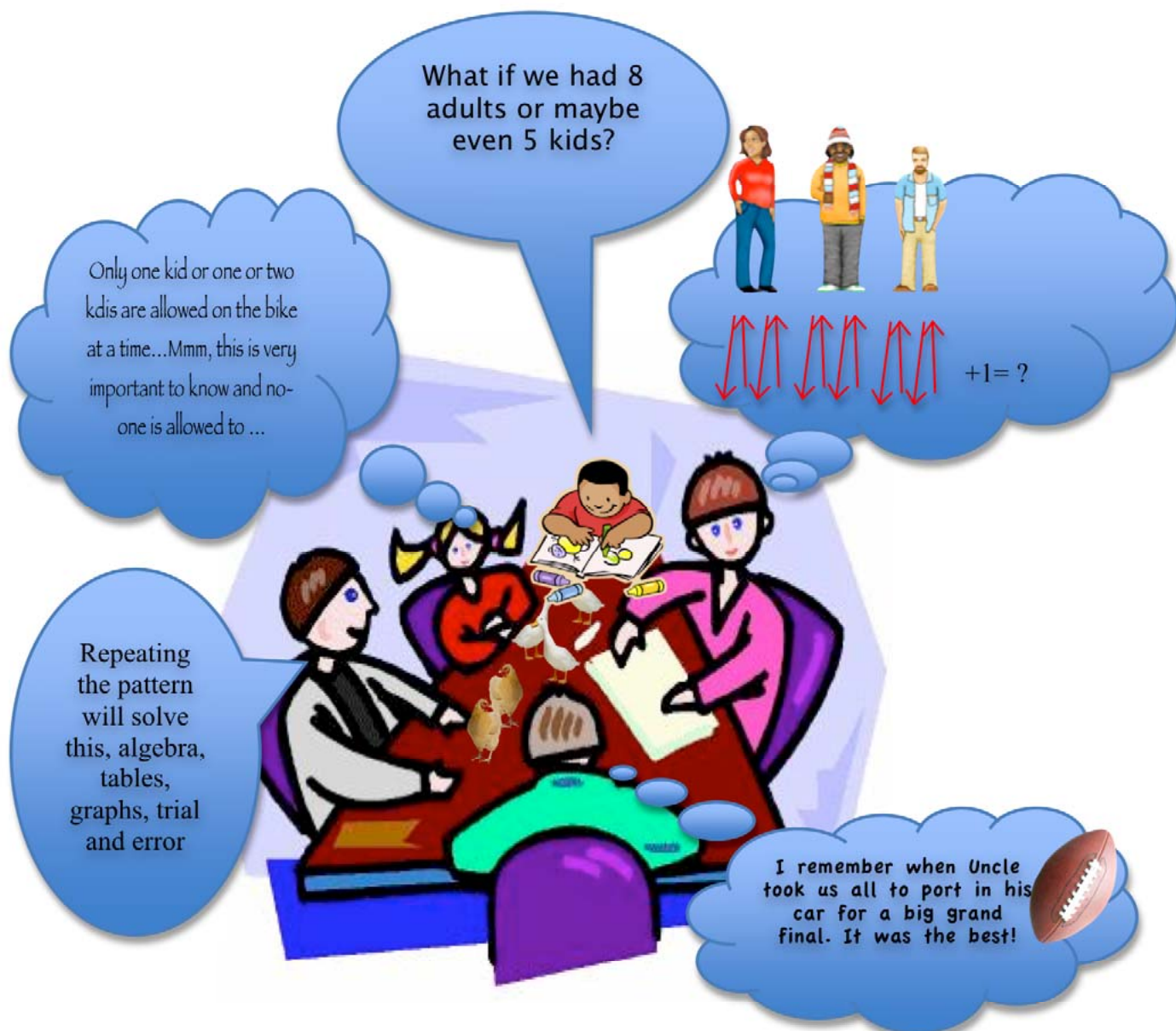


Numeracy Circles

Footy Trip in action

An example from *Interactive Numeracies: Maths situations in everyday Indigenous family and community life*



Draft only

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About this resource

This unit of work is designed for educators working with Indigenous learners but is certainly relevant for all learners from primary and middle years through to TAFE students as the learning can be extended or modified to suit age and diversity. It takes one of the rich, mathematical problem solving tasks from the *Interactive Numeracies: maths situations in everyday Indigenous family and community life* resource and outlines some teaching ideas based on the Numeracy Circles process.

This unit supports sound pedagogical practice, that is, teaching for effective learning – a pedagogical approach to develop expert learners and to personalise learning. It supports recent research and initiatives in mathematics education such as Principles and Standards for School Mathematics (National Council of Teacher of Mathematics, 2000) where traditional classrooms are replaced with learners talking to each other and groups of students voicing their opinions.

Briefly, this resource introduces a situation within a context - the situation being a problem-solving task wrapped in a context common to Indigenous family and community life - and decontextualises then recontextualises it. It teaches the strategies and conventions of mathematics but immerses them in contexts that provide meaning.

The Numeracy Circles process provides a framework for students to be presented with a problem to solve within a familiar context and, by playing different roles, students are involved in digging out and thinking about the mathematics and numeracies in different ways. With their new learning they are encouraged to consider new contexts for applying the newly learned mathematics.

