This paper focuses on the role of language and some issues associated with identifying appropriate language of instruction for three foundational Maths ideas in the Early Years of schooling. These are considered in relation to the project: Strong Literacy and Numeracy in Communities – Numeracy Component. This had two broad goals, firstly to work with paraprofessional Indigenous teachers to determine an effective language of instruction for specific foundational numeracy concepts and secondly, to create a resource to enable this to be shared. Only two of the project sites are considered here. Both are in Yolŋu communities in northeast Arnhem Land, where English is not widely used for interaction. We focus on the use of first language, Djambarrpuyŋu, for the children’s concept development. The English language that can be used is determined by what is possible for early second language learners. We will share some samples of the Djambarrpuyŋu identified for teaching early number ideas. We will describe the process by which suitable expressions for the key ideas in Djambarrpuyŋu were identified and some issues that arose regarding the use of language for comparing numbers. The project showed how ‘Maths’ lessons are a time both for concept development and for language development.

**KEY WORDS:** mathematics, Indigenous education, first language instruction, Early Years, Djambarrpuyŋu

**INTRODUCTION**

This paper reports on work within the numeracy component of the Strong Literacy and Numeracy in Communities (SLNC) project which focussed on Early Years (Foundation – Year 2) education within the Number strand of the Mathematics curriculum, undertaken by the Northern Territory Department of Education (NTDET) between 2010 and 2011. Its aim was to help Indigenous students build effective foundational numeracy concepts. The active strategies in the project for achieving this were twofold. The first involved working directly with paraprofessional Indigenous teachers to develop effective instructional approaches with a strong focus on the use of first language. The second was to produce a resource to facilitate...
the replication of these approaches by teaching teams in other locations. The resource was to use three languages of the NT: English, Kriol and Djambarrpuyŋu. This paper will report only on the work with Djambarrpuyŋu speakers. The resource produced is called Talking Namba (Northern Territory Government, n.d.; see also Bradbury, forthcoming) and can be accessed at: http://www.talkingnamba.net.

Most of the Yolŋu paraprofessional teachers were working as Assistant Teachers and we will refer to them as ‘YP/ATs’ – Yolŋu Paraprofessional/Assistant Teachers. John Bradbury was the Numeracy consultant managing the project. Melanie Wilkinson is a NTDET linguist with expertise in Yolŋu languages. Students involved were selected by the YP/ATs.

We stress that this was a pilot project and this paper reports on work conducted in 20 contact hours between Djambarrpuyŋu-speaking YP/ATs and the two authors, in two schools during five 2–2½ day visits over five school terms. This restricted how much Djambarrpuyŋu could be included in the resource and the number of foundational concepts considered.

We will provide some background to the sites for this project, to the research informing it and to some of the mathematical concepts. We will then describe the process by which mathematical understandings and language was developed and present some examples of the language used in YP/AT-student interactions. We conclude with some reflections on what was achieved.

BACKGROUND TO THE TWO YOLṈU PROJECT SITES

Work with the Djambarrpuyŋu paraprofessional teachers was undertaken in two schools in Yolŋu communities in northeast Arnhem Land. These communities were established as missions in the latter half of last century and until the arrival of communication infrastructure, for example, radio, televisions and phones during the 1980s, were largely isolated from mainstream Australia.

In both communities the evolving lingua franca is the Yolŋu Dhuwal variety often referred to as Djambarrpuyŋu. It is the first language of most students and the main language of daily life. English is spoken to some degree by all adults but many require interpreters for interactions with institutions such as Centrelink and the Courts. As well as limited use of English, cultural practices around number, which are common in wider Australian society, are not as entrenched in the homes or communities these children belong to.

Government primary schools have been in place since the early 1970s. One school has had a bilingual program since the 1980s, with both languages formally recognised as languages of instruction and literacy introduced through Djambarrpuyŋu. The other school is a designated English-medium school. For most children English is seriously encountered only when they enter school. In both schools the language and cultural demands of Early Years and Primary classrooms is provided for by teaching teams consisting of a teacher and an assistant teacher.
(AT) position. The most common teaching team consists of a Yolŋu Djambarrpuyŋu-speaking AT and a non-Indigenous English-speaking teacher. The challenge for these teams is how to best utilise the linguistic and pedagogical expertise of the team for the students’ learning.

