Numeracies in Indigenous communities

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This paper is part of a panel on mathematics education for indigenous students. It specifically looks at a project which was funded to develop a resource for schools and the Technical and Further Education sector that embraced numeracies in indigenous communities.

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, that is 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.

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 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

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 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 two 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 full doctoral project and not just 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 its three dimensional nature.

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 (For example 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

- ‘Having a picture that you’re brought up with that that’s where you belong’
- Using mathematics to describe connections – ‘he has 8 mothers’
- Using mathematics to describe where people are
- 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, for example a funeral, 21st 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. 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 aside their own amount to a maximum of $50 per fortnight.

The stories

A multitude of numeracy stories were collected. They were grouped according to the 3 contexts and the tasks developed from these. In family organisation there were stories around 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 and travel to a larger shopping centre.

Implications for the classroom

What does all this mean for the classroom? How does this learning impact on 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.
- Borrow literacy frameworks and apply to numeracy (Johnston, 2002)

  For example: 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.
- Look for other, unusual use of patterning and patterns. One experience I encountered when working with Aboriginal Education Workers 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.
- Link new learning with old learning, develop new skills in familiar contexts and familiar skills in unfamiliar contexts (Harris, 1984).
- 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.
- 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 (First Steps in Mathematics, 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.
- 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, that is all of the above.

Conclusion

I believe that many Aboriginal learners have many well-developed, complex numeracies in which they operate. Does this then mean that these numeracies are underpinned by a firm understanding of mathematical concepts? Does it mean they are very 'streetwise' in their use of mathematics?

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. 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.

References

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