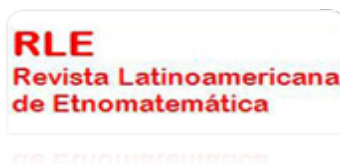


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## **Ethnomathematics in resettled indigenous communities whose language and children were once alienated**

### **La etnomatemática en comunidades indígenas reasentadas cuyos lenguaje y niños alguna vez fueron alienados**

Kay Owens<sup>1</sup>

#### **Abstract**

The Aboriginal Education Policy for an Australian State (New South Wales Department of Education and Training, 2008) requires partnerships and engagement with the local Aboriginal community. A case study of this policy in action was undertaken in a small rural city in the State. This paper provides an analysis of the strategies by which schools participating in three programs aimed at improving Indigenous education. Through a Stronger Smarter Learning Community, Make It Count and 8-Ways projects, schools have been able to make significant changes in their schools' ethos. Significantly, public education in this rural city has achieved results that reflect high expectations. Interviews with principals, teachers, Aboriginal students and their community highlighted the increasing interaction between the Aboriginal parents and community and the schools, the increasing warmth and welcome extended both ways, and the impact that these approaches are having on curriculum, teaching and learning. The strategies, small steps, clear goals, respect and flexibility resulted in changes in learning mathematics. The analysis illustrates how the Stronger Smarter, Make it Count and 8-ways approaches facilitated changing teachers' perceptions, skills, practices and curriculum and resulted in a culturally responsive, place-based mathematics curriculum.

**Key Words:** Australian Indigenous education; mathematics education; resettled Indigenous education; partnerships in education; place-based mathematics curriculum; transformative leadership; effective funding for Indigenous education.

#### **Resumen**

La política de educación aborígena para un estado australiano (New South Wales Department of Education and Training, 2008) requiere un compromiso y asociación con la comunidad aborígena local. Se realizó un estudio de caso de esta política en acción en una pequeña ciudad rural en el estado. Este documento ofrece un análisis de las estrategias de las escuelas que participan en tres programas dirigidos a mejorar la educación indígena. A través de tres proyectos —Stronger Smarter Learning Communities, Make It Count, 8-Ways—las escuelas han sido capaces de lograr cambios significativos. Significativamente, la educación pública en esta ciudad rural ha logrado resultados que reflejan las altas expectativas. Entrevistas con directores, maestros, estudiantes aborígenes y su comunidad destacan la creciente interacción entre los padres aborígenes, comunidad y las escuelas, y bienvenida entre ellos y el impacto que están teniendo estos enfoques sobre currículo, enseñanza y aprendizaje. Las estrategias, pequeños pasos, metas claras, respeto y flexibilidad dieron lugar a cambios en el aprendizaje de las matemáticas. El análisis ilustra cómo los métodos de Stronger Smarter, Make It Count y 8-Ways hacen que los maestros cambien de percepción, habilidad, práctica, y currículo, cambios que resultan en unas matemáticas locales y culturalmente responsables.

**Palabras claves:** Educación indígena australiana, educación matemática, educación de indígenas reasentados, compañerismo en educación, currículo matemático local, liderazgo transformativo, fondos efectivos para la educación indígena.

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## **THE SCHOOLS AND THEIR COMMUNITIES**

This is the story of a group of schools in a rural city on Wiradjuri country in NSW Australia who are finding ways to improve the numeracy of their Indigenous students. The story was generated by working with the schools to assist them to evaluate how three programs were generating change in their schools. The schools were part of a Stronger Smarter Learning Community set up to encourage them to support each other and build on their Stronger Smarter Leadership Training initiated by Aboriginal educators to assist teachers of Aboriginal children. The story was based mainly on interviews and documentation.