EARLIER RESEARCH

While somewhat peripatetic, and with findings not always at the core of classroom practice, research into the teaching of mathematics in the two sites has a local/regional history. During the 1980s attention to the learning of mathematics in remote Indigenous contexts in the NT followed the establishment of several Bilingual programs. Questions were raised about the mathematical background of the students and attention given to the language of instruction. Research encompassed different Indigenous peoples of the NT, including the Yolŋu (e.g. Graham, 1986, 1988; J. Harris, 1987; P. Harris, 1991; Rudder, 1983). Many of the research findings pertaining to instructional language in the learning of mathematics remain as true a reflection of the situation today as they were then. For example:

[Instruction in English] can seriously jeopardise the younger child’s chance at grasping the important basic concepts on which later learning of mathematics is built. The young child will be forced to learn foreign ideas in a foreign language which he has barely begun to speak… (P. Harris, 1980, p. 27).

This was followed by work by Yolŋu and other educators on the place of Yolŋu and ‘Western’ knowledge systems in the learning of Maths (see Cooke, 1991, and Yolŋu consultants consider maths in Aboriginal communities [Charles Darwin University, n.d.]). At the Yolŋu community of Yirrkala this led to the development of the local Garma Maths curriculum (See Marika, Ngurrwutthun & White, 1989; Ngurrwutthun, 1991; Watson-Verran, 1992; Yunupingu, 1991).

More recently there has been attention to the teaching of mathematics to Indigenous students in other parts of Australia, for example through the Maths in the Kimberley Project (see Sparrow, Kissane & Hurst, 2010), Numeracy in a regional setting in Western Australia: Some things different (Commonwealth of Australia, 2013b), RoleM in Queensland (Department of Education, Employment and Workplace Relations and the Australian Catholic University, n.d.) and Numeracies in Indigenous Communities in South Australia (Commonwealth of Australia, 2013b). There has also been some research targeting the role of the Indigenous paraprofessional in the classroom (e.g. Bautro, 2008; Siemon, 2010) and calls for culturally responsive mathematics pedagogy for indigenous students (Matthews & Morris, 2011).

The importance of language in mathematics teaching is acknowledged in recent work (e.g. McDonald, Warren & DeVries, 2011; Niesche, 2009) and some studies provide explicit samples (e.g. Warren, Young & DeVries, 2007). However, none detail the use of Indigenous first languages in the learning of mathematics, which was the primary objective of our project.
The need to attend to the use of Indigenous first languages in learning is also acknowledged in recommendations from two recent inquiries. Silburn, Nutton, McKenzie and Landrigan (2011, pp. x–xi) focus on the NT and House of Representatives Standing Committee on Aboriginal and Torres Strait Islander Affairs (2012, Recommendations 13–15) was nationwide. Both inquiries took into account research from within Australia and internationally.

THE SNLC – NUMERACY PROJECT

The research that directly informed the SLNC – Numeracy pilot project was conducted at one of the sites between 2006 and 2009. Titled Building Community Capital to Support Sustainable Numeracy Education in Remote Locations and led by Professor Dianne Siemon, it provided findings fundamental to the SNLC – Numeracy project, namely:

1. “Exploring key ideas in Number and ways to introduce these ideas to children … is an important step in developing Yolŋu adults’ knowledge and confidence to support the teaching and learning of school mathematics”; and
2. “It is essential that Yolŋu adults use children’s first language in introducing key ideas in school mathematics” (Siemon, 2010).

This research highlighted the importance of ensuring clarity around the specific conceptual knowledge being addressed, along with a need to minimise problematic culture-based assumptions (e.g. that ‘sharing’ implies equal division).

The description of Mathematical ‘Big Ideas’ (Siemon, 2007) provided an effective referent, enabling a useful deconstruction of ‘Number’. Consequently a Progress Map was produced collaboratively by Dianne Siemon and John Bradbury using these Big Ideas to guide the selection of foundational key concepts. The key concepts incorporated were selected for their essential role in early number understandings and included Counting, Comparing (and sequencing), Matching numerals to collections, Subitising, Part-Part-Whole and Place Value (see Figure 1).

The Progress Map was organised as a developmental pathway for the foundational key concepts and mapped to the Number strand of the Australian Curriculum. It provided the basis for the Talking Namba resource developed for classroom teaching teams (for further information see the Talking Namba resource [Northern Territory Government, n.d.]).

