'To be numerate is to be someone…': Tracing the doings of students labelled 'at risk'

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Abstract Scores from the Australian *National Assessment Program—Literacy and Numeracy* (NAPLAN) identify students 'at risk' of not meeting minimum standards deemed necessary for future success in school and employment. The NAPLAN tests include items related to numeracy but also mathematics content and skills. Research in the area of mathematics education examining the effectiveness of pedagogical interventions in improving student scores on NAPLAN and other international measures is not only shaped by the standardised testing regime, it also effectively corrals the problem within the school context. As such, it is unable to answer questions related to other factors implicated in the lives of those who continue to 'fail' in relation to numeracy outcomes. This paper critically examines the type of funded research being done in relation to numeracy and mathematics education, the 'social' turn and the disconnect between this research and the widening 'gap' in NAPLAN numeracy outcomes. It argues for a research approach informed by institutional ethnography that begins with the 'doings' of individual students labelled 'at risk'.

Keywords Numeracy · At risk · NAPLAN · Sociological theory · Institutional ethnography

Introduction

The *NAPLAN Achievement in reading, persuasive writing, language conventions and numeracy: National Report for 2014* (ACARA 2014) includes "For the first time, … data across a generation of students. Students who participated in the first ever NAPLAN tests in 2008 completed their final NAPLAN tests as Year 9

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students" in 2014 (ACARA 2014). The report provides detailed analysis of NAPLAN results and reports these grouped nationally and by state jurisdiction, for Years 3, 5, 7, and 9, and further subdivided on the basis of gender and whether students identify as being Indigenous or from a language background other than English (LBOTE). In the final wash-up, whilst there have been some fluctuations from year to year that generally compensate each other, the report states that "across jurisdictions there are few instances of changes in numeracy over the period from 2008 to 2014" (ACARA 2014, p. 302). We might surmise from this that for every student who improves as a result of both the targeted interventions aimed at students 'at risk' and any other classroom interventions being made for the sake of improving NAPLAN numeracy scores, another student's performance falls.

These somewhat alarming findings provoke the curious inquirer to consider how researchers have investigated, and are currently investigating, issues related to Australian students' levels of numeracy. This paper aims to provide a commentary and critical analysis of current research, including the so-called 'social' turn, being conducted in the interests of improving numeracy and/or mathematics education. It examines how a large portion of this research, in resisting 'deficit' constructions of students, takes an 'anti-deficit' approach that tends to focus on the pedagogy of teachers. Given the continuing and widening NAPLAN numeracy gap for socially disadvantaged and Indigenous students, it is critical that we engage with the underlying methodology of research that seeks to address these issues. I will argue that what has been missing from such research is a genuine engagement with inquiry from the standpoint of the learner. A standpoint that institutional ethnography (Smith 2005) might provide in order to expand our understanding of the seeming intractability of innumeracy.

Numeracy

The term 'numeracy' is defined and used differently across different policy texts and contexts. In the case of NAPLAN, it refers to the content knowledge and skills expected of students in Years 3, 5, 7 and 9. Such content and skills represent a subset of the broader field of mathematics and are inextricably linked to literacy skills. "NAPLAN tests the sorts of skills that are essential for every child to progress through school and life" (ACARA 2013), thus 'being numerate' is acknowledged as essential to a student's life chances. This NAPLAN definition of 'numeracy', in terms of content and skills, is problematic. As Anderson (2016) explains, "One issue is that some of the items in the NAPLAN numeracy test are testing students' capabilities in mathematics, rather than numeracy. Numeracy is best defined as 'mathematics used in a context'". To be numerate is to be someone who can "use mathematics effectively to meet the general demands of life at home, in paid work, and for participation in community and civic life" (DEETYA 1997, p. 15). A numerate person has knowledge of mathematics, they can choose and use this knowledge in a strategic fashion, and they can recognise and apply mathematical knowledge appropriate to the context in which they find themselves (Willis 1998). The terms 'numeracy', 'mathematics' and 'mathematical literacy' are

not clearly defined across policy texts, standardised testing regimes or research literature, either domestically or internationally. Nor is it usual for the distinction between these terms within any one publication to be clearly delineated. For the purposes of this discussion, I will work from the premise that attempts to improve numeracy scores on NAPLAN testing might address the application of mathematics in a given context but they might also focus on the teaching and learning of areas of 'school mathematics', which itself is a subset of the broader field of knowledge that is 'mathematics'. This has implications for the literature selected and for the terms developed to search the *Australian Research Council* grants data set (ARC 2015) in the discussion to follow.

