

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
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Teaching Students, not Mathematics

Normanton State School

Normanton is a small cattle town located in the Gulf region of Queensland. The region is tropical savannah with two very distinct seasons – a very humid wet season, followed by a rainless dry season. The area can become inaccessible in the wet season, with falls in excess of 650mm in one month.

Normanton is the administrative centre for the Shire of Carpentaria, established in 1867 when settlers relocated from Burketown which was abandoned due to fever and flooding. More than 1,000 people live in the town of whom approximately 600 are Indigenous Australians. Normanton's population has fluctuated from 1,250 in 1891 due to a short-lived gold rush, dropping to 234 in 1947.

Like many other towns in the Gulf region, Normanton has been part of the prawn industry but has recently become a popular tourist destination. Its long history means that there are many buildings of historical

significance. The town boasts the longest, original operating Burns Philps store, established in 1884. Other heritage-listed buildings in the town include the Normanton Railway Terminus, Westpac Bank Building and the Normanton Gaol. Situated in the centre of the town, next to the Shire Offices, is a replica of an 8.64m saltwater crocodile – the largest ever taken – that was shot and killed in the Norman River. The region is well known for its fishing, mostly barramundi and salmon.

Normanton State School was established in 1892. The school has many long serving staff members, some of whom have been there for more than 15 years. The current principal has been in the role for 10 years prior to which she served as a teacher at the school. The school proactively employs local Aboriginal people as Teacher Aides (TA) and for other roles within the school. Some of the



TAs have been at the school for as long as 30 years, with many working there for eight or more years. Many teachers stay for longer than their initial contract while others remain for shorter periods, having decided they are unsuited to remote teaching. This makes for a core staff who have remained at the school for longer periods than usual in remote locations, with a staff turnover of about five teachers leaving in any one year. The school's core business is literacy and numeracy so there is a strong commitment to these areas of education. More recently, the school has adopted the

“Putting Faces on the Data” approach (Sharratt and Fullan) where data are used to inform teaching.

Located in a town rather than a community, Normanton State School has not received the same level of funding as has been made available to community-based schools. As a National Partnerships school, the administrative team had focused on building human capacity, with many support people allocated through the funding. The school also focuses on providing support for its TAs, most of whom are Indigenous.

Defining success

The school has achieved strong NAPLAN results when compared with similar schools, performing consistently across year levels for a four year period.

	Year 3	Year 5	Year 7	Year 9
2013	Above	Above	Above	Similar
2012	Similar	Similar	Significantly Above	Above
2011	Above	Significantly Above	Above	Similar
2010	Similar	Significantly Above	Above	Similar

Prioritising Students

There is a strong expectation that teachers and TAs will provide quality education for the students. As a “Partners for Success” School, the principal, who has had a very long tenure at the school, has enabled the school to select (and retain) teachers who are willing to commit to the culture of the school. High expectations apply as much to staff as they do to students. Normanton has worked hard to build a culture whereby teachers, teacher aides and other staff are expected to do a “good day’s work for a good day’s pay”. Teachers remain on the job until they leave the school. As with many remote and very remote communities, students and families are circumspect about the “two-year bandits” who revolve through the schools in remote areas but with the core teaching staff, considerable strength has been built in terms of curriculum, expectations, and relationships with the community.

As a result of this commitment, teachers have built a strong rapport with the students. Teachers and teacher aides use a wide range of strategies to build mathematical understandings with the students. These strategies were articulated and observed within the practices of both teachers and teacher aides. Throughout all lessons observed at Normanton, teachers particularly emphasised the metalanguage of mathematics, and the importance of pacing and the use of humour to scaffold mathematical learning.

Meta Language

Modelling of the correct use of mathematical terms was constantly emphasised in lessons. The approach taken by the teachers was lighthearted so that the students could engage with the demands of the language. For example, in a lesson on exponential numbers, index laws were introduced. In the lesson, the students were expanding notation of operations. In that process, they were asked to articulate the expansion of 4^3 so they explained to the teacher that he needed to write 4 three times so he wrote 4×3 to which they said that was not right. The negotiation of their language with his

responses meant that language had to be refined to the appropriate mathematical terms. Throughout this process, there was a constant need to refer to the multiplicative process, which for many of the students, meant using the language of “times”. On each occasion that this term was used, the teacher would look at his watch and say the time. By doing so, he would consistently remind them that the proper term is multiplication rather than times.