Interactive Numeracies allows learners to intuit and interpret mathematics using their own cultural tools. It provides space for them to think about and describe mathematics using home language, and then mathematical language to re-describe it.

For more information about the *Interactive Numeracies* resource go to:

<http://www.aboriginaleducation.sa.edu.au/pages/Educators> (then click on 'Numeracy') or contact Caty Morris cmorris@aamt.edu.au.

To purchase the *Interactive Numeracies* resource, contact Savina Gallicchio on tel. 08 8226 1461 or email: Savina.Gallicchio@sa.gov.au.

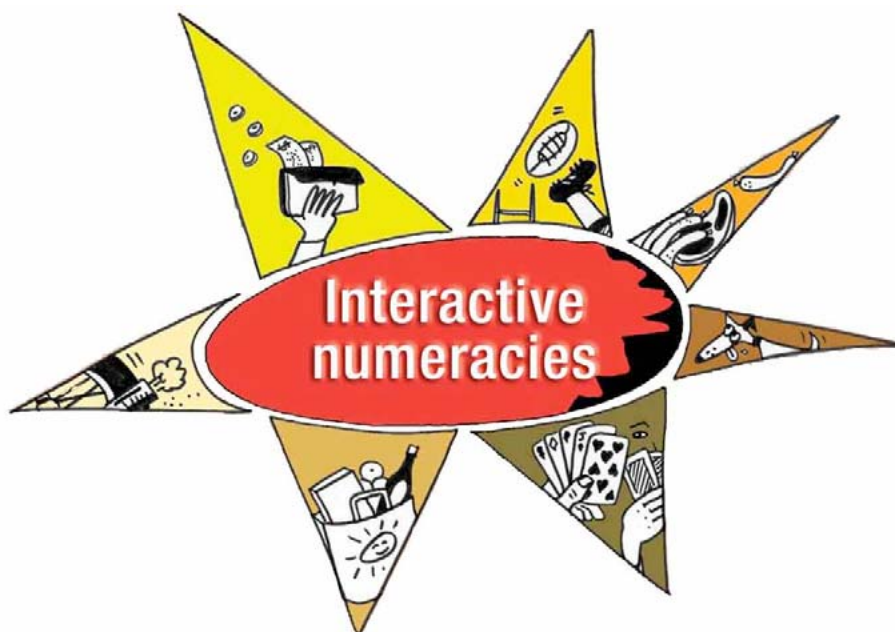


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Numeracy Circles and Footy Trip: Develop Expert Learners & Personalise Learning:

The National Numeracy Review Report Recommendation 3: *That from the earliest years, greater emphasis be given to providing students with frequent exposure to higher-level mathematical problems rather than routine procedural tasks, in contexts of relevance to them, with increased opportunities for students to discuss alternative solutions and explain their thinking.*¹

What are Numeracy Circles?

Numeracy Circles are small groups of students gathered together to discuss a numeracy problem-solving task and which allows them to become critical thinkers as they engage in ongoing dialogue about the task. Collaboration and cooperation is at the heart of this approach in student-centred learning environments where students are immersed in mathematical experiences and learning through critiquing, imagining, exploring, discovering and creating. *A rich task that is contextualised or based within a story and has a familiar theme or situation in it can be a great strategy for cultural and/or social inclusion. This can then lead learners to the mathematics through personalised learning that also develops expert learners.*



Rich mathematical tasks allow students to ‘build richer conceptual learning; collaborate and share knowledge; to intuit, rationalise, conjecture, hypothesise, test ideas, justify, and challenge mathematical ideas; and to represent thinking in a range of modes that will enable and foster deep mathematical learning. The tasks allow for multiple entry points and multiple pathways, and cater for the diversity in thinking and working mathematically.’²

Through structured discussion and extended written and artistic response, *Numeracy Circles* guide students to a deeper understanding of what they have done. The key aspect of this strategy is the structured use of roles and role sheets as students learn to discuss and contribute to the groups and learn to think in different ways about their learning and about mathematics. These sheets can also be used as evaluation tools. They are a possible strategy for “Assessment as Learning”.

After assuming their individual (or shared – students could work in pairs) role each group of students participates in a problem-solving task (usually about 15 minutes). Using the role sheet as a guide each student interprets and analyses what they’ve done and their learning. They then get back together in their circle and take it in turns in discussion. Students play different roles to develop and encourage different ways of critiquing, imagining, exploring, discovering and creating.

Why Numeracy Circles?

Numeracy Circles build students’ comprehension, thinking, engagement and creativity with

¹ Human Capital Working Group 2008 *The National Numeracy Review Report* Recommendation 8, p34, Council of Australian Governments.

² Zevenbergen R & Niesche R 2008 *Learning and Social Change. Reforming Mathematics Classrooms: A case of remote Indigenous education* p. 31, Griffith Institute for Education Research.

numeracy. Numeracy Circles combine independent and collaborative learning and build communities of learners to create networks of *thinking and working proficiently in mathematics*. Cooperative learning can lower anxiety levels and thus encourage collaboration.