Returning to 'numeracy' and the importance it is afforded in policy texts, the Council of Australian Governments' *National Numeracy Review Report* (COAG 2008b) commissioned by the Human Capital Working Group, comments that

> While overall levels of numeracy/mathematics achievement in Australia are quite good by international standards, there is an unacceptable proportion of Australian students (particularly but certainly not only amongst Indigenous students) who are not achieving acceptable levels of proficiency. Many students also lack confidence in the subject, do not enjoy or see personal relevance in it and are unlikely to continue its study voluntarily. This clearly is a risk to Australia achieving its human capital goals, but the personal and social consequences for individuals and their families and communities can be unfortunate in ways that go beyond the purely economic (COAG 2008b, p. xiii).

The inclusion of 'human capital' in the title of this working group is significant, and the implications of educating young people as 'human capital' is an important issue for discussion elsewhere. Focusing on numeracy for the present moment, the statement acknowledges that concerns related to numeracy are not just about Australia slipping in overall rankings on various international standardised tests, and it also raises concerns about the economic value of mathematics and its implication in the "fabrication of subjectivity" (Pais and Valero 2014, p. 245) of certain groups of students. Mathematics enjoys a privileged position in the curriculum as a subject of intrinsic importance. It has been described as "a gatekeeper to travelling successfully through the educational system and as an inherent marker of intellect" (Jorgensen et al. 2014, p. 223). In focusing so strongly on literacy and numeracy as the keys to identifying students who are educationally 'at risk', are we, as educators, at risk of contributing to narrow constructions of student subjectivities, blinded to other indicators of students as potentially successful learners and citizens?

The report goes on to say:

> In Australia, targeted interventions tend to be directed at students identified as at risk of not meeting the National Benchmarks. These, at least at Years 3 and 5, assess minimum standards rather than desirable levels of proficiency, the implication being that minimum standards are good enough, at least for some students. All students and their families, however, have a right to expect high

quality, not minimum, numeracy outcomes from their schooling. (COAG 2008b, p. xiii)

This concise paragraph points to a number of issues associated with considerations of both 'numeracy' and 'at risk'. It implies that the most common method of identifying students 'at risk' in regard to numeracy is through the use of minimum standards, "National Benchmarks", but clearly indicates that this is neither sufficient nor desirable. It also points to the most common 'solution' being some kind of targeted intervention directed at these particular students. It provokes the need for further discussion of:

(1) how students 'at risk' in numeracy are identified and accommodated by various government education authorities, responsible for the delivery of policy and education services;
(2) how research has sought to understand and/or address the problem of students 'at risk', particularly in relation to numeracy; and
(3) how research might be done differently in the future to have a greater chance of affecting 'the gap'.

Students 'at risk'

Literacy, numeracy and the notion of being 'at risk' are linked in slightly different ways by the 'governing' texts produced by various state education authorities responsible for addressing poor levels of attainment on NAPLAN tests. On some state education department websites, for example, Queensland and New South Wales, there is an obvious focus on NAPLAN results as the key driver. The New South Wales Department of Education (NSWDEC) (2014) *Early Action for Success 2014 Implementation Plan* provides a focus in line with that of COAG, as being on students at risk of not meeting the national minimum standard in numeracy, as measured by NAPLAN tests and defined as "the second lowest band on the achievement scale reported for each year level" (ACARA 2014, p. v). Identification of schools likely to be enrolling a greater proportion of 'at risk' students and, therefore, targeted to receive additional funding is ,however, determined by more than just NAPLAN scores. An "index of need" is calculated from the "school's contextual characteristics, including the degree of disadvantage, enrolment size and student demographic data" (NSWDEC 2014, p. 3).

By way of contrast, the Western Australian Department of Education (DEWA) *Students at Educational Risk Policy* (DEWA 2001) defines students at educational risk as "those students who may be at risk of not achieving the major learning outcomes of schooling to levels which enable them to achieve their potential" (p. 3). How that potential might be determined is not explained, but a set of characteristics for students at risk is provided and includes "not achieving the outcomes described

in the *Curriculum Framework*" (DEWA 2001, p. 3), suggesting a view that goes beyond NAPLAN results to include other curriculum areas. In accordance with this policy, Western Australian government schools are required to identify students at risk, make appropriate accommodations for them, and be accountable for their progress (DEWA 2001).

Teachers in Victoria are provided with a website guide for *Identifying students at risk* (VICDET 2015) where the concept of 'at risk' is strongly linked to 'disengagement' from schooling. There is a focus on attendance as causally linked to performance which, as Ladwig and Luke (2013) report, is a flawed assumption and, largely, a device of political expediency. Advice is also given on this webpage in relation to a number of factors that might place a young person at risk of disengaging. Whilst school-related factors, such as poor relationships with teachers, and personal factors related to the student's physical and mental wellbeing are recognised, at the top of the list are factors over which the school and the student themselves have little or no control; poverty, Indigeneity, parental unemployment and/or low educational attainment.

