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Celebrating success:

Numeracy in remote Indigenous contexts



What makes
for successful
numeracy
education in
remote Indigenous
contexts: An
ethnographic case
study approach

Stories on remote
indigenous
mathematics
successes
compiled by
Professor
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2014



Adopting a Whole School Approach

La Grange Remote Community School

Bidyadanga Aboriginal Community is a former mission run by the Catholic Church. It is located approximately 200km south of Broome, and is very close to the ocean. There are large tidal flows in the area, sometimes as great as 8 metres. Water activities, including fishing, as well as hunting, basketball and football are major recreational activities in the community. The state government has recently completed a large rebuilding project so there are many new homes in the community. There are five language groups in the community (Karajarri, Yulparija, Juwaliny, Nyangumarta and Mangala), and Aboriginal English is the language commonly used by community members. The community has a church, swimming pool, police station, community resource centre, store, health clinic, grassed oval, and stockyards.

The mission operated a school in the community until 1982. At this point, the mission passed the school over to the state

government to operate, thus creating La Grange Remote Community School. It is the largest remote community school in Western Australia. More than 170 students are enrolled at the school, which offers a comprehensive secondary school, with four secondary classes, six primary classes, and two early childhood classes. The school has created larger classes in order to allow funds to be targeted to specific areas of learning – literacy and numeracy.

The school is strongly committed to developing the literacy and numeracy skills of its students. In addition, the school offers across all year levels a diverse range of specialist programs, including music, art, physical education, and ICT. A priority in the secondary area is vocational education, with students engaged in TAFE-accredited courses delivered by lecturers from Broome each week, and Aboriginal School Based Traineeships and leadership courses. The school regularly has students

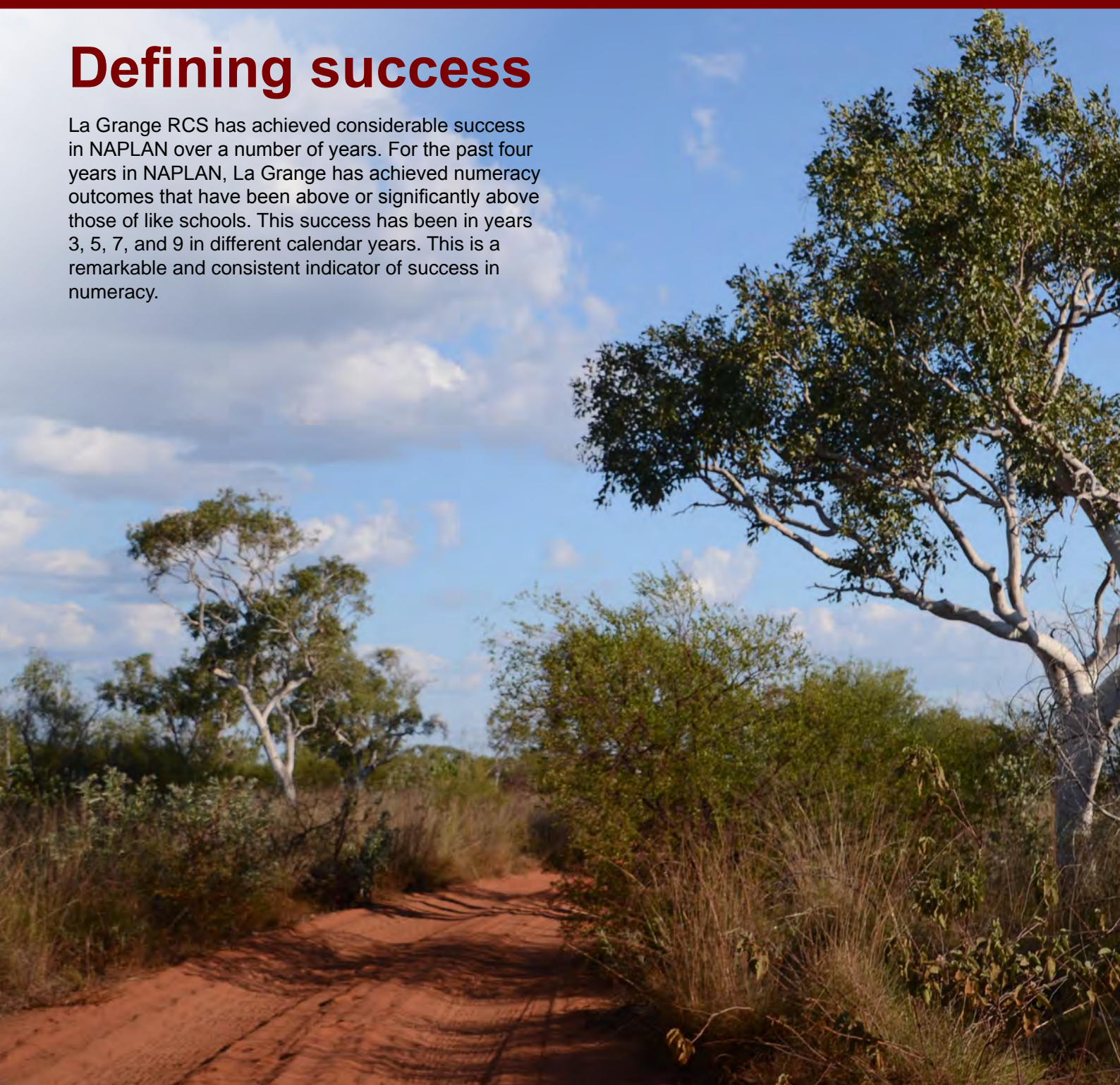
completing their senior education, gaining the WA Certificate of Education. Teachers generally stay for three to four years at the school, and some have remained for much longer periods of time, so the staff is relatively stable. This stability allows for the development and embedding of programs.

