Insights into the Beliefs and Practices of Teachers in a Remote Indigenous Context

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An enduring issue for education in Australia is the poor performance of Indigenous students in mathematics. This is more pronounced in remote locations where many of the teachers are new graduates who are enthusiastic but lack experience and are unfamiliar with the complexities of teaching in remote and/or Indigenous contexts. This paper discusses the beliefs and practices of teachers working in a remote, Indigenous region of Australia. It is proposed that the discrepancy between beliefs and practices found in the reconnaissance phase of a design study is due to the teachers realising that they need to implement changed practices to enable students to learn but have little knowledge of what such practices may look like. As such, the discrepancy forms a powerful space for teacher professional development.

Introduction

It still appears to be the case that Indigenous students are performing at a significantly lower level than non-Indigenous students and that the gap has increased in recent years (MCEETYA, 2006). Moreover, this recent data indicate that the gap widens the longer these students are at school. A number of factors contribute to this enduring educational issue, but in this paper we consider one significant factor – the role of the teacher. In particular, we focus upon the teacher's role in bringing about reform practices that may help to redress these inequities in access to, and performance in, school mathematics. This focus on the teacher was provoked by recent studies that have highlighted the critical role the teacher plays in providing quality educational outcomes for students (Hayes, Mills, Christie, & Lingard, 2006).

It has been acknowledged that many of the teachers who work in remote Australian, Indigenous communities are new or recent graduates. These teachers are mostly from white, middle class, urban backgrounds and often they have had little interaction with people of other ethnicities and social class (Allard & Santoro, 2004). There are considerable difficulties associated with the isolation of these remote communities, and generally these beginning teachers are not prepared for life in these environments. The teacher turnover is very high in rural and remote communities and, depending on the employing system, the time contracted to teach may be between two and three years so there is restricted scope for sustainable professional learning communities in these regions. Further, the tyranny of distance compounds the potential interactions among teachers in remote communities thus making the possibility of professional conversations difficult. As a result, these teachers have limited opportunities for professional learning.

In this paper we demonstrate some disjunctions between espoused teacher beliefs and their classroom practices in this particular context by drawing on empirical data collected in the form of a survey and videos of classroom teaching. From these data it appears that the relatively inexperienced teachers involved understand the need for inclusive practices in the communities but do not have the skills to enact appropriate strategies. This discrepancy between espoused and enacted beliefs can be seen as a powerful space for professional development. As these data are the reconnaissance data for a much larger

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project, they highlight the need to support teachers to be able to enact their aspirational pedagogies. Further, the data highlight the need for on-going in-service work in mathematics for teachers in remote Indigenous communities.

Background

We believe that it is important to highlight an important issue related to our use of the term 'Indigenous Australians'. The diversity among Indigenous people is as great as it is among many other groups of people. For this paper, we need to be able to express the focus of our writing in ways that will help support the coherence of the text, so we have adopted the protocol of referring to 'Indigenous Australians' but are cognisant that this is a crude and homogenising term that reflects a multitude of people, cultures, and languages.

Teaching Mathematics in Remote Indigenous Communities

It is recognised within the field of mathematics education that primary preservice teachers are often most fearful when it comes to their study of mathematics education. Frequently their content knowledge and pedagogical content knowledge are quite weak. Those who teach in remote communities are often fresh graduates who are highly motivated and enthusiastic with their appointments but lack the experience of the longer serving teacher. The schools are often small and frequently their teachers are new graduates and, therefore, there are limited opportunities for mentoring by more experienced staff. Further, the considerable distances between these schools limit the opportunities for professional, face-to-face meetings. Collectively these issues compound the challenges faced by teachers in these communities.

Beliefs and Practice

Ernest (1989) highlighted the importance of teachers' beliefs about mathematics teaching and learning, including curriculum and pedagogy, as a key factor in reforming mathematics education. Zevenbergen, Mousley, and Sullivan (2004) reported that when there was a synergy between teachers' beliefs and classroom practice, then inclusive practice that enable Indigenous students access to mathematical ideas and concepts was made possible. Of course, this simplifies a very complex phenomenon, but fundamental to the position we take in this paper is the need for beliefs and practices to align. This is difficult for all teachers, and may be particularly so for inexperienced teachers who work in remote communities. Furthermore, teachers' beliefs are contextual and related to practice and beliefs about practice, but they are not simply able to be mapped one to the other (Lerman, 2002).