In addition to the various targets of state government policies focused on all students deemed to be 'at risk', the COAG policy for *Closing the Gap on Indigenous Disadvantage* (2008a) provides a further target to "halve the gap in reading, writing and numeracy achievements for (Indigenous) children by 2018". The 'achievements' referred to here are measured by NAPLAN results. The action plan strategies associated with all of these policies include variously: early identification; targeted numeracy programmes; provision of personnel in 'leadership' roles to implement targeted programmes; professional learning for teachers; working with parents and community (Graph 1).
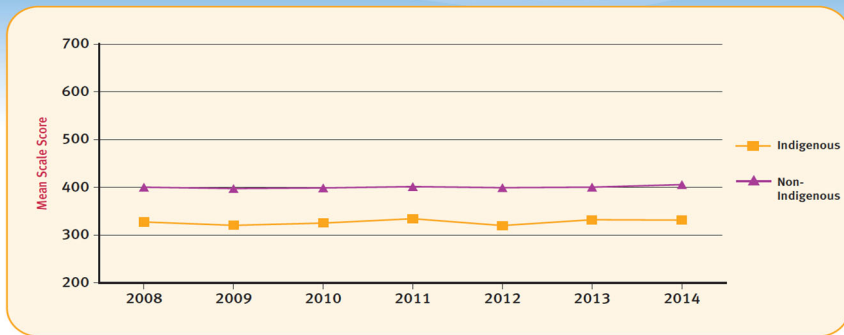
So how are we going with all of that? Graph 1 below provides a concise visualisation of the story of NAPLAN results over this period.

More alarming though is the story told by the following two graphs (Graph 2 and Graph 3):
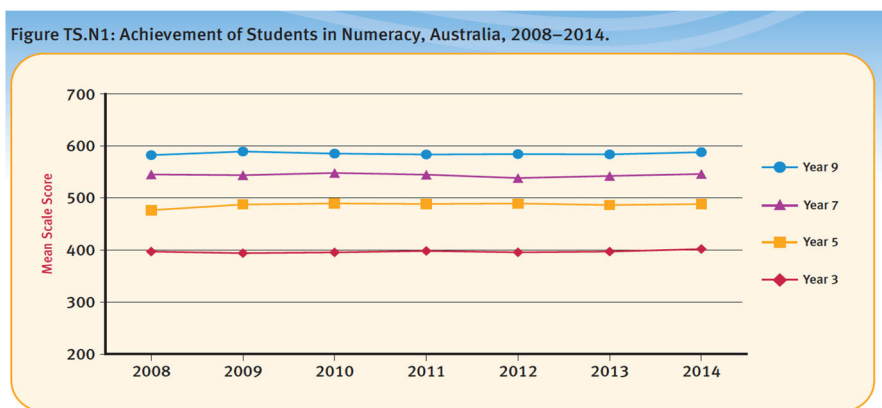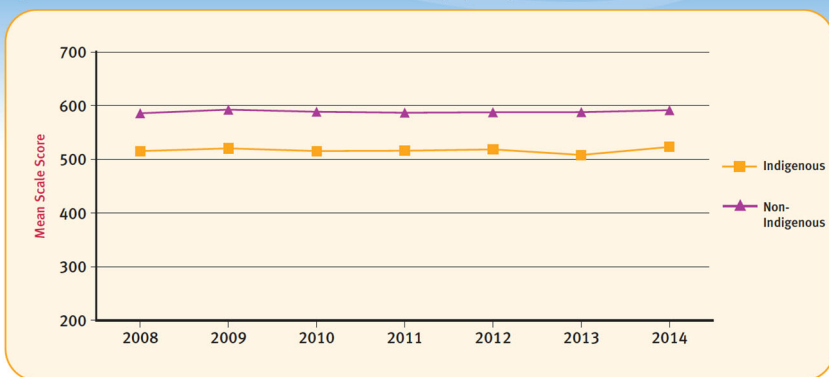

Graph 1 ACARA (2014, p. 279)

Graph 2 ACARA (2014, p. 284)

Graph 3 ACARA (2014, p. 287)

The average national gap between those students who identify as Indigenous and those who do not in Year 3, as shown by Graph 2, is 17.9 points, and for students in Year 9, as shown by Graph 3, is 22.2 points. Some annual fluctuations are evident in each graph, but overall, these graphs illustrate that rather than 'closing the gap', the gap remains the same for students within each year group between 2008 and 2014, and is consistently wider by Year 9 than it was in Year 3. The fact that this is also the case for the same cohort of students who were in Year 3 in 2008 and Year 9 by 2014 adds further emphasis, in case any where necessary. Clearly, NAPLAN itself, and what is being done in schools in the name of NAPLAN, is having no appreciable effect on average NAPLAN numeracy scores.