Numeracy Circles:

- Provide a space for students to express their mathematical thinking and reasoning
- Integrate different ways of knowing and doing
- Allow students to orient themselves with ideas and concepts
- Stimulate discussion and the development of mathematical language
- Allow for connections to other disciplines, across the curriculum
- Connect mathematics with numeracy and numeracy with mathematics
- Involve contextualising, de-contextualising and re-contextualising mathematics by transferring learning
- Encourages students to take responsibility as learners, to drive their own learning and to construct meaning together
- Are about debating and challenging one another in a supportive environment
- Encourage mathematical representations such as drawings and notes that reflect ideas
- Guide students to ask open-ended questions
- Encourage critical thinking, reflecting and reflexing about learning and the world at large
- Personalise learning
- Bring together the 'what' and 'how' - the content and the way content can be explored or developed - the thinking and doing of mathematics.

What do we mean by *thinking and working proficiently in mathematics*?

The National Curriculum³ describes the four proficiency strands in the national mathematics curriculum as:

- √ **Understanding**, which includes building robust knowledge of adaptable and transferable mathematical concepts, the making of connections between related concepts, the confidence to use the familiar to develop new ideas, and the 'why' as well as the 'how' of mathematics.
- √ **Fluency**, which includes skill in choosing appropriate procedures, carrying out procedures flexibly, accurately, efficiently and appropriately, and recalling factual knowledge and concepts readily.
- √ **Problem solving**, which includes the ability to make choices, interpret, formulate, model and investigate problem situations, and communicate solutions effectively.
- √ **Reasoning**, which includes the capacity for logical thought and actions, such as analysing, proving, evaluating, explaining, inferring, justifying, and generalising.

These processes of *thinking and working proficiently in mathematics* are incorporated into Numeracy Circles.

³ Commonwealth of Australia 2009 *Shape of the Australian Curriculum: Mathematics*, Commonwealth of Australia, ACT.

Key features of Numeracy Circles:

- All students can be successful
- A balance of group and individual work
- Different groups can do different tasks
- Groups meet on a regular, predictable structure to discuss their tasks
- Groups work towards a common goal
- Creates discussion
- Group meetings aim to be open, natural conversations about tasks, so personal connections, digressions, and open-ended questions are welcome
- Students play a rotating assortment of roles to develop different ways of thinking
- The teacher serves as a facilitator, not a group member or instructor
- When finished, students share with their classmates
- Allows students to take risks ie experimentation (no right answers), discovery and exploration in a safe environment
- Gives children time to develop hypotheses and to work on solutions
- Adaptable to many levels
- Evaluation is by teacher observation and student self evaluation
- Incorporates aspects of the Mu dictionary⁴ and the [Four Roles of a Numerate Person](#)⁵ (see Appendix).
- Students are learning to think and work proficiently in mathematics

Key ingredients in effective, collaborative task group discussions:

- Clear expectations
- Well-structured activities
- Groups have genuine autonomy and responsibility
- Discussion tasks or prompts are open ended
- Discussion topics come from the students
- Conflict resolution mechanisms are in place
- Group meetings aim to be open, natural conversations about tasks, so personal connections, digressions and open-ended questions are welcome
- A spirit of playfulness and fun pervades the room.

The Numeracy Circle Process

Once students are familiar⁶ with Numeracy Circles the following process could be used:

1. Each group of students chooses their own problem-solving task. (I have out a selection of tasks related to planned curriculum outcomes.)
2. Small groups are formed, based upon task choice. (Numeracy groups could also be already defined and which are multi-ability, multi-age).

⁴ Atkin J. 2008 *Knowing the Power of Four*, accessed online Oct 2009, <http://www.learning-by-design.com>

⁵ Maureen Forrest 1997 Four Roles of the Literate Learner, Freebody & Luke (1990/1999) Multiliteracies Map, Early Years Literacy Project, DECS S.A. 2005

⁶ The Numeracy Circle roles will need to be taught to students. I've done this by having the whole class take on the one role at a time, ie everybody is the Creative Connector, and we do the one task together. By doing it this way, everyone can all talk about the one role together and the different responses and ideas that the role generates.

3. Different groups solve different tasks⁷. (Depending on the mathematical experiences students already have, the processes and strategies for problem solving may need to be taught.)
4. Students determine which role they will take on within their group. They use written or drawn notes to guide both the problem solving and discussion with the relevant role sheets to guide them.
5. When tasks are finished, students share with their classmates. Refer to the following section for more details about how this can be done.
6. Once the Numeracy Circle discussion has finished students can form new groups around new task choices for next time. In newly forming groups, students play a rotating assortment of task roles. (Students could also share a role and work together). Alternatively, students can be in the same role for several tasks either in the same group or a newly formed group.

