Funds of Knowledge of Sorting and Patterning: Networks of Exchange in a Torres Strait Island Community

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This article focuses on the funds of knowledge that are mathematical in nature and how they might be used to support parents and children with their learning of mathematics that is taught and learned in the early years of school. Funds of knowledges are those that have been historically and culturally accumulated into a body of knowledge and skills essential for people's functioning and wellbeing. Drawing on community research design, where the process of learning is owned and framed by the community and its people, a consultative meeting was held to discuss the pilot project.

❚ **Keywords:** Torres Strait Islands, Torres Strait Islander Parents, Indigenous Knowledge Centre, funds of knowledge, sorting, repeating patterns

Background

In recent years a number of strategies have been implemented to increase Torres Strait Islander and Aboriginal parents' participation in the education of their children, with the view to making a difference and contributing to helping such families to live productive and fulfilling lives (see, e.g., *Closing the Gap Strategy*, Department of Families, Housing, Community Services and Indigenous Affairs, 2009; The Productivity Commission, 2009). For example, in April of 2007 the Council of Australia Governments (COAG) reaffirmed its 10-year commitment to closing the gap between Torres Strait Islander and Aboriginal people and non-Indigenous Australians, with the initial priority of ensuring that young children get a good start to life (COAG, 2007a). Then, in December of 2007, COAG communicated that all levels of government in Australia were to work together with Torres Strait Islander and Aboriginal people to achieve the target of closing the gap on disadvantage with a commitment to halving the gap in reading, writing and numeracy within 10 years (COAG, 2007b). In July of 2008, COAG agreed to sustained engagement by all governments over the next 10 years and beyond to achieve closing the gap targets for Indigenous people. It agreed in principle to a national partnership, with joint funding of $547.2 million over 6 years to address the needs of Indigenous children in their early years (COAG, 2008a). Indigenous early child-hood development continued on the COAG agenda, with a communiqué in October 2008 that all governments sustain their commitment, engagement and effort in achieving COAG's Closing the Gap targets for Indigenous people, with leaders signing the first National Partnership covering Indigenous Early Childhood Development (COAG, 2008b). The agreement detailed that all states and territories work together 'to improve the early childhood outcomes of Indigenous children by addressing the high levels of disadvantage they currently experience to give them the best start in life'. The National Partnership comprises $564 million of joint funding over 6 years to address the needs of Indigenous children in their early years. Detailed also in this agreement was that governments were to ensure that all Indigenous 4-year-old Children in remote communities have access to early childhood education within 5 years and that the gap be halved in reading, writing and numeracy achievement for Indigenous children within 10 years. As a further commitment, thirty-five Children and Family centres were to be established across Australia to deliver integrated services that offer early learning, childcare and family support programs. The central tenet in COAG's communiqués and government reports on the

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Closing the Gap strategy is that access to education for Indigenous people will create substantial social and economic benefits for remote and very remote Indigenous parents and children, thus increasing success in education and life opportunities (FaHCSIA, 2010).

Influence of Family and Community

A recurring theme of COAG's tenet is identified in government policy and literature on Torres Strait Islander and Aboriginal parent engagement in education (Department of Education and Training [DET], 2010; Department of Education, Employment and Workplace Relations [DEEWR], 2011; Schaller, Rocha, & Barshinger, 2007). The National Aboriginal and Torres Strait Islander Education Policy (AEP; DEEWR, 2011) advocates the importance of Aboriginal and Torres Strait Islander communities' involvement in education and its provision to 'ensure equitable and appropriate outcomes' (p. 1). Further, the Torres Strait Islander Regional Education Council (TSIREC; 2011) stresses the importance of improving 'parent and family engagement in their child's early years development' (p. 1). This emphasis is repeated in the green paper, *A Flying Start for Queensland Children* (DET, 2010). This document states that Torres Strait Islander and Aboriginal families who encourage and instil in their children the importance of learning, are providing the foundation for their children's later success when they enter formal schooling. Of importance here is the provision of before school and school programs that permit and promote parent engagement. Such programs aim to work towards closing the gap between Torres Strait Islander and Aboriginal and non-Indigenous Australians.