The *National Numeracy Review Report* (COAG 2008b) quoted above draws our attention to the "personal and social consequences for individuals and their families and communities" of remaining innumerate and, at the same time, urges us to consider issues associated with numeracy, or the lack thereof, in ways that go

beyond considerations of minimum outcomes. Vass (2015) argues that in order for the "gap era" (p. 391) policies, as described above, to realise their aspirations for equity, confronting questions related to how "the social conditions of schooling … remain intertwined with those of the wider community", particularly in relation to the reproduction of "raced identities" (p. 372), must be addressed. I turn now to an examination of the ways in which research has sought to understand the problem of the seeming intractability of innumeracy.

Understanding numeracy and students 'at risk'

It would seem that each of these topics, 'numeracy' and 'at risk', has the potential to provoke approaches to understanding them that are diametrically opposed. In terms of numeracy research, and according to Pais and Valero (2014), on one end of the scale sit studies that frame the problem as intrinsic to the individual and/or their socio-economic circumstances and are related to the "individual's cognition and performance" (Pais and Valero 2014, p. 243), usually on standardised testing. At the other end are studies that attempt to understand "the *societal* conditions within which the whole activity of mathematical education—not only mathematics teaching and learning—is constituted" (p. 241). In terms of the usefulness of further research at one end or the other of this divide, they make the claim that there already exists sufficient research that teachers may draw on in relation to the best pedagogical approaches to use for teaching particular mathematical concepts, including with assistance from technology. But, as argued by Pais and Valero (2014, pp. 242–243):

> when posing what Morgan (2014b) calls "unsophisticated questions", few answers are to be found in existing research. Questions on who fails in mathematics and how such failure is connected to the very same pedagogy that apparently claims to be 'inclusive' resist any straightforward investigation. Yet they make us aware that the answers to the problems of systematic failure in school mathematics are not to be found in the individual's cognition and performance (Pais and Valero 2014, pp. 242–243).

Considerations of the problem of 'at risk' appear to suffer a similar divide. As Kerr (2011) explains it, the two major competing conceptions in education are "the dominant neoliberal discourse on students 'at risk' that is concerned with risk management" linked to human capital theory (Quiggin 1999) and fear of a potentially unemployable group of young people. A further consequence of this approach is what she describes as 'othering' through institutionalised processes organised around risk to apportion 'blame' (Kerr 2011, pp. 28–29). The second "deconstructs the notion of 'students at risk' from an equity and social justice perspective" (p. 32), contesting deficit thinking and leaning towards a framing through critical pedagogy. She points out, however, that anti-deficit thinking tends to end up blaming teachers and teacher pedagogy rather than "making visible policies and procedures that mitigate against equity" (Kerr 2011, p. 50).

Finding 'what works' or 'what works best'

An Australian Council for Educational Research (ACER)-funded review of literature from the last decade of the twentieth century concerned with research aimed at understanding how numeracy learning and teaching might be improved, finds that "Every reported program and strategy implemented to improve numeracy teaching and learning reports at least some success" (Doig 2001, p. 28).

To get a sense of how research concerned with 'numeracy' and 'students at risk' has been approached in Australia since the turn of the millennium, I searched the *Grants Data Set* of the Australian Research Council (ARC 2015). Using the search terms 'numeracy', 'mathematics', and 'mathematics education' on the keywords column yielded results, whilst 'students at risk', and 'educational justice' and 'social justice' turned up nothing in relation, according to the project description, to numeracy and/or young people of school age (see Appendix Table 1: Results of search on *ARC NCGP Keywords Completed Feb 2015* and Table 2: Results of search on *ARC NGCP Keywords New and Ongoing Feb 2015*). The abridged description of each project, appearing in the Appendix as Tables 1 and 2, was selected such that it indicated the focus of the project. That is, what the project promised to achieve and for whom. Employing methods based on content analysis, this description was colour-coded to indicate projects concerned particularly with pedagogical interventions, students traditionally deemed to be 'at risk', and projects seeking to discover something about innumeracy that may not necessarily be related to classroom practice. What is revealed is the high proportion of projects concerned with pedagogical interventions, including ICT, and teachers' classroom practice. A closer examination of the full descriptions contained in the database for 'new and ongoing' projects (see Table 2) revealed no hints as to the intended theoretical framing of these studies. I was also interested to know whether any of them intended to employ a case study or ethnographic approach. To my knowledge, there is no way to get any more information about a particular project out of the ARC website using its search engine other than what is already included in the 'Project Summary' column of the two versions of the ARC database (see Tables 1, 2).

The lack of transparency particularly around theoretical framing, methodology and methods inherent in the information provided by the *Grants Data Set* presented a real barrier to my attempts to determine how questions related to numeracy had been investigated in the past. To ascertain whether a project actually addressed the topic of interest and how the topic had been investigated, it was necessary to trace the publication output from each project. Given that addressing 'the gap' in NAPLAN scores is of primary importance to this discussion, I will focus on research designed and funded after the time that the first NAPLAN results began to confirm 'the gap'. I will also note that this tracing process was, however, frustrated by the fact that a number of papers had been published in journals that were difficult to access. For example, journals for which major University libraries do not hold subscriptions.

