

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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2015



Catering for the Whole Child in the Learning of Mathematics

Strelley Community School

Strelley Community School is located in the Pilbara region of Western Australia and is the oldest operating Aboriginal Independent Community School in WA. . Currently there are 2 locations – Strelley and Warralong. It is located in two campuses – at Strelley Community and Warralong Community. A further campus, Woodstock, was closed in 2006. The original campus – located in Strelley Community – is the oldest operating community school in WA. The Strelley Campus suffered severe damage during Strelley community's school was wiped out in Cyclone George in 2007 and the Strelley families attended Warralong campus. The community school was left vacant for a number of years, before being re-opened in 2012. The Strelley campus re-opened in 2012 and is the smaller of the two campuses with around 20 xx students, and two teachers and a support person..

The Warralong

campus is the larger campus, and the administrative centre of the school, with approximately 65xx students, and 4 full time teachers, the principal and 3 support workers. The school offers education from the early years through to secondary school.

Strelley Community is near the Great Northern Highway and is located approximately 15kms from the main road and approximately 60kms from Port Hedland. Warralong Community is located 1420kms south east of Port Hedland and 850 kms north of Marble Bar. The community is located between the Shaw and DeGrey rivers, both of which are prone to flooding.

The region was established by pastoralists as cattle and sheep stations. The local people were employed as cheap labour on the stations that led to the 1946 Pilbara Strike where the



Aboriginal people sought improved salaries and conditions. Following the great strike in 1946, a group of Aboriginal men led by Don McLeod, the men formed a cooperative as this was seen to best represent the social structure of Aboriginal people. While the group split in 1959, the part led by Don McLeod established itself under the name of “Nomads” and purchased Strelley Station, Warralong and some others which they operate today. The Nomads Charitable and Education Foundation is the school’s authority, and is the employer of all non-indigenous staff at the school.

Strelley Community School has a whole school numeracy program but within it, teachers have considerable scope to teach how they like and how best to suit their students’ needs. Teachers all valued the overall guidance of a school program and were highly appreciative of the capacity to build their own classrooms in ways that suited their teaching style and the students’ needs. The classes are all multi-age and vary varied in their levels so teachers need to differentiate learning. The School also uses the AICS Numeracy Portal for planning and identifying students’ individual learning needs.

Defining Success

Strelley Community School has enjoyed on-going success in NAPLAN testing for an extended period of time. When compared with like schools, Strelley has scored light green and dark green consistently over the past four years.

	2011	2012	2013	2014
Year 3			*	
Year 5				
Year 7				

**It is noted that in 2013, the school also scored light green when compared against national averages.*

In the early years of large-scale testing (pre NAPLAN) and currently with NAPLAN, students can easily give up in tests, and not turn up at school, so the school has focused on developing the skills and resilience of the students to take the tests in full. Over the years, the students have moved to being able to complete the full test. Students are encouraged to attempt all questions so that now all students are able to complete the full text.





NAPLAN and Pedagogy

There are two strands to the Strelley Community School case study. The first relates to the general pedagogies used across the school. The second relates to the specific strategies used by the school to support success in NAPLAN.