Specific activities are linked to each step of the developmental pathway in the Progress Map. These were selected so as to incorporate proven mathematical (Sullivan, Jorgensen & Youdale, 2009) and ESL (Song, 2006) pedagogies including:

- Focus on language
- Building on what students know
- Clear intent
- Engaging activities (i.e. group work, interactivity etc.)
- A variety of concrete representations
- Explicit concept building from concrete to abstract representations
- Building automaticity where appropriate.

SCOPe OF THE SLNC–NUMERACY PROJECT IN THE TWO YOLṈU SITES

The language specific goals in the two YolṈu communities were:

1. To establish an effective language for constructing Number understandings for both paraprofessionals and for students in the Early Years. This would focus on the language, Djambarrpuyŋu, shared by the YP/ATs and the students.

2. To make recordings for the Talking Namba resource in Djambarrpuyŋu, including:
   a. Delivery of three activities in developmental sequence by a YolṈu paraprofessional for the key number concept (KNC) focused on in each site (see Figure 1);
   b. Explanations of the key number concept behind the activity; and
   c. Examples of focus language for teachers to use in their classrooms around these concepts.

At one site the conceptual focus was Subitising while at the other it was Comparing. Subitising is the ability to instantly recognise the number of objects in a small group without counting while Comparing (numbers) forces attention on the relative quantitative value of numbers as well as the positional connection to this value on a number-line.

English language use was not specifically targeted in the project but some examples of the English in that arose in YP/AT-student interactions will be described.

Video recordings for the three activities around Subitising and Comparing were completed. The work on explanations was more challenging and only descriptions of the activities were obtained in Djambarrpuyŋu, not full explanations of the key number concepts.

The Djambarrpuyŋu heard in videos for the activities related to the other three key concepts (Counting, Part-part-whole/Place Value and Matching numerals to Collections) came about through a different strategy. In these, Djambarrpuyŋu translations were dubbed over the speech of the English-speaking Indigenous paraprofessional teacher. This translation-dubbing strategy was the source of all the Kriol language in Talking Namba videos.

WORKING TOGETHER WITH YOLṈU PARAPROFESSIONAL/ASSISTANT TEACHERS

Through a number of contact sessions with the authors, the AP/YTs developed their own understandings about what students need to learn. They also developed proficiency in how to teach number to students through specific activities using accessible and effective language.
The focus on both Number and on identifying effective instructional language was established in the initial visit. This included discussing the use of Djambarrpuyŋu, the YP/ATs and students’ first language, and the importance of the YP/AT’s talk during an activity for helping students learn. The links between activities and particular KNCs, as well as the developmental stages the activities related to, were made explicit during each visit using the Progress Map (see Figure 1).

The nature of the work in the contact sessions ranged from professional development-like workshops, model lessons, to professional collaborations. Most were based around one or more of the maths activities that had been selected for the resource. These were all ‘hands on’ activities that could be shared and talked about allowing everyone a concrete access point. The use of English and Djambarrpuyŋu varied according to the language background of the participants and who they were addressing.
The Key Number Concepts addressed in the two Yolŋu schools are highlighted.

### Whole Number

#### Counting

- **Counts to 10 with support using number naming sequence:**
  - Counts collections to at least 10 starting from 1
  - Counts forwards and backwards from known, conceptual, or given number in range 1 to 10
  - As for previous level but in range to 100 (can count by 2s, 5s, or 10s from 0)

- **Counts forwards and backwards in place-value parts (tens and ones), starting from any number, in range to 999**

- **Counts in range to 9999**

#### Number lines, comparing, ordering and locating

- **Uses language to compare two small collections (eg, big, bigger, biggest, more than, less than, ...):**
  - Reads numerals to 10
  - Reads numerals to 99, locales to 10
  - Reads, compares and orders numbers to 99
  - Reads, compares, and orders numbers to 999

- **Recognizes numbers to 10 in terms of their parts (eg, 5 is 4 and 1 or 6 and 4):**
  - Recognizes numbers to 10 in terms of their parts (eg, 9 is 6 and 2, 1 more than 7, less than 10...)
  - Recognizes tens numbers in terms of their tens' structure (eg 10 and 5 is 15)

- **Identifies place value of digits in 2-digit numbers (eg, 17 is 1 tens and 7 ones):**
  - Identifies place value of digits in 3-digit numbers (eg, 47 is 4 hundreds, six tens and 7 ones)

- **Recognizes 2-digit numbers in terms of place-value parts (eg, 67 is 6 tens and 7 ones):**
  - Recognizes 2-digit numbers in terms of their tens' structure (eg 10 and 5 is 15)

### Whole Number System

#### Number and Number system

- **Whole numbers focus area for the Early Years:**
  - A full version can be downloaded from Talking Namba.

