealand, which may help



**Table 4.** School Principals' Perceptions About Their School's Resources and Teacher Shortages.

	Teacher shortage			Quality of school educational resources		
	Australia <i>SD</i> = .97	Canada <i>SD</i> = .84	New Zealand <i>SD</i> = .85	Australia <i>SD</i> = 1.05	Canada <i>SD</i> = .95	New Zealand <i>SD</i> = .95
School community	<i>M</i> ( <i>SE</i> )	<i>M</i> ( <i>SE</i> )	<i>M</i> ( <i>SE</i> )	<i>M</i> ( <i>SE</i> )	<i>M</i> ( <i>SE</i> )	<i>M</i> ( <i>SE</i> )
Village	.67 (0.05)	-.04 (0.02)	.32 (0.08)	-.05 (0.06)	.11 (0.03)	-.08 (0.10)
Small Town	.27 (0.06)	-.26 (0.03)	.14 (0.10)	.16 (0.05)	.50 (0.03)	.15 (0.10)
Town	.50 (0.05)	.17 (0.03)	-.04 (0.09)	.27 (0.06)	.29 (0.03)	.24 (0.10)
City	.05 (0.05)	-.43 (0.03)	-.21 (0.08)	.49 (0.05)	.52 (0.04)	.51 (0.10)
Large City	-.01 (0.03)	-.37 (0.04)	.27 (0.11)	.43 (0.04)	.43 (0.04)	.15 (0.11)
<b>Mean</b>	<b>.20 (0.02)</b>	<b>-.23 (0.01)</b>	<b>.08 (0.04)</b>	<b>.32 (0.02)</b>	<b>.35 (0.02)</b>	<b>.20 (0.05)</b>
<b>Gap</b>	<b>.70 <i>SD</i></b>	<b>.71 <i>SD</i></b>	<b>.62 <i>SD</i></b>	<b>.51 <i>SD</i></b>	<b>.43 <i>SD</i></b>	<b>.62 <i>SD</i></b>

Note. The "teacher shortage" index is reversed, that is, higher values mean more shortages. The "educational resources" index is inverted for scaling, and positive values indicate better quality educational resources.

explain why reading performance is higher in the latter. As suggested by this finding, teacher shortages are not only a problem for rural schools. In New Zealand, principals in the large city community reported the second highest mean on this index (after villages).

The quality of educational resources is generally positively related to community size in all three countries, with school principals in villages and small towns generally reporting that shortages of educational resources hinder learning to a greater extent than principals in larger (more urban) communities. Principals in cities have the most favorable responses regarding the quality of their educational resources in all three countries. Between-community inequalities on this measure are substantial and the size of the observed differences is educationally significant for all three countries. Across the three, New Zealand school principals report the highest shortages of educational materials, while the averages for Canada and Australia are similar. As shown in Table 4, differences in quality of school educational resources between communities with less than 100,000 residents in Australia and New Zealand are minimal. It is not likely, therefore, that this measure explains why New Zealand students in communities with less than 100,000 residents have higher reading achievement than their peers in Australia.

In contrast, Table 5 compares the school community means for the four student-derived indexes about teachers and classroom disciplinary climate. Classroom disciplinary climate is, on average, slightly lower in all three countries than the OECD average. The country means for Canada and Australia are very similar and slightly more positive than in New Zealand. Across all three nations, the lowest values are reported in small towns (3-15,000 residents) and towns (15-100,000), not villages (less than 3,000). In Australia, the difference in the reported disciplinary climate between regional communities (village, small town, and town) and urban communities (city and large city) is large, favoring larger (more urban) communities. In Canada and to a lesser extent New

Zealand, variations across communities are more evenly distributed. Differences in disciplinary climate across the five school communities are not educationally significant in New Zealand or Canada, as they are in Australia. Among the three countries, Australian students in the three smallest school communities report the least positive disciplinary climates, and Australian students in the two largest school communities report the most positive climates.

Table 5 also shows how students' perceptions of their relations with teachers in their schools vary by school community type and country. Within each country, this relationship is positively associated with community size, with the least positive values found in rural settings (villages or small towns), and the most positive in cities and large cities. The difference between the highest and lowest school community means, as expressed in *SD* units, is greatest in Australia and smallest in Canada, although none of these gaps is large enough to be considered educationally significant. Among the three countries, Canada has the highest (most positive) country mean and Australia the lowest. Across all five school community types, Australian students report substantially less positive relationships with their teachers than do their peers in Canada and New Zealand.

