REFLECTIONS ON PEDAGOGY IN A REMOTE INDIGENOUS COMMUNITY

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Commonly used definitions of pedagogy refer to both the art and science of teaching, but art and science are culturally bound as indeed is mathematics and mathematics curriculum. This paper describes two experiences in a remote Indigenous community that challenge universalist notions of pedagogy and support a case for re-assessing what is meant by culturally-responsive mathematics education in this context.

MATHEMATICS AT THE INTERFACE

The reflection was prompted by two events experienced in the context of the *Building Community Capacity* (BCC) project[1] that investigated an alternative approach to Indigenous teacher education in remote communities. The approach was aimed at supporting Indigenous teacher assistants use performance-based tasks in first language (L1) to identify where the Indigenous students were in their mathematics learning and work alongside the non-Indigenous classroom teachers to progress that learning.

The driving force behind this and many similar projects (e.g., Lipka, 1998; Kiska, Lipka, Adams, Rickard, Andrew-Ihrke, Yanez & Millard, 2012; Nicol, Archibald & Baker, 2010) is that Indigenous students are not experiencing the same level of success in school mathematics as their non-Indigenous peers (e.g., Cowley, Easton, & Thomas, 2011; Thomas, De Bortoli & Buckley, 2013). This situation severely restricts Indigenous students' opportunities to participate in further education and find meaningful employment. There have been many attempts to address this situation both in Australia (e.g, Harris, 1990; Jorgensen, Sullivan & Grootenboer, 2013; Yirrkala Community Education Centre, 1994) and overseas (e.g., Greer, Mukhopadhyay, Nelson-Barber & Powell, 2009;) Wong, Lipka & Andrew-Ihrke, 2014). These vary in their scope and focus but their common aim was (is) to explore culturally-appropriate ways of teaching *school mathematics*.

Some years back, Bishop made a case for distinguishing between *Mathematics* (with an upper- case M) and *mathematics* (with a lower-case m). This distinction was made not to privilege one form of mathematics over another or to assert that these are necessarily discrete, but to emphasise that mathematics is a cultural phenomenon, a *way of knowing* (Bishop, 1991). This raises the questions of what (M/m)athematics should be taught in what ways in particular educational settings. There is growing body of evidence to suggest that where cultural knowledge is valued and employed in the pursuit of Mathematics education, Indigenous participants are more likely to succeed (e.g., Kisker et al 2012; Lipka, 1998; Yirrkala Community Education Centre, 1994). This suggests that one way of understanding the challenges of teaching and

learning Mathematics in a remote Indigenous school is to view these through the lens of intersecting communities of practice (Wenger, 1998). In this case, the shared setting of the community school at Galiwin'ku on Elcho Island in the Northern Territory of Australia.

METHODOLOGY

Galiwin'ku is the major community on Elcho Island and one of the largest in North East Arnhem Land. It is a traditional Aboriginal community with restricted access. It has a population of approximately 2200 people, although this varies seasonally with many homeland residents migrating to the community during the wet season due to inaccessibility. The school has an enrolment of about 550 students, but attendance also varies quite considerably with the seasons and cultural commitments.

The BCC research project that enabled the research team to visit Elcho Island on a regular basis, was based on the premise that Indigenous student numeracy (Mathematics) outcomes are more likely to be improved where what student's know in relation to a small number of key Mathematical ideas is identified and responded to in first language (L1) supported by knowledgeable community members.

The research was underpinned by a sociocultural, interactionist view of learning that acknowledges the importance of discourse in the shared construction of meaning (e.g., Lerman, 1998; Rogoff, 1995). This approach has its origins in a *situative perspective* that views learning and development in terms of transformation where

> the central question becomes how people participate in sociocultural activity and how their participation changes from relatively peripheral, observing and carrying out secondary roles, to sometimes being responsible for managing activities (Rogoff, 1995, p.157)

This underpinning perspective lead to the recognition of three intersecting communities of practice, the Yolngu school community, the school Mathematics community and the Study Group community that was created to explore (M/m)athematics at the interface of these communities (see Figure 1). The study group, comprised of Indigenous teacher assistants (community teachers), non-Indigenous teachers and research team members, met at least once or twice per school term over a three-year period. An experienced linguist and/or community elders who had a past association with the school also participated in the study group sessions from time to time. The study groups were intended to operate both as a space where different communities of practice could meet to negotiate shared meanings about key aspects of Mathematics and as a research tool to explore the processes involved in building community capital. A small number of performance-based tasks (probe tasks) designed to explore student's understanding of key number ideas were used as boundary objects in this process (Wenger, 1998).