Numeracy Circle process when task has been completed

1. **Choose Leader** – Students choose a discussion leader. This person will be student Number 1, with others numbering off clockwise around the group.
2. **Share Role Responses** – Starting with the leader, take turns giving your response. Follow this format:
 - 1) Student Number 1 talks to their response sheet to the group. Starting with student Number 2, each student is encouraged if necessary to respond in some way:
 - ‘I agree...’
 - ‘That’s interesting because...’
 - ‘I like...’
 - ‘I see your point but...’
 - 2) Student Number 2 gives response.
 - 3) Starting with student Number 3, everyone responds.
3. Continue until all have given their role response and others have responded.
4. **Discuss** – Leader asks if anyone would like to discuss anything else about the task. You can tell your favourite part, make predictions, give your opinion about things, ask questions about parts you don’t understand, etc.
5. **Decide** – Decide which task you would like to do for the next meeting. Write this down in your journal.
6. Students can keep their role sheets/responses in a journal. They can also be used for evaluation purpose etc⁸.

⁷ It’s also really interesting to see what different groups come up with when solving the same task.

⁸ Students could storyboard the task and create a group recount or similar for a slideshow. These could then be linked in their electronic student portfolios.

What are the Numeracy Circle roles?

Artful Artist

Artful Artist is encouraged to construct mental images of the problem solving and to illustrate or make a representation of it. This could be the context, a specific problem, an exciting part, a surprise, a prediction of what could happen next, an equation, a graph or an interesting way of recording or organising important information. They can use different forms of mathematical representation or texts from concrete and diagrammatic to symbolic or abstract. Their response is representative of thought and action and could encompass aspects of the different Numeracy Circle roles.



Visualising mathematics is an important step in developing conceptual understandings and analogies and the Artful Artist role encourages students to create and use their own ways to represent the mathematics, such as their own symbols, to 'map' and transfer their thinking for others to see. It helps them to develop frameworks for organising and remembering what has happened and to be able to represent, retrieve and communicate information.

Creative Connector

Creative Connector finds connections between the task and the world outside and encourages personal contextualisation and connections. This means connecting and relating the task to: their own life happenings at school or in the community; similar events at other times and places; other people or problems; other tasks; other patterns; data; strategies; similar problems and helps the student to connect new concepts with old or familiar contexts.



Creative Connector encourages students to give personal anecdotes and a personal touch to the Numeracy Circle and to bring in prior knowledge.

Discussion Director

Discussion Director writes down some good questions they think the group would want to talk about (and considers possible answers) and poses problems e.g. Can we check this another way? / How many solutions are there? Could we have done this a better way? What are the maths concepts being used here, what do they mean? What are the patterns, the rules, the formulas? Are they right/wrong and why? What other information can help explain what we've done and where can I go for more information about the mathematics. By asking questions the Discussion Director helps to de-contextualise the task by digging out the mathematics and stimulating discussion about it.

Being able to create and generate questions is as important as being able to answer them. Questions are generally about *why*, *when*, *where*, *what* *how* and *who*.



Numeracy Luminary

Numeracy Luminary selects parts of the task that they want to talk about with their group. These can be strategies used, students' reactions (e.g. humour, frustration) and why they think students responded this way; what information surprised them (and why); what they considered to be the most important thing they've learned. They can also talk about ways to explore the learning further or deeper and consider how to create something new or make predictions or inferences?



The Numeracy Luminary re-contextualises the task by coming up with questions and answers about how the learning might be used in their lives or in other or unfamiliar contexts. It encourages students to create another problem from what we've found out.

Word Wizard

Word Wizard looks for special words, language and literacies to describe what they've done. Words that are new, different, strange, funny, interesting, important, hard, the language of maths used by students. They could be key words that define a concept. They can look for words that can be built on eg verbs and how they can be nominalised (*multiply* and *multiplication*) or used in other ways eg have other meanings; find the opposite meanings; break down or chunk words and examine; relate new words to previous tasks, experiences; associating an experience or a concept to a new word/words; find other related words or phrases or discuss how words are related to each other.

Word Wizard helps students to make connections and comparisons between home language and school language; the language of numeracy with the language of mathematics; practical discourse and technical discourse; and, social discourse with academic discourse and what fits between.

The role sheets

The following role sheets will assist students in developing the different ways of thinking, critiquing, imagining, exploring, discovering and creating in the tasks and within the mathematics, numeracy and problem-solving generally. The language used in the role sheets can be adapted according to your students' year level.



ARTFUL ARTIST



Name: _____

Problem Solving Task: _____

You are the Artful Artist. Your job is to make a 'representation' eg a model or drawing about the task and the maths. It can be a sketch, cartoon, diagram, an equation, flow chart, graph or stick figure scene. It could be of something that was talked about in the task, something that the task reminded you of, or something that tells an idea or feeling you got from the task. Any kind of model or drawing or graphic is okay. You can even label things with words if that helps. Make your representation on this paper. It could be of:

- The people in your group
- The stages you went through to solve the task
- The context (or story) for the task
- An equation or symbols that show what you did
- The final result
- Some further activities you could do with the task
- Something you predict could happen
- Things people did

Do any kind of 'representation' you like. When your group meets, don't tell what your drawing is. Let them guess and talk about it first. Then you can tell about it.