The teacher also used explicit referencing to the terms used for numbers – the base number, the power (and other similar terms). Throughout the teaching episode there was constant revision of these terms so that he could be sure that students learned the terms and their usage. For example, the extract below shows how the teacher not only modelled the use of mathematical language but also encouraged the students consistently throughout the lesson:

T: *What is my base number going to be?
What is my index?*

T: *Is this hard so far?
No, this is pretty easy.*

Teachers and Teacher Aides recognised the importance of language and how the students needed to hear and learn appropriate mathematical terms and their meanings. Language was constantly repeated so that students could hear how it is used in context and the meanings that the words conveyed. In a Prep lesson students were estimating and then measuring using informal units (teddy bears) in order to work out which were heavier or lighter than other items. The TA was constantly using the terms ‘more’ and ‘less’ to compare estimates and whether these were larger or smaller than previous items. Across all lessons observed, teachers and TAs strongly emphasised the correct use and modelling of mathematical language.

Key words and definitions are also represented in written form so that students can refer back to these if needed. Mathematical equations were written in a variety of formats, thus exposing the students to different symbolic representations.



Pacing

Lessons are fast paced. Teachers pose questions to the students to engage them with the content of mathematics. The fast pace helps to keep the students engaged and encourages a sense of automaticity that in turn drives the pace of the lessons. Teachers pose questions briskly, engaging students with the banter. The pacing remains focused and lighthearted.

Rapport

One of the challenges in many remote schools is the high turnover of mathematics teachers, particularly in the secondary school. Normanton has also experienced this turnover in its secondary sector in the past few years. It has been felt by the leadership team that one of the key needs for teachers who are new to the school (and in mathematics) is to develop a strong rapport with the students. When teachers have been unable to develop this rapport, it has made for challenges in managing student behavior and optimizing engagement, learning and success. The culture at Normanton values a strong respect of students and their families without compromising high expectations of learners and learning. Teachers are encouraged from their initial induction period and throughout their time at Normanton to develop a strong rapport with the students while maintaining a professional relationship with the students and their families. This focus has been a particular focus in the area of mathematics in the secondary school sector.

Use of Humour

Throughout the lessons, there was a light-hearted approach to teaching where the teachers used humour to encourage students to engage with mathematical content but also to build rapport. This approach enabled lessons to remain light but still focus on substantive learning. Teachers reported that students tend to disengage when the learning was too difficult or too challenging but through the use of humour, they felt encouraged to keep trying. The lightheartedness of the lessons deflected attention positively, reducing the likelihood of disengagement.

Consistency

Consistency within and across lessons is a feature of the mathematics lessons. By having consistency of format across mathematics lessons, students are able to engage with the lessons rather than having to predict what is going to occur in any one lesson. The students are familiar with the ways in which the mathematics lessons will unfold and therefore what to expect when they engage with their mathematics lessons. It has been found that when there is inconsistency, students are potentially confused by the changes, so standard formats to mathematics lessons has enabled teachers and students to move through content in a smooth process. The following features are those that are common to mathematics lessons.

Fast Facts

All maths lessons begin with a fast facts session. Here the teachers are able to use a variety of formats for presenting information that generally relate to the topics that the students are doing. For example, in some classes fast facts were simply mental maths exercises that focused on operations. In others teachers used a variety of formats to enable the students to see that mathematics can be represented in different ways, for example:

- $3 + 7 = ?$;
- $3 + \square = 10$;
- Is 357 closer to 350 or 360?;
- 5, 10, 15, _ , _ .

The fast facts are often a timed practice so that students have to try complete as many questions (correctly) within the allocated time. Teachers design the fast facts to suit their students, to support the focus of lessons and for the extension of students. In most cases, the facts were displayed using a PowerPoint projection and these were timed for each question.

The fast facts also serve as the basis for formative assessment so that teachers are able to monitor student performance over time and better target their teaching.



Learning Intent

The learning intent of a lesson is visibly displayed in the classroom so the intent of a lesson is transparent to the students. At the same time, teachers also refer to the success criteria for the students so that the students know what they will be able to do to demonstrate their learning and experience success.