The last two indexes presented in Table 5 capture students' perceptions of their teachers' instructional strategies. For teacher use of structuring and scaffolding strategies, students in all five school communities in all three countries report higher values than the OECD average. The use of structuring and scaffolding strategies is positively associated with community size in Australia and Canada. Differences across the school communities are the largest in Australia and the smallest in Canada, although they are less than .25 *SD* in all three countries and are, therefore, not educationally significant by standard benchmarks. Across the three countries, Australian students in all five school communities are the least likely to report that their teachers use structuring and scaffolding strategies, whereas Canadian teachers are the most likely.

**Table 5.** Student Perceptions of Classroom Disciplinary Climate, Teacher-Student Relations, and Teacher Instructional Strategies.

School Community	Classroom disciplinary climate			Student-teacher relations			Teacher use of structuring and scaffolding strategies			Teachers' stimulation of reading engagement		
	Australia SD = 1.01	Canada SD = .96	New Zealand SD = .96	Australia SD = .99	Canada SD = 1.03	New Zealand SD = .95	Australia SD = 1.05	Canada SD = 1.06	New Zealand SD = 1.05	Australia SD = 1.00	Canada SD = 1.05	New Zealand SD = 1.02
	<i>M (SE)</i>	<i>M (SE)</i>	<i>M (SE)</i>	<i>M (SE)</i>	<i>M (SE)</i>	<i>M (SE)</i>	<i>M (SE)</i>	<i>M (SE)</i>	<i>M (SE)</i>	<i>M (SE)</i>	<i>M (SE)</i>	<i>M (SE)</i>
Village	-.22 (0.009)	-.08 (0.006)	-.02 (0.020)	-.01 (0.010)	.24 (0.007)	.07 (0.018)	.13 (0.011)	.38 (0.006)	.43 (0.023)	-.02 (0.010)	.09 (0.006)	.08 (0.020)
Small Town	-.20 (0.006)	-.10 (0.004)	-.19 (0.010)	-.05 (0.006)	.30 (0.004)	.10 (0.010)	.06 (0.006)	.37 (0.004)	.27 (0.011)	-.09 (0.006)	.10 (0.004)	.01 (0.011)
Town	-.26 (0.005)	-.11 (0.003)	-.19 (0.009)	.03 (0.005)	.30 (0.003)	.15 (0.008)	.12 (0.005)	.38 (0.004)	.20 (0.009)	.02 (0.005)	.15 (0.004)	.06 (0.009)
City	.01 (0.004)	-.09 (0.003)	-.05 (0.008)	.15 (0.004)	.35 (0.003)	.27 (0.008)	.25 (0.004)	.49 (0.003)	.41 (0.009)	.19 (0.004)	.35 (0.003)	.17 (0.008)
Large City	.01 (0.003)	-.01 (0.004)	-.09 (0.008)	.18 (0.003)	.38 (0.004)	.23 (0.008)	.30 (0.003)	.46 (0.004)	.37 (0.008)	.24 (0.003)	.33 (0.004)	.21 (0.008)
<b>Mean</b>	<b>-.07 (0.002)</b>	<b>-.08 (0.002)</b>	<b>-.12 (0.004)</b>	<b>.11 (0.002)</b>	<b>.32 (0.002)</b>	<b>.19 (0.004)</b>	<b>.22 (0.002)</b>	<b>.43 (0.025)</b>	<b>.33 (0.005)</b>	<b>.14 (0.002)</b>	<b>.23 (0.002)</b>	<b>.13 (0.004)</b>
<b>Gap</b>	<b>.27 SD</b>	<b>.10 SD</b>	<b>.18 SD</b>	<b>.23 SD</b>	<b>.14 SD</b>	<b>.21 SD</b>	<b>.23 SD</b>	<b>.11 SD</b>	<b>.21 SD</b>	<b>.33 SD</b>	<b>.25 SD</b>	<b>.20</b>

Note. For all indexes, smaller values are less positive.

The final instructional index we examined is students' perceptions of teachers' stimulation of students' engagement in reading. Students in all three countries report more positive responses than the OECD average in all school community types except villages and small towns in Australia. In all three countries, this index is positively related to community size, with the most favorable responses occurring in the largest (most urban) school communities, and the least favorable responses occurring in the smallest (most rural) school communities. Differences among school communities are the largest in Australia and the smallest in New Zealand and are educationally significant in Australia and Canada. Among the three countries, Canadian students report the most favorable reading engagement in all five school community types. Student responses in the three smallest, most rural school communities are the least favorable in Australia.