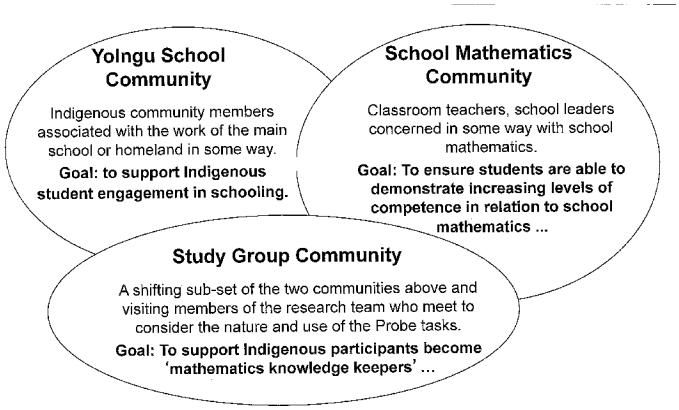

Figure 1: Three communities of practice recognised in the BCC project

While a range of factors variously impacted the project, a number of issues emerged to challenge the initial design and pose new questions (Christie, 2007; Siemon, 2009). For example, the relative positioning of Indigenous teacher assistants in the school, hereinafter referred to as community or Yolngu teachers in recognition of their critical role in the classroom, and their propensity to appropriate diagnostic tasks for teaching purposes. This questioned the use of formative assessment in this context and motivated me to learn more about the nature of the pedagogical practices Yolngu use to enculturate their children into Yolngu knowledge systems and ways of knowing.

The purpose of this paper is to illustrate what I have come to see as the *cultured* nature of pedagogy and comment briefly on the implications of this for school (M/m)athematics education in remote Indigenous community settings. In doing so, I am acutely aware that my observations are coloured by a particular worldview that is different to the Yolngu[2] world that I have had the privilege of coming to know in a very small and naïve way over recent years. In view of this, and wishing to be respectful of Yolngu mathematical practices, I shared my observations with three highly regarded senior members of the Yolngu community, Maratja Dhamarrandji, a bi-cultural consultant, Rose Guywanga, the first Yolngu Principal of the community school, and Dorothy Gapany, a teacher who had also taught at the school. On two separate occasions approximately 6 months apart, they heard these stories and conferred with me on the meanings I was to draw from them. I am indebted to them for helping me see through different eyes and I acknowledge their contribution to the interpretations below, which are offered in a spirit of respect and genuine interest in learning *from* Yolngu.

REFLECTIONS ON PEDAGOGY

In the interests of facilitating a conversation about pedagogy that parallels Bishop's (1991) M/mathematics distinction, I will use *Pedagogies* (with an upper-case P) to refer to the plurality of pedagogies used in school Mathematics (inclusive of 'traditional' and 'reform' practices (e.g., Boaler, 2002), and *pedagogies* (with a lower-case p) to refer to the possibility that different mathematics, stemming from different value systems and world views, may well entail different pedagogies. In doing this, it

is important to note that I do not see these as dualities, but I do want to distinguish between *Pedagogical* practices that are advocated for use with Indigenous students by largely non-indigenous teachers (e.g., Martin, 2008; Mathews, Howard, & Perry, 2003; Jorgensen, Sullivan & Grootenboer, 2103; Zevenbergen, Mousley, & Sullivan, 2004) and *pedagogical* practices that are integral to the production and reproduction of Indigenous knowledge systems (e.g., Christie, 1985; Marika, 1999; Rennie, 2006; Yunkaporta & McGinty, 2009).