The searches of the ARC database and subsequent publications provide evidence in support of the argument that there continues to be a predominance of research framed in terms of mathematical and psychological theories of learning aimed at finding the intervention that works best (English 2012, 2013; Mulligan and English 2014) to improve the numeracy performances of individual students, who are often but not always categorised according to measures of social disadvantage (Jorgensen and Lowrie 2013). The majority of studies take the form of 'intervention' research for the sake of improving NAPLAN results leading to possibly unintended support of the testing regime through their participation in the existing system. Findings from research concerned with pedagogical interventions (Makar 2012; Watters and Diezmann 2013) highlight the importance of teachers and their pedagogy in addressing lack of student engagement as a contributor to the intractable nature of the 'gap' in numeracy performance on NAPLAN. The persistence of the 'gap' in numeracy performance on NAPLAN indicates, however, that attempts to understand numeracy from this approach alone have not been able to explain many of the problems faced by students and their teachers. In conference presentations based on some of the research work conducted for DP130103585 (see Table 2), Jorgensen utilises a case study approach to examine in detail the factors influencing the numeracy learning of one young learner who could be considered 'extremely disadvantaged' based on "poverty, remote location, English as a foreign language, cultural diversity and Aboriginality" (Jorgensen 2010, p. 26). This work marks a significant turning point for its acknowledgement of the influence of factors beyond the learner's control, the teacher or classroom and for the 'voice' it gives to the learner in describing their experiences.

Taking a 'social turn'

An alternative framing of the problem has been pursued by some researchers, and Lerman (2000) refers to this framing as an attempt to address the 'social' or the 'elsewhere' through recognition of "the inseparability of culture, context and cognition" (Morgan 2014a, p. 123). Research taking a social perspective was being conducted on the Australian scene pre-NAPLAN and is exemplified in the work of Goos et al. (2004) in a project funded by the Australian Government. Findings and recommendations arising from this study are evident in many of the state government literacy action plans, particularly in relation to 'working with communities'. Jorgensen (2014) (and see Table 2 DP130103585), an Australian researcher focusing particularly on the achievement 'gap' for Indigenous students, contends that

> those theories that pervade current educational discourses and research paradigms that are framed by social theories—such as situated cognition, Activity Theory, or sociocultural theory—may have explanatory value but they may be causing educational research to be "barking up the wrong tree" (p. 313)

in that they have failed to address the "re/production" of inequality (see Connell et al. (1982)). In reviewing research from such 'social' perspectives, Jorgensen is not aiming to discount the value of the understandings that have resulted from such research but, rather, to draw attention to the problem that remains. That is, "social theory has failed to make any substantive inroads into challenging the status quo in terms of equity, access and/or success" (Jorgensen 2014, p. 314). She goes on to discuss the importance of a new paradigm for research that explores mathematics learning as "knowledge-making" and concludes with underlining the importance of teachers' pedagogy which seems to bring us back again to finding 'what works' and 'what works best'. Whilst this focus on pedagogy may be critical to improving student learning outcomes, it does not reveal how policy texts that govern social relationships and, hence, learners' experiences are implicated in the continuation of the numeracy 'gap'.

An alternate positioning that seeks to employ a sociological perspective refers to research that moves away from "locating the reasons for failure in the character-istics of the individuals concerned or their communities towards seeking to understand how the practices and structures of the education system itself, as well as the broader society and its dominant discourses, serve to construct and sustain disadvantage" (Morgan 2014a, pp. 123–124). In taking a sociological approach, such research recognises that mathematics (of which 'numeracy' represents a subset) cannot be separated from the places where it is used (Pais and Valero 2014, p. 245). At the same time, it seeks to move away from the 'socio-cultural' notion that knowledge is constructed through some interaction between the individual and the social context and seeks, rather, to gain a better understanding of the conditions that 're-produce' inequality.

Much of the research taking this kind of 'sociological' position comes from the UK and Canada, countries 'ahead' of Australia in terms of the implementation of a neoliberal education 'reform' agenda with an emphasis on standardised testing and regimes of accountability. Some of this research, however, works across the global divide to incorporate perspectives from Australian researchers. For example, in trying to understand the relationship between mathematics and social practices, Jorgensen et al. (2014) examine the cases of two students taken within the one school in the UK. The selected cases differ in gender, parent background (what would be measured as socio-educational difference in Australia) and class placement at the beginning of secondary school. The cases are analysed through the theoretical lens of Bourdieu's (1984) concepts of habitus, field and capital, as it relates to social class, to reveal "ways in which the practices help to create parallel worlds which are structured quite differently inside and outside the classroom" (p. 221). The authors conclude that students' "mathematical learning trajectories… will, in all likelihood, be shaped by their social background"(p. 221). Whilst the study pays close attention to each student's habitus and capital through analysis of their 'talk' and the 'talk' that surrounds each of them, it does not make connections to institutionalised processes governed by 'ruling' texts (Smith 2005).