Success in NAPLAN

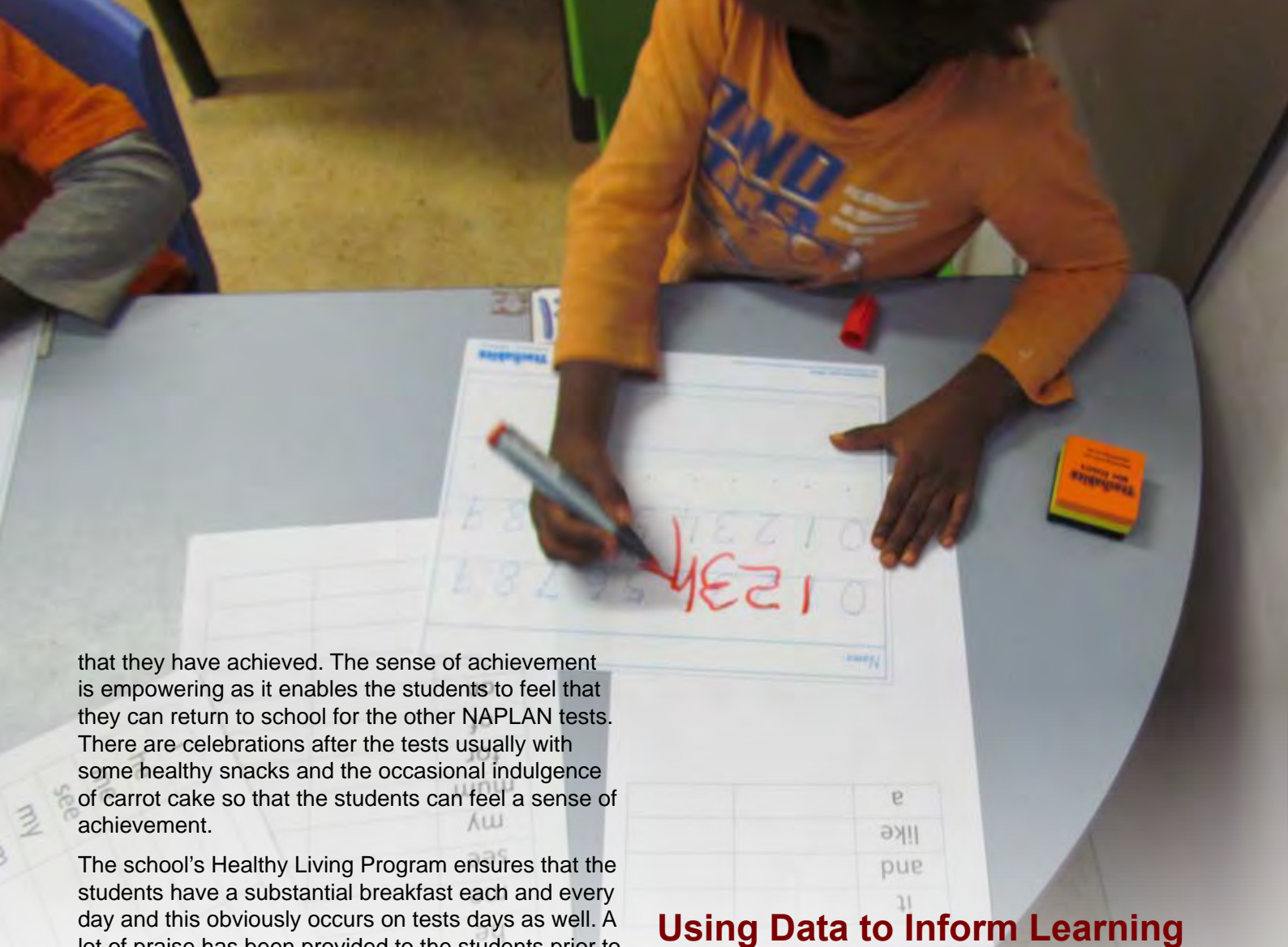
Success in NAPLAN is as much about mathematics as it is about test taking. For many Indigenous learners, the task of taking a test, such as NAPLAN, is quite foreign and stressful. To mitigate test taking stress, the school has adopted an approach to support students with test-taking competences as well as building the confidences of the students when they are taking the tests. Two weeks prior to the NAPLAN testing, an external facilitator works with the students to help build their confidence with taking the test and give them strategies on to how to respond to test items. Having the confidence to have a go at the items, and to keep trying for the duration of the test, has been a focus of the work-shopping. There is a concerted effort to assist students to feel confident and relaxed with the test taking process.

Taking tests is quite a foreign skill for the students at Strelley Community School as the use of questions to gather information is not inherent in the students'

culture. Students need to be skilled in the ways and roles of questions, so the process of NAPLAN testing is a foreign process. The workshops help students to engage with the tests.

The language demands of NAPLAN also create significant challenges for Strelley students who speak several languages other than English. In the lead up to the NAPLAN tests, and in mathematics lessons, students are explicitly taught the language demands of written tests, and focus is directed at what the question is asking, and key words that will help students to access the questions. This may not be the most accurate strategy but it helps students to make educated guesses with responses. Also, the test taking strategy has helped students to move through the whole test – first if they do not know the answer to a question, they move on. If there are questions that are missed, then they are encouraged to “have a go” rather than to leave the question/s uncompleted. The completion of the test is seen as a success and this is celebrated. Over the years, Strelley Community School has developed the “have a go” philosophy that has flowed into NAPLAN tests so the students have developed a capacity to complete the tests rather than to give up.

After the tests, the facilitator and teachers also recognise the students for their efforts so that they feel



that they have achieved. The sense of achievement is empowering as it enables the students to feel that they can return to school for the other NAPLAN tests. There are celebrations after the tests usually with some healthy snacks and the occasional indulgence of carrot cake so that the students can feel a sense of achievement.