CREATIVE CONNECTOR



Name: _____

Problem Solving Task: _____

Your job is to find connections between the task your group is doing and the world outside. This means connecting the task to your own life, happenings at school or in the community, similar events at other times and places, or other people or problems that this task brings to your mind. You might also see connections between this task and other tasks. There are no right or wrong answers here. Whatever the task connects you with is worth sharing. You could make connections with:

- Your own life or feelings about something
- Similar events at other times and places
- Happenings at school or in the community
- Other people's problems that you are reminded of
- Something in the newspaper or on television
- Other tasks, patterns, data, strategies
- How you could use your learning from the task in everyday living

Some things today's task reminded me of were:

- _____
- _____
- _____
- _____

Write two questions that will prompt the group to make connections.

- _____
- _____

When you meet with your group, share your connections and then ask the group your two questions to begin some discussion.

DISCUSSION DIRECTOR



Name: _____

Problem Solving Task: _____

You are the Discussion Director. Your job is to write down some good questions or ideas that you think your group would want to talk about or you'd like to ask them. These could be about:

- What was going through your mind while you did the task?
- How did you feel while doing the task?
- What was discussed during the task?
- Did today's task remind you of any real-life experiences?
- What questions did you have when you finished the task?
- Did anything in this task surprise you?
- What are the one or two most important ideas / concepts?
- What are some things you think will be talked about?
- Could we have done it better? / How can we improve it?

1. _____

2. _____

3. _____

4. _____

5. _____

Hint: Begin a question with: Why... How... If... Who... What...eg: Can I check this another way? How many solutions are there? What happens if? How will I know when I've found all the solutions?

WORD WIZARD



Name: _____

Problem Solving Task: _____

Your job is to be on the lookout for a few especially important words, phrases or symbols in today's task that explain or describe what's happened. If you hear or find any that are puzzling or unfamiliar, write them down while you're doing the task. You may also run across familiar words or phrases or symbols that stand out somehow - that are repeated a lot, are used in an unusual way, or provide a key to solving the task or explaining something.

Write down these special words and phrases and symbols, and be ready to point them out to the group. When your circle meets, help members to discuss them. They could be:

- New
- Strange
- Different
- Important
- Interesting
- Hard
- Words that can be made into new words
- Have other meanings
- Words that relate to another word
-

Word/phrase/symbol

Why I picked it

NUMERACY LUMINARY



Name: _____

Problem Solving Task: _____

Your job is to pick a part of the task or something about the task that you want to tell your group about.

This could be:

- Something that should or could be investigated further
- An interesting part ie an 'aha' moment
- A pattern you saw or made
- A connection you've made between what people did to solve the problem
- Strategies used to solve the task (eg writing an equation, making a list, trying all possibilities, making a model, acting it out)
- Interesting things that learners said
- Skills used by students (eg adding, dividing)
- Maths concepts (scale, even, time, measurement, angles, shapes)
- Students' reactions (humour, frustration, puzzlement, amazement)
- A prediction about what could happen next

When you find the part, write why you have chosen it:

An example of Numeracy Circles in action: Footy Trip

Footy Trip is a problem-solving task from the *Interactive Numeracies* resource. Use the processes and materials in the preceding pages in conjunction with Footy Trip as outlined in the next few pages. It is recommended that you become very familiar with the task and the Numeracy Circles format before you unleash them on your students!

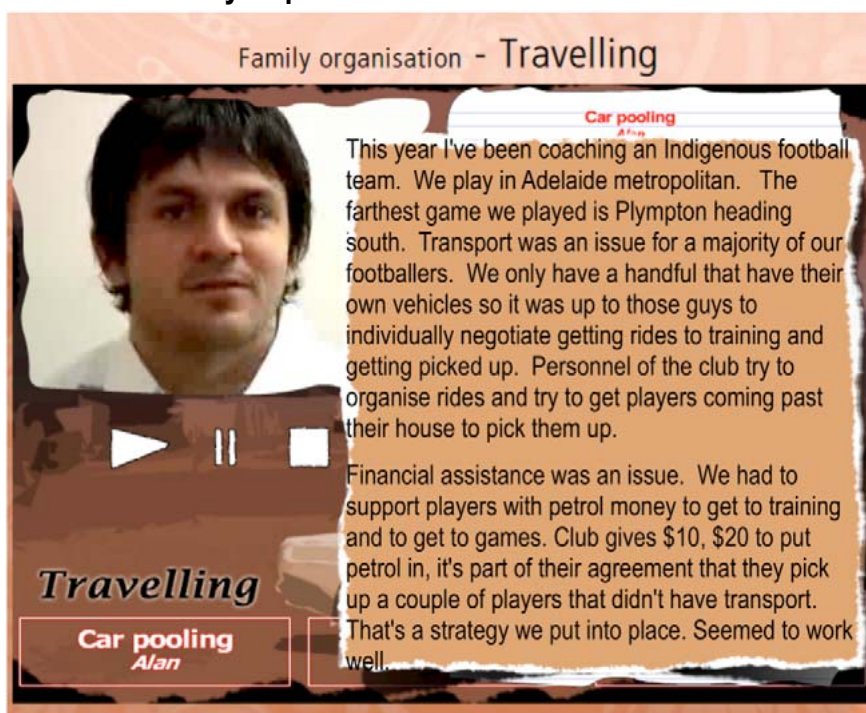
Footy Trip is a great example of a rich problem-solving task that can be used in Numeracy Circles. It is easily adaptable and extendable and, generally, can be used from Years 3/4-9. Students will be engaged in working mathematically in a number of ways including:

- Basic number operations
- Patterning
- Algebraic thinking.

