

# Numeracies in Indigenous Communities



## Background

Today I'm going to talk to you about being a non-Aboriginal teacher working with Aboriginal learners and my experience and perspective on that. As a teacher I'm very aware of my responsibility to 'make a difference' – that it is my business to do so. I know that Aboriginal students bring to the teaching/learning environment a host of numeracies with an intricacy of understandings, concepts, skills, strategies and language and it is my job to make use of these in the teaching/learning process.

I will be referring a lot to the *Numeracies in Indigenous Communities* project – a project funded by ANTA to develop a resource for schools and TAFE that embraced numeracies in Indigenous communities. It must be pointed out that, from the onset, we (myself and my colleagues who helped with the project) were discouraged by a number of Indigenous leaders in Aboriginal education to leave the nomenclature of 'Indigenous numeracies' right out of the picture for reasons that will become apparent throughout the rest of this talk and to avoid stereotyping.

I continue to be very concerned that these numeracies are not reflected in that teaching / learning environment and in the ways we assess teaching and learning in mathematics and numeracy. In many classrooms Aboriginal learners may be working with unfamiliar contexts, language, pedagogy and curriculum. To put it another way, they may well be able to do the mathematics but a combination of circumstances may be preventing this. For example they may have the mathematics but not the classroom language, they may have the

numeracies but have developed these in other ways i.e. their ways of knowing and doing could be different to those taught and assessed in the classroom.

I know that Aboriginal learners can bring to the classroom very innovative, creative and intuitive mathematics and numeracies. Recently I worked with Certificate III Aboriginal Education Workers who, when introduced to the concept of 'numeracy', very quickly and easily understood it. However they were a lot less confident in dealing with 'mathematics'. They were very quick to understand and apply numeracy as opposed to mathematics. It was a lot easier to have a good conversation about numeracy (eg how we got to work today) than it was about mathematics and once there was a good understanding of what was meant by mathematics, participants were able to see it and identify it everywhere and in everything.

What also became apparent was the fear about mathematics and the many embarrassing experiences while at school where students felt 'dumb', 'stupid', 'insignificant and isolated and experienced very few feelings of success believing they were no good at mathematics.

This experience and similar such ones in schools and in certificate training encouraged an underlying theory that perhaps the mathematics could be better learned if it were wrapped in familiar numeracies, contexts, language and activity and if people could unpack their fears and anxieties and re-learn in new contexts. This is nothing really new to the world of mathematics or numeracy but something that could be built upon in one way or another. The challenge lies in which way and how.

At the start of the *Numeracies* project one of our first questions was about transferring numeracies to the classroom while also taking on board that, as teachers, we need to make sure that what we teach and how we teach empowers our students to make decisions that will improve quality of life, to move forward and away from disadvantage (many of our Indigenous communities are amongst the most disadvantaged in Australia and across the world).

From the start of the project we needed a clear understanding of what numeracy was.

Perso (2003) says that '*Numeracy is about the 'maths we need'. Numeracy is a cultural construct in that unless the learned mathematics is 'practised it is not necessarily retained as a skill'*' and asks '*When does maths become numeracy? Maths could become numeracy when it is solving a problem in hand and useful for everyday life*'.

A group of teachers (Maths300 participants 2003) I worked with a while ago likened it to playing sport – the coaching and training was the mathematics and the game on Saturday was the numeracy. Perhaps some Aboriginal learners know how to play the game but haven't had the same coaching and training as many of their non-Indigenous counterparts.

Further questions focussed on:

- What are numeracies in the community and where, when, how, why and by whom are they used?
- In what contexts and situations are they used? What mathematics are within them?

- What choices or options are made to represent numeracies, to understand numeracies?
- How do people choose to use mathematics for particular purposes?
- How are numerate decision made?
- What determines the decisions that are made about numeracies and how mathematics is implemented eg: 'do I walk or do I drive?'
- What affects the decision-making?

Our aim was to produce a resource that consisted of a set of (a.) 7 tasks intrinsically aligned with numeracy as a family and community practice, and, (b.) numeracy stories from community people. We went through a process of identifying numeracies and the contexts in which they were used, listened to the numeracy stories and dug out the mathematical strategies and skills that were being used.

We settled on the 3 contexts of shopping, socialising, and family organisation. From these evolved the tasks and the alignment of them with our Curriculum Framework, learning outcomes and a constructivist approach to teaching and learning. Amongst other things, the tasks reinforce that we learn mathematics through use and that we can use the same mathematics in different ways or for different purposes.

## Teacher as a learner

As a teacher I understand the importance of improving and developing my pedagogy and that by doing so, it keeps me stimulated, challenged and engaged. I know that the more I learn about, and from, my students the better I can teach.

Most teachers of Aboriginal students are non-Aboriginal and will develop more as teachers if they are prepared to take on a learning role with their students.

Throughout the project there was an enormous amount of learning and plenty more learning that could occur. We worked with many Aboriginal people and communities across SA. This did not include those in the remote Anangu Pitjantjatjara Lands. The focus was on 'non-traditional' communities and where most of our Aboriginal learners are.