When in community, the students generally attend school. Substantive cohorts in each class attend regularly, and these students perform strongly in mathematics. Other students attend intermittently. Consequently, there is considerable diversity within the classes. Creating activities that cater for this diversity is a strategy that has been incorporated into

the school-wide approach to mathematics. The school has used a collaborative approach to the selection of programs and design of their mathematics lessons so that all staff have been involved in the evolution of the program. Currently the school uses two key programs: a standard mathematics lesson structure throughout the primary school, and a fun maths day on Fridays to boost attendance on what has been traditionally a day of low attendance. The school has created some strategic initiatives within the school, and despite significant budgets cuts in 2014, has managed to retain a numeracy coordinator and a literacy coordinator, as literacy and numeracy are priority areas of learning within this school and community.

Defining success

La Grange RCS has achieved considerable success in NAPLAN over a number of years. For the past four years in NAPLAN, La Grange has achieved numeracy outcomes that have been above or significantly above those of like schools. This success has been in years 3, 5, 7, and 9 in different calendar years. This is a remarkable and consistent indicator of success in numeracy.





Whole-School Approach

La Grange has sought to develop across the primary school a consistent approach to the teaching of mathematics. Initially implemented in the primary school, the approach has been adopted by the junior secondary school, so there is now a common approach across P-10. The school has adopted a whole-school approach to numeracy where there is consistency in programs and daily mathematics lessons. Before selecting a mathematics program, the leadership team researched the mathematics programs that similar schools were using. A number of criteria guided the selection of a program – the program needed to align with the Australian Mathematics curriculum; have good differentiation and cater for different levels of learners; provide scaffolding for teachers so that they could learn how to teach particular concepts; and support teachers in ways that they needed. After considerable research and consultation with other remote schools, the leadership team decided to buy into two commercial programs. Further consultation was undertaken with the staff regarding their views.

There is an expectation that all teachers will adopt these programs. The initial startup of the programs required all staff to undertake professional

development in the use of the programs. The leadership team organised the authors of the programs to conduct one-week inductions for staff, which included workshops on the program, working with individual teachers, and modelling teaching within classrooms. This was an expensive investment of school funds but has enabled the school to be versed in the program. There has been an on-going induction process for incoming staff. The numeracy coordinator supports the induction of new staff and the ongoing maintenance of the programs.

The school has also taken a very strategic step and increased the contact hours for numeracy beyond those recommended by the Department of Education. Maths is taught every day. Across the primary school sector, numeracy is taught in the second block of the day. Maths is taught every day for 1 hour, but one day per week, every class has a double session of maths, making for a total of 6 hours of instruction each week. Lessons follow a set format but the additional lesson allows teachers to undertake sustained investigations into particular topics of interest or relevance to the students. Seeing and modelling the application of mathematics to the worlds around the students is an important element of the double sessions of mathematics.