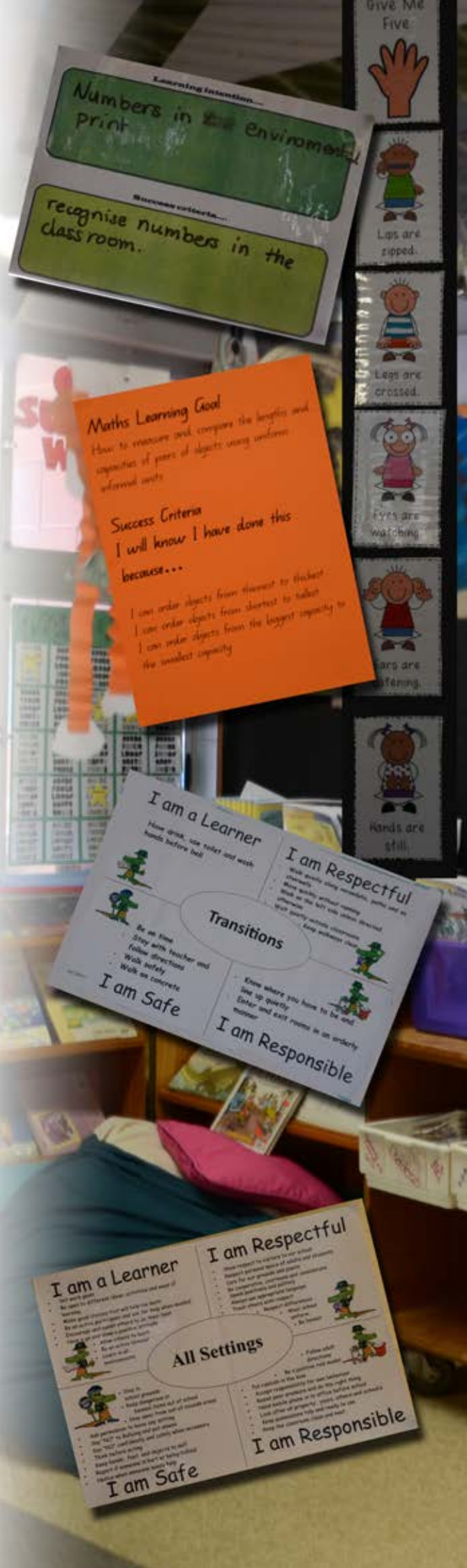
Teachers are expected to model appropriate strategies for solving problems and in many cases, there are multiple paths for problem resolution. Teachers are also expected to backward map from the learning intent of the lessons, and then to demonstrate differentiation within their classroom.

High expectations

The school has adopted the National Curriculum and seeks to provide mathematical experiences commensurate with each nominated year level. As in most remote and very remote communities, there is great diversity among the student cohort in any one classroom. Regardless of where a student is within the bands of the curriculum, their experiences in mathematics seek to extend their thinking.

Students are regularly assessed and experiences are then planned to extend their mathematical thinking, knowledge and processes. While it is possible for them to feel overwhelmed with much of the mathematics content, the strategies used by the teachers along with support from the TAs, creates a palpable sense within the classrooms that students will experience success. Teachers encourage students explicitly to engage with the content, to come along with them on the learning journey. There is a real sense that teachers believe that the students can experience success if the teaching is right, the support is right, there is adequate scaffolding, and there is reinforcement of learning.

Approximately 25% of students have been formally assessed as needing learning support and many of these students are also the source of behavioural problems in the classrooms. The school has employed a Learning Support Teacher who works with these students. Special mathematics lessons are taken by the Learning Support Teacher early in each week where she monitors student learning and then develops a weekly program for individual students based on assessments of learning. Where possible, the programs are aligned with the topics being undertaken in class. During the remainder of the week, the students are placed back into their age-appropriate classes and work closely with the teacher and TAs so that there is almost one-on-one work undertaken in the classroom. In some cases, where the students have significant behavioural issues, they are withdrawn into a small group taken by the Teacher Aide. This supports the individual students, while allowing the teacher to work with the remainder of the class on focused teaching. The teachers have the same high expectations for this cohort of learners albeit commensurate with their levels of understanding. This process has been found to build confidence with the students who are more likely to engage with content with which they can experience success.