Indigenous Knowledge Centres as Place of Agency

The establishment of community network spaces such as Indigenous Knowledge Centres (see, e.g., Taylor, 2004) in Torres Strait Islander and Aboriginal communities has provided places of agency that permit and promote engagement in a range of activities for parents and their children. Indigenous Knowledge Centres are spaces where Torres Strait Islander and Aboriginal culture and knowledge are showcased to the wider community, a repository for community knowledge where such knowledge can grow and where two-way learning can occur (e.g., the State Library of Queensland's Indigenous Knowledge Centre). They can be spaces where Torres Strait Islander and Aboriginal cultural knowledge is kept safe to pass to future generations.

Several issues are relevant here:

1. Torres Strait Islander and Aboriginal parents engage in educating their children using a range of strategies that reinforce and nurture their culture — it is their lived experiences (Martin, 2007; Mellor & Corrigan, 2004; Priest, King, Nangala, Brown, & Nangala, 2009).

2. Parents and community mathematical and science funds of knowledge become the building block for the development of schooled or academic concepts?

3. Through Indigenous Knowledge Centre Programs, Torres Strait Islander and Aboriginal parents and their networks can extend on this education (see, e.g., Lester-Irabinna, 2011; Lowe, 2011; O'Connor, 2009; Priest et al., 2009).

Networks

Torres Strait Islander and Aboriginal parents and networking are interconnected and rely on networks (Witheridge, 2009). That is, parents belong to community networks and, in turn, community networks are comprised of parents (Ewing, 2009; Janmohamed, 2005; Martin, 2007). Community networks are not static homogenous entities. They reflect values, beliefs, as well as hopes and accomplishments. They are complex and can be mobilising forces for social justice and the redistribution of power and material advantage (Sefa Dei, 2005). They can exist in a range of combinations as:

1. spatial localised settings that are defined for the pursuit of socially meaningful interactions;

2. affective and relational communities where members draw on bonds of affinity, and shared experiences of values, attitudes, beliefs, concerns and aspirations; and

3. moral communities where participation and belonging in a citizenry work to achieve common goals defined as a collective good.

Within these communities, tensions, struggles, ambiguities and contradictions are captured; however, the integrity of a collective membership is maintained. Local knowledges are nurtured and made relevant for daily life (Lahn, 2006; Sefa Dei, 2005).

Networks as Funds of Knowledge of Mathematics

Networks build capacity in Torres Strait Islander and Aboriginal parents (Makuwira, 2007). They validate the parents' own definitions of maths as it exists in their communities — and through exchanges with kin and non-kin alike, these bodies of knowledge are activated, grown and transformed (Gonzalez, Moll, & Amanti, 2005). The idea of funds of knowledge views that people are competent and have knowledge that has been grown and developed through their life experiences that have given them that knowledge (Gonzalez et al., 2005). The assumption here is that a funds of knowledge approach provides a powerful and rich way to learn about communities in terms of their resources, the competence they possess and the way they utilise these resources to support them with the education of their children.