## Discussion and Conclusion

Australian, Canadian, and New Zealander school systems share several organizational features and sociocultural traditions. Examining educational inequity associated with rural-urban differences for these three culturally alike systems provides the prospect of better understanding variables that could potentially reduce the disadvantages in educational opportunities and outcomes for rural communities. As researchers based in Australia, we are, of course, concerned with identifying trends in student and school variables to inform efforts that reduce rural educational disadvantage in Australia. The insights uncovered via large-scale international data, however, may also be useful for other countries. The findings presented here may be beneficial for informing theory about the contexts and conditions that potentially

mediate rural educational disadvantage in other national contexts.

Our analysis of PISA data shows that rural educational disadvantage is more pronounced in Australia than in Canada or New Zealand. This can be seen in two ways, both within and across the three countries. First, the magnitude of the gap in educational outcomes (specifically, reading literacy performance) between rural and urban students is larger on average in Australia than in Canada or New Zealand. Second, students in rural communities in Australia enjoy less positive educational experiences than their peers in Canada or New Zealand. These findings are intriguing and somewhat surprising given that average SES (e.g., parent educational attainment) in rural school communities is similar in Australia and New Zealand.

Explanations by researchers such as Williams (2005) suggest that students living in villages and small towns, who typically have lower reading performance compared with their urban peers, often have lower SES as well. Furthermore, the perception that SES and academic achievement are closely linked resonates with the broader education community throughout Australia and reflects similar findings in international education research (Reardon, 2011). The current analysis, however, shows that rural students in New Zealand, with similar SES on average to their peers in Australia, have better reading literacy performance at 15 years old, as measured by PISA.

The reason behind New Zealand's rural success compared with similar school communities in Australia is not clear. This analysis may, however, provide some insight. On the four learning environment measures reported by students, Australian students consistently report the least favourable responses among the three countries. Principals in rural

communities in Australia were also the most likely to report that shortages of teaching personnel hinder learning in their schools, a finding supported by Harris, Jensz, and Baldwin's (2005) research. Some researchers, such as Downes and Roberts (2018), question why teacher shortage remains an ongoing issue given our well-developed knowledge in this area. One could argue that there have been many studies about rural school staffing, but few linked to policy or tracked across time. Perhaps one answer lies in geography. For example, one could reasonably hypothesize that significantly smaller geographic distances between rural and urban communities in New Zealand, contrasted against enormous and challenging distances in Australia, reduce the level of shortages of teaching personnel for rural communities in New Zealand, and, therefore, weaken the relationship between rurality and educational disadvantage. Given greater distances between urban and rural or regional centers in Australia, it is not difficult to envisage greater staffing difficulties. The impact on attracting and retaining staff and implementing staff development would be great. For example, with regard to staff professional learning, there would likely be reduced opportunities for skill development in rural communities, and that could have direct impact on career development and skills, and, by extension, teacher recruitment and retention. Perhaps, therefore, future research could examine the apparent differences in these relationships. It would seem quite plausible that rurality (the distinction between larger and smaller school community types) impacts more negatively when geographic distances between school communities are large, with many rural settings classified as "remote," as in the case of Australia, than when distances separating communities are smaller and less challenging, such as in New Zealand.

Whether or not a hypothesis about the differential effects of distance on rural disadvantage via (for example) the differential recruitment, retention, or professional learning of teachers ultimately is supported, this study nevertheless has limitations. Perhaps most important, school-level variables used in the analysis are based on principals' and students' reported perceptions and experiences rather than independent observations. In addition, PISA samples 15-year-old students, typically in their last year of compulsory schooling, and the associations observed among rurality, SES, and educational outcomes, which typically manifest as rural educational disadvantage, may not hold at other levels of schooling (e.g., primary).

As an exploratory study that documents differences between school communities and education systems, this study lays a foundation for several future lines of enquiry. Future research could explore how schools in rural communities and small towns differ among Australia, Canada, and New Zealand, for example. Observational studies of classrooms and ethnographic studies of schools could help explain why educational outcomes are weaker in rural Australia than in comparable communities in New Zealand. Another line of

research could examine how teachers are allocated to rural schools in the three countries. Future studies that examine the nature and degree of support and professional development provided to rural school teachers in the three countries could illuminate how best to support teachers in Australia, as well as contribute to a larger theoretical framework about the role of schools and school systems in mediating rural educational disadvantage.