The *Interactive Numeracies* resource houses seven problem-solving tasks in a sturdy, metal case. Each of the tasks derives from one of three contexts: shopping, socialising and family organisation. These contexts were chosen as they are familiar to many Indigenous families and communities and Indigenous learners in schools. Footy Trip is based on the well-known problem-solving task Crossing The River. It sits within the context of family organisation and presents a familiar situation that provides great opportunities for the teaching of mathematics through contextualising mathematics. Through the Numeracy Circles process outlined in the preceding pages, students can then decontextualise the learning, play with the mathematics and then re-contextualise these by applying their new learning to other situations and contexts.

The *Interactive Numeracies* resource provides narratives (video on CD-Rom) from community members who talk about numeracy situations and contexts. For example, the following excerpt provides a lead into the Footy Trip task with Alan talking about picking up various players on the way to the footy. Note the rich mathematical language Alan uses in his story.

The story behind the task Footy Trip



Family organisation - Travelling

Car pooling
Alan

This year I've been coaching an Indigenous football team. We play in Adelaide metropolitan. The farthest game we played is Plympton heading south. Transport was an issue for a majority of our footballers. We only have a handful that have their own vehicles so it was up to those guys to individually negotiate getting rides to training and getting picked up. Personnel of the club try to organise rides and try to get players coming past their house to pick them up.

Financial assistance was an issue. We had to support players with petrol money to get to training and to get to games. Club gives \$10, \$20 to put petrol in, it's part of their agreement that they pick up a couple of players that didn't have transport. That's a strategy we put into place. Seemed to work well.

Travelling
Car pooling
Alan

The Footy Trip task

The following two pages (pp 16-17) are copied from the Interactive Numeracies resource and provide the necessary information to complete the task. However, you don't need the actual task itself from the Interactive Numeracies resource – just follow these instructions...

Materials required per group: 3 counters of one colour which will be the 'adults' in the task and 2 of another colour for the 'children'. Alternatively, you can get the class to act it out or role-play but make sure they can delineate between adults and children. I often give the 'children' hats to wear. I've found students – and teachers – love *being* the mathematics by acting this out.

Here's the problem to solve:

Three adults are travelling on a dirt track to get to a footy game when their car breaks down. They start walking across a paddock to get to the main road.

Two children on a motorbike come along and agree to help the adults get across the paddock to the main road.

The motorbike is so small it can only carry 1 ADULT OR 1 OR 2 CHILDREN. Everyone can ride the bike. How many trips will be needed for everyone to get to the main road?



What to do:

A great way for using the task in the classroom is to begin with the whole class. Five students become the 'adults' and the 'children' and act it out as suggested above. They will need to work out the hows and whats of the trips and will engage in some interesting discussion.

Alternatively, the onlooking students could be asked to have a go and move the 'adults' and 'children' across the paddock to make the necessary trips to the main road.

Once the whole class role-play has occurred students can then form their groups and begin their Numeracy Circle.

Footy trip

Goal: to use logic, algebra and patterning to solve a problem

You need

- > 3 adults and 2 children models
- > one playing board
- > 1 or more participants.



What happens

Three adults are travelling on a dirt track (see playing board) to get to a footy game, when their car breaks down. They start walking across a paddock to get to the main road.

Two children on a motorbike come along and agree to help the adults get across the paddock to the main road.

The motorbike is so small it can only carry 1 ADULT **OR** 1 OR 2 CHILDREN. Everyone can ride the bike.

What to do

Calculate: How many trips will be needed for everyone to get to the main road?

Challenge yourself further

How many trips would be needed if there were:

- > 4 adults and 2 children?
- > 8 adults and 2 children?
- > 11 adults and 2 children?



Where the task came from

Transporting people to sports matches can sometimes be tricky if there are more people than seats in cars. Often more than one trip might be needed to get everybody there.

Other times, car pools are organised to pick up players who don't have their own transport.

The numeracies include...

- > getting people or things from one location to another
- > organising trips such as shopping trips, trips to footy matches.


The mathematics include...

- > thinking through the options and determining which way is the best or only way to get the necessary result.

Curriculum framework key ideas

- > recognising relationships within different number concepts to make sense of, and represent numerically, a range of community activities and social processes
- > using computational tools and strategies, and understanding and representing the thinking processes used to solve problems
- > identifying, describing, constructing, representing and predicting patterns and relationships when working with data, measuring and calculating. Learners relate these patterns and relationships to their everyday lives
- > demonstrating, recording and reporting on logical and critical thought processes by searching for and abstracting generational algebraic representations from patterns drawn from current social situations
- > employing everyday language and mathematical symbols to represent and communicate generalisations about mathematical situations and structures (eg calculating petrol costs per person and how many people will cover the costs)
- > analysing mathematical structures and using algebraic formulae to represent situations. Learners develop further the capacity to express themselves and to solve problems involving linear relationships.

