This paper explores the relationship between social backgrounds and geographical locations with mathematical achievement. Using the national testing system in Australia, correlations between the variables were explored and it was found that students from rural and low SES backgrounds are still being marginalised in school mathematics – in terms of their success. This is despite 50 years since the first critical sociology of education noted the structural inequalities of education. For the authors this creates a challenge for researchers to consider better ways to understand the factors that may be impacting on mathematical achievement, particularly for those target groups within our study. The work of Bourdieu is used to frame the paper.

From the critical sociology of the 1970s (Bowles & Gintis, 1976; Connell, Ashendon, Kessler, & Dowsett, 1982), the ways in which families and schools were structured were seen to be contributing to the non-random success (and failure) of particular groups of students. Since then there have been many initiatives that attempt to address systemic failure in Australian schools including the long-standing Disadvantaged Schools Program (Connell, White, & Johnston, 1991) which is still operating in contemporary times after being initiated in the early 1970s. What has been generated during the intervening period has been a plethora of research that explores various aspects of schooling that contributes to the marginalisation of particular students. This paper establishes that the patterns of success and failure that were noted in the 1970s still remain in education nearly half a century later. Despite significant research and considerable allocation of targeted funds to redress structural and personal inequalities in mathematics education, it is alarming that the entrenched patterns of success remain. While the research presented in this paper is from the Australian context, we do not think that this is a unique case, but rather, it is illustrative of general trends in international education – except for rare exceptions such as the much noted case of Finland.

This paper explores the nexus between the social and geographic backgrounds with numeracy scores on the national testing program for Australian schools. After five decades of knowing the students from social, cultural, linguistic and geographical locations are more at risk of not succeeding and with substantial targeted funding and reforms, we were keen to know the impact of such work. We sought to establish whether there is a link between these areas of education after the long-standing and many interventions during this period, and if it does, to explore any nuanced relationships between the social and geographical location of students with their achievement in mathematics. We have targeted social background and geographical background as these are well recognised as being two of the most salient variables in educational success, and most notably
mathematics education. We recognise that other factors, particularly Indigeneity are profound in terms of success in mathematics education, but have focussed our attention on only social and geographical variables, which intersect strongly with Indigenous issues, compounding the potential for success (and failure) in school mathematics.

We establish that there remains an ongoing correlation between success (and failure) in school mathematics with the backgrounds of students, despite considerable growth in knowledge and policy as to the mitigating factors for this correlation. To help make sense of such correlations, we draw on the work of Bourdieu to theorise this relationship and offer ways forward to better understand the intersection of many factors that may contribute to the construction of this outcome.

In the contemporary education context, Australian students may perform moderately well on international tests such as TIMSS but it has also been acknowledged that while at a national level the results are positive, there is considerable variation across the country. There are some groups of learners in some locations who are performing quite poorly (McGaw, 2004). This pattern noted by McGaw were recently the focus of much media attention when the results of the latest TIMMS study were released, again showing the long tail in equity outcomes for Australian students. The Australian mean is quite high, but the ‘tail’ in the national distribution shows that many students are doing very poorly, this creating great disparities between the high achieving students and those who have traditionally done poorly in mathematics. The implications for equity are profound as the results suggest that there are some specific characteristics identifying students who perform considerably below expected standards. As McGaw (2004) highlighted, Australia may perform well as a nation, but our achievement tail makes us one of the worst nations in terms of equity. Most notably in the Australian context one of those characteristics is that of ethnicity where remote Aboriginal students perform significantly below the national benchmarks (MCEETYA, 2009). It is noted that this does not apply to all Indigenous students. Those most at risk of educational failure are those who live in remote areas (Australian Curriculum Assessment and Reporting Authority, 2011). Yet it is also recognised that other factors such as social-economic background and geographical location also impact on educational outcomes (Perry & McConney, 2010). The compounding of these factors is also an important consideration given the tendency for many Indigenous communities to live in remote geographic locations. However, while remote Indigenous Australians are the most likely to perform well below national numeracy benchmarks, they constitute a very small portion of the overall population. Indeed, the specific impact of such a small representation was a key consideration in a national project aimed at enhancing mathematical outcomes for Indigenous Australians.