The Indigenous population consists mainly of families who were resettled by government into the town, their descendants, and relatives. Much of the cultures of the communities has been lost and some children are only now learning to what language group they belong as a result of changes in Departmental policies and school approaches. None of the families up until now have spoken their language except for some words and phrases, sometimes in an Aboriginal English dialect. Each school is a part of the Stronger Smarter Learning Community (Stronger Smarter Institute Queensland University of Technology, 2010) around the hub school of Glenroi Heights Public School<sup>2</sup>. The four schools are different. Glenroi Heights is a large school in an area with 98% unemployment, 50% of enrolment is Indigenous and when the current principal began at the school there was 50% attendance, a deficit model of education and plenty of excuses as reasons for poor performance. Bowen Public School is a small school also with a transient population of children and with a low socio-economic catchment and large proportion of Indigenous students. Orange East Public School is another small nearby school with less than 10% Indigenous population and a higher socio-economic catchment. Both schools tend to have a number of recently arrived immigrant families from, for example, Africa. The final school is a large well-established school with a growing number of Indigenous students (60-70 still below 10%) identifying as Indigenous. This story illustrates how people in the schools and community, professional development and funding can make a difference when a wider, cultural view of mathematics expands the possibilities for future opportunities and reduction of

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<sup>2</sup> Names are used when permission was given. The focus school had a new principal who decided that at that point in time, the school name should not be used.

discrimination, often previously unrecognized in deficit models of education for minorities. This story extends the role of ethnomathematics in cities with highly colonised effects on thinking and status.

Both the State (New South Wales Department of Education and Training, 2008) and National (Department of Education Employment Work Relations, 2009) governments have policies on Indigenous education that emphasise partnerships with local Indigenous communities. Several projects are funded to facilitate these projects. One of these is the Stronger Smarter Institute (SSI). There are now 44 teachers in these schools and surrounding schools who have been trained through the Stronger Smarter Institute (Stronger Smarter Institute, 2011) in a year-long program involving two forums of several days, a commitment to planning and implementing projects and supporting fellow participants. Forums are generally residential in Queensland with participants from across Australia but one year there was a local forum given the local interest from schools. Thus a large number of teachers, others in the schools (e.g., Aboriginal Assistants), and community members had benefited from this leadership training. In addition, the two schools with low SES and a high proportion of Indigenous students received Priorities Schools funding while the other two schools were part of a cluster of schools receiving Make It Count funds for improving numeracy education (Australian Association of Mathematics Teachers, 2009). All schools had access to Norta Norta funds to assist Indigenous students individually if they were below the middle bands of achievement on national testing which involved Personalised Learning Plans. School infrastructure such as Interactive Whiteboards, computers and network facilities received further funding. There were connected classrooms across a network of schools in the surrounding area. There were also two regional programs: one called 8-ways processes (Yunkaporta & McGinty, 2009) for improving Indigenous education and Positive Behaviour for Learning plans developed jointly by parents, students and teachers for some students requiring this assistance. Preschools, women's groups, and Elders groups were also funded in the community.

### **KEY FEATURES OF TRANSFORMATIVE ACTION**

A critical pedagogy of place fosters connection and attachment to local places and provides interrelationships between one place and another, between the community and the land

(Owens et al., 2011). Such an approach is particularly appropriate for Indigenous communities whose familiar relationships are strong and whose connection to the land is part of their culture, whether they live on their traditional lands or have made an attachment to a new place. Gruenewald (2008) says “to know anything about this world is to know its places” and to value them. Place-based education contextualises opportunities to explore the ecological, social and political dimensions of those places and recognises Indigenous conceptions of place as an inseparable link between person and country (Cameron, 2003). Critical pedagogy of place involves educating within a local and ecological context, identifying and challenging oppressions of race, class, gender, (and nature), decolonising and re-inhabiting place-based knowledge (Gruenewald, 2008). With the history of Australian colonization of the cultures such as the prevention of speaking of the language and lack of citizenship until 1967 and the invasion of the Indigenous lands, the critical pedagogy of place is a relevant basis for this study. The schools were moving along this trajectory and as a result of their actions, values were changing (Lovat & Toomey, 2009).