Teacher Aides

Teacher Aides are an integral part of the school. The school has been innovative in managing funds to create spaces and roles across the school, most notably, there has been a strong emphasis on Considerable funds are allocated to human resourcing at the school, and generally human support in the classroom as a priority over physical resources (such as commercial programs). All classrooms have at least one TA and most often there are two. Most of the TAs are local Aboriginal people while others have relocated to Normanton from other areas. While the employment of TAs can create challenges for community politics, the school has taken a strong leadership position to build a culture whereby the relationships outside in the community are not to impact on the work of the school. In a diverse community such as Normanton, community politics may be played out in ways that detract from learning. This is in part achieved through the naming of TAs as "Miss X" rather than conferring the community status of "Aunty".

The TA's role is to provide teaching support as much as it is to support the students' social and emotional aspects of learning. Their key role is to work with the students who struggle academically in classes and they are supported by the Learning Support Teacher who devises individual maths learning plans (see above) for students with diagnosed learning difficulties. The TAs play an important role in integrating these students with their same-age peers both academically and socially. Having a good support system within the classroom enables the identified students to work and learn and thus helps to maintain quality learning environments within the mathematics classroom. Teachers cooperate with the TAs to ensure that they have the mathematical knowledge they need to help the students.

In the lower years of the school, the TAs also work with small group rotations. The teacher explains the tasks to them and they then manage the small groups. This practice enables differentiation within the classroom so activities within the small groups can be targeted to the learning needs of the students within a group.

Numeracy Planning

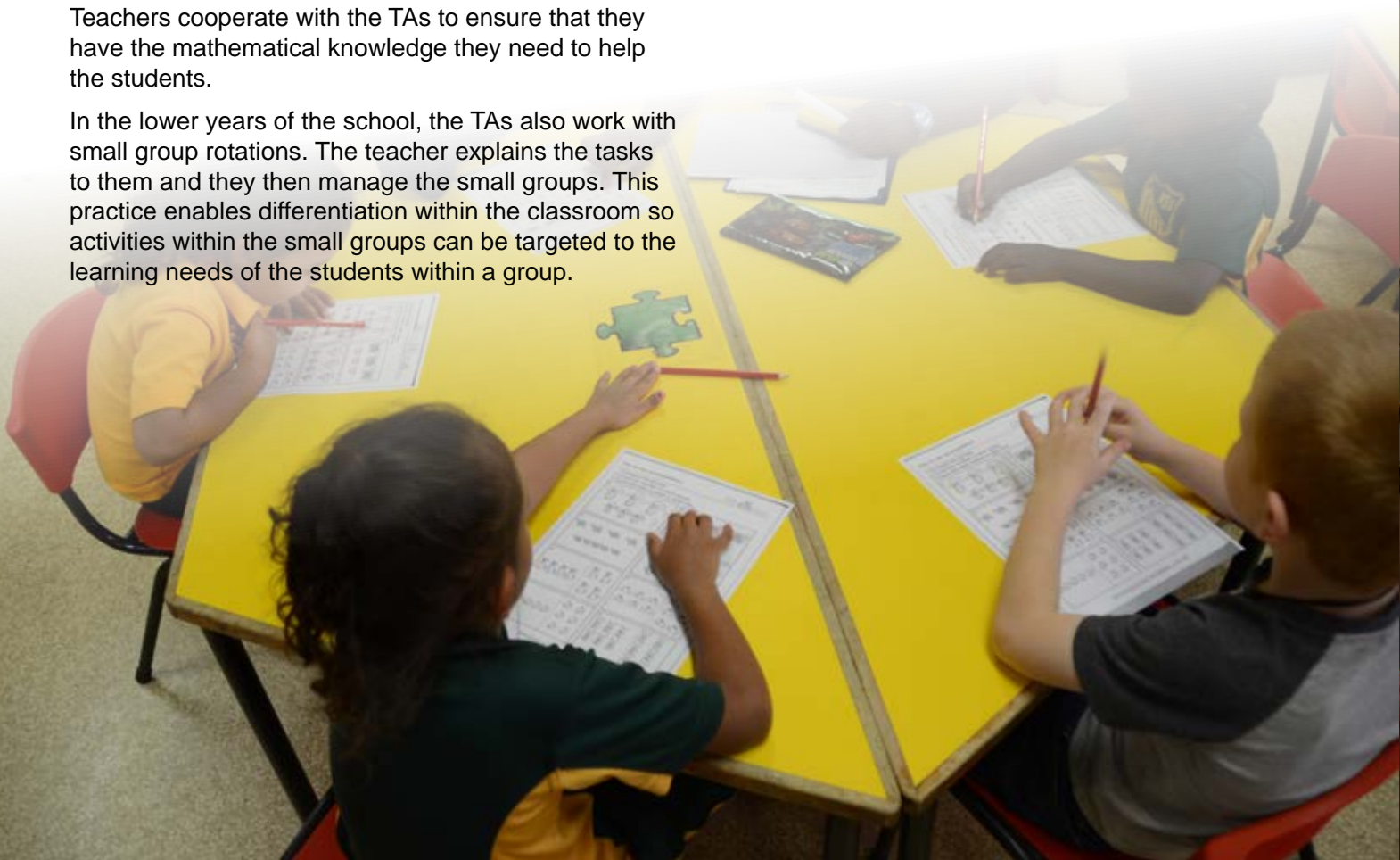
It is expected that all teachers will follow a format in which lessons commence with a session of fast facts. These are designed by the teacher and are implemented in a variety of fashions, depending on the teacher and the lessons being conducted. Sometimes these are quick powerpoint displays and in other cases the teacher opts for other media. The quick facts are based on current learning and the modules that teachers may be implementing.