We believe that it is vital for education systems to understand the significance of "gaps" in educational outcomes among school communities within a country. Since PISA 2009 and despite efforts to close urban-rural disparities in Australia's literacy performance, unequal outcomes persist between Australia's urban (metropolitan) and rural (provincial and remote) communities, and these differences remain large (Thomson, De Bortoli, & Underwood, 2016). For example, this study indicates that fewer Australian rural students report that their teachers foster supportive relationships with their students, promote a productive classroom climate, or use teaching strategies that are generally thought effective for teaching reading, in comparison to rural school teachers in New Zealand or Canada. Wallace (2008, p. 6) states, "The disparity between learners' interpretations of life and knowledge, and educational institutions' interpretations of learners' lives and knowledge in regional Australia, can impact on learners' engagement with education and training." It is evident that teachers need to be culturally assimilated into a community and cannot relate to, or teach, what they do not know or understand. This message is reinforced by several researchers committed to exploring rural education issues in the context of the values and motivations of the people who live in rural and remote communities, and who argue that social justice should frame our education programs (Cuervo, 2016; Pini & Bhopal, 2017; Roberts & Cuervo, 2015; White, 2015).

Considering the notably higher level of government expenditure on public education, as a percent of GDP, provided by New Zealand, it would be interesting to examine how the distribution of education funding varies between Australia, Canada, and New Zealand. Researchers such as Kline, White, and Lock (2013) have suggested that teachers in Australian rural school communities could be better supported and trained, and Schleicher (2009) has used PISA data to foreground aspects of educational policy associated with high-quality learning outcomes and equitable distribution of learning opportunities. Perhaps a finer grained examination of the distribution of educational funding for Australia could apply an urban-rural lens, as well as lessons from Canadian and New Zealander systems, to more effectively address the persistent challenge of rural disadvantage. We hope that, like our predecessors, this study contributes in a positive way to improving rural educational disparities in Australia. We hope community awareness of rural education inequity is thereby increased and policies promoted that influence educational systems to make changes that support equal opportunities

and equitable outcomes for rural and remote students across Australia.


#### **Declaration of Conflicting Interests**

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

#### **Funding**

The author(s) received no financial support for the research, authorship, and/or publication of this article.

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## Appendix: Questionnaire items for selected indexes

### Classroom disciplinary climate

Students are asked how often the following five items occur in their English/reading class:

- Students don't listen to what the teachers say
- There is noise and disorder
- The teacher has to wait a long time for the students to quiet down
- Students cannot work well
- Students don't start working until after a long time after the class begins

Students are given four response categories, with 1 = "never or hardly ever", 2 = "in some lessons", 3 = "in most lessons" and 4 = "in all lessons". The index is inverted whereby smaller values represent less positive disciplinary climates.

### Student-teacher relations

Students are asked how much they disagree or agree with the following statements about teachers at their school. The index is derived from five items in the student questionnaire:

- I get along well with most of my teachers
- Most of my teachers are interested in my well-being
- Most of my teachers really listen to what I have to say
- If I need extra help, I will receive it from my teachers
- Most of my teachers treat me fairly

Students are given four response categories, with 1 = “strongly disagree”, 2 = “disagree”, 3 = “agree” and 4 = “strongly agree”. Higher values on the index represent more positive relations.

Teacher use of structuring and scaffolding strategies

Students are asked how often the following occur in their reading/English class:

- The teacher explains beforehand what is expected of the students
- The teacher checks that students are concentrating while working on the <reading assignment>
- The teacher discusses students’ work, after they have finished the <reading assignment>
- The teacher tells students in advance how their work is going to be judged
- The teacher asks whether every student has understood how to complete the <reading assignment>
- The teacher marks students’ work
- The teacher gives students the chance to ask questions about the <reading assignment>
- The teacher poses questions that motivate students to participate actively
- The teacher tells students how well they did on the <reading assignment> immediately after

Students are given four response categories, with 1 = “never or hardly ever”, “in some lessons”, “in most lessons” and 4 = “in all lessons”.