Not surprisingly we found a diversity of numeracies in these diverse communities. The nucleus of everyday family and community life encompasses family organisation, socialising and shopping.

### ***Family & community: a context for mathematics***

We began with looking at 'family' and in particular family trees because we felt that this would be a very familiar and valuable context for the majority of communities and that most people would be able to talk extensively about family. When I'm asked where I belong in my family tree I say, 'Well here's me, my 4 brothers and sisters, my Mum and Dad, their parents and then all the grandchildren'. Pretty easy stuff to follow, very linear and 2 dimensional.

However, in talking with Indigenous families it soon became apparent that we were way out of our depth and that the subject warranted a PHD and not a 12-month numeracy project. For example a lengthy discussion (a whole day) with a mother / daughter team – Sue and Jane - about family took us into such deep, complex and powerful notions of place and belonging that we became

completely lost – the mathematics was beyond our capacity of understanding. In fact we changed the term 'family tree' to 'family web' to represent the '3Dness' of it.

They talked about intricate webs of connections and interconnections and the grouping and levelling of its members. Determining a place within a family web may depend on place (where a person is born, where the parents come from), time, generations, colour, politics (eg voting rights), who delivered the baby, relationships, tolerance, sharing, acceptance, recognising the rules and obligations that help fit people in the family web (enculturation of connections – mathematics that structures things as opposed to counting things), grouping, who can marry whom, respect of Elders...

The family web is seen as the big picture and involves:

- Shifting between the generations of the family web which means going up and then down again 'like a lift' which open up on different floors and in different directions, stepping back from this side of the generation, going the other way, that is the order of thinking when doing generational levels.
- Using living memory for generation order and classification
- Representation of the family web in different ways
- Making complex connections and interconnections
- 'having a picture that you're brought up with that that's where you belong'
- using algebra to describe connections – 'he has 8 mothers'

- using mathematics to describe where people are at
- the point of relationship as an intersection on a graph.

So now, when I ask someone like Sue to explain where she belongs and she replies with, 'Well, it all depends...' I'll have some idea of what they're talking about!

## **Family organisation**

### **Catering**

Enormous collaboration, communication and cooperation can go into organising and managing a big event. The catering part of an event is a great example of a diversity of numeracies and mathematics at work. Catering for major events eg a funeral, 21<sup>st</sup> birthday or Christmas can be a big thing.

Recipes, especially those for the Christmas pudding, can be handed down from one generation to the next. These ways of learning and knowing can be done through mentally retaining and recalling information, procedures, numbers and quantities and in this example a family recipe has been handed down through several generations:

*Q: Have you any family recipes written down?*

*A: No. We have a Christmas pudding recipe that we make each year. I just remember it. Sometimes if I'm not sure I'll ring Julie (sister). She remembers it.*

### **Socialising**

#### **Card games**

Card games can be very popular in many communities and can be played on a regular basis. Some communities have well organised processes in place where

'the game' (can be concurrent games played at the one time) is hosted in someone's house. Organisation can include:

- with whom you can play cards
- people moving from one game to another
- 3-4 scores / games going at the one time
- the 'main game' which is usually in the kitchen as you can fit more people around the kitchen table
- 'fast games' where participants play really quickly.

Interestingly, it came out throughout these conversations that many people are leaving the pokies and returning to the card games because they've realised there's more chance of winning with cards and that the money stays in the community. A good example of critical numeracy at work!

### **Shopping for Christmas**

There are many different ways to shop and the decisions around these can be based on many things. One of the most popular situations is shopping for Christmas. Buying hampers from Christmas hamper clubs is a popular way of budgeting and preparing for Christmas and ensuring there will be food and presents. Decisions may be made around catering for a large extended family, for example, 20 or more extra people staying for a couple of weeks; Christmas hamper clubs can mean 4-5 packs or hampers being purchased through direct debit with a typical family setting maximum of \$50 per fortnight.

## **The stories**

A multitude of numeracy stories were collected. They were grouped according to the 3 contexts. In family organisation there were stories around setting a routine, storing food, catering and travel.

In shopping the various stories focussed on bulk buying, when to shop, quality purchases, packing the esky with grocery shopping, buying a 'killer' (a steer from the local station), travel to a larger shopping centre, grocery shopping and saving for Christmas.

One of the most popular stories in the socialising context was about playing cards

It was evident throughout that there were many different ways of doing things, of solving problems which were innovative, creative and original. Seven tasks were developed from a number of these stories and are in the process of being published. As well as the tasks the resource includes supporting software and an interactive CD featuring many community people telling their stories. The numeracies and mathematics have been identified and linked to curriculum outcomes.

## **Implications for the classroom**

What does all this mean the classroom? How does this learning impact of the teaching learning process? Following are a number of possible implications and recommendations.