Evaluating Classroom Practice

In this project we have drawn upon the productive pedagogies framework (Lingard et al., 2001) in conjunction with Boaler's (1997) elements of reform pedagogy in order to examine classroom practices.

Productive Pedagogies

The idea of productive pedagogies arose out of a longitudinal study into schooling in Queensland, Australia (Lingard et al., 2001). Following the longitudinal study, research has been undertaken to examine the framework and to use it in classroom settings (e.g.,

Hayes et al. 2006). The term 'productive pedagogies' refers to classroom practices that are likely to make a difference in the academic and social learning of students (Lingard, Hayes, Mills, & Christie, 2003). These 20 pedagogies have been broken down into four dimensions – intellectual quality, connectedness, supportive classroom environment, and, working with and valuing difference. The productive pedagogies framework emphasises that all students need to be provided with intellectually challenging classrooms, and it has been demonstrated that when students from marginalised backgrounds engage with intellectually challenging work, their outcomes are likely to improve (Boaler, 1997; Hayes et al., 2006). Similarly, an attempt to make schooling more connected to students' lives can provide them with more meaningful experiences that may help to alleviate the alienation students from disadvantaged backgrounds often feel when presented with decontextualised school knowledge. The supportive classroom dimension is concerned with creating a classroom environment in which students are able to 'take risks' and not be ridiculed or put down if they make mistakes. Working with and valuing difference emphasises the need to recognise and value the cultural backgrounds of students for them to achieve better outcomes (Hayes et al., 2006).

Reform Pedagogy

Reform pedagogy draws on the work of Boaler (2008) in which she documented the reforming of classrooms in the United States to create more equitable outcomes for students learning mathematics. This approach is based largely upon the notion of complex instruction (Cohen & Latan, 1997) which promotes pedagogy that can have a powerful positive impact the learning outcomes for disadvantaged students. Such concepts as group work, assigning status, complex tasks, and multidimensionality are some of the ideas with which we have worked to build a reform pedagogy that is suitable and culturally relevant for remote Indigenous students. We also recognise the importance of language, story telling, and 'yarning' among Indigenous peoples so we have also included a dimension that focuses on quality interactions. It is also important to note that Boaler (2008) argues that the outcomes of such a reform pedagogy approach are not limited to academic outcomes but also include social outcomes whereby students actively seek to work with and resolve social and cultural conflicts in their communities. The key aspects of our reform pedagogy approach include:

- **Group Work** – Students work in groups to solve a problem or task that could not have been solved individually.
- **Roles within the Group** – Each member of the group is to be assigned a specific role so that all members of the group can actively participate in the task.
- **Quality Interactions within the Group** – Significant discussion occurs amongst the students in the solving of the task or problem.
- **Teacher as Facilitator** – The teacher scaffolds the students but absolves responsibility for learning to the students.
- **Use of Home Language** – Students are encouraged to negotiate meaning in their home language, but must report their findings in Standard Australian English.
- **Multiple Pathways** – The task is designed such that students can seek different pathways to solve the problem. There is not only one particular answer or pathway.
- **Multiple Entry Points** – In classes of very mixed age and ability it is necessary that each student has a suitable entry point to the task so as not to feel alienated.
- **Multirepresentational** – Various methods of representation for the students' work need to be encouraged to embrace the diversity of learners within the classroom.

This reform pedagogy approach, in conjunction with the productive pedagogies approach, should provide a comprehensive model for analysing the classroom teaching practices of teachers working in remote, Indigenous contexts. It should be noted that this work is still in its early stages and future adjustment may well be needed. However, we think that there is scope for pedagogies to be employed in the classrooms to promote the stronger mathematical learning for students in remote Indigenous schools.

Data Collection

The data employed in this paper were collected as part of a 3-year project and for our current purposes we have drawn on two data sources: an initial survey and video-taped lessons. We acknowledge that data do not constitute a solid and robust set in terms of rigorous quantitative analysis. Indeed, we have not undertaken extensive statistical analysis for this reason; however, the data do reveal some insights into the beliefs and practices of the teachers in this remote context.