Institutional ethnography and 'standpoint'

Utilising a sociological approach to the problem of students 'at risk' but taking a standpoint of the student as 'knower' (Smith 2005) of their own experiences has potential to reveal insights into the ways in which pedagogy, schooling processes, policy, and life beyond school all contribute to maintaining disadvantage. The sociology that Dorothy Smith calls institutional ethnography (IE) begins from the 'actual doings' of the person occupying the 'knower' standpoint. The commitment of institutional ethnography, Smith describes as being

> …to remain in the world of everyday experience and knowledge, to explore ethnographically the problematic that is implicit in it, extending the capacities of ethnography beyond the circumscriptions of our ordinary experience-based knowledge, to make observable social relations beyond and within it in which we and multiple others participate (2005, p. 42).

The persistence of a 'gap' in numeracy achievement has led researchers to address 'problems' associated with why some students fail to learn and, thus, remain 'at risk' of not meeting benchmarks. Whereas, the 'problematic' that might steer future, and hopefully more fruitful, research would attempt to discover how the conditions that resulted in either continuing innumeracy or improved numeracy outcomes were coordinated both locally and extra-locally (Smith 2005, p. 40).

Institutional ethnography does not assume that the social relations responsible for control are necessarily "malign"(Smith 2005, p. 36) but rather by working from people's experiences as they relate them and their doings as they may be observed; it attempts to trace "how their everyday lives and doings are caught up in social relations and organization concerting the doings of others, although they are not discoverable from within the local experience of anyone" (Smith 2005, p. 61). How this 'discovery' of the concerting of peoples' activities is achieved is not laid out, either by Smith or other institutional ethnographers, in terms of any particular standard set of methods other than the stipulation that the inquiry must begin in the doings of actual people (Talbot 2015). It is often the case, however, that careful attention to the doings of the 'knower' is followed by some preliminary coding of interview and observational data from which further methods for inquiry evolve to trace the ways in which such doings have been coordinated. Such coordination is often achieved through texts, and Smith asserts that the way in which institutional ethnography extends beyond normal ethnographic procedures is by bringing into the inquiry "the textual…as integral to coordinating local actions with others elsewhere and else when" and that this consideration of 'texts' provides scope to reach into "the forms of organising power and agency that are characteristic of corporations, government, and international organisation" (2005, p. 44), including schools. Smith draws on Bakhtin's (1986) explication of 'speech genres' to justify the assumption that a text has the capacity to be dialogic and can, therefore, operate in different ways with different individuals to coordinate their actual doings (Talbot 2015). She views these texts, that may well be "prescriptions of the law", as not existing in "an abstract theoretical space" but rather that "they are locally incorporated into

people's work and the coordinating of their work as a sequence of action" (2005, p. 67).

Nakata (2007) proposes an "Indigenous standpoint theory" (p. 11), drawing on Smith's foundational theoretical work in establishing IE and also Polhaus (2002). Taking the standpoint of the individual as 'knower' has, he claims, potential for attending to Indigenous experience in the "contested space between knowledge systems" (Nakata 2007, p. 9), Indigenous and Western, in ways that recognise the locale of the knower and account for what is said by them. An important strength of such an approach is that it "acknowledges the everyday tensions as the very conditions to what is possible between Indigenous and non-Indigenous positions" and, as such, might serve to "help unravel and untangle ourselves from the conditions that delimit who, what or how we can or can't be" (p. 13).

Everyday experiences of students

Studies informed by IE have taken the standpoint of teachers as 'knowers' in relation to students 'at risk' in terms of literacy practices (Comber 2012), literacy and numeracy practices (Kerr 2011) and professional learning (Talbot 2015). From the standpoint of students, IE has been utilised to trace the 'textualisation' of students with disabilities (Daniel 2004), but the standpoint of students as 'knowers', rather than data source, remains relatively unconsidered in most research related to students 'at risk' in relation to numeracy, as evidenced by the methods employed in the ARC-funded projects discussed above. It should be noted here that there is a difference between the positioning of students as 'knowers' in the sense that IE describes, where it is the actual doings of students that are inquired into, and research that acknowledges students as 'knowers' but is focused on collecting data about the doings of teachers (see, for example (McDonald 2005)).

Students most often considered to be 'at risk' in terms of literacy and numeracy include refugees, students and those from low socio-economic backgrounds. There is certainly a body of research, including 'student voice' work, framing the student as the 'knower' of their experiences and often focused on students from these 'at risk' groups. For example, Uptin et al. (2013) conducted interviews with young refugees to construct narratives of the students' experiences. These narratives were analysed thematically to reveal the key factors affecting experiences of schooling. Similarly, Donovan (2015) builds on an extensive body of work by Indigenous and non-Indigenous researchers to justify how rare but how important it is to listen to the voices of Aboriginal students. He highlights the use of "Yarning Circles" (p. 615) as a way of providing a culturally safe space in which Aboriginal students can describe their experiences. An IE approach informed by the methods and analysis utilised in such studies would build on this work to 'trace' key experiences back to the governing processes and texts implicated in such experiences.

