SOCIO-ECONOMIC STATUS AND RURALITY AS SCHOLASTIC MORTALITY: EXPLORING FAILURE AT MATHEMATICS

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Within the Australian context, some students are more at risk of failing at mathematics than others. Australia performs poorly in terms of equity outcomes in mathematics. This paper explores two significant social contexts – low socio-economic status and rurality – two characteristics where students have traditionally performed poorly in mathematics. The first of two key foci of the paper is the extent to which social backgrounds constrain mathematics outcomes. The second focus draws on a range of literatures to explore the variables that may contribute to this systemic failure. We frame the project using Pierre Bourdieu's theoretical ideas. Together, these two foci provide us with a rationale for more detailed work to be undertaken to explore the extent and impact of variables in these two contexts. This work forms the basis for a three-year project in which we explore pedagogies associated with these outcomes.

THE CONTEXT OF THE RESEARCH

Australians may perform moderately well on international tests such as TIMMS but it has also been acknowledged that while, at a national level the results are positive, there is considerable variation across the country as a whole where some groups of learners in some locations are performing quite poorly. The implications for equity are profound as the results suggest that there are some specific characteristics identifying students who perform considerably below expected standards. 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). Yet it is also recognised that other factors such as social-economic background and geographical location also impact on educational outcomes; the compounding of these factors is also an important consideration given the tendency for many Indigenous communities to live in remote geographic locations. In the Australian context "remote" and "rural" are not particularly synonymous and both have their own specific socio-economic structures. However, while remote Indigenous Australians are the most likely to perform well below national 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. This project specifically targeted urban and regional Indigenous students (Australian Association of Mathematics Teachers, 2008) in recognition that the issues around remote education were quite different from those of urban and regional settings.

Aside from these issues of remote Indigenous education, other factors – most notably low socio-economic background and rurality – are key variables that impact on considerable numbers of Australian students (including of course Indigenous students). In order to provide a suitable framing for understanding how educational practices are themselves implicated in the success or failure of students, we draw upon the sociological ideas of Bourdieu which help us understand how embedded social practices may enhance or hinder the learning of students from low socio-economic status backgrounds, or students who live in rural settings. 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 United Kingdom has similar issues with its so called "failing schools" which are usually in inner city, low socio-economic status (SES) communities, or communities with high racial diversity. 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 in these contexts has been widely recognised in Australia as well as internationally (Prince, 2002).

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 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; at 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. 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).

This paper is the beginning of a larger project, the main aim of which 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 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 does not have a national curriculum and consequently there 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).

One site is a major city with a population of over 1 million people and where there is considerable socio-economic diversity, the second site is within a rural area (in another state) that has a mixture of regional centres and small farming/agriculture regions. Schools vary in size from very small (30) to large (over 800). We are confident that these regions represent the distribution of schools across Australia. A total of 676 schools were part of the sample (see Table 2 below).

For this paper and for the sake of early simplicity, we draw only on the data for the ICSEA scores and the school numeracy scores. 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 intersection of social background and numeracy.

SCHOOL-BASED SES AND NUMERACY DATA

For data on social class, the protocol adopted by ACARA is that the standardised national average ICSEA score is 1000 with each standard deviation being 100. In terms of the NAPLAN scores, the national average in 2009 for Grade 5 was 487 and Grade 9 was 589. The scores are modelled so that there is a progressive increase as the students progress through bands indicating a nominal growth pattern over time.

For our cohort, there were statistically significant relationships between the ICSEA variable and NAPLAN numeracy performance for Grade 5 pupils [$r = 0.53$, $p \leq .01$] and Grade 9 pupils [$r = 0.59$, $p \leq .01$]. These data suggest a *moderately strong* yet significant relationship between social advantage (ICSEA) and the school's numeracy performance (NAPLAN) across the two geographic locations.

However interesting patterns emerge when we separate out the relationship between ICSEA and NAPLAN variables by geographic location (urban and rural) and Grade (Grades 5 and 9). Whilst for both Grade 5 and Grade 9 all correlations are statistically significant ($p \leq .01$), there is a much stronger relationship between urban schools than those in the rural cohorts (Table 1**,** Note: *$p \leq .01$).).

Year level	Urban	Rural
Year 5	0.716* (n = 228)	0.289* (n = 150)
Year 9	0.739* (n = 52)	0.430* (n = 73)

Table 1: Correlations between SES and Numeracy Scores

In order to provide some more detailed understanding of the underlying patterns in these data, we undertook ANOVAs on mean scores (for both ICSEA and NAPLAN results) at Grades 5 and 9 levels using geographical location (urban and rural) as the dependent variable. Given the national standardisation procedures conducted on these data (and the large sample sizes), we were satisfied that the underlying conditions for ANOVA have been met for these data, including the sample distribution and homogeneity of variances. Means and standard deviations are reported in Table 2.

Grade	Geographic Region	N	ICSEA Mean *(S.D)*	NAPLAN Mean *(S.D)*
Grade 5	Urban	281	1016.9	476.2
			83.1	*32.0*
	Rural	268	989.1	485.1
			53.8	*30.4*
Grade 9	Urban	52	997.5	572.3
			71.4	*32.3*
	Rural	75	993.8	579.9
			49.0	*27.6*

Table 2: Means (and Standard Deviations) for ICSEA and NAPLAN by Region

ANOVAs revealed statistically significant differences on ICSEA scores by geographic location across the Grade 5 cohorts ($F_{1,\ 548}$= 21.58, $p \leq .01$; effect size Cohen's d = 1.84). The mean ICSEA scores are higher for urban locations than for rural. Furthermore, for Grade 5 pupils, there was a statistically significant difference in NAPLAN scores ($F_{1,\ 377}$ = 7.25, $p \leq .01$; effect size Cohen's d = .75) with mean scores for urban students higher than that of students in rural locations.

Interestingly however, in contrast, there is no statistically significant difference between the ICSEA scores of students in urban and rural areas across the Grade 9 cohort ($F_{1,\ 126}$ = 0.117, $p > .05$). In terms of differences in the performance of Grade 9 students on NAPLAN scores, the ANOVA revealed no statistically significant differences in the means of the cohorts by location ($F_{1,\ 124}$ = 2.01, $p > .05$).

These data further 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 areas. 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 (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.

CONCLUSIONS

These analyses indicate that there remains a strong correlation between social background and geographical location and numeracy outcomes. This is not a new phenomenon despite nearly 40 years of educational research and intervention into alleviating this discrepancy and despite successive national governments claiming to close the 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 et al., 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 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.

BOURDIEU AND SCHOLASTIC MORTALITY

To understand this phenomenon, we draw on Bourdieu's work, particularly that related to education, albeit it, 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. 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 [1] 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 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 analysis 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 these. 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.

NOTES

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