

Issues of social equity in access and success in mathematics learning for Indigenous students



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Robyn Jorgensen is Professor of Education at Griffith University. Professor Jorgensen has worked in the area of equity in mathematics education for more than two decades. Her work explores how the social, political and cultural contexts contribute to the exclusion of some students as they come to learn school mathematics. The particular foci of her work have been in the areas of social class, geographical location (rural and remote) and Indigenous contexts and learners. She recently took leave from the university sector to work with Anangu communities in Central Australia. The immersion in the lived worlds of remote Aboriginal education has provided key insights into the delivery of Western education in remote Australia.

Abstract

On Western measures of education performance, such as NAPLAN, students living in remote areas of Australia are over-represented in the tail of performance. The gap between Indigenous and non-Indigenous learners in numeracy widens as students progress through school (ACARA, 2009). This presentation explores the context within which this gap is created and offers some suggestions to teachers, educational researchers and policy makers on reasons for this gap, but also on how the gap may be addressed.

Introduction

Provision of quality learning for Indigenous learners, particularly for students whose home culture is still very strong and not contiguous with Western culture, remains an elusive challenge. Developing quality learning environments for Indigenous students requires a holistic approach to practice and policy. Keeping mathematics education isolated from the complex milieu in which learning occurs fails to incorporate and address the competing demands faced by teachers and education providers. In this session I consider three key elements that impact on mathematics teaching and learning: attendance, language/culture and mathematics. All of these variables impact on how teachers and education systems plan for quality learning.

In the model proposed in this presentation, I wish to extend the thinking of mathematics educators to encourage a greater awareness, recognition and embodiment of the wider issues that shape, constrain and enable mathematics learning. Without consideration of these other variables, the field of mathematics education is impoverished and unable

to address the systemic marginalisation of Indigenous Australians. If the field continues to research and theorise about mathematics education divorced from the reality of the teaching context, the field will remain impoverished and unable to address the systemic failure of generations of Indigenous learners.

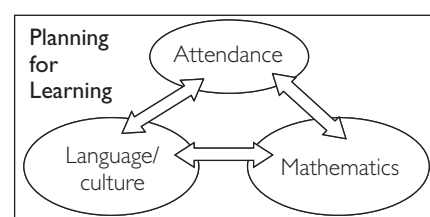


Figure 1: Planning for learning mathematics

To develop a more holistic sense of the issues of teaching mathematics in some of the most disadvantaged contexts in the Australian educational landscape, I propose a model that incorporates, but is not limited to, a number of key issues impacting on the development of quality learning for Indigenous students. In this paper I contend that without regular attendance and subsequent engagement in mathematics learning, the issues of culture and language must also be considered as part of the nexus of mathematics education. Failure to do so, will result in the continued practices that have for generations dealt failure to too many students.

Attendance

Attendance is the most challenging aspect of education delivery in remote communities. The need to attend (and engage) is perhaps the biggest challenge for teachers – of mathematics and other subjects – in creating quality learning. The pressure on schools to have good attendance figures means that there is a range of techniques used to record student attendance. Typically students may appear to be marked as

Table 1: Secondary school attendance by Indigenous status and age, 2006

Age in Years	Indigenous %	Non-Indigenous %
15	73	89
16	55	81
17	36	66

(Source: ABS, 2010)

Table 2: Secondary school attendance by remoteness area by age, Indigenous persons, 2006

Age in years		Major cities	Inner regional	Outer regional	Remote	Very remote
15	%	77	77	76	67	53
16	%	60	58	60	49	34
17	%	44	38	37	29	16

(Source: ABS, 2010)

attending, but the reality is that they may have appeared for only a short time in the day. As such, attendance figures are often significantly inflated in terms of the real number of students attending. This rolling attendance presents unique problems for the teaching of mathematics. Not only is attendance irregular over a period of time, but also over the day. As such, both short-term and long-term planning are compromised.