#### Progress Map

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**ARTICLES**

**NUMBER AND TWO LANGUAGES IN THE EARLY YEARS: REPORT ON A PROJECT WITH PARAPROFESSIONAL INDIGENOUS TEACHERS IN TWO NT NORTHEAST ARNHEM YOLṈU SCHOOLS**

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Typically, the structure over a session or series of sessions for the work on the activities would include:

- Introduction of the activity and discussion of the underlying Maths concept (English);
- Discussion and further refining of the Maths concept (English/Djambarrpuyŋu);
- Role play – delivery of activity by a YP/AT to peers acting as students (Djambarrpuyŋu);
- Discussion about the activity including issues, language of instruction, etc. (Djambarrpuyŋu/English);
- Trial delivery of activity to children (mainly Djambarrpuyŋu);
- Discussion to further refine language and delivery (English/Djambarrpuyŋu); and
- Final delivery of activity to children – video for the resource (mainly Djambarrpuyŋu).

The learning was highly collaborative. Participants engaged fully with the role-plays, often with a sense of fun. A person not so skilled with an activity was scaffolded by others. Talk included direction or correction on how the activity should be done, explanations as to its purpose as well as discussions about the best language to use. The role-play sessions were a point at which interaction by YP/ATs dominated, both in terms of the use of Djambarrpuyŋu, and in the direction the session took.

Flexibility was essential. At times we were working with groups and at others with a single person, depending on when release from classrooms could be arranged. Each visit was responsive to what we saw happening, which activities had been undertaken, the understandings and reflections of the YP/ATs, the levels of the students they were working with and what activities might be relevant in terms of either the YP/ATs’ or the students’ progress in numeracy. Each day we shared our observations about the day's work and planned for the next.

All contact sessions were predominantly oral. The liberal use of video and audio recordings proved a highly useful strategy for working orally. Most contact sessions were recorded, not just the activities with students. The recordings were especially helpful for sharing, reviewing and reflecting on sessions as well as for capturing valuable instructional language that occurred ‘outside’ of sessions dedicated to recording particular activities. The focus on oral communication during the project and the incorporation of video recordings in the Talking Namba resource were strategies to accommodate the cultural dominance of the oral medium for Yolŋu.

We were only able to record explanations about the key concepts behind a particular activity if the discussions advanced far enough, and if a YP/AT felt confident enough. Those with the confidence tended to have more teaching experience, both with the particular topic and in working with students at the level the activity targeted. As time went on several participants became enthusiastic about work on the Djambarrpuyŋu explanations and were disappointed when this work on all the KNC could be not be completed before the project came to an end.
IDENTIFYING EFFECTIVE INSTRUCTIONAL LANGUAGE

Given the process that we used, most of the instructional language development occurred during the YP/AT discussions and role-plays and their delivery of activities to students. It ensured understanding of the concepts and their relation to the developmental phase of the learners, practice in the classroom activity and explicit attention to the language to be used. By the time of the final recording the language had been through a process of negotiation and review with both peers and students.

We now consider some issues that did arise in identifying appropriate language to use with young Yolŋu children. These occurred in relation to talk about comparing numbers in the ‘Western’ number system associated with the KNC of Comparing.

LANGUAGE OF INSTRUCTION FOR THE KEY NUMBER CONCEPT OF COMPARING

We begin by identifying conflicting expectations set up in curriculum, describe the ‘slippage’ that occurred in the conduct of one particular Comparing activity and conclude with some examples of key language used when the activities were successfully delivered.

In the Northern Territory Curriculum Framework (NTCF) for Mathematics (Northern Territory Government, 2009), key mathematical language is identified for each level. In Table 1 below we note some specific examples for the Early (Foundation–2) and lower Primary Years (3–4).