Participants in the current study were 25 teachers from six remote Indigenous schools in outback Australia. A survey consisting of 125 items assessed the extent to which participants agreed with statements regarding their professional practice including pedagogy, teacher attitudes, planning, and assessment. Participants responded to each item on a Likert scale. Response options ranged from 1 (*strongly disagree*) to 5 (*strongly agree*).

The video data consist of 14 video-taped lessons from a range of teachers within the six participating schools. Each of the videos was analysed by at least three researchers using a framework developed to evaluate reform pedagogy (see Zevenbergen, Niesche, Grootenboer, & Boaler, 2008). The scoring consists of a 5-point scale, according to which a score of 1 designates that the pedagogy was not observed, while a 5 signals that the pedagogy was an integral part of the lesson. In working through the videos the research team negotiated their understandings of practice in relation to the productive and reform pedagogies frameworks. Each researcher scored each video individually and then engaged in a process of negotiation and consultation to come to an agreed score and this score was recorded. The negotiation process between the research team created rich discussion that has enabled the unpacking of each criterion. It must be noted that the final score is an agreed score and not just the average of the scores. In this way, the negotiation is crucial.

Examining Beliefs and Practice

In comparing the survey data with the video data we have identified four significant areas of mismatch. These are inclusiveness, or the importance of culture; group work; connectedness, or applied context; and multiple pathways.

Inclusiveness

The identification of pedagogies related to the valuing and working with difference is an important dimension to the research project. It has been recognised that valuing and working with difference is a good in and of itself (Lingard & Mills, 2007). Similarly, the teachers' responses to questions relating to cultural inclusivity in the survey show that they also believe this to be an important dimension, as the data in table 1 demonstrate.

Table 1
Mean Response on Items Related to Inclusiveness.

Consideration of the students' culture is essential for planning to teach quality mathematics.	4.5
The context is suitable culturally.	4.0
I use the culture and/or geography productively	3.5
Mathematics is found in all cultures	4.8

This indicates that teachers not only believe that culture is important in the teaching of mathematics but also that they do actually acknowledge culture in their planning and implementation. While explicit recognition of culture and difference were seen to be highly important in the survey responses, there was no evidence of this in the pedagogy recorded in the video data. Indeed, in the video data there were no instances of pedagogies related to inclusivity (i.e., connectedness beyond school, inclusivity, narrative, and use of home language). This may be because these pedagogical strategies were not relevant for the particular lesson or that they were going to be or already had been attended to in another lesson. However, it is surprising that inclusive pedagogies were not observed when the teachers concerned had previously espoused a belief in the importance of inclusiveness.

It is important to note that the use of narrative (one of the inclusivity pedagogy dimensions) has been a contentious issue, particularly when issues of Indigeneity and the curriculum area of mathematics are involved. The story telling heritage of Indigenous cultures has led to the assumption that the use of narrative would be useful for Indigenous students. However, it must be acknowledged that not only are there differences between Indigenous groups in their forms and styles of storytelling, but also that some researchers (Nakata, 2001) have emphasised the importance of Indigenous students acquiring Western knowledge systems in order to effectively participate in Australian society (Mills & Goos, 2007). There needs to be further research into this uneasy juxtaposition between the valuing of traditional storytelling and the acquisition of skills to participate in Australian mainstream society. In this research project we have tried to bridge this issue by having a focus on the reporting back stage of each lesson so that while the students can represent their work in a range of ways, they are still required to report to the class and teacher using Standard Australian English. In addition, we recognise that cultural recognition in and of itself is not enough to critique the role that schools play in eliminating differential academic achievement (Gale & Densmore, 2002) and, consequently, we agree with Mills (2008) that teacher education needs to move beyond a superficial treatment of diversity.

Group Work

The use of group work has been a focus of the notions of complex instruction and reform pedagogy. In the survey, the mean responses to items related to group work were generally high. For example, the items "Small group work is a very good strategy for teaching maths" and "Working in groups allows students to learn from each other" both had a mean score of 4.6. However, the same enthusiasm for group work was not observed in video data as is indicated in table 2 below.

Table 2
Mean Scores for Pedagogies Observed Related to Group Work.