### **SCHOOL AND COMMUNITY LEADERSHIP**

Recognition of community leadership is an important step forward in improving community-school relationships. The principal of Glenroi Heights recognised that relationship building with the parents and community was essential so she began by visiting every family once a semester. Funding and training opportunities assisted but more importantly the community was taking action to provide for their children’s readiness for school by setting up a playgroup. While the teachers’ professional development assisted with their cultural awareness and competence, the parents and community undertook recognised courses in advocacy and child development. Furthermore there were meetings at different levels of management across the government departments and other organisations to assist families in a more holistic manner. Parents were empowered and became role models, teachers, employees at the school and elsewhere. Some of these also participated in SSI training.

## **PROFESSIONAL DEVELOPMENT OF TEACHERS**

The SSI training in particular ensured that teachers moved away from a deficit model of thinking towards a more recognitive model of social justice (Apple, 2004). Furthermore they made plans for change with small steps that significantly impacted on current practice, thinking and relationships with the community (Owens, 2011). The training changed teachers personally and the affect spread to other teachers. Each teacher and staff member interviewed indicated how there was change for them. “It makes you realize your own filters” because it provides an opportunity for deeper thinking, pondering and discussing (Karen Brill, Glenroi Heights, Assistant Principal). The school provided strong encouragement for this thinking and reflecting.

I came back and it moved all judgement out of my system. It's amazing when you take judgement away from every person you work with, how it's a different relationship. (Glenroi Heights Public School Principal, Jane Cameron)

In several cases, Stronger Smarter Leadership challenges had enhanced other professional development. For example, Duncan Peard, noted that Stronger Smarter reminded him of who he really was (friendly, joking, supportive, and a people-person) and how he could be that kind of teacher and a leader. This in turn led to a more positive relationship with the students. By adapting the Eight Ways approach to the mathematics programming, other teachers are now saying they can see how it is benefiting all students.

Smarter Stronger training ... was very much the best inservice that I've done ... because it is very empowering ... at Calare, they had some teachers do Stronger Smarter training too, and really stepped up and gotten involved there (with the 8-ways mathematics programming and Indigenous Homework Centre). (Duncan Peard)

(Smarter Stronger course was) enormously thought provoking, stimulating. ... We're here to learn some things, particularly to learn some things about ourselves and from each other. ... but at the same time made you feel comfortable very quickly. And the changes - I guess it opened a whole world to me that I had only seen at a distance. It has changed the way I interact with kids, with all kids you know. ... So, some of the approaches around consistently high expectations particularly struck a chord. A lot of the stuff about deficit thinking and avoiding deficit thinking and deficit language struck both a personal chord which has produced some change, and also struck a chord that works with the staff particularly here.

I think it's probably gone together with stuff that we are doing about 8ways and Make It Count maths. And just looked at broadening what I do at including you know some things that are culturally significant and looking at learning styles and you know in reflection, my learning style was reasonably stuck in the rut of you know talk, paper.

So yeah it's forced me to broaden what I'm doing, and ... to be more inclusive so that more kids have a chance to achieve. ...use more narrative, ...more non verbal, ...more action learning (Bob Hoy)

The changes in colleagues encouraged other staff to take on principles from Smarter Stronger with enthusiasm and were seen as important life-long learning experiences (Sarah Jeffries, Glenroi Heights). Amy Copelin, from Orange East, said Smarter Stronger had provided different perspectives and often common sense but something that you never thought of before. Her confidence and passion was boosted and she knew even small things could make a big difference when changes are on-going and every day. However, she still needed to let go of results and focus on process. She said, "I don't think I can explain how much of an impact it (SSI training) has. ... It's something you have to experience yourself". Nadine McAllister from Glenroi Heights said the difference was that she was making sure everything she did was quality under a supportive staff and children. The program encouraged her to continue and be a team player in the school.