If funds of knowledge of mathematics are those that reflect the unique histories and culture of Indigenous
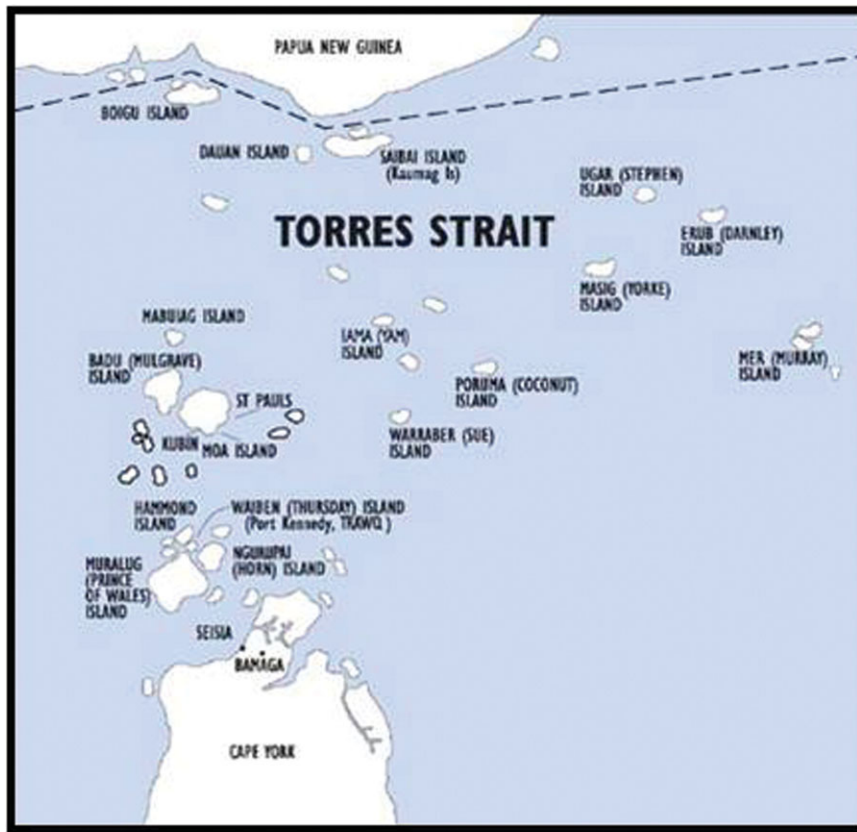
FIGURE 1

(Colour online) Torres Strait Regional Authority map.

communities, they provide an effective entry point into engagement in learning because it is connected with and situated in communities and the voices of the people. The process of learning then is owned and framed by the community and its people, who then work to build a sense of pride and self-worth in individuals (Khamaganova, 2005; Smith, 1999). Indigenous parents' identities are shaped in their distinct ways in a distinct physical space such as networks, with their knowledges, stories and relationships an integral part and tied to physical locations (Khamaganova, 2005; Lahn, 2006). This relationship ensures that maths is emerging from communities and their networks because they are taught and learned in such contexts.

Methodology

The project adopted a qualitative design approach: community research (Smith, 1999). Community research is described as an approach that 'conveys a much more intimate, human and self-defined space' (Smith, 1999, p. 127). It relies upon and validates the community's own definitions. As the project is informed by the social at a community level, it is described as 'community action research or emancipatory research', that is, it seeks to demonstrate benefit to the community, making positive differences in

the lives of one Torres Strait Islander community. I had established strong working relationships with the parents and community members over time as a consequence of another project; nevertheless, embarking on this preliminary process in close collaboration with the community was a challenge linguistically and geographically.

A Geographic Excursion

The Torres Strait Islands consist of 18 islands and 2 Northern Peninsula Area communities (Torres Strait Regional Authority, 2010). They are geographically situated from the tip of Cape York north to the borders of Papua New Guinea and Indonesia and scattered over an area of 48, 000 square kilometres. There are five traditional island clusters in the Torres Strait: top western, western, central, eastern and inner islands (see Figure 1, Torres Strait Regional Authority Map, 2011). The research project was conducted at one site in the eastern cluster.

Language in the Torres Strait Islands

Specific languages are spoken in the Torres Strait Islander communities, including Standard Australian English, Yumplatok (Creole), Kala Lagaw Ya (Mabuyag) and, Meriam Mir (Osborne, 2009; Shnukal, 2004). Kala Kawaw Ya (KKY) is understood to be a dialect of Kala Lagaw

Ya (Osborne, 2009). The traditional languages of the top western and western islands, Kala Lagaw Ya (KKY and Mabuyag) are understood to come from the mainland of Australia, with the eastern island language, Meriam Mir, emerging from Papua New Guinea. Yumplatok, identified as a modern language and stemming from colonisation, is derived from 'meshing' both traditional languages and English, thus creating a language in its own right (Osborne, 2009; Shnukal, 2004). This language is identified as unifying, that is, it is the one that everyone in the Torres Straits can speak, whereas the western traditional language speakers cannot speak and understand the eastern language speakers (Osborne, 2009; Shnukal, 2004).

Participants

Twenty adults and eight children took part in the community consultation meeting. All reside at the site where the meeting was held. The identities of participants are protected (Queensland University of Technology, 2011). For ethical reasons pseudonyms have been used to protect the identity of participants. The location is referred to as the Island.