The learning intent and success criteria are displayed for the students so they are aware of what they will be learning, and how they can demonstrate their learning in ways that will be recognised by the assessments. The teacher then works through the learning material using practices appropriate to the learning intent. This may be through whole class teaching, followed by individual or small group learning. At the end of the lesson, the teacher will then revise key learnings and provide space for reflection.

Teachers are expected to undertake regular assessment of students, usually on a five week cycle, so that they are aware of what students know and how they can build curriculum experiences to match their learning needs.

Assessment

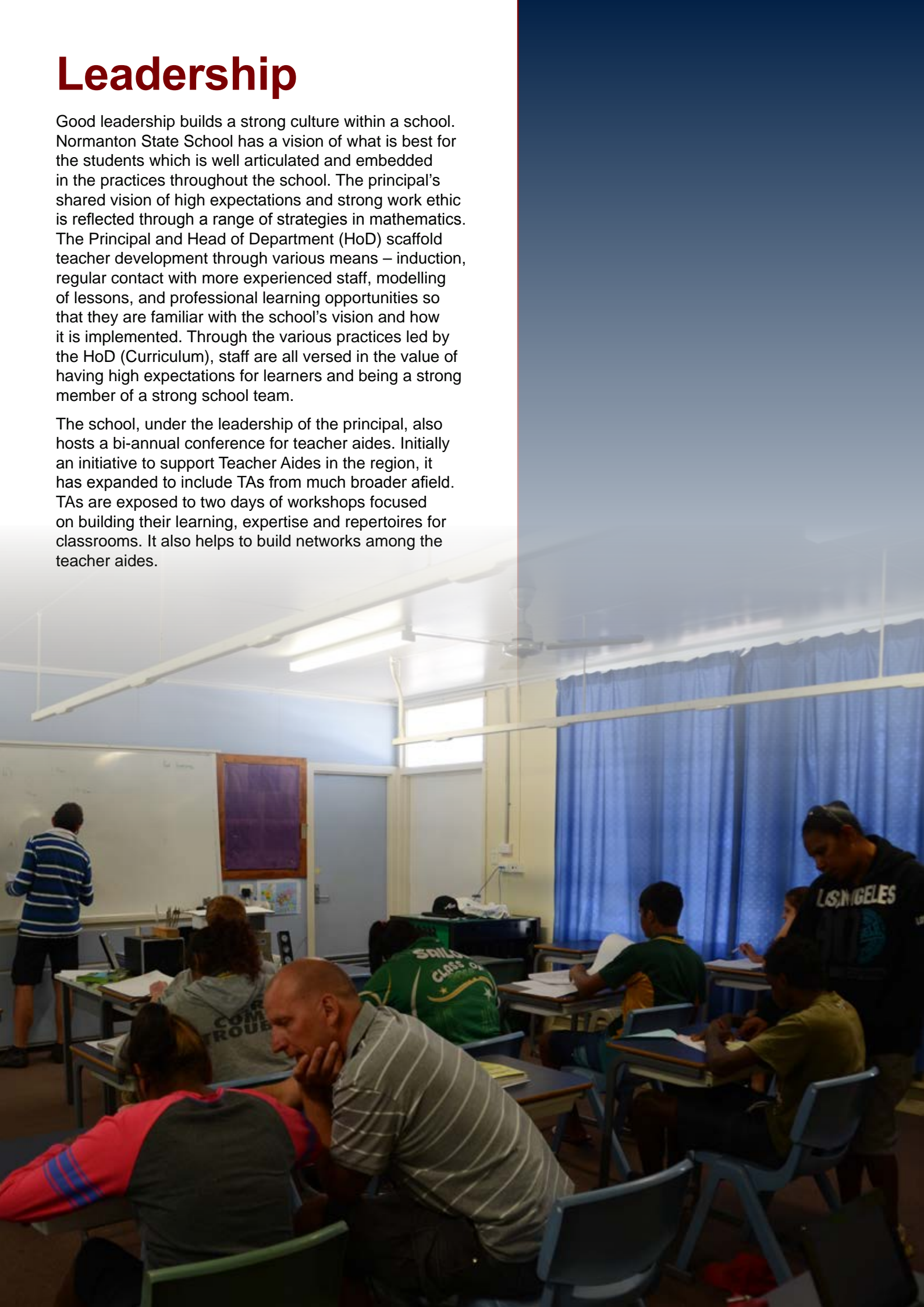
Teachers recognise that if assessment is presented as a large task, it will be too challenging for most of the students. Therefore assessment is broken into smaller, more manageable tasks, enabling students to feel success in completing the tasks and a more accurate assessment to be undertaken.