### Teacher stimulation of reading engagement

Students are asked how often the following occur in their reading/English class:

- The teacher asks students to explain the meaning of a text
- The teacher asks questions that challenge students to get a better understanding of a text
- The teacher gives students enough time to think about their answers
- The teacher recommends a book or author to read
- The teacher encourages students to express their opinion about a text
- The teacher helps students relate the stories they read to their lives
- The teacher shows students how the information in texts builds on what they already know

Students are given four response categories, with 1 = “never or hardly ever”, “in some lessons”, “in most lessons” and 4 = “in all lessons”.

### Shortages of teaching personnel

Principals are asked to evaluate the degree to which, ‘student learning in their school is hindered by shortages of qualified teachers and support personnel’. The teacher shortage index is comprised of six items about support personnel and teachers in different learning areas (e.g., mathematics and science). Higher values on the teacher shortage index represent greater shortages.

### Quality of educational resources

Principals are asked to evaluate the degree to which, 'student learning in their school is hindered by shortages of educational materials'. The educational materials index comprises seven items about instructional materials, library books, laboratory equipment, audiovisual resources, computers, computer software and access to the Internet. The educational materials index is reversed; wherein higher values represent better resourcing.



## **Significance of Study**

Compared to teacher quality and other aspects of school resources, less is known about how learning environments may vary between schools in rural and urban communities. A review of the literature, undertaken prior to completing the third research paper, suggests that researchers have examined the relationships between learning environments and educational outcomes and motivation for rural students (see for example, Hardre & Reeve, 2003 and Young, 1998), but have paid less attention to how learning environments vary by geographic location. An exception in Australia is a study by Waldrup and Fisher (2007), who show that students in metropolitan schools are more likely to report negative relationships with their teachers compared to students in rural and remote areas. I believe a better understanding is required of the disparities that exist between schools from different geographic locations. By examining PISA 2009 data and contrasting international school communities, this research paper highlights how school communities from countries such as Canada and New Zealand, share characteristics that can offer insights to improving equity within schools in Australia.

Paper 3 provides a comparative analysis of the Australian education system using PISA 2009 reading literacy outcomes and questionnaire responses associated with school resources and learning environments. The research of 'like' school communities within different, but culturally and economically similar international school systems provide useful comparative data. The outcome of broadening my research to be inclusive of comparable international education systems is that it highlights that trends and patterns associated with rural education in Australia are somewhat unique. The comparative analysis provided in paper 3 also provides clues as to why some countries have smaller achievement gaps between rural and metropolitan students.

My research highlights that students in rural school communities across an international study display weaker educational outcomes and generally enjoy less favourable learning

environments than their city peers. Weaker educational reading outcomes in PISA 2009 may be reflective of rural educational disadvantage. This inequality is pronounced in Australia. My investigation, presented in paper 3, indicates that education equity cannot be attributed entirely to school socioeconomic status but is likely to be influenced by variables such as, 'shortages of teaching personnel'. These variations may provide clues as to why Australia's achievement gap in reading in PISA 2009 is disproportionate to New Zealand and Canadian 'like' school communities. International school community comparison used in this way suggests that the lower than average literacy levels in PISA 2009 reading assessment, associated with rurality in Australia, may be connected in some way to the structure of school resources and learning environments.

In the ensuing chapter, I will elaborate on the key findings of my study and examine the significance, limitations, recommendations and future possibilities associated with my research.

## **Chapter 7:**

### **Conclusion**

#### **Key findings**

Throughout the course of my research I have explored PISA 2009 data and worked closely with my supervisors, stayed abreast of current literature, conducted research and analysed data in the endeavour to uncover evidence of associations among school resources, learning environments and student achievement, as measured in PISA 2009. I used descriptive statistics to compare school characteristics and student outcomes across different school contexts, geographies and countries. Analysing this data has enabled me to uncover possible indicators of important differences across urban-rural school communities. The research has also provided a means to develop the skills required to show meaningful patterns and relationships using large-scale, international datasets. However, as is well understood, the cross-sectional nature of data included in my study preclude establishing causal relationships among school resources, learning environments and student learning variables.

This thesis has led to findings about the ways in which perceptions of school resources and learning environments vary across school communities. Questions as to ‘why?’ rural school communities in Australia are disadvantaged may remain unresolved but the nature and extent of disparity and inequity in Australian rural education has been achieved. Furthermore, in analyzing learning resource and learning environment constructs greater knowledge and understanding of the characteristics of Australian students and their learning experiences has been achieved. In the following paragraphs, I summarize the main findings of this research.