As can be seen in Table 2, for secondary Indigenous students, attendance rates at school decreases with the level of remoteness. Similar trends occur for primary school students. For example, for 17-year-olds living in major cities, 44 per cent of Indigenous students attend school. In contrast, only 16 per cent of 17-year-old Indigenous students living in remote areas attend school.

Teacher morale is seriously compromised by poor attendance. Never sure if there will be 1 or 2 students or 20 students, teachers are required to be professional and prepare as if there will be a full contingent of students attending. However, the poor attendance is reflected in learning

outcomes so that for any cohort of students, the variance in performance levels is considerable. This makes planning for learning complex and unpredictable. The frustration caused to teachers by non- or irregular attendance has a devastating effect for many teachers on their sense of identity. As one teacher commented, 'I did not spend four years training to have a class with no students turning up.'

With overall poor attendance, teachers in remote areas are faced with substantive issues in how to address the significant gaps in learning. While there is a considerable push from Indigenous educators such as Chris Sarra (1995) to have high expectations of learners, this goal can be somewhat misplaced. The issues around attendance means that while the teachers may hold high expectations of learning in mathematics, the levels of achievement and understandings are quite limited for students. This makes the high expectations mantra difficult due to the very limited achievement and need for backfilling of mathematical ideas. The gaps for many Indigenous learners are profound. Many basic concepts and

understandings are not evident, so holding high expectations may be a worthy ideal, the practical ramifications for secondary-aged students requires a primary level of work. This renders the 'high expectations' as misplaced in terms of benchmarking activities.

Language and culture

In many remote areas, home culture is still a strong part of the life worlds of Indigenous students. These cultural activities impact on learning in many ways. First, cultural events can demand time out of school. In Central Australia, Men's Business may require many young fellas to be out of school for a month or more, as well as the impact on the community members through which Men's Business is undertaken. Other cultural events, such as Sorry Business, similarly impact on attendance. In Northern Arnhem land there have been moves to shift school terms to allow for the extended cultural activities over the wet season which may go for several months. Collectively, these events take priority over schooling, thus resulting in substantive periods of missed school.

At a more local level, culture impacts on the interactions in classrooms. This may be in the way that the students interact with the teacher and/or community. The styles of interaction and questioning are often different from those of mainstream education. For students coming into school, there is a need to constitute their Indigenous habitus to enable them to access the dialogic patterns in order to 'crack the code' of classroom practice. For example, posing questions in classrooms – such as 'What is the sum of 15 and 23?' – is met with a barrage of answers. Students play a different game to the teacher. While the teacher's game is one in which he/she is seeking the students to add two numbers and come to a total of 38, the students' game is one of responding with any

answer. These two dialogic patterns are quite different in goal so that there is considerable scope for misrecognition of the outcome.

Language and culture are intrinsically intertwined so that the culture is represented through language. As the language game above indicates, the goals of the teachers may be different from those of the students but these goals are intrinsically interwoven with the cultures. In Pitjantjatjara, language use is very frugal so that there is often little said and what is said is very contracted. The language structure is one with brevity in speech. This is evident in the language developed within the context of desert people.

Prepositions

In Pitjantjatjara, there are less than 10 prepositions, whereas English has more than 60. If the language of mathematics is considered in concert with the pedagogic relay where concepts are taught/learned through language, the use of prepositions in coming to learn mathematics is profound. As has been argued elsewhere (Zevenbergen, 2000, 2001), coming to learn mathematics is heavily associated with the use of prepositions. How one learns number sense is through comparisons and place. Consider the following statements – Which number is *bigger than* 4?; Which number is *2 more than* 6?; Which number comes *before* 3?; Which number comes *after* 11? These little words are significant in how students learn the value and order of numbers.

Imagine the difficulties of Indigenous learners, who often have hearing problems, differentiating between *off* and *of*. In Pitjantjatjara for example, there is no 'f' sound, so terms such as 'football' is pronounced as 'pootball'. In trying to hear the difference between *off* and *of* when there is no sound in the home language would be very difficult. Yet, in mathematics, these

differences in meaning are significant. As has been identified in other learners of mathematics (Zevenbergen, Hyde, & Power, 2001), the skills learnt in reading texts mean that skimming is a well developed strategy, yet in mathematics the highly contracted language means that such a strategy is very misplaced.