Group work	2.6
Roles defined	1.7
Quality interactions	2.7
Teacher as facilitator	2.3

While the above data do not paint as stark a picture as the recognition of culture dimensions, there is still a sizeable variation between teacher beliefs and practices. While the mismatch is evident in the data, the discrepancy is perhaps not entirely unexpected given some of the difficulties teachers face in these remote contexts. For example, in these communities the class sizes are often small; in some cases, there may be enough for only one group in a class, and the group may consist solely of family members due to the ways in which the community is formed. This creates a unique context for group work in some Indigenous communities, particularly those communities that are in remote areas of the country. However, while such constraints may create particular circumstances, we believe the principles of group work outlined by such authors as Burton (2004) can be adopted and would encourage interaction and deep learning – mathematically, socially, and linguistically.

The notion of specific assigned roles within the group, according to Cohen and Latan (1997), is important for all students participating in the cognitive labour. This is one aspect of group work that received a lower score (i.e., infrequently observed) in the pedagogies analysis. Perhaps this could be due to class size and make up as discussed above.

Connectedness/Applied Context

We divided Lingard et al. (2001) concept of 'connectedness to the world' into three new items: connectedness to other areas of maths, connectedness to other areas of the curriculum, and connectedness beyond school. This was another dimension where there was a large discrepancy between the survey data and the video data. The mean response to items in the survey related to connectedness was 4.2, indicating strong support for mathematical pedagogy that is related to other areas and contextualised. However, as with inclusivity, there was very little evidence of this in the classroom videos that were analysed. The mean score for the three dimensions of connectedness to other maths, other curriculum, and beyond school were 1.1, 1.0, and 1.0. This stark mismatch is evident here despite the recent emphasis on numeracy across Australia.

Multiple Pathways

The multiple pathways item of the reform pedagogy refers to the notion that the students are able to work in various ways to solve the mathematical task or problem. The purpose of this flexibility is to allow the students to draw upon the variety of skills within each group and to recognise and value diversity and different cultural backgrounds and knowledge. As with the three previous areas, the participants' average survey responses on items related to multiple pathways indicated good support. For example, the mean score for the item "There are a range of possible pathways to solve the task" was 4.3, and for the item "Students have options to choose their own pathways in how they solve the task" the mean was 4.3. However, in analysing the classroom video data on the criteria of multiple

pathways the mean score was 1.9, which corresponds to students having only some minor variations in solving mathematical tasks.

Conclusion

In this paper we have highlighted some of the discrepancies between the espoused beliefs and observed practices of some teachers in isolated Indigenous schools. In many respects it should be expected that mismatches between espoused and enacted beliefs would occur because we have seen this before in many other settings. Indeed, it is accepted that beliefs are contextual (Green, 1971) and the beliefs outlined in the questionnaire can be seen as somewhat idealistic or aspirational, whereas the beliefs enacted through teachers' pedagogy are more 'real life' and significantly affected by other pressing concerns of the classroom (for a more detailed discussion see Grootenboer, 2008). It is important, then, that these discrepancies are not seen as another opportunity to chastise teachers for the apparent hypocrisy of 'saying one thing and doing another', but rather to use the tension as a site for professional development and growth. We see the beliefs the teachers promoted in the questionnaire as aspirations for practice and, therefore, the agenda for the project over the next couple of years is to assist the teachers in translating these into practice. The striking differences between the two data sets reveal that there may be a range of intermediary factors that constrain confidence in the practical outworking of the reform pedagogy. Certainly the difficulty of teaching in these remote contexts is an important factor to consider. Many of the teachers are within their first few years of teaching, and coupling this with their lack of confidence in teaching mathematics (indicated by survey data, as well as informal conversations) creates an environment in which it may be difficult for these teachers to 'practice what they preach'. To this end, the participants in the study have explicitly asked for resources and input that will enable them to adopt more inclusive practices. Also, they acknowledge that their understandings are limited in terms of their knowledge and experience.

The isolation and challenges of working in these remote, Indigenous communities present challenges for researchers, mathematics educators, and policy makers and more research needs to be conducted to evaluate and support pedagogical reform from a distance. The research suggests that the productive and reform pedagogies can have a significant benefit to the academic and social outcomes of Indigenous students in remote schools, and certainly the teachers' survey data show that the teachers believe such approaches have great benefit. Therefore, the challenge is to translate these beliefs into concrete classroom practices by working in the developmental space created by the tension between teachers' espoused and enacted beliefs. We are now working with the teachers and principals to align their teaching practices with elements of the productive and reform pedagogies towards which a number of these teachers have already made a mind shift.

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