Aside from the issues of remote Indigenous education, other factors -- most notably low socio-economic status (SES) background (or social class) and rurality -- are key variables that impact on considerable numbers of Australian students (including of course Indigenous students). According to Australian Bureau of Statistics data (2010), one third of the population resides outside a major city. Given the geographical size of Australia, the further away from a major city you live, the less choice (and indeed access) one might have when it comes to educational opportunities (Argy, 2007). The PISA 2012 study further reinforced the differences in performance in mathematics by students’ geographical location. The PISA study reported that the Australian mean in mathematics for urban students was 523 while for those in the smaller, more isolated villages was 468, showing
significant differences between rural/urban students in mathematical performance. Researchers concluded that the results for Australia showed that “In Australia, student performance in all three domains [mathematics, reading] consistently and significantly increases with the size of the population base in which schools are located from village to large city” (Lietz, Darmawahn, & Alduos, 2014, p.117). Furthermore, a report by the Human Rights and Equal Opportunity Commission (HREOC) in 2000 found that students in rural and remote areas were more likely to drop out of school before completion of year 12 than students in metropolitan areas; have more absences across their school life; and less likely to attend university or a tertiary education institute (HREOC, 2000).

In this paper we provide a context for our work in such schools. Many of these students are in schools often described by employing authorities as “difficult-to-staff schools” either due to the demographics of the communities or the physical location of the schools (Berry, 2005). This is not an issue unique to Australia as the UK has similar issues with its so called “failing schools” which are usually in inner city, low SES communities, or communities with high racial diversity. Additionally, recent research suggests that white, working-class students are one of the biggest groups of underachievers in the UK education system (Demie & Lewis, 2011). In many states of Australia, teachers are employed by the state and to ensure that these difficult-to-staff schools have teachers, teaching staff are provided with incentives to teach (generally for short periods of time) in these schools. Many new graduates, for example, take the opportunity to gain extra credits that can be accumulated and exchanged for teaching positions in sites that are preferred by many teachers. The need to ensure quality teachers and continuity in employment in these contexts has been widely recognised in Australia and well as internationally (Brasche & Harrington, 2012; Prince, 2002).

There is a considerable literature in the field of mathematics education that identifies areas of curriculum, pedagogy and/or assessment that contribute to the marginalisation of students. For example, the comprehensive work of Cooper and Dunne (1999) in the UK showed how national mathematics tests favoured middle-class children through the use of esoteric and contextual problems. Similarly, Dowling’s (1998) analysis of mathematics text books showed the reification of social class through differentiated schema for organising examples in these books. Boaler’s work in the UK (1997) and the US (Boaler & Staples, 2008) has shown how pedagogical practices used in mathematics classrooms stratify learning outcomes. Similarly there is a substantial body of work that also alerts to issues around teacher quality and the mathematical content knowledge of teachers as being instructional in how teachers organise learning background (Ball, 2000) but what is less known is the relationship between the background knowledge of teachers and where they teach. Pearson (2009) has strongly advocated for the ‘best’ teachers to be placed in the most disadvantaged schools as he argues that often these schools are filled with teachers who have very weak content and pedagogical knowledge. What is less well known in the Australian context is how factors such as the background knowledge of teachers and their placement in schools, may be impacting on the learning and learning environments of students who are most at risk of failing in school mathematics.
**Framing Mathematical Success and Failure**

For this paper, we draw on Bourdieu’s theoretical work to frame success or failure in school mathematics. In spite of its theoretical difficulties we have chosen to retain a commitment to the term ‘social class’ to refer to the relative educational and economic (dis)advantage experienced by members of the wider Australian community. However, we accept there is considerable tension over a clear definition of social class, particularly in a nation such as Australia which popularly considers itself an egalitarian society. We adopt a Bourdieuan position on class as a construct created so as to explain a particular phenomenon rather than representing real categories or objects. It then becomes possible to theorise sets of people who occupy particular positions within the social strata. Consequently,

Classes [are] sets of agents who occupy similar positions and who, in being placed in similar conditions and subjected to similar conditionings, have every likelihood of having similar dispositions and interests and therefore of producing similar practices and adopting similar stances. The “class on paper” has the theoretical existence which is that of theories…. It is not really a class, an actual class, in the sense of a group, a group that mobilizes for struggle; as most it is a probable class, inasmuch as it is a set of agents which will present fewer hindrances to efforts of mobilization than other sets of agents (Bourdieu, 1985, p. 198).