Leadership

Good leadership builds a strong culture within a school. Normanton State School has a vision of what is best for the students which is well articulated and embedded in the practices throughout the school. The principal's shared vision of high expectations and strong work ethic is reflected through a range of strategies in mathematics. The Principal and Head of Department (HoD) scaffold teacher development through various means – induction, regular contact with more experienced staff, modelling of lessons, and professional learning opportunities so that they are familiar with the school's vision and how it is implemented. Through the various practices led by the HoD (Curriculum), staff are all versed in the value of having high expectations for learners and being a strong member of a strong school team.

The school, under the leadership of the principal, also hosts a bi-annual conference for teacher aides. Initially an initiative to support Teacher Aides in the region, it has expanded to include TAs from much broader afield. TAs are exposed to two days of workshops focused on building their learning, expertise and repertoires for classrooms. It also helps to build networks among the teacher aides.





Benefits for learning and learners

The approach at Normanton is heavily and obviously focused on the students' needs and through strong leadership. The models adopted by the school include high expectations, sound teaching techniques and a prudent strategy to build the skills, knowledge and confidence of the TAs so that they are a key part of the Normanton culture. Teachers and teacher aides are supported to adopt high expectations of the students, and of themselves, in achieving success for learners. It is recognized that the students face many challenges in their home lives, but the school has a role to play in providing quality learning in a supportive and engaging context. The culture of the school is not to make excuses for students, but to provide environments where the students can learn mathematics as well as to build confidence and sociability more generally.

Normanton's NAPLAN results – notwithstanding the limits of this testing scheme – show that there has been sustained and consistent success in numeracy.





Advice to teachers

Teachers consistently articulated in their responses that poor performance should not be attributed to the students, that there's a need to "understand students are kids and not blame the kids". "Teachers need to understand who the students are and why they are like they are." The focus for successful learning of mathematics was thus the united role of the teachers, teacher aides and students, rather than to hold students, families or community responsible.

Building a strong rapport that is respectful of students, their families and the communities while maintaining a professional role is integral to successful engagement, building respect and achieving learning outcomes. In that process, it is important to set the students up for real life: "real life can be hard and they have to be ready for it". Careful scaffolding of both academic and the social/emotional aspects of life is critical to

preparation for life beyond the school. Once rapport is built, then trust and engagement will follow, after which learning can take place.