Advocated Pedagogies: Most of the practices advocated for use with Aboriginal students living in traditional communities are derived from the work on Aboriginal learning styles or preferences by Harris (e.g., Harris, 1978; Christie, 1985) and Graham's (1988) related work on the interfaces between school Mathematics and Aboriginal knowledge systems. Harris (1978) suggests that Aboriginal[3] learning is characterised by observation, imitation, and personal trial and error rather than verbal instruction or demonstration; real-life performance rather than practice in contrived settings; mastery of context-specific skills rather than abstract, context-free principles; an orientation to persons rather than information; and to present time rather than the future. According to Harris, Aboriginal learning is informal and unconscious and persistence and repetition are used as problem solving strategies rather than 'analysis-before-action'. It occurs in settings that are inherently conservative (i.e., there is little expectation that the Yolngu cosmos will change), highly respectful of authority, and discourage unsanctioned questioning; where listening rather than speaking is privileged in interactions, and embarrassment is strongly avoided. Despite considerable criticism on the grounds of cultural relativism (e.g., McConaghy, 2000; Reid, 2004), these observations are evident in the advice provided to practitioners (e.g., Martin, 2008; Warren, Baturo, & Cooper, 2005) and in the practices adopted by researchers as they work with Indigenous communities to improve student outcomes in Mathematics (e.g., Zevenbergen et al, 2004) and literacy (e.g., Martin, 2008; Rennie, 2006). Researchers have also recognised the relevance of reform practices such as collaborative group work, contextualisation, problem solving, and an emphasis on social interaction. For example, Zevenbergen et al (2008) described their intention to blend reform pedagogies with the "literature on Indigenous learning preferences" (p. 1).

Graham (1988) observed that where individuals "grow up in a society in which the system that controls the economic realities of life are based on relationships between people rather than relationships between quantities", they are more likely to be better at "talking to establish personal relationships with their teachers than they are at talking to transact knowledge inside the classroom" (p.128). Graham also makes a case for building on students' visual and spatial skills, including negotiated elements of ethnomathematics (mathematics) in school curricula, and for teaching Mathematics in L1 wherever possible. Connections can be seen between these observations, aimed at valuing and connecting home culture to schooling, and the practices advocated in the more recent literature. For instance, Martin (2008) suggests

considering Indigenous education in terms of 'ways of knowing', 'ways of being' and 'ways of doing'. Zevenbergen et al (2004) illustrates the efficacy of linking home to school languages and using a more orally focussed mode of communication. Mathews et al (2003) emphasise the importance of warm, positive relationships with teachers, contextualisation, and building on the knowledge and skills that children bring with them to school. They also acknowledge the link between identity and culture and the value of having high expectations as do Warren, Cooper, and Baturo (2008), who argue that to improve Mathematics outcomes "it is essential that Indigenous students experience practices that acknowledge their indigeneity, that are based on expectations of success, and that are better suited to their learning style" (p. 44).

While it is clear that many of these practices coincide with reform-oriented Pedagogies aimed at reducing inequalities based on language, ethnicity, or class (Boaler, 2002), they are nonetheless interpreted and implemented through the lens of the dominant Mathematics culture. Whether these are described as culturally appropriate, culturally congruent, or culturally responsive (see Ladson-Billings, 1995), without L1 and a preparedness to genuinely engage with local communities, such practices run the very real risk of essentialising Aboriginal learning or drawing on Indigenous knowledges in ways that are educationally inappropriate or culturally disrespectful (Graham, 1988; McConaghy, 2000; Ladson-Billings, 1995).

Yolngu pedagogies: By contrast, the practices that are integral to the production and reproduction of Indigenous knowledge systems are much harder to identify, possibly because Yolngu see no point in separating knowledge from the method of acquiring it. There are numerous examples of situations where Balanda[4] have probed Yolngu perceptions of *how* they learn (e.g., see Christie, 1985, 2007; Harris, 1978; Rennie, 2006) which are answered by recounts of *what* was learnt (e.g., "which moon and which tide to go collecting *diyamu*", a species of shell-fish) suggesting that this is not a sensible question to consider. Not because Yolngu do not have rich pedagogical practices but because the activity of learning/teaching is largely unconscious, it happens over a long period of time and in ways that are entirely integrated with everyday practices. In the words of one of Harris' correspondents, "I just do it" (p. 20), was as close as one young man could get to explaining how to teach tracking. Learning in this sense is a function of *being Yolngu*, it is not something that is subject to scrutiny in and of itself. A further example was provided in a two-day workshop[5] prompted in part by the BCC project. Ten senior Yolngu consultants were brought together with Balanda researchers to discuss issues around (M/m)aths and (M/m)aths education (my emphases). After a lengthy discussion on various aspects of Yolngu knowledge, one of the researchers asked, "the one who doesn't understand, how will he learn?" Waymamba, a Yolngu university lecturer replied, "From a knowledgeable Yolngu. From *following* the words of a clever Yolngu" (emphasis added). This points to learning/teaching practices intimately connected to Yolngu epistemology, personal relationships and social responsibilities that are exercised in and through activity,