We suggest that this theorisation could be similarly applied to people living in rural and remote areas, and also applied to how rurality is defined. Bourdieu goes on to expand his categories, arguing:

> This “class on paper” has the theoretical existence which belongs to theories: as the product of explanatory classification… it allows one to explain and predict the properties of things classified—including their propensity to constitute groups. (Bourdieu, 1991, p. 232)

Using Bourdieu’s constructs it becomes possible to understand how class operates as the embodiment of culture into what is referred to as a class (or rural) habitus. This habitus is a “system of durable, transposable dispositions which functions as the generative basis of structured, objectively unified practices” (Bourdieu, 1979, p. viii). Using this approach to understanding social groupings, we can think about groups of people (and in particular learners of mathematics) who share similar dispositions, similar attributes, and thereby a similar habitus. Indeed, Atkin (2000) and Funnell (2008) suggested that a rural habitus is a real and powerful construct where “ideologically charged and dominant versions of rurality come to inform the identities, beliefs and norms of the people who inhabit rural spaces” (Pini, Price, &McDonald, 2010, p. 18). This similarity within the collective, and hence difference from others, is what makes the construct of class such a powerful one, albeit a difficult one for which to create a tight definition. The classed habitus provides a lens for seeing and interpreting the world and for interacting with the social world. The capacity to be successful in school mathematics, for example, can then be seen as a process of aligning the home habitus, whether based on social class or geographical location, with the school institutional habitus – the cultural norms and dispositions represented through the school mathematics curriculum (Reay, David, & Ball, 2005). Accessing school mathematics thus becomes a task of ‘cracking the code’ that is represented through the classroom practices of mathematics education (Zevenbergen, 2000). Where students have a particular habitus that allows them to see and interact in the mathematics world in particular ways (or not), they are more (or less) likely to experience success (or failure).
Using Bourdieu’s framing we come to see the practices of schooling as a means for creating scholastic mortality where those students from particular social and geographic locations are excluded from the successes, and its reward systems, of mathematics. While his focus was on social class, Bourdieu explains that educators need to understand the processes around the conversion of social and cultural backgrounds into school success. He argued that:

To fully understand how students from different social backgrounds relate to the world of culture, and more precisely, to the institution of schooling, we need to recapture the logic through which the conversion of social heritage into scholastic heritage operates in different class situations (Bourdieu, Passeron, & de saint Martin, 1994, p. 53).

The notion of social heritage thus becomes a central variable in coming to understand the differential successes in school mathematics. From this perspective, the notion of ‘game’ becomes useful to theorise the role of various practices that have been adopted in the mathematics classrooms. Bourdieu has employed the metaphor of a game to theorise how social practices enable some participants to be winners and others to be losers. The games metaphor is an apt one as it enables a theorisation of how the practices within the teaching of mathematics enable some students’ greater access to mathematical knowledge while excluding others. Bourdieu (1990) explains it in the following way:

The earlier a player enters the game and the less he is aware of the associated learning, the greater his ignorance of all that is tacitly granted through his investment in the field and his interest in its very existence and perpetuation and in everything that is played for it, and his unawareness of the unthought presuppositions the game produces and endlessly reproduces, thereby reproducing the conditions of its own existence. (Bourdieu, 1990, p. 67)

This paper is the beginning of a larger project of which the main aim is to understand the already well-established phenomenon of social inclusion/exclusion through mathematics education. For this paper, we follow Bourdieu’s advocacy for the use of statistical confirmation of social class and other social categories to clarify some of the underlying structures of educational success and failure. To this end, the remainder of this paper draws on Australian data from the national testing of 2009, published in 2010 to illustrate the resonances between social and geographical background and achievement in school mathematics.

**Social Background and Numeracy**

To ascertain the relationship between factors of social background, rurality and performance in mathematics, we drew on the national testing data from the Australian Curriculum Assessment and Reporting Agency (ACARA). These data are available from a national site – My School (Australian Curriculum Assessment and Reporting Authority, 2010). On a school-by-school basis, data are provided about the number of students, the percentage of indigenous students, the level of relative social dis/advantage (as indicated by the Index of Community Socio-Educational Community Advantage - ICSEA score) and the mean score for the school in the years of performance. The ICSEA data are constructed by the Australian Curriculum Assessment and Reporting Authority based on information about parental occupation, school education, non-school education and language background that has been obtained from school records in conjunction with data obtained from the Australian Bureau of Statistics (ABS) census data. Current testing is undertaken in Years 3, 5, 7 and 9.
We are aware of the controversy over the quality of such assessment data and debates about such testing and the data they yield. On the one hand the Australian Curriculum, Assessment and Reporting Authority (ACARA), the administrators of the tests and analysis, claim:

The reliability of NAPLAN tests is high and that they can be used with confidence and are fit for purpose. The rigorous processes that are carried out during the development of NAPLAN each year ensure that the results are reliable and comparable between years. (ACARA, 2010)

On the other hand the Australian Primary Principals’ Association (APPA) has its reservations:

Currently details describing the reliability and validity of the NAPLAN tests are kept from the public. This means that it is not possible to estimate the confidence that can be attributed to differences in test scores. In regard to school performance reporting it is conceivable that differences between high and low performers may be due to measurement error. (APPA, 2009, p.4)

We use this data because it is the only extensive database available to us – while we support the APPA claim that the use of such data should not serve to distort or destabilise the educational system. Moreover, we have used these data to establish relationships and differences across schools rather than making judgements about the performance of individual schools or about specific assessment items within tests.

At present, Australia is in the process of implementing a national curriculum. Until recently there were, and still are, distinct differences in the nature and organisation of schooling across the country. In order to establish a representational data source, we needed to consider the country’s diverse geographic representation (urban and rural) and the fact that there are differences in schooling across states. As a result, we opted to only use the data from Years 5 and 9 so as to reduce possible differences cause by different commencing ages (which would have most impact on Year 3 data) and for the transition to secondary school (which would have the most impact on Year 7 data as some states commence secondary studies in Year 7 while others start in Year 8).

To cater for the diversity across an expansive nation, we have elected to base the study in two major regions of the nation, one urban, and one rural. The urban site is a major city with a population of over 1 million people. Within this site, there is considerable diversity in socio-economic status: Some families are wealthy, and there is a large number of elite independent schools; but the site also contains some of the most economically poor areas in the country, and the Department of Education has invoked a policy whereby teachers working in schools in this region accumulate the same status points as teachers working in remote Indigenous communities, because the schools are so difficult to staff. The rural site, in another state, has a mixture of regional centres and small farming/agriculture regions. Schools vary in size from very small (30 students) to large (over 800 students). We are confident that these regions represent the distribution of schools across Australia. We have deliberately excluded remote and very remote regions as we have acknowledged that Indigeneity and remote location have a profound effect on school performance data. A total of 676 schools were part of the sample.

This paper uses data from the ACARA MySchool website to examine the relationship between social advantage, as indicated by ICSEA scores, and NAPLAN numeracy scores; and between location (urban versus rural) and NAPLAN numeracy scores. The MySchool site is the database for the national testing scheme in Australia where students in Years 3, 5, 7 and 9 sit four tests for literacy (reading, writing, spelling, grammar and punctuation) and one test in numeracy. The scores for individual schools are displayed on this site. Extensive research documents the relationship
between social advantage and mathematical achievement and between urban (as opposed to rural) location and mathematical achievement. Consequently, it was predicted that numeracy scores would be positively correlated with ICSEA scores, and would be higher in urban schools than in rural schools. More complex multivariate analysis will be undertaken at a later stage to explore the interactions of other factors such as school size and size of the Indigenous populations. The purpose of this paper is only to explore the intersections of social advantage (ICSEA scores), rurality, and numeracy.

**School-Based SES and Numeracy Data**

The standardised national average ICSEA score is 1000, and the standard deviation is 100. The NAPLAN numeracy scores are modelled so that there is a progressive increase as the students progress through grades indicating a nominal growth pattern over time. For example, in 2009, the average numeracy score was 487 for Grade 5 and 589 for Grade 9.

From the MySchool website, we obtained the ICSEA scores from 2008, 2009, 2010, and 2011 for the selected schools (note that only one ICSEA score was calculated for both 2008 and 2009). As shown in Tables 1 and 2, the mean ICSEA scores for selected schools were within 1 standard deviation of the national mean.

Table 1
Grade 5 ICSEA Scores

<table>
<thead>
<tr>
<th>Year</th>
<th>All selected schools</th>
<th>Urban schools</th>
<th>Rural schools</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008/2009</td>
<td>1008.00 (76.65)</td>
<td>1021.70 (85.13)</td>
<td>987.45 (56.05)</td>
</tr>
<tr>
<td>2010</td>
<td>1022.40 (89.58)</td>
<td>1052.53 (88.18)</td>
<td>977.32 (70.98)</td>
</tr>
<tr>
<td>2011</td>
<td>1024.52 (87.63)</td>
<td>1053.62 (86.93)</td>
<td>980.97 (68.77)</td>
</tr>
</tbody>
</table>

Table 2
Grade 9 ICSEA Scores

<table>
<thead>
<tr>
<th>Year</th>
<th>All selected schools</th>
<th>Urban schools</th>
<th>Rural schools</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008/2009</td>
<td>996.06 (63.64)</td>
<td>997.50 (71.44)</td>
<td>994.50 (54.65)</td>
</tr>
</tbody>
</table>
NAPLAN numeracy scores for the selected schools were also obtained from the MySchool website for 2008, 2009, 2010, and 2011 (see Tables 3 and 4).