In the context of students 'at risk', detailed representations of an individual's interactions with the social and textual relationships (Smith 2005) implicated in their schooling and wider life might include the student's actions, teacher actions, parent actions, and interactions with various procedures and governing texts. Such

detailed mapping of the 'materiality' of experience makes it possible to observe patterns across time for individuals, institutions, and from one institution to another. Taking the standpoint of student as knower does not imply that everything can be understood at the level of the individual. It is more that the individual provides a node from, and to which, those factors that construct the individual as 'at risk', or not, can be mapped to better understand the sociological nature of how being 'at risk' is produced and perpetuated.

Conclusion

Beginning with the everyday embodied experiences of students considered to be 'at risk' and using methods inspired by institutional ethnography to trace the students' 'doings' to social relationships, local and extralocal, or 'boss' texts (Griffith and Smith 2014; Smith 2005; Smith and Turner 2014) has potential to extend beyond the classroom and to other social relationships, including parents who "are differently placed to assist" (Comber 2012, p. 124). Beginning with the student offers the potential to examine the interaction between student actions, social support and institutional structures in such a way as to illuminate educational policies and practices that support or work against equitable outcomes for a student.

Appendix

See Tables 1 and 2.

Table 1 Results of search on *ARC NCGP Keywords Completed Feb 2015*

Project ID	Funding Completion	Abridged Description	keywords
LP0215770	2003	...explores the development of young children's expertise with information and communication technologies from the preschool to the second year of school	numeracy
DP0211777	2004	...a detailed model of teaching and learning in numeracy using information technologies (IT)	numeracy
DP0210309	2004	...explore the relationships between the values embedded in the pedagogical practices of primary and secondary teachers of mathematics and science, and student values outcomes	mathematics education
DP0344229	2005	...investigate mathematics teaching in upper primary school, to identify the influence of teachers? mathematics-specific pedagogical knowledge, first on teaching practice and subsequently on students? learning outcomes	mathematics education
DP0345508	2005	...to improve the basic reading and numeracy skills of low-achieving school students. The aim of the research is to investigate the effects of improved automaticity of basic skills on higher-order processes such as comprehension and problem solving.	numeracy
LP0219676	2005	...will create detailed models of the 'New Basics' approach to teaching and learning numeracy using information technologies (IT)	numeracy
LP0347733	2006	Early numeracy... program for teaching measurement ...studying how students' understanding of measurement concepts develops between Years 1 and 4 and by investigating the effectiveness of teaching based on the Framework.	numeracy
LP0348932	2006	... significant numbers of students finish primary school without successfully learning basic arithmetic. These students have little chance of catching up this learning during the secondary school years and of becoming numerate adults ...no established intervention programs in the Years 3-6 range. ... develop successful intervention programs.	numeracy
LP0348448	2006	...investigate the efficacy of a new assessment-guided approach to improving student numeracy outcomes in Years 4 to 8	numeracy education
LP0348631	2006	...how generic conceptions of teacher pedagogy and school change intersect with subject matter knowledge and traditions in the closely related areas of mathematics and science	mathematics
DP0451818	2006	...examining the teaching context and the characteristics of student learning in integrated science, mathematics and technology classrooms... the connection between integrated pedagogy and student learning and motivation	mathematics education
DP0557360	2007	to reconcile the apparent differences in instructional practice between well-taught ?Asian? and well-taught ?Western? mathematics classrooms. ...effective practices of competent teachers	mathematics education
DP0664415	2008	...will develop new theoretical understanding of why technology-related innovation in secondary school mathematics teaching takes hold in some educational settings but not others. The findings will lead to practical recommendations for design of teacher professional development programs, and shed light on reasons why teachers may embrace or reject educational change	mathematics education
DP0667073	2008	...will provide evidence-based pedagogical strategies for the reform of classroom teaching and learning in the crucial areas of mathematics and science. We will develop a form of pedagogy	mathematics education
DP0772787	2008	...an average Australian lesson exhibits the 'shallow teaching syndrome', having relatively lower complexity, higher repetition and less mathematical reasoning than high-achieving countries. ...recommend practical ways in which lessons that engage students more deeply, can be encouraged	mathematics education
DI0668328	2008	Schools have low mathematics expectations for Indigenous students; low performance is blamed on their culture which is seen as primitive and instruction is reduced to repetitive rote learning of computation. There is evidence that Indigenous students could excel in mathematics if it is contextualised and taught from patterns and structure. A theory showing how Indigenous students can develop strong mathematical understandings would provide a counter to accepted wisdom of low performance and a model for future Indigenous student attainment.	mathematics education
DI0775799	2009	...strengthening Australia's social and economic fabric by developing new knowledge about effective ways to prepare young Australian Indigenous children for mathematics success in school.	mathematics education
DP0984349	2011	High quality science and mathematics education is central to economic prosperity. ... explores the importance of subject matter knowledge in teaching. ... inform the current debate about the appropriate models of teacher education and the balance of emphasis on content knowledge and pedagogical knowledge. ..given a number of attempts to attract mid career professionals with high qualifications to teaching... will provide evidence on how these people transition to their new careers and what support is needed.	mathematics education
DP0984178	2011	...providing young learners with the foundations of data modeling... ways to implement mathematical and scientific experiences that capitalise on young children's potential	mathematics education