Information that has been brought to light through my research will hopefully contribute to understanding variations in school resources and learning environments across Australian urban-rural school communities, and the association of this variability with

variability in students' achievement. Amongst other findings, my research identified learning environments in large Australian regional towns (up to 50,000 residence) are perceived by students as experiencing less positive learning environments, and recruiting and retaining teachers in large regional Australian town school communities is considered by principals to be less positive than in rural regions. The trends from PISA 2009 questionnaire data also signpost a rural-urban geographic bias that indicates greater shortages associated with rurality, such as shortage of instructional material and equipment on learning.

In undertaking an investigation into PISA 2009 data, I gained valuable knowledge about rurality inequalities associated with education opportunities, in particular: learning materials, teachers and facilities across Australia's urban-rural school communities. I have also discovered that low SES rural school communities in New Zealand outperform their counterparts in Australia and instructional practices and relationships between teachers and students play an important role in determining the quality of student experiences and education outcomes.

Research into Australian school community learning resources suggests the presence of an unequal distribution of resources (teaching materials and personnel) between rural and urban Australian schools, favouring schools in close proximity to urban centres. My research suggests that the distribution of resources across school communities as reported by principals closely mirrors school academic performance and school socioeconomic status. For instance, rural schools, on average, have weaker academic literacy across all subjects in PISA 2009 and as indicated by school questionnaire data are more affected by shortages of teaching materials and personnel than are schools in larger towns and cities. However, my research also suggests some Australian 'large town' school communities are just as disadvantaged on some indicators as compared to the most rural/remote school communities in Australia. These findings highlight

the need for researchers to gain a better understanding of the characteristics of Australia's school communities and the association of these characteristics with learning outcomes.

Whilst the association of school resources on student outcomes is still an open question, understanding how these vary across school communities provides context for future research, policy and practice. My findings support previous research that asserts school resources impact positively on student learning experiences (Alton-Lee, 2003; Darling-Hammond, 2000; Greenwald, Hedges, Laine, 1996; Hill et al., 2005). For instance, school principals in small rural communities are more likely to respond that their school's capacity to provide instruction, 'is hindered more by shortages of teaching personnel' than by, 'shortages of teaching resources'. My findings indicate that instruction is perceived by school principals to be hindered substantially more in smaller communities than in the larger, more urban communities. Also, my analysis of PISA 2009 showed that 66% percent of school principals in small rural communities responded unfavourably to questions relating to 'shortage of qualified teachers' as opposed to only 21% of school principals close to the centre of a very large city. These findings provide useful information about the distribution of resources across Australia's school communities and may raise awareness about the necessity of addressing this problem.

My research highlights that students' and principals' perceptions of their school's climate and learning environment varied across rural and urban school communities. Students' perceptions of their 'classroom disciplinary climate' were, on average, less positive in rural communities than in very large cities: for example, 40% of the students in towns with 15,000-50,000 residents reported that students in their classroom do not listen to their teacher, compared to 25% of students who attend schools close to the centre of capital cities. Principals' perceptions of both teacher and student behaviour is considerably more negative in rural communities and country towns than in cities. Students and principals from inner-city schools in very large cities reported the most positive learning environments of any of Australia's

school communities. These students, on average, come from families with higher socioeconomic backgrounds.

Information that has become known through my research includes: learning environments in large Australian regional towns (up to 50,000 residents) are perceived by students as less positive; and, recruiting and retaining teachers in large regional Australian town school communities is considered by principals to be less positive than the smallest rural regions. The trends from PISA 2009 questionnaire data also signpost a rural-urban geographic bias that indicates an increase in the shortage of instructional material and equipment associated with rurality.

Educational opportunities, experience, and outcomes for high school students are much more unevenly distributed across geographic rural-urban communities in Australia than in Canada or New Zealand. Cross-national analysis of school communities highlights that school SES is lower on average in Australian and New Zealand rural school communities than in Canada. The interrelationship between school resources and learning environments and academic achievement is difficult to distinguish. However, patterns emerged in my research that indicates that SES does not play a lone hand in determining academic performance. For instance, New Zealand students in rural school communities performed at a much higher literacy level in PISA 2009 reading than their Australian counterparts, despite lower mean school SES and similar levels of parental education.