Table 3
Grade 5 Numeracy Scores

<table>
<thead>
<tr>
<th>Year</th>
<th>All selected schools</th>
<th>Urban schools</th>
<th>Rural schools</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008</td>
<td>476.77 (34.81)</td>
<td>463.52 (36.01)</td>
<td>474.65 (31.71)</td>
</tr>
<tr>
<td>2009</td>
<td>479.44 (31.83)</td>
<td>476.15 (32.08)</td>
<td>484.86 (30.78)</td>
</tr>
<tr>
<td>2010</td>
<td>483.71 (33.85)</td>
<td>483.83 (34.16)</td>
<td>483.49 (33.42)</td>
</tr>
<tr>
<td>2011</td>
<td>481.55 (31.77)</td>
<td>480.25 (33.84)</td>
<td>483.75 (27.88)</td>
</tr>
</tbody>
</table>

Table 4
Grade 9 Numeracy Scores

<table>
<thead>
<tr>
<th>Year</th>
<th>All selected schools</th>
<th>Urban schools</th>
<th>Rural schools</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008</td>
<td>568.18 (30.03)</td>
<td>565.48 (32.03)</td>
<td>571.29 (27.55)</td>
</tr>
<tr>
<td>2009</td>
<td>577.42 (30.19)</td>
<td>572.33 (32.26)</td>
<td>582.94 (27.03)</td>
</tr>
<tr>
<td>2010</td>
<td>569.39 (30.90)</td>
<td>568.86 (35.09)</td>
<td>570.00 (25.29)</td>
</tr>
<tr>
<td>2011</td>
<td>569.38 (38.86)</td>
<td>565.16 (35.75)</td>
<td>574.27 (31.22)</td>
</tr>
</tbody>
</table>
We calculated correlations between ICSEA scores and numeracy scores in 2008, 2009, 2010, and 2011 (note that only one ICSEA score was calculated for both 2008 and 2009). Statistically significant positive correlations were evident between ICSEA 2008/2009 scores and 2008 numeracy scores ($r = .599, n = 380, p < .01$); between ICSEA 2008/2009 scores and 2009 numeracy scores ($r = .547, n = 380, p < .01$); between ICSEA 2010 scores and 2010 numeracy scores ($r = .582, n = 372, p < .01$); and between the ICSEA 2011 scores and 2011 numeracy scores ($r = .645, n = 372, p < .01$). These correlations indicate that, for the Grade 5 data, greater social advantage (higher ICSEA scores) was associated with higher numeracy scores. In each case, the relationship between ICSEA and numeracy scores was moderate or strong.

Similarly, for Grade 9 data, statistically significant positive correlations existed between ICSEA 2008/2009 scores and numeracy 2008 scores ($r = .693, n = 100, p < .01$); between ICSEA 2008/2009 scores and numeracy 2009 scores ($r = .655, n = 100, p < .01$); between ICSEA 2010 scores and numeracy 2010 scores ($r = .642, n = 98, p < .01$); and between ICSEA 2011 scores and numeracy 2011 scores ($r = .648, n = 98, p < .01$). Thus, for Grade 9 data, greater social advantage was associated with better numeracy scores. In each case, the relationship was strong.

What these sets of data suggest is that there is a positive relationship which, in most cases, is strong. This means that students from high SES backgrounds are more likely to do well in mathematics while their peers from low SES are less likely to do well in mathematics. This pattern was consistent across the two year levels of the study (primary and secondary school) and the different years in which we examined the NAPLAN data, suggesting that the patterns remain in place over time.