Data Collection Techniques

For the purposes of this article, the data collection techniques included digital photography, field notes, and email documents. Digital photography as a non-written source of data allowed for the capturing of visual images that were central to the preliminary process and which served as a reminder for me (Stringer, 2004). They also assist audiences to more clearly visualise settings and events. Field notes provide descriptions of places and events as they occur. They provide ongoing records of important elements of the setting and assist with reporting and reflecting back over events. Email documents provided an efficient and easy form of communication between participants, who then networked with their community. Each technique afforded the value of insight into the important preliminary planning of the project (Stringer, 2004).

Analysis and Discussion: Engaging with Communities

In recent years, building on what communities bring to particular contexts and on their strengths has been shown to be effective with engaging with communities (González & Moll, 2002). How does this occur? A way to engage community was to draw them in with knowledge that was already familiar to them, and which then served as a basis for further discussion and learning (González & Moll, 2002). However, with this process there was a challenge and dilemma. How did I know about the knowledge that they brought to the meeting without falling into stereotyping their cultural practices? How did I address the dynamic process of the lived experiences of the community? Smith (1999) argues the responses to these questions have emerged from community-based research that relies on the community's definitions and discussions.

The Community Meeting

The process of networking within the community to inform them of the meeting developed through several steps: (1) discussion of the project with school campus leader; (2) discussion with the Island Councillor and to seek permission to meet under the 'Omei Tree' (Tree of Wisdom), which was suggested by Denise, a senior community woman; (3) a chance meeting with the radio announcer for the Island radio that resulted in a radio interview that was broadcast to the Island community; (d) with support from Denise and a parent from the community, a paper-based flyer was delivered in person to the homes of Island parents to inform them face-to-face about a proposed community meeting; and (4) a community meeting held under the Omei Tree.

The content of the flyer was brief and aimed to provide succinct information for ease of reading and clarity. As per the flyer schedule, the meeting was held for 1 hour under the Omei Tree, with a number of community members in attendance. The fig tree is believed to be over 100 years old and has been a significant meeting place for the Island community. During the meeting I explained the project and how participants might be involved. Gaining consent was respectful of the community's place and environment as also was that as a visitor, I needed to be mindful of my actions and presence in the community and conduct myself in an ethical manner. I asked the community group where they use mathematics in their daily lives and what mathematics they use specifically.

The responses included buying food at the supermarket, cooking and counting fish and shells, indicating that it emerges through daily activities. As the discussion progressed, I explained some of the early number ideas such as sorting/classification using shells, sticks, leaves, and Poinciana pods gathered from the community. These items were gathered after seeking permission from Julia, a senior community leader, whose home was near the beachfront.

Children learn to sort objects from their environments into groups, such as shells. They learn to identify sameness, which defines the characteristics of groupings (Sperry Smith, 2009). In the meeting, Denise volunteered to sort shells into groups (see Figure 2). The group and I had to identify what criteria were used for the grouping. The idea of creating and naming sets continues throughout life and is a way of creating and organising information and making connections with peoples' experiences. Before young children can learn to count sets, they begin the process of defining a collection using the objects in their daily lives (Baroody & Benson, 2001). In Figure 2, Denise established the features of each of the sets of shells. If the criteria for membership to a set are vague, it is more challenging to decide whether the shells belong to a particular set. Meeting

FIGURE 2

(Colour online) Sorting shells into sets.

members talked among themselves, with Denise allowing them time to identify the features of the sets.

From my experience, I could not identify the criteria that defined the sets; however, there was consensus among community members that criteria had been established — edible and non-edible shell creatures. In this example, the community used their daily lives and activities as an opportunity to talk about sorting using their home language — Yumplatok and English. When I asked when children learn about edible and non-edible shells there was consensus that this occurs at a very young age — for example, 1 to 2 years — and during times when families walk along the shores of the Island, and when fishing or playing in the water. This example reinforces what Nakata (2007) and González and Moll (2002) state, that learning can be rich and purposeful when it is situated within that which already exists — the culture, community and home-language of the group. Gonzalez (2005) explains this further by stating that mathematics is embedded in social knowledge and mediated through language and the activities of the community. It is not learned, nor is it disembodied from its social meaning and context as happens within formal schooling and becomes a linear process of dialogue. The learning about sorting edible and non-

edible shell creatures was distributed among the group. It was a shared collective construction of mathematical knowledge.