Table 1 continued

DP0987253	2011	...provide opportunities for ==Indigenous students, and other disadvantaged cohorts==, to have improved ==access to digital technologies== that have the potential to enhance their mathematical understandings	mathematics education
DP0986955	2012	...student optimism may be key to strengthening problem-solving capacity in mathematics ...Understanding how these human resources are nurtured and enhanced informs ==pedagogies== to increase academic performance	mathematics education
LP0990184	2012	... ways to accelerate the process of ==developing teachers' confidence and expertise== in teaching mathematics with inquiry	mathematics education
DP110103586	2013	...==program== promoting ==young children's== mathematical and scientific reasoning will be evaluated from grades one to three	mathematics education
LP100100154	2013	High quality ==early childhood== education for ==Indigenous students== is an essential precondition for school readiness... This research builds a foundation in mathematics that levels the ==assessment== playing field and supports participation in higher levels of mathematics.	mathematics education
LP110100553	2013	The study aims to improve mathematics outcomes for ==young Indigenous children== and advance the ==pedagogical content knowledge== of early childhood educators and working towards closing the gap in numeracy achievements for Indigenous children.	mathematics education

==Pedagogical programs, teachers' practice, classroom practice==

==Indigenous, low SES, traditionally most at risk students==

==Genes & environmental factors==

==Families, practices beyond school==

==ICT for learning or assessment==

==NAPLAN &/or standardised data, international comparisons of performance==

==Early childhood==

==Seeking knowledge of innumeracy not necessarily related to ICT/pedagogy==

Table 2 Results of search on *ARC NGCP Keywords New and Ongoing Feb 2015*

Project ID	Funding Completion	Abridged Description	keywords
LP120200591	2015	...aims to develop theory that will enable mathematics programs to be constructed to accelerate Years 8-9 students' learning to the point that Years 10-12 mathematics can be accessed and employment and life chances increased	numeracy, mathematics, education
DP130103585	2015	...teachers and schools who have enabled remote Indigenous learners to engage with, and learn, school mathematics... This project investigates and documents successful practices in 32 schools located in remote communities.	numeracy
DP130102211	2015	...identifies differences between the delivery of mathematics assessment in pencil-and-paper and computer-based modes. Primary students' mathematics reasoning is compared across these modes and to cohorts from Singapore	mathematics
LP100200841	2015	Poor performance of students in schools located in high poverty communities ... educational disadvantage in poor rural communities...strengthening policy and practice knowledge about educative usage of performance data and the development of rich forms of accountability...provide an evidence base for success of the national partnership on low socio-economic status schools	educational justice
FT110100203	2015	This project is concerned with ensuring that students who experience systemic disadvantage are not excluded from the benefits of a formal education. It provides an account and critique of the growth of second chance schooling options catering to such students in both Australia and the UK.	education and social justice, education
DP140101361	2016	The Lexicon Project will initiate cross-cultural dialogue to identify pedagogical terms from selected Asian and European educational communities and use these as analytical tools to categorise, interrogate and enrich our classroom practice, classroom research, and educational theorising	mathematics education
IN150100045	2017	...aims to focus on improving incarcerated Indigenous and low SES young people's mathematics education outcomes to reduce this risk and thereby improve these individual's potential to improve their quality of life	numeracy
LP140100548	2017	Numeracy@Home will enhance the actions that families can implement at home, in collaboration with educators, in order to enhance children's learning in and positive dispositions toward the development of numeracy...will lead to better outcomes for families and their children, particularly those who are marginalised and experience disadvantage.	
DP150101961	2019	...aims to better understand how students process mathematics tasks, so the inevitable move toward digital assessment can be managed effectively to promote assessment for learning	numeracy, mathematics education

Pedagogical programs, teachers' practice, classroom practice

Indigenous, low SES, traditionally most at risk students

Genes & environmental factors

Families, practices beyond school

ICT for learning or assessment

NAPLAN &/or standardised data, international comparisons of performance

Early childhood

Seeking knowledge of innumeracy not necessarily related to ICT/pedagogy

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