Educator options

- > Monitor and assess to inform future practice:
 - what questions are the learners asking
eg 'What's the best way to start?' 'Is there more than one way to solve this?'
 - what do you hear the learners talking about?
eg how they worked it out; comparing answers and ways of recording trips
 - what strategies are the learners using?
eg did they record the trips or keep a tally  of each trip?
- > Give learners a hint by asking who they think should be making the first trip on the bike.
- > Suggest learners try different numbers of adults and children.
- > Work out the **formula** and use for different numbers of adults.

Learner options

- > Change the rules *eg only one of the children can ride the bike.*
- > Draw a community map and give a pathway for picking up people (ie mapping) to go shopping etc.

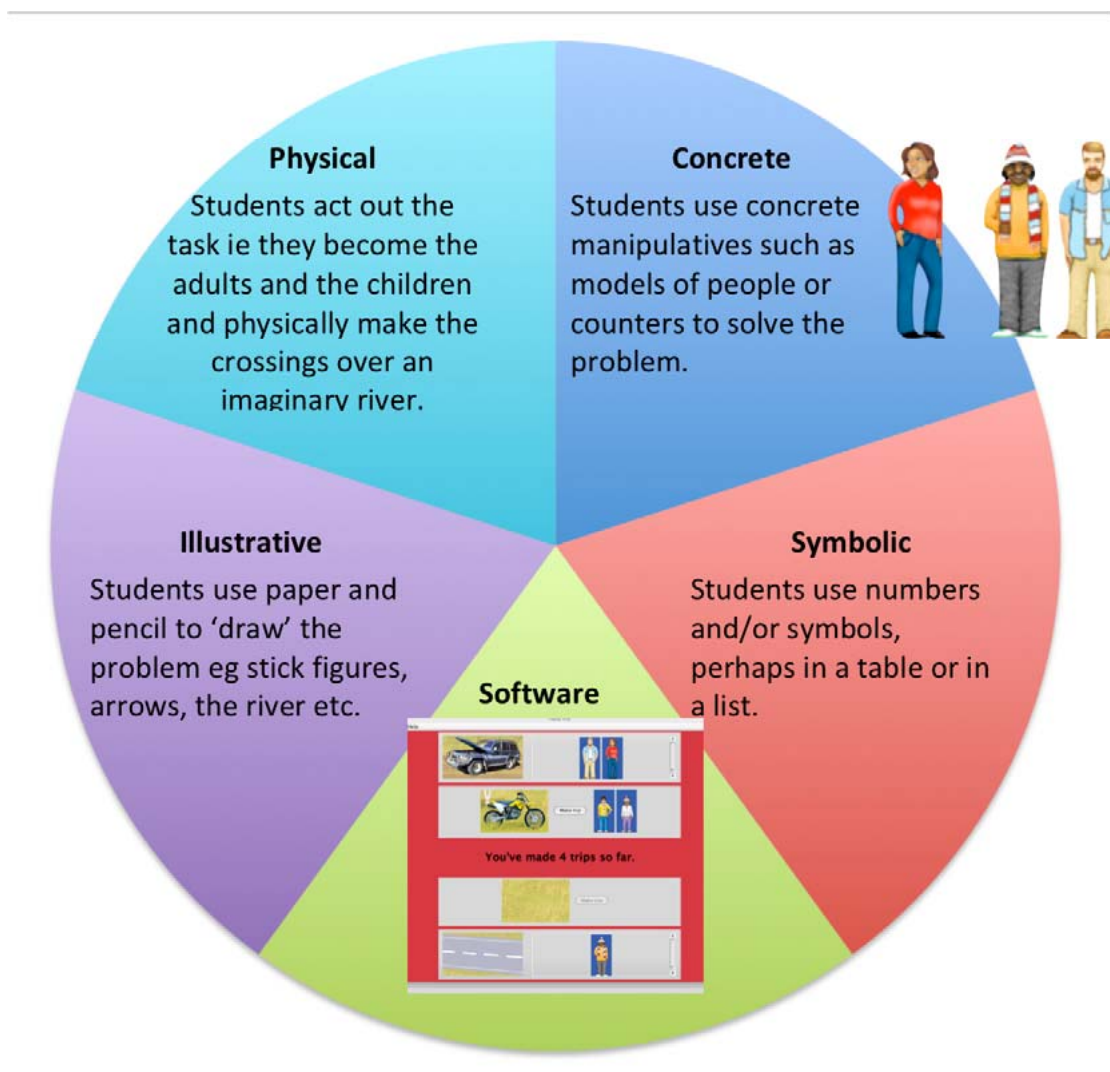


Link to CD: Family organisation
> Next > Travelling

Multi-modal learning and mathematical representation

Footy trip offers great opportunities for **multi-modal learning** in solving the task and in different ways of representing and recording the mathematics, for example, in tables and graphs. These are further described on the next page in the Numeracy Circles and the Mu Dictionary diagram. I like get students to experience the different modes so they can make connections between them and weave threads of understanding between them as they become more experienced mathematicians.

Different modes for solving (and playing with) Footy Trip⁹



⁹ The software section in this diagram refers to the software available in the *Interactive Numeracies* resource.

Footy Trip in action

Discussion Director

DD asks questions to define and describe what they've done eg about patterns, concepts, rules, equations, formula, operations, what if, why, how, who, when to encourage others to analyse what's happened and what they've done.