stories and song (Marika, 1999). Learning is not separated from being and being is not separated from knowing. This might help explain why formal schooling is often viewed as a practice against culture (e.g., Christie, 1985; Zevenbergen et al, 2004, 2008) and the belief that attendance is sufficient to learn (Christie, 1985).

Story 1 (May 2009): During one of my many visits I was invited to attend one of the many ceremonies associated with a funeral. This experience left a lasting impression on me and was a catalyst in helping me see school Mathematics and all that that entailed in a remote Indigenous community through different eyes. It would be inappropriate for me to attempt to describe the rituals and the deep spiritual significance of funerals to Yolngu people in any great detail – planning takes place over a considerable amount of time and many people are involved – it is important that this is done 'properly' (see Watson, 1989) – certain events need to take place in a certain order at agreed locations, and certain songs and dances need to be performed and/or observed by particular groups of people. The ceremonies last for about two to three hours generally from late afternoon to dark but continue beyond that if necessary to complete what was planned. The ceremony continues with seemingly little break or overt orchestration, although it was clearly proceeding in an organised and coherent way from a Yolngu perspective. Sitting with an Indigenous woman that I call *yapa* (sister) I observed as she explained the significance and meaning of some of the songs and dances. I sat there for a long time, absorbed in the collective intensity and sense of purpose. Children of all ages participated; some of the older children were invited to participate by a gesture or by name, while toddlers joined in of their own volition. Older teenagers and adults were clearly concerned to perform as well as they possibly could. Those who were seen to have performed well were acknowledged and dancers would relocate to position themselves closer to someone who was seen to be doing the dance well. Older children might be mildly scolded for not performing as well as might be expected. No particular attention was paid to younger children, although a good rendition of a particular movement was noted and rewarded with a smile or a gesture.

Reflecting on this experience both during and after the event, I was struck by the power of the learning environment dancers and spectators alike. While observation, participation, and imitation were all evident, there was something more. Apprentices become tailors through a similar process of activity-mediated enculturation and tailoring contributes to their on-going sense of identity and agency, but it does not define or explain their existence. The something more seems to have something to do with value, what Maratja refers to as *mingurrmirr* (to hold precious) and purpose.

Story 2 (5 August 2009): A young Yolngu mother, one of about 5 or 6 mothers or aunties invited to come into the Year 1 classroom at the community school, was sitting by herself at one of the small tables while the children, mostly 6 year-olds, were seated on the mat. The children were listening attentively to the classroom teacher (non-Indigenous) and the Yolngu teacher who were describing what they would be doing next. The class had just finished a subitising activity in which they