Kylie Greatbatch noted about SSI training and how it confronted teachers when they saw a role play about what the children meet at home:

It's been really good. It's opened a lot of the teachers' eyes to see the struggle that Aboriginal people have. They haven't got that negative thing against us – the Aboriginal people – anymore, especially here – it's really, really good at this school. It's made them open their eyes and realise that we are all the same and how we've got to struggle to get where we want to be. Non-Aboriginal people don't have to but we do; we've got to fight to get to where we want to go. With Pam – the person to follow – she's a very strong Aboriginal woman, very strong.

These comments indicate changes in people's knowledge, attitudes, values of themselves and others, and pedagogy that are benefitting Indigenous and non-Indigenous students' education. However, the changes in relationships with the community were also significant.

### **COMMUNITY RELATIONSHIPS WITH SCHOOLS**

Bernie from the community of Bowen Public Schools who was encouraged to help children to learn to read in the reading program noted the impact of the community in the school. He said:

But yes, we came here 20 years ago ... and I grew up with an English stepfather so I didn't have a lot of culture. My first four years, five years, was with culture but nothing in the years in between. I'm now finding my way back and I've been here at Bowen for six years. What I've found here is that I can actually be me. This is the

first time I've ever felt comfortable in my own skin – to come here to Bowen and it's just magic; absolute magic. ... We now have a painting circle which is a really good thing. We're working on getting a yarning circle set up. Tracey, our assistant principal, she's organised a dance group and we have somebody come in to teach them the Aboriginal dancing which is just fantastic. ... I think the school's fantastic because now we are developing more lessons – well not lessons but more activities centred around the Aboriginality of our kids and I think that's going to be a big stepping stone into the future. ... that's my passion about being here is trying to teach them how to read, giving them the skills to what I say is decompose the word and put it back together and teaching them little tricks that they don't get in the classroom but the passion that I have is for all of these kids that I've had for the last three years doing reading, to have them be able to sit there and read to me comfortably; they're not shamed by doing it and that's a big thing too.

On two sides of town, two women Karen Powell and Ros Hodge talked of setting up playgroups. Karen said: “Well at first it was just all of us Aboriginal women, we just got together and we started doing playgroup” and later Pam Boney set up for them to do a TAFE certificate in child development. Daryll Parson's commented:

We're actually teaching culture, being an initiated man myself and from this tribe again we tell the Dreamtime stories of this country and how Mount Canobolas and Mount Panorama how they related and again yeah just the Dreaming stories and the dancing and ... and it's good to be a part of what they (the children) experience here in this little world of theirs. ... it's good that we've got someone like him (Aboriginal Education Officer Adam Goolagong) here that can also push the kids and get them involved in activities.

Adam was a good liaison between teachers and the community and he was keen to encourage the community to write their stories to provide readers for the children. He set the students high expectations in terms of attendance and participation in class. In the two larger schools, the AEOs played equally important roles.

The schools established action plans. One Deputy Principal noted the format of the plan:

These are all Chris' (Sarra who leads SSI) words, not ours, ... 'Engaging Indigenous communities in schools', 'Creating a sustainable attitude and belief about the learning ability of Indigenous students', 'Community leadership for improved Indigenous student outcomes in schools'.








For each, there was a table of a number of planned ways for achieving these outcomes, together with the people involved in these plans, needed resources, and indicators of achievement. Thus the way forward was operationalized into practical, achievable approaches tailored to the school and community.




## CURRICULUM DEVELOPMENT

There were two programs that were used by the four schools for numeracy. One school, along with another Make It Count partner school, used a commercial program with textbooks that was said to be language focussed, incorporated working mathematically, and represented the syllabus well. In this school, parents and community were regularly invited to come into the first years to see how their children’s learning occurred in the school. This together with art, other projects, and a playgroup encouraged the parents to come and feel at home in the school. Where possible, the teachers applied mathematics to the school art work and making use of the school playground that replicated the Aboriginal land. In addition, all the Aboriginal students from all schools participated in a number of large activities such as a Cultural Day, an Aboriginal Maths Fun day, and several other days recognising Aboriginal community and history.