<table>
<thead>
<tr>
<th>Level</th>
<th>Comparative language listed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Key Growth Point (KGP)2 (Foundation/Year 1)</td>
<td>big, bigger, small, smaller, same</td>
</tr>
<tr>
<td>Key Growth Point 3 (around Year 1)</td>
<td>costs more, costs less, not enough money, too much money</td>
</tr>
<tr>
<td>Band 1 (around Year 2)</td>
<td>equal to, less than, more or greater than; big, bigger, biggest, small, smaller, smallest, large, larger, largest; different</td>
</tr>
<tr>
<td>Band 2 (around Year 4)</td>
<td>compare, order ascending, descending, differences, lower, higher; equals, not equals/unequal, greater than, less than (symbols)</td>
</tr>
</tbody>
</table>

*Examples are taken from the Measurement strand (p. 6) and Number strand (p. 11).
We draw attention to the fact that the language moves from everyday terms to those of the Mathematics register, for example, from ‘bigger’ at KGP 2 (F/Year 1) to ‘greater than’ at Band 1 (Year 2). It is also noteworthy that single words are used to indicate the focus language. These words, however, assume a number of grammatical constructions including the comparative construction, for example, ‘2 is smaller than 6’.

For English learning by students in these contexts, teachers are guided by the English as a Second Language (ESL) component of the NTCF, both for the learning of Standard Australian English and for its use for learning in curriculum Learning Areas such as mathematics. The earliest entries for students’ use of the language of comparison are at Level 3 (Northern Territory Government, 2002, p. 113 and p. 139). Students would be beginning Level 3 only by the end of Year 2 given high expectations and effective ESL informed teaching.

What we have here is an expectation for talk about comparison in the mathematics curriculum that does not match the developmental pathway in the ESL curriculum. Students do not yet have enough English to fully understand explanations incorporating grammatical constructions in which terms such as ‘bigger’ and ‘smaller’ occur. This exemplifies why Djambarrpuyu, the language the students have full command of, is important for developing their number understandings.

There was one Comparing activity that drew attention to the need to monitor an activity and ensure its purpose was fully understood by the YP/ATs. This was the Comparing activity titled Bigger/Smaller Than dot cards which can be viewed from the Video Library of the Talking Namba resource (see Northern Territory Government, n.d.). This activity required the delineation of three discrete areas, accomplished by using three sheets of A3 paper. These three sheets were placed in a row, with the centre sheet displaying the word ‘Same’. The sheet to one side of this contained the words ‘Bigger, More, Greater than’, while the sheet on the other side, the words ‘Smaller, Fewer, Less than’.

The YP/AT selected a card from a deck with dots from a given range of quantities (e.g. 1 to 10) and placed this on the ‘Same’ sheet. This became the reference card. She then randomly drew cards, one by one, which the students had to compare with the reference number and then appropriately place in the ‘bigger’, ‘smaller’, or ‘same’ area.

This activity focuses on the understanding that each number is a collection of discrete magnitude. In other words, that each number has a ‘value’ that is given by the size of the collection it represents. Dot cards are used initially to make the quantities more transparent. Numeral cards are introduced later.

When this activity was trialled, during both role-play and teaching sessions, a ‘slippage’ occurred around the role of the reference (‘Same’) number. The card representing the reference number was incidentally moved to one of the other piles and it became apparent that the significance of the
reference number had not been adequately communicated, and that the perceived purpose of the activity was to assign cards into two general areas for ‘big numbers’ and ‘small numbers’.

We are unsure exactly why the slippage occurred. Clearly the goal of the activity, in relation to locating quantities with reference to a standard, was not understood after the initial introduction through English nor does it seem the written cues on the three pieces of paper were utilised. Lack of familiarity with the English comparative construction may also have contributed. Indeed, even with the YA/PTs the English comparative construction arose as a focus of attention during a discussion about this activity, with the stronger English speakers clarifying its form with others. It should also be noted that there is no direct equivalent of this construction, or comparative suffixes such as ‘-er’, in Djambarrpuyŋu.

Once the problem with the reference number was identified it was able to be resolved through further discussion and adaptations of the resources for the activity were made with the aim of making the cues for important aspects of the activity more evident. These included inserting a box for the reference number and providing alternative visual cues for ‘bigger’ and ‘smaller’.

**DJAMBARRPUYŊU INSTRUCTIONAL LANGUAGE FOR COMPARING**

We present some Djambarrpuyŋu vocabulary and expressions used in the ‘Bigger Than/Smaller Than’ activities to develop students understanding about numbers as different quantities. Key vocabulary is presented in Table 2.