Timetables have been managed so that teachers all have an extra hour per week for duties other than teaching (DOTT), and one of the DOTT hours is targeted for literacy and numeracy. Teachers plan their numeracy in clusters (around the year levels), with support from the numeracy coordinator.

The use of Standard Australian English (SAE) in mathematics is a key focus within the whole-school approach – in mathematics and across all learning areas. It is recognised that learning and performance can be affected by levels of SAE, so explicit teaching of SAE is undertaken. Teachers refer to the language being spoken by a student – “That is great Aboriginal English (AE), but can you say that in Standard Australian English?” – and then the teacher might model the SAE. Teachers also wear coloured wrist bands – one to represent AE and the other to represent SAE. Teachers point to the appropriate wristband so that the student is aware of the code that the teacher would like the student to use. This helps to keep the lesson moving in the desired direction without taking focus away from what is being discussed or taught. Through the subtle but overt reference to language use, students recognise the need to code switch and to use SAE when necessary.

The school takes a flexible approach to organising classes, since the numbers of students may vary from year to year. Classes may include several age groups depending on the number of students within year bands. Students are reported against their nominated year levels. There is an expectation that students should be performing at, or close to, their nominated year level.

The AIEOs are skilled and undertake professional learning activities alongside teachers, and undertake activities targeted to the AIEOs. They often work with small groups in the classroom and work as a teaching partner with the teacher.

Many of the students come to school late, so, often, there are insufficient students for a standard lesson. For this reason, teachers are allocated one-on-one time with students in the mornings. The first session of the day is a sports/fitness session and, while some teachers are involved with the fitness program, other teachers use this time to work one-on-one with students. This happens 2-3 times each week for each teacher. The one-on-one sessions allows teachers to work on assessment, intervention, extension, NAPLAN readiness, or any other aspect of the student's needs.