- Use constructivist teaching and learning that allows learners to build on their knowledge, thinking, ways of knowing and doing, skills and mathematical language

- Make sure learners know and understand what mathematics is and what numeracy is – the training and coaching versus playing the game.
- Aboriginal learners are likely to be very numerate in their own settings. Recognise these skills they already use in the world and transfer them to the classroom.
- Borrow literacy frameworks and apply to numeracy (Johnston 2002)  
eg
  - *Numeracy Circles* adapted from Literacy Circles (Day 2003) which are based on Freebody's 4 reader roles. Instead of discussing texts or stories, learners are having conversations about tasks (which are often stories within themselves). My experience in using them reinforces that learners are more willing to communicate their thoughts and feelings and views if they are representative of the group rather than individual. Participants referred to 'working together' as an integral part of learning. Through the numeracy circles participants were able to talk together about their learning and make predictions, develop hypotheses and construct their own learning. *Numeracy Circles* offer a way for learners to become critical users of mathematics and numeracies.
  - Another example of a borrowed literacy framework is Brian Gray's Accelerated Literacy where a service provider helped us to rewrite a unit of mathematics using this

pedagogy. We all know that mathematical language is an essential element in working mathematically and developing thinking around mathematics. We wanted to encourage the development of mathematical language and the use of doing words such as 'flip', 'rotate', 'translate' and their nominalisations such as 'rotation' and 'translation'.

- We changed our mode of questioning and used preformulation as in Accelerated Literacy. Preformulation is the cultural information that precedes a teacher's question in any context where new learning is being introduced. Preformulated questions stand in strong contrast to teachers' 'display' questions, beginning with 'what', 'why', 'where'. Questions are not asked to test learners' knowledge or reasoning ability. They are only asked when the teacher is sure the learner will be able to answer them. Furthermore, questions are not targeted directly at individual learners...When very little common knowledge exists between teacher and learner, the teacher employs a highly supportive questioning strategy, referred to as 'preformulation'. Preformulation prepares the learner to answer the question. Once learners have responded, the teacher accepts their answers positively then expands on them using a

strategy termed 'reconceptualisation'. . . (Parkin 2004)

- Look for other, unusual use of patterning and patterns. One experience I encountered when working with AEWs was how one of them watched for patterns in the way participants played 'Greedy Pig' (a game of chance and data). The patterns she was looking for focussed on participants' behaviours based on her relationships with each of the participants and between participants.
- Listen to the questions Indigenous learners ask. Identify mathematical language used by learners as a form of mathematical assessment, for example, *what are the nouns and verbs Aboriginal learners are using in mathematics and numeracy?*
- Group problem solving and learning teams working together is a key part of learning (this is often how problem solving occurs in many communities). Learning teams and learners helping each other make for more learning.
- Link new learning with old learning, develop new skills in familiar contexts and familiar skills in unfamiliar contexts (Harris 1984).
- Provide learners with familiar, relevant contexts to apply/use/further develop and understand their new learning
- Consider that the learner may not be interacting with or seeing the mathematics because the context is too distracting / unfamiliar / more interesting than the mathematics.
- Do not assume that learners will be able to link or apply their mathematical learning in the classroom to other areas of learning

or other contexts outside the classroom. Not only do we need to teach the mathematics, we need to teach how, where, when and why it can be applied and how learners can be critical users of mathematics and numeracy.

- Learners may be using mathematics outside the classroom but cannot identify with it or recognise it in the classroom.
- Allow for different ways of doing things. You may be surprised at some of the ways learners get to a solution.
- Learners may be able to do the mathematics but for the wrong reasons. It is very important to make consistent, professional judgments.
- Consider that you may have misconceptions about students' learning. For example the majority of students learn to subitise (instantly see how many without having to count and can attach a number name to the amount) in the early years. Some students **can** subitise without having the associated number word (FSIM 2005).
- When learners are using mathematics in any situation, point this out to them and the mathematics they are using. They may not realise they are using mathematics.
- Focus on the numeracy problems your learners face in their homes and communities and build the mathematical content into them.
- Allow learners to play with mathematics and be creative with it. Use real life situations, transfer these to hands-on/concrete simulations in the classroom then to pencil and paper representation /

interpretation, followed by the use of ICT to back up learning and then lead onto more abstract learning and thinking and then push this learning back to real life situations again.

- Make the learning experiences such that they become stories for learners to tell. Many Aboriginal people love telling stories and come from a long history of storytelling.
- Provide opportunities that enable access to numerate discourse and numerate thinking ie all of the above.

## Conclusion

I believe that many Aboriginal learners have many well-developed, complex numeracies in which they operate. As teachers it is our responsibility to make a difference, to improve outcomes for Indigenous learners and to be continually thinking about how they will benefit from our teaching.

We need be able to project our teaching beyond the classroom so our learners can project their learning beyond the classroom. It is within our power to do this and thus empower learners by teaching them something that matters.

Consider how you can make a difference for Aboriginal learners, how your teaching and learning can benefit and empower your learners in the classroom and how this learning can be transferred to their communities, to make better decisions and build capacity and improve quality of life.

## Reference

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