<table>
<thead>
<tr>
<th>Djambarrpuyŋu</th>
<th>Common local ‘English’ counterpart</th>
<th>English gloss</th>
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</thead>
<tbody>
<tr>
<td>dhaŋaŋ</td>
<td>“full”</td>
<td>lots, plenty</td>
</tr>
<tr>
<td>ḫurrkun’</td>
<td></td>
<td>few; three</td>
</tr>
<tr>
<td>yindi/yindipuy</td>
<td></td>
<td>big</td>
</tr>
<tr>
<td>nyumukuŋiny’</td>
<td></td>
<td>small</td>
</tr>
<tr>
<td>dharrwa</td>
<td></td>
<td>lots, many</td>
</tr>
<tr>
<td>rambanja</td>
<td>“same”</td>
<td>same; together</td>
</tr>
<tr>
<td>bura</td>
<td></td>
<td>middle; in between; centre</td>
</tr>
<tr>
<td>wäŋa</td>
<td></td>
<td>place; country; home, camp</td>
</tr>
<tr>
<td>djulkmaram</td>
<td></td>
<td>to pass, overtake, surpass (transitive verb)</td>
</tr>
</tbody>
</table>

Table 2. Key Djambarrpuyŋu vocabulary for talking about Comparing in the ‘Bigger Than/Smaller Than’ activities
The middle column includes words that are commonly heard in Djambarrpuyŋu. The distinction of these words as loans or local Aboriginal English or even in this context learner English has yet to be determined. Care must be taken to ascertain whether the words have the same meaning as Standard Australian English or whether they retain the meanings of the Djambarrpuyŋu word they ‘translate’.

Both ‘Yes/No’ questions and information questions are common in the recordings about Comparing. Explanations were also provided.

In examples 1–5 Yes/No questions in Djambarrpuyŋu from the Bigger Than/Smaller Than Comparing activities are presented. Questions 1–4 are all asked about a number in relation to the three pieces of paper cueing the ‘same’/reference number and bigger and smaller numbers. The context combined with the questions is leading the students to compare the size of numbers.

1. **Dhaŋaŋ wo jurrkun’?**
   lots/plenty or few/three
   Are there lots or a few?

2. **Wäŋa nhanŋu dhaŋaŋŋur wo jurrkun'ŋur?**
   place its lots-at or few-at
   Is its place with ‘lots’ or ‘few’?

3. **Ga ŋunha nhän yindi wo nyumukunyn’?**
   and there what/something big or small
   Is that big or small?

4. ‘Twenty’ /twentɪ / maṉḏa ‘thirteen’ /θɜːntɪ / rrambagi?
   twenty they(two) thirteen same/together
   Are the two twenty and thirteen the same?

5. **Dhiyaŋ ḋānyą ga djulkmaram wo ḋayi**
   this(middle no.) it(card no.) ‘ing’ pass/go ahead or it(card no.)
   ḋānyą ga djulkmaram?
   it(middle no.) ‘ing’ pass
   Is this (the reference number in the middle) ‘passing’ it (the number on the card) or is it (the card number) ‘passing’ it (the reference number in the middle)?

Information questions in Djambarrpuyŋu in the Bigger/Smaller Comparing activities are shown in examples 6–11. They demonstrate the range of question words available in Djambarrpuyŋu to scaffold the students understanding about numbers as quantities. Questions 6 and 7 are about identifying the numbers. Questions 8–10 are in relation to the
location of the bigger and smaller quantities. Question 11 is asking the students to explain how they know where a number should be placed.

6. Nhà dhuwal?
   what this/here
   What’s this?
   (Response: Den Ten)

7. Nhàmunha’ dhuwandja?
   how many this/here+Focus
   How many is this (referring to a number)?
   (Response: Five. Four)

8. Wanha wàɡa nhançu?
   where place its
   Where is its place?

9. Wanha dhaŋgaŋdja?
   where lots+Focus
   Where are lots/more? (Students are being asked to identify the position of the ‘bigger’ numbers in the activity)

10. Ga nhàkurra ñayi dhu martjin?
    and where–to it will go
    And where does it (the number[card]) go?

11. Nhàpuyu?
    Why?
    Response: Bili ñayi namba yindi
    Because it number big
    Because it is a big(ger) number.

Djambarrpuyŋu explanations about the Bigger/Smaller Comparing activities are presented in examples 12 and 13:

12. Ga nhàlii dhu ñayi mala rulbaŋdhun ga nhàlii dhu
    and where–to will big group put/place and where–to will
    nyumukûŋinji mala rulbaŋdhun.
    small group put/place
    And (learn) where to place the big(ger) ones and where to put the small(er) ones.
ARTICLES

13. Dhiyaŋuny gayi ga maŋutji–läkaram buraŋurnyđja wanha nhanŋu
   this–focus it ‘ing’ show middle–at–focus where its
   wäŋa ĭurrkun’ku ga dhaŋaŋgu.
   place few–for and lots–for
   
   This (number) in the middle is showing us where the place is for the small(er)(ones)
   and for the big(ger) (ones).

‘ENGLISH’ USE IN YP/ATS INTERACTIONS FOR COMPARING ACTIVITIES

While Djambarrpuyŋu was the main language of interaction between the YP/AT and students
there is some English. English was more extensively used in the site focussing on Comparing. Factors contributing to this may have been the YP/AT’s confidence with
English or that being a designated English–medium school rather than a Bilingual school,
there was a greater expectation in regard to the use of English in the Early Years. In
recordings for this project children used single English words such as ‘bigger’ and ‘smaller’
but no full comparative constructions.

At times the YP/AT explained or modelled the English. In examples 14–16 the YP/AT paid
explicit attention to English with the students:

14. YP/AT: More or Less
   Chn: More Four
   YP/AT: More more biyak walal.
   do thus they
   “More, more” Say it like this everyone.
   Chn: More
   YP/AT: More–ny dhuwal mayali’ nhakun dhaŋaŋ.
   more+Focus this/here meaning like lots/plenty
   The meaning of ‘more’ is like ‘dhaŋaŋ’

15. YP/AT: ‘Smaller’ dhuwal nha yāku yolŋukurr?
   this what name ‘yolŋu’–through
   What is the name for ‘smaller’ in Yolŋu (language)?
   Chn: ĭurrkun’
   Few.

16. YP/AT: ‘Bigger’ dhuwal nhä yāku limurrŋ yolŋukurr?
   this what name for us/our ‘yolŋu’–through
   What is our name for ‘bigger’ in Yolŋu (language)?
   Chn: Dharrwa.
   Many/lots of
In the following examples particular key English vocabulary is incorporated within Djambarrpuyŋu questions and students’ responses:

17. YP/AT: Nhä mala dhuwal same? Same maŋa?
what group this same same they(two)
Are these the same? Are the two the same?
Chn: Yaka, Roŋ
No. Wrong

18. YP/AT: Nhä ɲayi ‘big’ namba wo nyumukuŋinyi namba?
what it/he/she big number or small number
Is it a big(ger) number or a small(er) number?
Chn: Nyumukuŋinyi
Small(er).

An English question from the YP/AT may get a response in Djambarrpuyŋu:

19. YP/AT: Less or bigger?
Chn: Nyumukuŋinyi
Small(er).

Or the students may respond with English words:

20. YP/AT: Dhuwal nhäma namba.
this look at number
Look at this number.
Chn: Same
Different
YP/AT: Different-thírr ɲayi ga ŋe.
different-Intransitive Verbaliser he/she/it ‘ing’ ‘yes’.
It is different isn’t it.

As these examples demonstrate, the English that is used is mainly key vocabulary related to the focus number concept, for example, ‘bigger’, ‘more’, ‘same’, ‘different’, ‘smaller’, ‘less’, ‘counting’. There is also some general instructional language English vocabulary used (e.g. ‘slowly’ and ‘well done’). The examples highlight these students as English language learners and the need for this to be explicitly acknowledged in Maths lessons.
REFLECTIONS

In the videos of activities such as the Bigger Than/Smaller Than dot cards activity clip and the Bigger Than/Smaller Than numeral cards to 20, a YP/AT is seen working with a group of students who are demonstratively engaged. In particular, they are engaged in the maths understanding that is the focus of the activity. This is highlighted by the children being able to answer why questions (see example 11) and by the student who offered a way of talking about comparison that had not yet been used by the YP/AT. This was the use of the verb djulkmaram, a transitive verb meaning to ‘pass, overtake, or surpass’ (see example 5).