Temporality

Many Indigenous cultures live in the here and now so that long-term planning is a foreign/elusive concept. Yet planning underpins much of Western thought. There are considerable examples of how the non-planning of Indigenous practices and events are at loggerheads with Western ways of thinking. The need to plan a long trip in the desert is undertaken with a strong sense of gravity as it can mean life and death. Yet, for many Indigenous people, the trip is one of opportunity as the sense of life and death is not as paramount due to their intimate knowledge of the desert and survival. These two very different world views impact on the primary goal of much of what is taught in schools and the home cultures.

Mathematics

In drawing together absenteeism and culture, the impact on mathematics becomes obvious. In remote communities, there is a lack of number and text so that immersion in number is difficult in remote communities. Some of the fundamental assumptions made in Western world views are very different from those of the bush. Travelling along a dirt road may be measured in kilometres, with particular markers at particular distances. However, travel in outback roads is marked by other significant bearings – such as landmarks or man-made markers rather than a particular distance. Similarly, the quality of roads at a point in time is more profound than the distance to be travelled. These

differences make for very different assumptions that underpin learning activities.

In many remote communities, the absence of number in their world views is obvious. The need for number is relative to the region. As Wittgenstein (1953) argued strongly, our knowledge systems derive from and are shaped by the language games that are played out in a particular system. The need for number in remote areas is limited. For coastal mobs, where trading was more likely a keener sense of number is more relevant, but this is not the case in remote areas. Many students do not know their age or birthday; few have phones in the home; streets are not named or numbered; there is no need for large numbers. Their life worlds shape the need for number (or other mathematical ideas/concepts).

While number may not be a strong aspect of many Indigenous cultures, the sense of space is acute. In a comprehensive study of Yolngu life worlds, Watson and Chambers (1989) documented the complex ways in which land was signed. For Yolngu, the land was marked by cultural and historical events. These landmarks were 'sung' to younger generations who internalised these stories and so developed a sense of their land. These stories are markedly different from those of Western conventions, yet serve to make strong connections to the land.

Planning for quality learning

In order to create environments that support access and success in school mathematics for Indigenous learners, the three key factors that have been identified in this paper must be considered in concert with an emphasis on planning for learning. The learning is for both teachers and students. The reality for teaching in remote areas is

that the teaching force is predominantly early career teachers who have had little or no exposure to remote education, to working with Indigenous students and communities and to teaching as a profession. Collectively these experiences contribute to the identified difficulties with retaining teachers in remote areas. The high turnover rates can be seen to be indicative of the challenges of remote education. This claim is not new and the issues have been recognised for some time as can be seen in the Human Rights and Equal Opportunities Commission report:

... schools may suffer from high teacher turnover, a lack of specialist services, a restricted range of curriculum options and a high proportion of young inexperienced teachers.

(Commonwealth Schools Commission, 1975: 75–79)

Coming into remote contexts to teach Indigenous students whose attendance is often low, who have gaps in their mathematical understandings, whose culture and languages are significantly different from mainstream schools, creates a set of challenges that need to be addressed. Teachers need to develop skills that will enable them to learn to plan and adapt to these circumstances. Appropriate access to such skill development is critical if successful change is to be implemented. However, this must also be considered within the constraints imposed by economics, geography and available resources for such skill development. Further compounding the issue of professional development is the risk of investment in staff where there is a high turnover.

Planning for quality learning must take into consideration these multiple factors in order to enable access and success for Indigenous learners. Neophyte and established teachers need to be able to

develop innovative models of planning for diversity in learning needs and demands of remote education. Working within the existing dominant paradigms will not yield the outcomes required for successful Indigenous education participation and/or outcomes.

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