Next, the relationship between location (urban versus rural) and numeracy scores was examined. Independent samples t-tests were conducted to determine whether numeracy scores differed between urban schools and rural schools. Contrary to expectation, urban Grade 5 students scored lower in numeracy ($M = 463.52$, $SD = 36.01$) than did rural Grade 5 students ($M = 474.65$, $SD = 31.71$; $t(322.53) = -3.099, p < .01$). Although the difference was statistically significant, calculation of eta squared showed that location (urban versus rural) accounted for only 2.56% of the variance in numeracy scores in 2008. Similarly, in 2009, urban Grade 5 students scored lower in numeracy ($M = 476.15$, $SD = 32.08$) than did rural Grade 5 students ($M = 484.86$, $SD = 30.78$; $t(363) = -2.556, p < .05$). Again, the effect size, determined by eta squared, was small: Although the difference was statistically significant, location (urban versus rural) accounted for only 1.76% of the variance in numeracy scores in 2009. There was no difference in numeracy scores between urban Grade 5 students and rural Grade 5 students in 2010 (urban students, $M = 483.49$, $SD = 33.42$, $t(339) = .087, p = .930$) or in 2011 (urban students, $M = 480.25$, $SD = 33.84$; rural students, $M = 483.75$, $SD = 27.88$, $t(309.61) = -1.04, p = .322$).

The same analyses were conducted for Grade 9 data. There was no difference in numeracy scores between urban Grade 9 students and rural Grade 9 students in 2008 (urban schools, $M = 565.48$, $SD = 32.03$; rural schools, $M = 571.29$, $SD = 27.55$; $t(95) = -.950, p = .345$), 2009 (urban schools, $M = 572.33$, $SD = 32.26$; rural schools, $M = 582.94$, $SD = 27.03$; $t(98) = -1.775, p = .079$), 2010 (urban schools, $M = 568.86$, $SD = 35.09$; rural schools, $M = 570.00$, $SD = 25.59$; $t(90.603) = -.182, p = .856$), or 2011 (urban schools, $M = 565.16$, $SD = 35.75$; rural schools, $M = 574.27$, $SD = 31.22$; $t(93) = -1.314, p = .192$).
As discussed above, we were interested in differences in numeracy scores between urban and rural schools, and the Grade 5 results for 2008 and 2009 indicated a difference between urban and rural schools; specifically, urban schools performed better than rural schools. These data suggest that there are differences in the primary years but this is not the case for secondary years. These data are different from what we had expected from the literature. To seek to understand this variance from other studies we undertook further analysis to investigate the possibility of an interaction with geo-location and SES.

Next, we wanted to determine whether there were differences in numeracy scores between urban and rural schools when only low-ICSEA schools were considered. For 2008/2009, 2010, and 2011, schools with an ICSEA score of at least 1 standard deviation below the mean were identified. Usually, independent samples t-tests are used to determine whether means of two groups differ significantly. However, the low-ICSEA 2008/2009 urban schools group was substantially larger than the low-ICSEA2008/2009 rural schools group. Thus, one assumption of the t-test was violated. Consequently, a non-parametric alternative to the t-test, the independent samples Mann-Whitney median test, was used to compare the numeracy scores of the two groups. The median numeracy score in 2008 for the low-ICSEA urban schools (413.00) was significantly lower than the median numeracy score for the low-ICSEA rural schools (446.00; \( p < .05 \)). The median numeracy score in 2009 for the low-ICSEA urban schools (427.50) was significantly lower than the median numeracy score for the low-ICSEA rural schools (471.00; \( p < .01 \)).

Independent t-tests were used for the 2010 and 2011 data. These tests showed that low-ICSEA2010 urban schools scored lower in numeracy in 2010 (\( M = 438.63, SD = 22.73 \)) than did low-ICSEA2010 rural schools (\( M = 460.35, SD = 33.25, t(48) = -2.674, p < .05 [p = .01] \)). Eta squared showed that location (urban versus rural) accounted for 12.96% of the variance in numeracy scores for the low-ICSEA2010 schools. Similarly, low-ICSEA2011 urban schools scored lower in numeracy in 2011 (\( M = 435.58, SD = 19.43 \)) than did low-ICSEA2011 rural schools (\( M = 459.85, SD = 27.74, t(50) = -3.654, p < .01 \)). Eta squared showed that location (urban versus rural) accounted for 21.08% of the variance in numeracy scores for the low-ICSEA2011 schools. In sum, contrary to expectation, Grade 5 rural classes tended to perform better than did Grade 5 urban classes. This effect of location (urban versus rural) was especially pronounced when only low-ICSEA schools were considered.

For the Grade 9 classes, differences between low-ICSEA rural and low-ICSEA urban schools were not examined, due to low sample sizes for these groups (e.g., 9 urban low-ICSEA and 5 rural low-ICSEA schools).