Student might talk about the importance of the rule which helps to determine the formula ie only one adult or one or two children can row the boat at a time, no-one is allowed to swim or use a rope ie the pattern needs to be repeated four times to get the three adults to the other side...and use an equation...

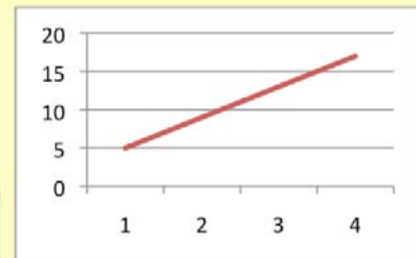
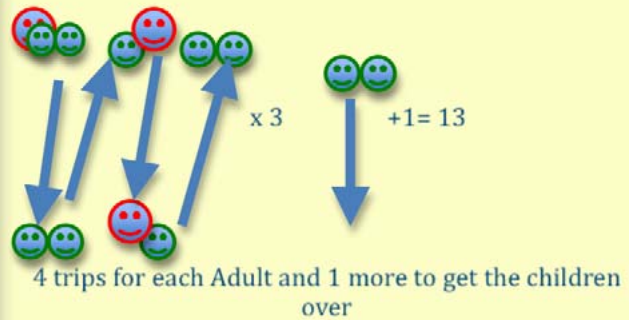
$$(4xA) + 1 = 13$$

$$4x + 1 = 13$$

Student may also ask questions of the group asking for clarification.

Artful Artist

AA gives a model or illustration, conceptual analogy, graphic / symbolic representation, images, metaphor...



Numeracy Luminary

NL bases their discussion on any combinations of the other 4 roles and can make connection between them. Gives ideas for exploring the learning further and deeper.

Word Wizard

WW focusses on, and gives examples of, appropriate language that describes the learning and the hows eg concepts, strategies, processes, key or important words, the ways they've recorded information.

Student might talk about the strategy of looking for patterns, recording data in tables, the language that describes the process or steps they went through to solve the problem eg 'firstly we acted it out and someone recorded the number of trips for each person. Then we realised there was a pattern and developed a hypothesis (this word means we had an idea that we wanted to try out)...'

Creative Connector

CC relates to themselves, their experiences and feelings by giving a story or anecdote...



Student might talk about the day the family went to a footy grand-final and the experience, how they felt etc.

¹⁰ © Julia Atkin, 2008

Appendix: FOUR ROLES OF A NUMERATE LEARNER

This framework is for educators to critically examine practice and consider the comprehensiveness of numeracy programmes. The examples below are only some of the aspects that might be included under each role.

FUNCTIONAL USER – (SKILL)	MEANING MAKER – (CONCEPT)
<p>How do I crack this code?</p> <p>Understanding the patterns and processes</p> <ul style="list-style-type: none"> ➤ Number: e.g. numerals and counting, patterning, equations, formulae, percentage, decimals and fractions ➤ Measurement: e.g. units of length, mass and capacity, comparisons, estimations, measurement and calculation of time, money ➤ Chance & Data: e.g. probability, collection and organisation of data, sequencing, classification, tables diagrams and symbols ➤ Space: e.g. recognition, construction and analysis of 2D and 3D shapes, rotations, reflections and translations, use of spatial language, features of Mathematical figures and objects ➤ Algebra: algebraic notation, graphs, and equations 	<p>How do I make meaning and understand this?</p> <p>Understanding how different processes and concepts operate and link</p> <ul style="list-style-type: none"> ➤ Thinking and working mathematically ➤ Drawing on background knowledge of the context ➤ Relating previous experiences with similar tasks ➤ Transferring knowledge/interpreting ➤ Seeing own interests and lifestyles reflected in contexts ➤ Having an understanding of how Mathematics is used in life ➤ Developing an understanding of the Mathematics of other groups and cultures ➤ Understanding the literacy of Mathematical questions eg which words describe the concept, the process and the technical aspect ➤ Questioning and responding
CRITICAL ANALYSER –(ANALYSIS)	TRANSFORMER –(APPLICATION)
<p>What does this do to me?</p> <p>Understanding that numeracy is not neutral and can be challenged</p> <ul style="list-style-type: none"> ➤ Able to comment critically on the strengths and weaknesses of various forms of data collection, analysis and display in terms of what information can be obtained from them and what conclusions might be drawn ➤ Able to see how the Mathematics is used and has been used to represent, describe and explain our world ➤ Able to discern who benefits and who doesn't benefit from the Mathematics being used ➤ Having the skills to question, reflect and respond ➤ Exploring the intention of the author/illustrator/composer 	<p>How do I use this information in a new way?</p> <p>Understanding the appropriate tools, techniques and processes to use in new and different situations</p> <ul style="list-style-type: none"> ➤ Able to select, integrate and represent Mathematical ideas, relationships and information in a new way ➤ Applying appropriate Maths formats and methods for particular purposes ➤ Using Mathematical language appropriate to the context ➤ Able to select, decide, choose and use tools, techniques, processes ➤ Relating maths to real life experiences and applying in non routine situations using established understandings ➤ Applying mathematical concepts and processes to create and design new ideas