The other three schools were making use of a fairly explicit program for teaching mathematical procedures that was based on Reading to Learn (R2L) Maths developed at Glenroi Heights from the R2L approach. Again there was a focus on language but they were adapting the various sample units of works from the Department of Education and Training and incorporating the 8-ways processes (Yunkaporta & McGinty, 2009), either explicitly or implicitly. In the larger school, programs and lessons plans had symbols for each of the following processes used appropriately in a particular lesson plan. The processes consisted of:

- connecting through the stories that are shared ;
- picturing pathways to knowledge ;
- seeing, thinking, acting, making and sharing without words ;
- keeping and sharing knowledge with art and objects ;
- working with lessons from land and nature ;
- putting different ideas together and creating new knowledge ;
- working from wholes to parts – watching then doing ; and

- bringing new knowledge home to help the family/community . (Yunkaporta & McGinty, 2009)

The stories and land links were frequently mentioned. One AEO said,

I talked to the parents about the land links ...and how we used them at school. ... with the little infants with their maths, I take them outside and we drew snakes and then they had to measure it with the paddle pop sticks, little things like that, yes they are using it, and yes that's working really good as well.

At this school, they were setting up a database that could be used with all the rooms through their Interactive White Boards.

Then our units that we're writing, if you wanted to look at the unit on 3D shapes for Stage 1, you could click on that (launching boomerang) and it would give you the yarn up (stories) ideas for that lesson. If you click on this (non-verbal approaches) it will give you the differentiated hands on activities for that lesson. (Deputy Principal)

They were also setting up a garden that would tell the Wiradjuri story and be very useful for mathematics lessons. The uses of plants were known by the community and the garden was requested by the community. Funds were being obtained to do this properly. One of the reasons that the garden is significant is the fact that Aboriginal people for 40 thousand years had survived in a relatively harsh climate through hunting and gathering food from plants. This knowledge for the local remnant grassy box woodland forests (savannah) is still known but children do not always have the opportunity to spend time with their Elders in the forests. Thus they are not always learning about the shapes that assist in recognizing the plants, the seasons for fruits, and the use of plants for food and medicine.

## **CONCLUSION**

The programs that the schools were involved in encouraged an improvement in numeracy as well as other aspects of education. The year-long Smarter Stronger program offered to many teachers made them think about relationships, strengths of Indigenous culture, the ways of engaging and explaining in Indigenous cultures, and the equity challenges of the schooling program. Above all, the Indigenous staff and community were accepted by themselves and the school as having a significant leadership role within education at the school. The Make It Count project provided specific encouragement in numeracy while the other projects supported the teachers in implementation. The 8-ways project gave specific

ways to bring about change in learning plans which were collaboratively developed and the cross-school learning community of practice provided support for teachers who were bringing about change and a place for sharing stories about past and present injustices and ways forward with reconciliation. Thus the teachers' knowledge and values had changed together with the strengthened community's values and expectations.

Despite the loss of culture as a result of practices resulting from colonisation and invasion that pervaded Australian society for 200 hundred years, the local Wiradjuri and other communities in this city were strongly developing an approach to learning including learning mathematics that linked to Indigenous culture. These developments were reflective of the Funds of Knowledge projects in the USA (González, Moll, & Amanti, 2005) and the Sámi projects in Sweden (Jannok Nutti, 2008; Johansson, 2009). The community was supported by the schools to influence the schools' policies and practices, their teachers, and their programs. There is no doubt that varied, long term professional development was a significant factor in these transformations with teachers being enthusiastic about how they were working in partnership (Gervasoni, 2005; Owens, et al., 2011) with the Indigenous community in a whole-of-school community of practice (Kahan, 2004).

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