Many of the students do not have the language of school mathematics in their home vocabulary. Recognizing the difference between the two languages without devaluing home language is important. Giving students strong experiences with the language of mathematics enables them to access and engage with the discourse of mathematics.

Having high expectations of students, staff and community builds success. Strategies are enacted to enable the high expectations to be realized. The leadership team plays a critical role in enabling staff to build the repertoire of skills to enable this to be realised.



Model for Quality Learning

General Principle	Implications for mathematics	Focused strategies
Learning environments	Engaging with mathematics and learning mathematics.	<ul style="list-style-type: none"> • Developing rapport with the students. • Using pace and humour to create engaging environments. • Scaffolding the language of mathematics. • Create differentiated strategies for the diversity of learners.
Using data to inform pedagogy	Regular assessment of students' mathematical achievement is used to inform iterations of pedagogy and learning.	<ul style="list-style-type: none"> • Conduct regular testing of students to monitor progress and to inform subsequent teaching • Tests should be broken into manageable blocks so that students can experience success – smaller tests are more likely to be achieved than large assessment items. This brings about a greater chance of true assessment and success.
Teacher Aides	Key support for both academic and social aspects of learning mathematics.	<ul style="list-style-type: none"> • Provide support for teacher aides to learn mathematics and mathematics education. • Create teaching teams in which the TAs are an integral and valued part.
Teacher Aides High Expectations	Key support for both academic and social aspects of learning mathematics.	<ul style="list-style-type: none"> • Have high expectations of TAs as key staff within the school. • Organise professional development (including conferences) to support the learning of teacher aides. • Teachers employ resources to ensure mathematical content is at year level. • Teachers develop pedagogical strategies to effectively teach age-appropriate mathematics.

Model for Quality Learning (cont)

General Principle	Implications for mathematics	Focused strategies
High Expectations School culture	Students are exposed to age-appropriate mathematics as outlined in the National Curriculum. Teachers and teacher aides support high levels of mathematics learning.	<ul style="list-style-type: none"> Teacher Aides support learners-academically and socially. Teachers and teacher aides work collaboratively to achieve outcomes for all students. A culture with a strong work ethic is embedded at the school where all members of the teams are expected to work for the achievement of students.
	Developing high expectations of mathematics learning.	<ul style="list-style-type: none"> Expecting that students will receive mathematics at age-appropriate levels. Shared vision of the school goals and expectations. Scaffolding staff to the practices expected within the school.
School culture	Developing high expectations of mathematics learning.	<ul style="list-style-type: none"> Building capacity of staff, including TAs. Creating learning environments where the students are engaged in learning.
	Developing strong work ethic of staff and students in mathematics.	<ul style="list-style-type: none"> All staff and students.



Key messages – summary

When teaching maths, it is the teacher's role to enable learning; it is not the students who have the problem learning. A school culture that reinforces this view of learning is important to the success of the students.

Creating learning environments where teachers develop rapport and respect with the students enables productive engagement that results in learning outcomes.

High expectations of staff and students help to develop strong learning environments. Teachers need to believe that students can learn high levels of mathematics and then create the opportunities for students to engage with and learn mathematics.

Scaffolding the metalanguage of mathematics is a key strategy for learning mathematics. It enables students to engage with the substantive ideas, concepts and processes within mathematics and scaffolds their learning

for future concepts. There are differences between the home language and the school mathematics language so it is imperative that teachers enable pathways into school mathematics through language.

Consistency in mathematics lessons is important. Creating the Fast Facts at the start of each lesson, in every sector of the school, meant that students were orientated to mathematics, were revising aspects of mathematics and were familiar with the orientation of a mathematics lesson.

Fast Facts at the start of the lesson also help to settle students before engaging with substantive teaching. The Fast Facts were not always designed to stretch the students too far, but the speed of the delivery of the questions helped to build automaticity.



School demographics

Year range	Prep-10	FTE teaching staff	18.3
Total enrolments	186	Non-teaching staff	22
Location	Very Remote	FTE non-teaching staff	14.4
ICSEA (school)	691	Indigenous students %	88%
ICSEA (distribution of students) (bottom quarter to top quarter)	80% 15% 4% 1%	Enrolments: Girls/Boys	97/89
Teaching staff	19	Language background other than English	60%
		Student attendance rate %	74%