## Significance

A consistent finding from my research is that student and principal perceptions are less positive in rural communities and towns than in cities. These data contradict the study of Waldrip and Fisher (2007). Nevertheless, these findings show the degree to which perceptions vary across school communities, along a larger variety of dimensions than has been previously shown. Policy to support this perceived deficit in rural school communities could include the implementation of better rural teaching training for university graduates.

My findings show that the relationship between community size and perceptions of learning environments is not linear, with the most negative responses occurring in larger towns rather than the smallest rural communities. This information may be of enormous benefit to education policy-makers, school leaders and teachers who seek to improve the learning experiences and outcomes of their students. The significance of this finding is heightened when consideration is given to existing research that suggests teachers' expectations of students and teachers' ability to manage their classroom can impact on the literacy level of their students (O'Brennan, Bradshaw & Furlong, 2014; Williams, 2012).

Shortages of teaching personnel vary substantially across school communities within Australia, Canada, and New Zealand. Australian principals are the most likely to report that 'shortages of teaching personnel' hinder learning in their school. The findings contained in my thesis will hopefully lead researchers to investigate why the inter-connectedness of shortages of teaching personnel and learning outcomes is stronger in some school communities and in some national contexts than others. Reform in this area could occur through government support of university initiatives to attract students specializing in difficult to staff learning areas and closer relationships between all levels of education in Australia.

Other important findings from this thesis indicate that rural educational disadvantage is more pronounced in Australia than in New Zealand or Canada. This is illustrated through



comparison of rural and urban student outcomes and principal and student questionnaire response to learning resources and learning environments, such as ‘shortage of teaching personnel’ and ‘most of my teachers treat me fairly’. These findings, which were explored in Paper 3, pose further analysis as the average socioeconomic status and parent educational attainment in these rural school communities is similar in Australia and New Zealand. Potentially the data may provide clues to better understanding the interrelatedness of school-related factors.

The higher literacy achievement of New Zealand rural school communities in PISA 2009 reading, in comparison to higher socio-economic peers in similar school communities in Australian is especially important for Australian education policy-makers, rural principals and their school community’s parents, teachers and students. Innovative government policy is required that seeks to provide better rural education funding, teacher training and resource allocation to rural school communities shown to have implemented curriculum reform that targets outcome improvements, fosters close relationships between school and community, promotes positive attitudes towards learning and immerses local culture into their school community.

Through the research and analysis in this thesis, it is hoped that a clearer knowledge of academic potential and achievement will be realised in low socio-economic rural school communities across the globe. I strongly believe the message of this thesis, for Australian policy-makers and Australia’s rural school communities, is to set high goals and endeavour to promote the seemingly impossible barrier to achieve equivalent academic literacy levels; not only to counterparts in rural New Zealand school communities, but more importantly to peers in Australian urban school communities.

## **Limitations**

This study is based on a secondary analysis design and a descriptive statistics method of analysis. Descriptive analysis used in this research includes PISA 2009 literacy outcomes and principal and student questionnaire response. The data analysis utilised in my thesis provides a better understanding of individual variables, such as ‘shortage of school resources’, on student literacy performance in PISA 2009, and relationships, associations and distributions of data across my area of inquiry. However, performing regression analysis on specific variables with any certainty is problematic as there is an inability to disentangle variables, such as student socioeconomic status from other variables. Consequentially, I believe that it is more plausible to consider the combined effect of individual variables rather than try and attempt to identify the impact of an individual variable on a school community. Also, the end-point of this research is not just to identify specific questionnaire variables that may predict performance outcomes, but rather to provide (or, support) a better understanding of school communities themselves. This is because regardless of whether positive teacher-student relationships are related to achievement, they are still a positive ‘outcome’ in their own right.

A possible limitation of this study is that the school resources and learning environment variables are based on the perceptions of students and principals rather than observational data: for instance, it is possible that when measuring school resources and learning environments perceptions rather than reality differ. Also, the analysis of questionnaire mean response limits the potential of this study to measure outliers. However, given PISA’s large sample sizes, I believe that the questionnaire research is of value. Another limitation of PISA is that the degree of remoteness and isolation of rural communities is not specified. It is not clear from the dataset whether schools in villages are more remote in terms of distance from students’ homes or to larger population centres in Australia than in Canada or New Zealand. Evidence of how school

community size is related to remoteness, for example, may help explain the cross-national differences that were uncovered in my study.