As the meeting progressed, the discussions focused on an introduction to early algebra — patterning. Patterns are a way for people to recognise and organise their lives. In the early years, two particular pattern types are explored: repeating patterns and growing patterns. They are used to find generalisations within the elements themselves (Warren & Cooper, 2006). What comes next? Which part is repeating? Which part is missing? Repeating patterns are patterns where the core elements are repeated as the pattern extends. Young children recognise patterns when singing songs, dancing, learning how to weave and when playing. Some examples of repeating patterns are shown in Figure 3.

Repeating patterns can also be represented with actions: jump, hop, jump, hop; as sounds: bell ring, clap hands, bell ring, clap hands; as geometric shapes: triangle, square, triangle, square; and as feel: soft, hard, soft, hard. Generally children explore patterns in a sequence: copy a pattern, continue the pattern, identify the elements repeating, complete the pattern, and translate the pattern to a different medium (Warren & Cooper, 2006).

FIGURE 3

(Colour online) Examples of repeating patterns.

Using two Poinciana pods, I tapped them together to create a repeating sound pattern. The community was then asked to continue the pattern and identify the repeating elements, using clapping. They were then asked if they would like to offer a repeating pattern. One community member clapped a pattern, to which the remaining members responded. The community were then asked where they might see or use patterns in their communities. Responses included: the seed pattern inside the Poinciana pod (ABABAB), the weaving pattern used to weave coconut leaves together (ABABAB), when singing songs to the children, the seasons of the year, and how the winds, seas, sea life, plant life, and bird life work in a repeating cycle with many core elements. It was this final response that reminded me of my place within the community, a visitor who had a great deal to learn from community about patterns and how they exist in their natural environment. It taught me that the community has extensive knowledge of patterns because they exist in their everyday lives in very rich ways — funds of knowledge, knowledges that are historically and culturally accumulated and shared.

The community was asked if they would like some early mathematics workshops to be organised for and with the parents and children. Of importance was that the community needed time to network and discuss whether they wanted me to return and work with parents and children on the Island and if there were any benefits for their community.

Conclusion

The process of networks as exchanges of funds of knowledge within the Island community has been significant for engagement with the community and to respond to research as described by Smith (1999). I found this aspect challenging because I had to rely on the community's networks, which I did not belong to. However, what did become evident was that the networks comprise of parents and they use such networks for communication. What was also evident was that the networks were used as valuable sources for nurturing local knowledges and practices. At the meeting, the community validated their definitions of knowledge — sorting and patterning. In doing so, this process provided a rich way to represent their knowledge and competence to support their children.

From this initial experience and through the process of theoretical refinement, I argue that going beyond the simple dichotomy between community funds of knowledge (experience, out-of-school, intuitive, tacit) and academic (in-school, linear, deliberate) is critical. The experience demonstrated that the meaning-making in which the community engaged can be described as the principles that should underpin classroom instruction — authentic engagement in productive activities, drawing on prior knowledge and complexity and the dialogical emergence of instruction. What this means for educational practice

is that by inviting children into a world of motivating activities where the everyday and spontaneous comes into contact with school, the children's and their parents' engagement with both the activity and the social context are foregrounded (González et al., 2005). That is, the classroom becomes an information exchange that draws on multiple funds of knowledge that are activated and tied with mathematics curricula.

At this stage, I can report that after providing time for the community to network and consult about whether to permit me to conduct the parents and children mathematics workshops, the process has allowed me to:

1. have confidence in the way that I had consulted with community and the community with me;

2. continue to work with community for as long as they see that there are benefits;

3. continue to work with the materials similar to those gathered for the community meeting;

4. frame the project's agenda that situates research as reflexive engagement with the real — the community's funds of knowledge as well as my own; and

5. understand how pluralism is about respect for diversity and a willingness to explore and change in ways that continues to remain diverse for situated learning.

These points relate to the processes of engagement and community consultation and research, which are envisaged as continuing once the project officially commences.

Acknowledgments

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