were invited to say how many dots there were on a series of flash cards that were shown for about 2 seconds each. The cards depicted collections of 0 to 10 dots in different ways (e.g., dice or card patterns, ten frames and random collections). This was done as a whole class activity with the children responding orally. For numbers larger than 3, the teacher would repeat the correct number (e.g., "6" for an arrangement showing a collection of 4 and a collection of 2) and ask "6 billi?" To which the children would respond as a group or individually, "4 ga 2" or "2 ga 4". It was evident that nearly all of the children could recognise composite collections up to 7 irrespective of representation but had some difficulty with larger numbers. As a consequence, the children were asked to draw a picture that told a story for 8 in terms of its parts. An example, involving 2 birds and 6 birds was shown to the class and briefly referred to in L1 by the community teacher. The children went back to their tables where paper and coloured pencils were available. At some point, the young woman decided that she would draw a picture too and by the time three of the children joined her at one of the tables, she was deep in concentration. Instead of starting their own drawings, they immediately and without instruction, moved closer to the young woman to observe what she was doing. There was complete silence at the table (not the case elsewhere in the room), while she very carefully drew 4 trees to one side of the page and 4 trees on the other. When this was completed she said "4 ga 4" quietly to herself. She continued, detailing the trees in a consistent and patterned way completely oblivious to the little band of highly attentive observers. Still the children did not pick up a pencil or move to do a drawing despite the fact that other children in the room were moving around and showing their drawings to the teachers and other adults. When the young woman had completed the detail on three of the trees, she very carefully, indeed reverentially, picked up the paper in both hands and placed in front of the child to her left with a nod and gesture for him to complete it in the same manner. She then drew an identical picture without the detail and again reverentially placed this in front of the child to her right, all without speaking. While she proceeded to engage in a different drawing, the remaining child, without any instruction to do so, started detailing the trees on the other side of the second child's drawing. At no point did she make eye contact or speak to the children.

To a conventionally trained teacher, this episode could be regarded as poor pedagogical practice – it was highly teacher centred, involved little or no social interaction of any sort (at least to the observer's eye), there was no room for error or risk taking on the part of the children, and they were engaged in a repetitive process not of their own creation and yet they were utterly involved in the enterprise even to the extent of quietly saying "4 ga 4" to themselves as they worked. This experience challenged my taken-for-granted views about Pedagogy (reform or otherwise) and made me think again in terms of value and purpose.

DISCUSSION

One can only begin to speculate on the implications of this for schooling and Mathematics education in remote communities but at the very least it suggests that

researchers and educators working in this context should question the applicability of 'best practice' Pedagogies, including those culturally relevant practices that claim to accommodate Aboriginal learning preferences. Observation and imitation may just involve something much more profound than we have understood to date. Indeed, as Lave and Wenger (1991) have observed, the impact of legitimate peripheral participation in a community of practice offers "more than an observational lookout post: it crucially involves *participation* as a way of learning – of both absorbing and being absorbed in - the culture of practice" (p. 95). This seriously questions the simplistic use of observation and imitation in Mathematics education where the cultural practices of schooling are often opaque and disconnected from the day-to-day aspects of life and death in remote communities.

Working with cultural artefacts and contextualising Mathematics might also be much more problematic than we envisage, particularly if these practices serve to disrupt or threaten Indigenous knowledge systems. This includes the very vexed question of the use of L1 in community schools for which there are two responses: learn Mathematics *through* L1 wherever possible using culturally relevant Pedagogies, or seriously question the 'elephant in the room', that is, Mathematics and all that comes with it, at least in the early years of schooling. Perhaps it is time we took seriously a recurring theme raised by Yolngu at the workshop referred to earlier, that "children can not learn to do balanda maths (Mathematics) unless they have received a firm *foundation* in their own Yolngu culture" (Christie, 2007, p. 4).

We need to recognise that all (P/p)edagogy is *cultured* - this speaks to something other than culturally relevant Pedagogies and challenges us to work as equals with Yolngu to better understand Indigenous knowledge systems and the values and purposes underpinning the pedagogies that are intricately associated with these. This requires extensive consultation and collaboration with community members, not to displace one way of knowing and being with another, but to work on ways in which we can, for different purposes at different times, agree to foreground one over the other. In my view, until we clarify our shared values and purpose, there is little to be gained from culturally relevant, appropriate or responsive Pedagogies alone.

NOTES:

1. The *Building Community Capital to Support Sustainable Numeracy Education in Remote Locations* Project 2006-2009 was funded by the Australian Research Council and the NT Government. The views expressed are the author's and not necessarily those of the funding bodies.
2. Yolngu is the term the Aboriginal people of Northeast Arnhem Land use to describe themselves.
3. 'Aboriginal' is used to refer to the original inhabitants of Australia – 'Indigenous' is inclusive of Aboriginal and Torres Strait Islander peoples.
4. Balanda is the term Yolngu use to describe non-Aboriginal people.
5. A report of the *Mathematics as a Cultural Practice* workshop, including translated transcripts, can be found at www.cdu.edu.au/centres/macp/whatemerged.html

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