These data strengthen our hypothesis that numeracy performance, as measured through high-stakes national testing, is strongly influenced by social measures though the relationship is complex, intersecting with geographical location in ways we have yet to understand. We are, however, able to draw on a number of research outcomes to hypothesise why these may be the case, and these will be the basis for a much larger research project to better understand the observations reported in this paper. It is known that many rural students (of high SES background) are likely to leave rural areas to attend boarding colleges when they reach high school, so this may impact on the data for rural
Further, we also know that it is difficult to staff rural or hard-to-staff schools with teachers who have strong mathematical content knowledge. This may impact on the numeracy experiences of learners as international research suggests that strong content knowledge of teachers positively influences learning outcomes (An, Kulm, & Wu, 2004; Davis & Simmt, 2006). Many of these schools are also staffed by early career teachers who are not strong in pedagogical content knowledge. The impact of this practice is worthy of investigation so that we can understand the impact on learning for our targeted (low SES and rural) students.

**Implications: What have we learned about equity in 50 years?**

These analyses indicate that there remains a strong correlation between social background and geographical location with numeracy outcomes. Sadly, this is despite nearly 50 years of educational research and intervention attempting to alleviate this discrepancy and despite successive national governments claiming to close education disparity. We now seek to move forward from these hypotheses by undertaking further investigations that explore the reasons for these outcomes. It is not our intention to subscribe to deficit models and focus on characteristics of individual students but rather to examine the social, practical and policy contexts within which these results occur.

The reasons for such correlations are complex and need to be considered carefully (Cogan, Schmidt & Wiley, 2001). There are multiple reasons for the observations in the data provided in this paper. First it has been shown elsewhere that the quality of the teachers *vis a vis* their mathematical backgrounds (e.g., level of tertiary mathematics and specific content knowledge) is an important factor in pupil learning outcomes. For example, it has been shown that the mathematical background of the teacher has a significant positive relationship with learning gains, particularly in the early years of schooling (Hill, Rowan et al. 2005, p. 371). Also, the teachers’ mathematical background has been particularly salient in low SES schools where there is a much larger effect in low SES schools than in high SES schools (Nye, Konstantopoulos et al. 2004). However, mathematical content knowledge must be considered in concert with pedagogic content knowledge which has similarly been found to affect learning outcomes (Baumert, Kunter et al. 2010). Other issues may also be implicated in producing the outcomes noted in this paper and are worthy of further exploration.

As the research on effective schooling has shown, the impact of the individual teacher is the most salient variable in performance outside the background of the learner. Exploring what constitutes effective teachers in bringing about success in school mathematics becomes important to understand. In this context, coming to better understand the practices adopted by teachers becomes increasingly important, particularly when considering the impact of teaching in terms of equity. To do this we have developed a model to explore the nexus between performance and context (Figure 1). We recognise that the confirmatory cases where there is an expected outcome that correlates background with performance may shed some light on the reproductive nature of the practices. Being able to note similarities and differences between these cases will be illuminating. However, and of more interest, are those cases that teach against the grain – high SES and/or located in urban schools that should perform well but do not – these cases will help us understand what may be problematic in the teaching of mathematics. Conversely, those cases where there is low SES and/or located in rural settings that perform well in numeracy may help cast light on those practices that
address systemic failure. The illuminative cases may highlight what works in addressing and stemming.

By examining the practices of schools that produce the typical trends in numeracy outcomes, that is, high SES schools producing high numeracy outcomes, understandings of how the social order is reproduced become apparent. But by examining the practices in schools where the outcomes are counter general trends – such as low SES schools producing high numeracy outcomes, then better understanding of reform pedagogy and/or the factors within a school that contribute to such outcomes can be understood.