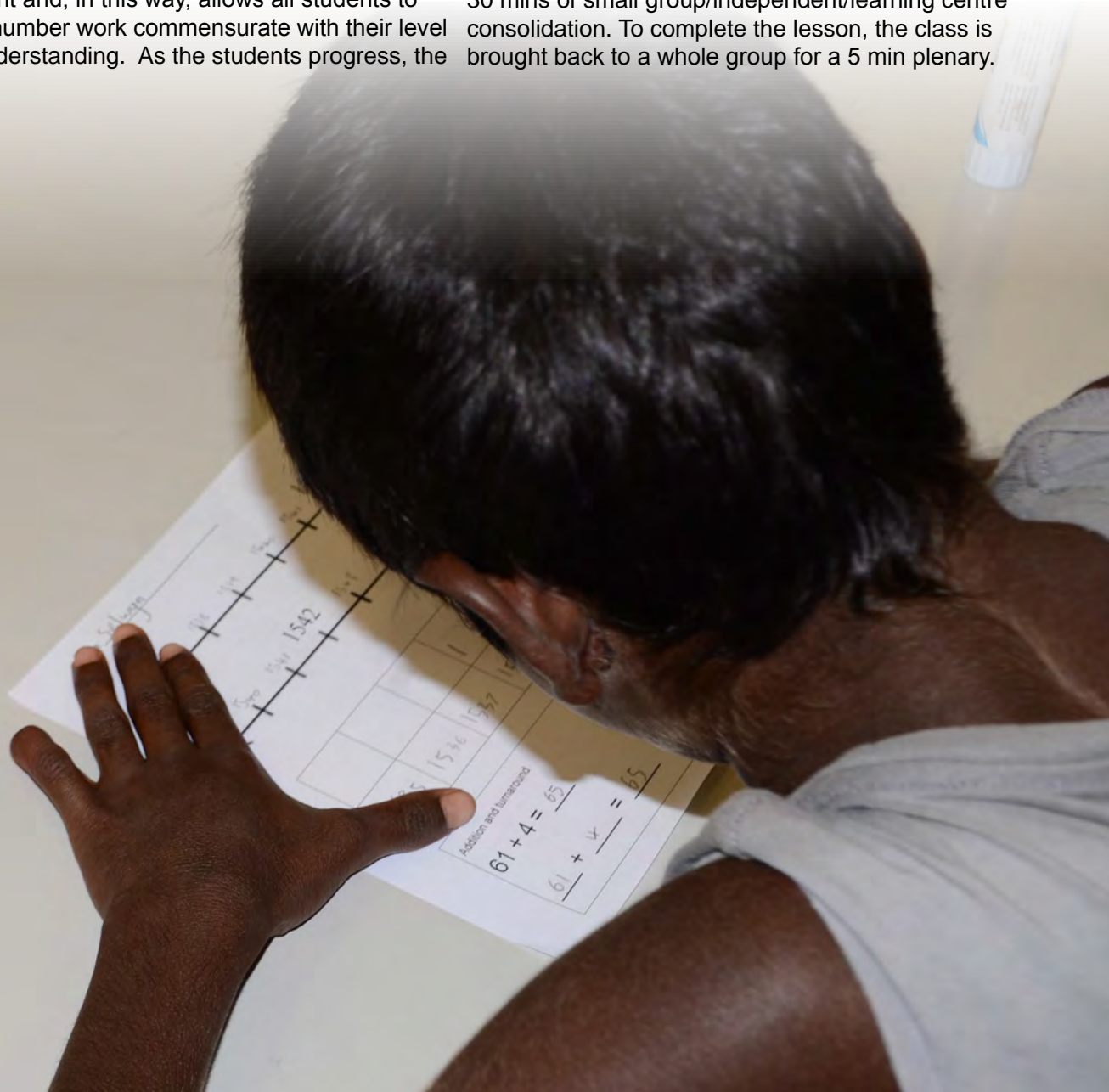
Daily Maths Lesson Structure

As part of the whole-school approach, the school has implemented a daily lesson structure so that as students progress through different year levels or have different teachers, they are familiar with the La Grange approach to maths.

Each lesson commences with the number book, which is based predominantly on number work. There is considerable diversity within any one class, and this diversity often increases as students progress through the school years. By the end of the primary years, a class may include students who are working at a level expected for students of that grade, in addition to students working at a pre-prep level. Consequently, although all students work on a page that looks similar, the number book is targeted to each student's level of achievement and, in this way, allows all students to engage with number work commensurate with their level of number understanding. As the students progress, the

number work changes so that by the time they are in the upper primary, the activities in the number book help build students' number understandings and also help familiarise students with testing regimes (such as NAPLAN tests).

Teachers may then focus on number strategies, and mental computation. Activities are again targeted for students' level of identified developmental understanding. The general lesson structure adopted across the school involves a whole-part-whole structure. Teachers' intro/reinforce/practice/extend concept according to scope and sequence. The introductory part of the lesson lasts about 10 min. The class is then involved in whole class explicit teaching for about 10mins. This is followed by 30 mins of small group/independent/learning centre consolidation. To complete the lesson, the class is brought back to a whole group for a 5 min plenary.



Numeracy Coordinator

Under previous funding arrangements, the school had sufficient funds for a full-time numeracy coordinator. As a result of the funding cuts in the 2014 school year, the school has had to re-assess the continuation of the numeracy coordinator role. The coordinator role was believed to be essential to the maintenance of the school programs, so the school has shuffled funding to ensure that the numeracy coordinator position is maintained, albeit in a reduced capacity (70%). In a consultative process, the school opted for larger classes in order to free funds to allow this position to continue.

The numeracy coordinator role provides support for teachers in a range of areas. The role is determined by the needs of the teachers, and also ensures the ongoing professional learning of staff in relation to the programs within the school. Funding cuts have meant that the school is unable to source the original authors to work directly with the school. Consequently, the numeracy coordinator obtains on-line support from the authors of the program. The on-line support is a

much cheaper option for the school and helps to maintain the external validity of the program. The numeracy coordinator works directly with the staff to maintain the operational viability of the program at the school level.

The school uses the Kimberley Literacy and Numeracy Profile (KLNP) (adapted to more comprehensively suit the school's longitudinal data collection needs). The KLNP contains a database for Kimberley government schools to use to record student data. Teachers are expected to assess their students each term and enter data into the database. The database allows teachers to access student data when new students arrive from other schools. Consequently, teachers are able to create programs for such students much more quickly than prior to the use of the profile, when they had to assess the student and then develop a program of teaching to that student's needs.





Fun Friday

The school has introduced two initiatives in response to the traditionally poor attendance on Fridays. First, the school days on Mondays to Thursdays are longer, thus making Friday a shorter day so that less time is lost on absenteeism on Fridays. On Fridays, the school closes at midday. Second, to help boost attendance on Friday, numeracy (and literacy) are taught through fun activities.