Some viewers may observe that at times children seem to be guessing in their responses (see also Graham, 1986, p. 100). However the recordings show the YP/AT consistently scaffolding the children towards understanding the activity so they can perform successfully. This, we would suggest, is testimony to the use of the children’s language and the maths understandings of the YP/AT. We believe the recordings represent excellent exemplars of both instructor pedagogy and language which can be used as models for YP/ATs in the future.

We have shown that it is possible to use the shared language of the paraprofessional teacher and the students, their first language, to support student learning while they are beginning to learn English. There are many other remote contexts in the NT where, as shown in the examples above, the children have not yet enough English for the learning demands in the Early Years. Instruction in first language could assist the learning of these children. We have been encouraged by the interest of other NT remote schools in working with Talking Namba since the pilot was completed.

The process outlined for identifying appropriate language reveals some of the complexity involved. It points to the need for more attention to subject-specific vocabulary and the constructions that occur in relation to the teaching and learning of key concepts. It highlights the need for integration of concept and language development in teaching in these classrooms. Observations of student interaction throughout the project indicated the potential for enrichment of student proficiency in both English and the first language, in addition to a better understanding of the targeted maths concept.

One note of caution we would make is against adopting the translation-dubbing strategy. While it was envisaged that this would be a time saving device, it in fact proved very time-consuming inserting the translations. Importantly this strategy removed the opportunity for Indigenous paraprofessional teachers to develop their own understandings around the mathematics curriculum and to identify and practice the best instructional language to use with their students.

We would like to contrast the process described for identifying appropriate first language with the expectation, unfortunately not uncommon, that YP/ATs will spontaneously translate
during lessons. Teachers in remote classrooms are often only there for short periods and do not have specific training for the language demands of their classrooms. They are also not helped if the school does not schedule times for classroom teaching teams to plan together nor provide for appropriate training for the YP/ATs. Successful learning by the students rests on the teaching teams having the skills to instruct the students in language they understand, whether in the students’ language or in English.

This project has shown what can be achieved through the interaction of research with local school communities and knowledge holders around mathematics, pedagogy and languages across both cultures. We believe the strategies to explore key curriculum concepts using first language we have described would be equally successful in other Indigenous community schools where Indigenous languages, including Kriol, are the languages of daily life which young children bring with them to their classrooms.

ACKNOWLEDGEMENTS

We would like to thank all the Yolŋu who collaborated with us. We would also like to thank the two anonymous reviewers for their helpful comments on an earlier version of this paper. The SLNC project was funded by the Australian Government Department of Education, Employment and Workplace Relations (DEEWR) as part of the Education Revolution – Improving our Schools – National Action Plan for Literacy and Numeracy.

REFERENCES


Yolŋu is the name used collectively for Indigenous people from a number of clans in northeast Arnhem Land. Throughout this paper we use the established Yolŋu orthography. $\eta=\text{ng}; \bar{a}=\text{a}; e=\text{i}; o=\text{a}; t, d, l, ng$ are retroflex sounds; $\text{th, dh, nh}$ interdentals; $\text{tj, dj, ny}$ palatals; $rr$ a trill; ‘glottal stop.

Strictly speaking Djambarrpuyŋu is the name of one of the 50–60 clans in the Yolŋu socio-cultural/language area but its use has become extended. Clan names are also used to refer to the language variety of each clan, all of which have some distinctive linguistic characteristics. Dhuwal, as used here, refers to a grouping of clan language varieties that share substantial linguistic features. Dhuwal is also the demonstrative ‘here/this’ used in Djambarrpuyŋu and these other clan languages (see Wilkinson, 2012). Since many speakers have affiliations to clans other than Djambarrpuyŋu some people prefer to refer to the lingua franca as Dhuwal.

Professor Siemon is based at the School of Education at RMIT University. The project was undertaken through an ARC Linkage project in conjunction with the Northern Territory Department of Education and Training, Charles Darwin University and Batchelor Institute of Indigenous Education.

The NTCF was the current curriculum document at the time of the project. This has since been replaced by the Australian Curriculum. Subsequent to writing this paper the Australian Curriculum, Assessment and Reporting Authority (2012) released the Annotated Content Descriptions for Mathematics component of the English as an Additional Language or Dialect Teacher Resource. We found the same mismatch for the language of comparing we observed in the NTCF documents.