### **Future research**

My research has reinforced the need to learn more about how and why Australia's rural, remote and metropolitan school communities vary. It is clear there is still much to be learned in this important field of research. It will only be through learning more about school community characteristics that researchers will be able to better understand the link between rural-urban variables and be able to identify the role that school community characteristics play in determining academic opportunities and education outcomes. The findings highlight the need to consider learning resources and learning environments as an end in themselves and not just as a predictor of academic outcomes and to introduce education policies and structures to reduce educational disadvantage.

It is clear from this research that comparisons of PISA questionnaire responses across school communities at national and international levels can provide clues as to the different make-up of the school community, but it also underlines that more elements need to be analysed to discover the reasons behind educational inequity and disadvantage. Simple modifications, like expanding the number of rural school communities included within the dataset and re-classifying these school communities as to geographic location, would increase the accuracy of data, and provide a clearer understanding of rural inequities in education. For instance, rural school communities in Australia's far north could be compared with the south-eastern region of Australia. Comparisons like these will increase our understanding of the dynamics of rural school communities.

This thesis identifies that a strong positive relationship between mean student SES and academic performance exists across Australia's urban-rural school communities. Further analysis is required to better inform educational policies and practices that seek to

improve outcomes for rural school communities in Australia. A comparable qualitative study of rural education in Australia, Canada and New Zealand is an example of research that would strengthen my personal understanding of this quantitative study. In doing a qualitative analysis of rural school communities across Australia, Canada and New Zealand I would endeavour to gain a more thorough understanding of the interrelatedness of variables contained in my thesis. Perhaps then I could assert with a degree of confidence why Canada's rural teacher shortage is less pronounced than in Australia and New Zealand.

### **Recommendations**

Living in a rural community, whilst offering amazing positives and benefits to individuals, is in many ways a pre-existing condition to being vulnerable to natural elements such as weather and associated natural disasters like floods, droughts, fire, famine and to downturns in rural industry associated with economic and political events that affect demands for resources. These factors have ramifications on the social fabric that influences rural school environment and the economic costs associated with school resourcing.

It is difficult to isolate and measure the impact of socioeconomic status, but it can be argued that factors such as low socioeconomic status are magnified in regional and remote communities. At the same time, the findings from the comparative study suggest that socioeconomic status cannot play a lone hand in student academic outcomes. It also suggests that the relationship between socioeconomic status and educational opportunities, experiences and outcomes vary across contexts. Understanding the conditions that mediate the relationship in different contexts would be a worthy future study.

The findings uncovered in this thesis will hopefully encourage universities to be more conscious of educating their students of specific rural education needs and take responsibility to ensure graduate teachers who are sent to remote schools are better prepared for teaching in rural settings. My optimism is that rural school communities become more aware of the need to

immerse new staff in local culture and inform them and place them in a position that will empower them to better understand how their school resources and the relationships that they establish within the school community may impact on student achievement. The findings will also enable rural schools to recognise the need to better support new teachers to their school communities. This could be provided through better funded regional specific professional development designed to increase awareness of the need for teachers to establish supportive relationships with their students, promote a productive classroom environment and use effective teaching strategies. Policy-makers may also use information such as recognising the proportion of students in rural areas is greater in Canada than either Australia or New Zealand, to make informed decisions on capital expenditure.

From a personal level the most significant finding from my study is that rural students in Australia, Canada and New Zealand generally enjoy less favourable learning environments than their urban peers, with disadvantage being most pronounced in Australia. One policy recommendation that could stem from the research that I have undertaken is Australian rural schools would benefit from an increase in availability of instructional materials. Addressing teaching shortages in rural communities is difficult as it represents Australia's shrinking rural and expanding urban population. However, providing sufficient instructional materials for Australian rural school communities should be a routine matter for a wealthy country such as Australia.

The underlying message of this research is to raise awareness of the need for a more thorough analysis of the impact of learning environments and learning resources on student achievement within a school community. I would argue that schools in rural communities should have the opportunity to have resources distributed depending on specific needs. The research conducted in this thesis would also benefit from a greater understanding of school communities, for instance providing factual data, on the number of libraries and community

centres within a designated radius could help to contextualise information. Exploring how schools in rural communities and small towns differ in Australia and between Australia, Canada and New Zealand would provide tremendous value to interpreting questionnaire analysis findings. Improvement in understanding could also come via observational studies of classrooms and descriptive ethnographic studies of schools. Such studies would help researchers to better understand why rural educational outcomes are lower in Australia than in New Zealand.

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