Each teacher is responsible for creating fun activities relating to a particular maths topic (such as data, chance, measurement, place value). Students move through the activities on a weekly rotation, and the complexity of the activities is adjusted for the level of the students. The activities are planned by the teachers in whole-school consultation, so that they are aware of what the others are doing. In some cases, the starting point may be mathematics, in others it is the activity. In one case, during the hot season, the teachers thought the students would enjoy water play (using large water pistols) so planned the activity around the mathematics that could be explored through trajectories, volume, capacity etc.

The maths activities are not seen as assessable activities and hence sit outside the usual mathematics programs. However, with the support of the numeracy coordinator, the teachers are required to identify the mathematics in these activities and plan them so that they are generally consistent with the usual mathematics program requirements to ensure that the mathematical

potential of activities is not lost. Through the activities, teachers also find creative ways to use mathematics resources to enhance learning.

The value of the activity is that children enjoy the activities and attendance on Fridays is now at a level commensurate with other days. There are, however, lower numbers on weeks where families receive their Centrelink payments and go to Broome for shopping. But even on these days, the attendance is higher than would have normally been the case prior to the introduction of fun Fridays.

Fun Fridays initially occurred only in the primary classes, but the value of the approach has been acknowledged by the secondary sector of the school. Consequently, the four secondary teachers now implement Fun Fridays through investigations, one of which involves building new outdoor furniture for the area where the students sit. Students will need to design, cost, and purchase the materials, and then build the seats.

Benefits for learning and learners

The Fun Fridays have had considerable success in boosting attendance on Fridays and creating an enjoyable atmosphere around mathematics. Many of the students see mathematics in a non-enjoyable way, so this activity has changed the attitude that maths is “boring.”

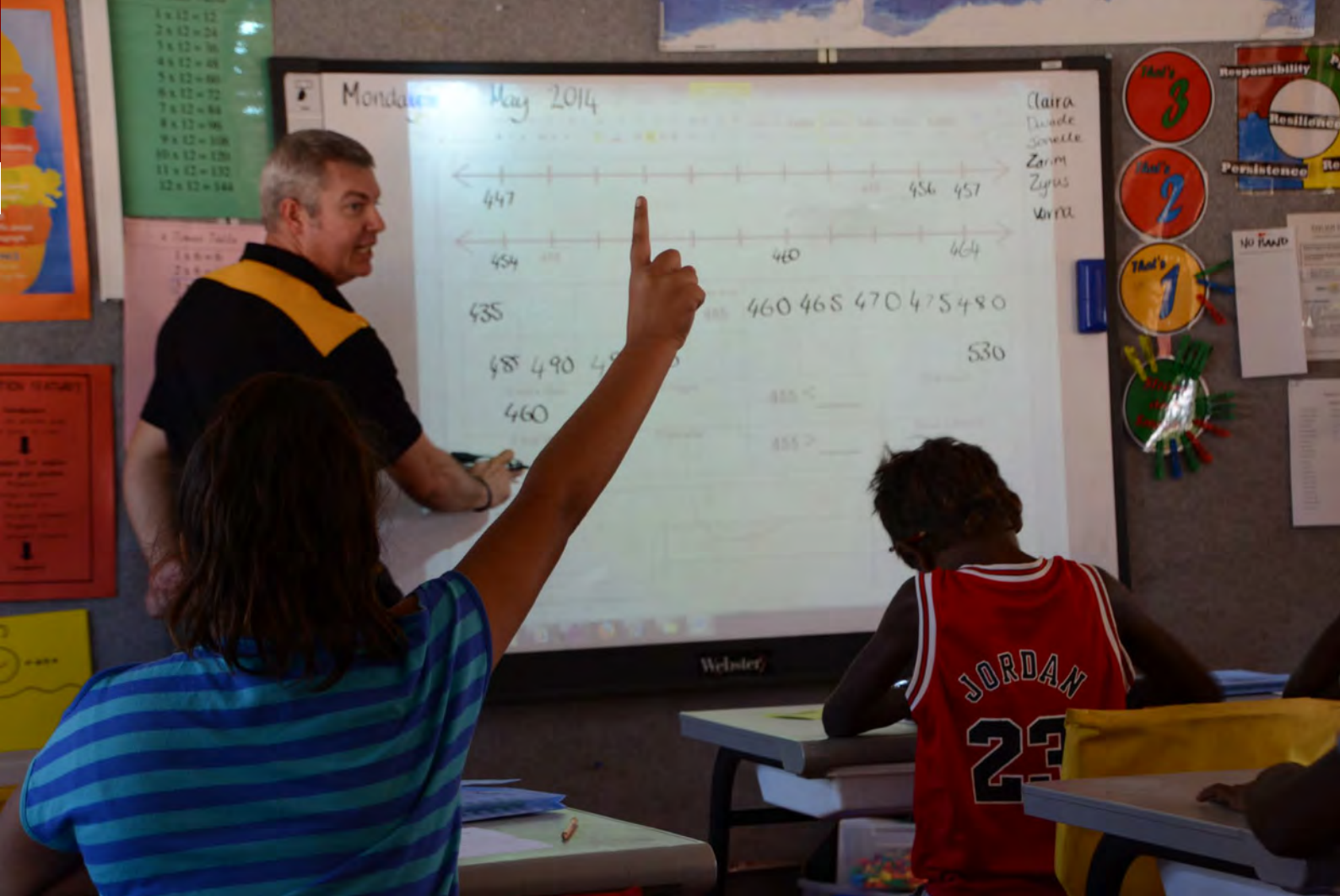
The Fun Fridays, through the rotations, enable the students to work with students outside their classes, and to get to know the other teachers in the school. This helps with transitions into future classes. The Fun Fridays also enable teachers to get to know students in other classes, and give them a greater sense of students and achievement levels.