**Figure 1.** Model of the four quadrants of SES/Rurality and Numeracy score.

Bourdieu and Scholastic Mortality

To understand this phenomenon, we draw on Bourdieu’s work, particularly that related to education, albeit, higher education. However, his constructs apply to the school context and we will locate our work within this framework. It has been well recognised that his work on habitus, field and capital help to understand the ways in which practices (such as mathematics teaching) enable some students greater or lesser access to important knowledge and hence power. Using this framework, we are able to see the habitus which Bourdieu describes as “the product of history [that] produces individual and collective practices” (1977, p.82) such that it can be seen that the familial circumstances create particular ways of seeing and acting in a social world that are influential but not deterministic in how that student acts in the world of school. He argues that the habitus is integral to the generation of social practices as well such that “system of durable, transposable dispositions which functions as the generative basis of structured, objectively unified practices” (1979 p. vii). The student in the mathematics classroom may come to school with a particular habitus that may predispose him/her to act in the classroom in particular ways and these ways of interaction and displays of particular knowledge may, in turn, be rewarded or not by the teacher. In this way, the habitus thus can become a form of culture that is differentially acknowledged and rewarded by the teacher and system. For Bourdieu, this habitus as a representation of culture now becomes a form of capital that can be exchanged for other goods. These goods may be in the form of grades, certificates and so on. But this may not be the case for all students and as such
Bourdieu’s framework allows for a theorisation of why some students are more at risk of failing school mathematics, not due to some innate or inherent natural ability but due to the structuring practices within the school system. Such structuring practices may include practices such as examinations or ability grouping where they provide experiences that help to normalise the social background of the students in ways that ultimately reify social differences. Through structuring practices students (and teachers and families) come to see the success (or failure) of students as being due to some innate mathematical ability and, in so doing, deny the reality of the practices as socially structuring practices that recognise or marginalise students based on the culture and disposition (i.e. habitus) that they bring to the mathematical learning context. These practices acknowledge and reward particular aspects of the culture and hence create a form of symbolic violence for those students whose culture does not resonate with the school practices. Within this framework, the failure of some students becomes a form of scholastic mortality -- death due to the lack of resonance between the practices within the field of school mathematics and the culture of the student. While there may be critique that this is a deterministic position, by recognising that failure may be due to culture rather than something more innate, educators can become aware of the cultural disparities to create opportunities for learning – or restructuring the familial habitus – so that students can learn the code of school mathematics.

Using Bourdieu’s theoretical framework, we are able to theorise that the differential outcomes noted in this paper may be representations of the inconsistent alliance of classed and geographic habitus (the internalised culture) of students with the practices of school mathematics. That urban, high status students are more likely to be successful in school mathematics has been shown to be statistically highly significant. Similarly, students with low status or rural habitus are less likely to perform well in the practices of school mathematics. Bourdieu’s work enables us to understand this as being related to the ways in which the social heritage of learners, that is their social background, aligns more or less with that of the school (Jorgensen & Sullivan, 2010). Where there is not a strong alignment with the social heritage as represented through the habitus, there is a greater chance of scholastic mortality. This theoretical position has been endorsed by the statistical analysis undertaken in this paper.

**Future Directions**

The work presented in this paper is the starting point for a three-year project in which we are exploring the nexus between social/educational practices in urban (wealthy and poor) and rural communities in Australia. More detailed work to be undertaken with regard to these data will allow us to theorise, in greater detail, the ways in which practices are implicated in the outcomes explored herein. It is our intent to explore the cultural practices in these contexts in order to better understand the complexity around the structuring practices adopted and enacted by schools in these settings. The initial data presented here confirms the marked differences in performance of students in these areas. The project will identify schools that conform to the anticipated trajectories of school performance vis a vis social and geographical location – high SES/urban and high performance, low SES/rural and low performance as these confirm the general educational trends. Understanding the

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1 This project is funded by the Australian Research Council under its Discovery Grants scheme.
confirmatory practices will enable us to develop understandings of the general observable trends in education. We are also seeking to explore those contexts where the trends are reversed – high SES but low performance; and low SES and high performance. These sites may help in understanding the practices that are enacted that enable the constitution of habitus and practices to enable access to school mathematics.

Our initial statistical analyses of the regions under investigation have shown that the hypothesis underpinning this project is robust. Using a range of factors drawn from the research literature that are thought to be powerful in mathematics – such as years of experience, experience in working with the nominated cohorts, teacher knowledge (pedagogic content knowledge and mathematics content knowledge), leadership and reform in schools -- we are now in the process of surveying teachers working in the targeted schools that represent the distribution of students on SES, rurality and success (or not). From this we will identify eight schools (four in urban setting and four in a rural setting) that align with the confirmatory and non-confirmatory model. These schools will form case studies from which we intend to develop detailed analyses of classroom practices that may (or may not) be contributing to scholastic success or mortality. Bourdieu’s work will be most useful in framing our observations and data in order to build a coherent and comprehensive study of school mathematics and how it contributes, or not, to success for particular cohorts of students.

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Acknowledgements

Acknowledge two support people here – deleted for the purposes of blind review.

This paper was funded through the Australian Research Council Discovery Grant scheme