The consistency of the whole-school program and the structure of the daily lessons enable students know what

to expect, so that they do not need to decipher what the teacher intends in a lesson. As a result, students are able to readily engage with the lesson and mathematics. The consistent approach to mathematics also means that as students progress through the school, they do not have to learn the nuanced behaviours and teaching approaches of new teachers.

Teachers are provided with opportunities to learn from other teachers and build stronger mathematics programs. The sharing of knowledge and ideas for teaching benefits the teachers as well as the students. Particularly in remote communities where access to professional learning opportunities is often limited, working collaboratively with other teachers provides opportunities for new experiences and learnings.





Advice to teachers

The intermittent attendance of some students creates quite diverse classrooms, so catering for the range in a classroom is critical to learning mathematics. Teaching needs to meet the needs of the students, so knowing where students are in terms of the mathematical learning is essential. Creating activities that are targeted for the individual students enables all students to move forward.

Creating fun activities around key learning areas, such as numeracy, entices students to attend school. Making mathematics fun for the students is an effective strategy for building mathematics knowledge and creating new spaces for application of mathematics, and helps to encourage engagement with maths. Linking math to hands-on, real and practical situations suits our Indigenous students' need for meaningfulness.

A whole-school program enables teachers to build a coherent program across the school so that students and families are familiar with the approach. It also helps teachers to co-plan and share ideas and resources, as everyone is working in the same way.

Having a person within the school who assumes responsibility for numeracy/mathematics helps build a coherent program and a strong learning community.

Students need to have a strong grasp of SAE if they are to experience success in mathematics. The school needs to have strategies to build the language of mathematics and competency in communicating mathematically so that students can engage with mathematics.



Model for Quality Learning

General Principle	Implications for mathematics	Focused strategies
Whole-school approach	The school has developed a whole-school approach to mathematics. The school uses the Origo Stepping Stones program for whole school, and the Anita Chin approach for pedagogy.	<p>Collaborative decision making in regard to selection and rollout of programs.</p> <p>Professional development of staff in relation to the programs. Initially face-to-face, but this was too costly (being remote) so the school has moved to on-line support.</p>
	Online recording of student achievement based around the big ideas of the two programs.	<p>All teachers enter data into the school database so student records can be accessed by all teachers for planning.</p> <p>This is very useful for new teachers – they are not losing time assessing students at the start of the year. Planning based on students' needs can be undertaken quickly, strategically, and in a targeted manner.</p>
	Extra time is allocated to maths.	<p>Maths is taught every day for one hour.</p> <p>One day a week, there is a two-hour block of mathematics.</p>
	The school uses the Kimberley Literacy and Numeracy Profile, tailored to their needs, to record student data.	Data from students is entered into this database. The database provides comprehensive longitudinal data on students from K- Grade 10 and, in addition, helps track students as they move between schools in the Kimberley region and aids the new teacher in knowing the mathematical background of a student when he/she commences at a new school.
	High expectations.	There is a whole-school culture of teacher excellence. Teachers also have high expectations of learners in mathematics. Building learning opportunities commensurate with their levels of mathematical achievement and then extending them is important.
	Larger classes.	<p>The school has built classes larger than typical remote classes. This provides a "critical mass" in the classroom. This has freed funds for a numeracy coordinator at the school.</p> <p>Larger classes have enabled teachers to do group rotations, create discussions, and target learning in small groups relevant to the needs of the learners.</p>

Model for Quality Learning (cont)

General Principle	Implications for mathematics	Focused strategies
Standard mathematics lesson structure	Students know that all maths across the school will follow a particular format. Consistency in approach across teachers and across years enables students to readily engage in learning rather than trying to work out the ways in which the lessons will be conducted.	<p>All lessons commence with number work from the number book.</p> <p>All number book activities are targeted to the student's level of understanding, so teachers can address the diversity of needs in a classroom.</p> <p>Hands-on activities.</p> <p>Mental maths.</p> <p>Explicit teaching of strategies for number work.</p>
Numeracy coordinator	The school has created larger classes (approximately 18 students) so that funds can be reallocated to support a numeracy coordinator. With current budget cuts, the role has been cut to 0.7 so the coordinator undertakes classroom duties which frees teachers for planning (DOTT).	<ul style="list-style-type: none"> Helps with induction of staff into the school maths program. Works closely with graduate teachers. Works with teachers on developing quality mathematics programs and lessons Assists with data analysis and entry; teachers collect own classroom data so that they are familiar with their students' levels of performance.
Making maths fun	Fridays have been a day of poor attendance so mathematics lessons need to be fun but with a rich mathematics focus to them.	<ul style="list-style-type: none"> Teachers work as a team to plan the activities. Activities are on a weekly rotation with the students undertaking one activity each week, then moving to the next activity the following week. Activities are planned and have a rich mathematical focus, but are not assessable.
SAE	Building competence in SAE in and through mathematics – poor literacy (SAE) can impact on mathematical learning and performance.	<p>Teachers build the language of mathematics and communicating mathematically throughout maths lessons. Explicit recognition of the differences between Aboriginal English and SAE are noted when teaching</p> <p>Teachers have wrist bands – one to represent AE and one to represent SAE – and teachers point to the appropriate band so that students are cued into the language they are using or should use.</p>

Key messages – summary

Building a whole-school approach to numeracy builds consistency and transparency in the program that allows students (teachers?) to be familiar with the processes and strategies associated with the effective teaching of mathematics.

Investing in learning in the early years is critical. Establishment of a pre-numeracy framework guides explicit teaching within the context of structured play-based learning as per the EYLF.

Building a common lesson structure allows students to recognise a consistent structure and to engage with this when they enter mathematics classrooms. Adopting a common routine to lessons means that students do not lose time trying to understand the implicit assumptions in the teaching process.

Building strong SAE is important for students to successfully engage in mathematics, and for students to be able to effectively communicate mathematically.

Creating fun and enjoyment in mathematics helps to not only enhance mathematics learning and positive attitudes towards mathematics, but also build attendance.

Teachers need to have high expectations of learners and to provide scaffolding to meet the needs of the learners.

Building a strong mathematics community of learners requires someone to manage the building process and to support teachers as they learn and grow. A key person, such as a numeracy coordinator, can assume responsibility for managing change within the school, supporting teachers (particularly graduate teachers or teachers new to remote teaching), and developing sustainable practices that remain in place as teachers move on.

Change is a slow process and there needs to be a consistent effort in managing change. Leadership teams need to support staff and provide resources to enable change.

School demographics

Year range	K-12	FTE teaching staff	21.1
Total enrolments	184	Non-teaching staff	18
Location	Very Remote	FTE non-teaching staff	14.7
ICSEA (school)	660	Indigenous students %	98%
ICSEA (distribution of students) (bottom quarter to top quarter)	85% 12% 3% 0%	Enrolments: Girls/Boys	87/97
Teaching staff	22	Language background other than English	98%
		Student attendance rate %	79%