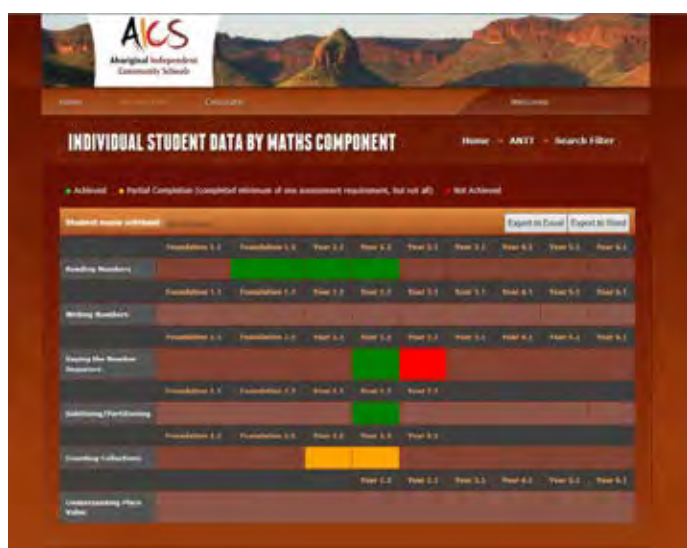
The school's Healthy Living Program ensures that the students have a substantial breakfast each and every day and this obviously occurs on tests days as well. A lot of praise has been provided to the students prior to the tests and post the tests so that they feel that they will be able to achieve on the tests.

Building the test-taking skills, confidence and resilience of the students to complete the NAPLAN tests is addressed by the facilitator. This is valued by the staff as this allows them to work with the other students in their classes who are not taking the tests. The school focuses on the test-taking skills needed for the successful completion of the NAPLAN tests.

Using Data to Inform Learning

The school has structured its week so that Fridays are a shorter day. This is to allow teachers time to enter data into the Numeracy Portal. Teachers are constantly assessing students' learning, through both formal and informal methods. Regular testing is done in Week 5 and Week 10. Data is updated on the Numeracy Portal. The Portal is used to support teachers to develop targeted learning activities once the data is entered.

Teachers receive regular support from the AICS Numeracy Consultant who works with teachers at both campuses. Her input has been particularly valuable for the teachers working in the secondary schools. The consultant provides on-going professional development for the teachers. The support is provided via a number of avenues: observing lessons and providing feedback, modeling lessons, helping to develop plans for learning, helping to interpret assessment, and supporting teachers to use the Numeracy Portal effectively. The consultant works with teachers on an individual basis so that the needs of the teachers are being addressed. The consultant was seen to be an invaluable asset to the teachers. As there is no accommodation in community, the consultant often stays with teachers in their homes, and in so doing, professional conversations are continued in after-school hours.





Well Nourished Learners

Both campuses of Strelley Community School offer a comprehensive meals program so that the students are nourished and ready for learning. The first meal, prepared by the teachers or support persons (depending on the campus), is a full meal, as opposed to a 'regular' breakfast, consisting of meat and vegetables. The students are also provided with a freshly squeezed juice that is full of vitamins – made each day from celery, beetroot, carrot, apple and oranges. This is served prior to school and is offered to all. The second meal is a standard lunch fare of sandwiches or similar and includes fruit. The students are encouraged to drink plenty of water and are given additional snacks if it is deemed necessary.

The healthy meals program is seen to help prepare students for their daily learning activities but also ensures that their long-term dietary needs are met. The school has a strong commitment to supporting the students' multi-dimensional learning, so cognitive, emotive and physical wellbeing are key to the approaches taken at the school. Providing good food options ensures that the physical needs of the students are met and they are able to then engage with learning.

As there is no store in the Warralong or Strelley community, and the nearest shopping facilities are 60kms away, provided the roads are passable, the school provides the food to the children for the main meals of the day, but also often to families. Anyone is welcome at the morning meals. The food program has been primarily sponsored by outside companies (usually mining companies) to the effect of \$50K per annum. The down turn in mining has had an impact on this sponsorship.



Student-Staff Ratios: Focus on Transition to School

As the people in the community are fairly recent in their contact with white people, there are significant gaps in the students' preparedness for school. As such, Strelley has an emphasis on building the skills of the younger students so that their transition into school (and its routines and knowledges including mathematics) is a focused strategy at the school. Having low student-staff ratios in the lower years enables teachers to work closely with the students as they come to know the routines and knowledges of school. In the lower years, class sizes are kept

small (10) while the upper primary and secondary classes are larger ($n=18-24$) depending on attendance. Classes are moved each year so that smaller numbers, and hence greater teacher input, per child can be achieved. It was felt that the closer relationships between students and teachers in the foundation years of schooling were important. By having smaller classes in the early years, the teachers are able to build the skills of the students, support their transition into school practices, and support their progression into SAE.



Bringing Culture and Community into Maths

Across the school there is a strong emphasis on bringing the experiences and culture of the students into the mathematics classroom. Teachers want the students to see that they bring important knowledges and experiences into the school and that mathematics can be related to their lives.

Culture and Art

In the Year 1-4 class, the teacher had been working with number activities. With the activities differentiated for the students, the students worked on various aspects of number. For the final part of the lesson, the teacher placed a large painting done by one of the local women. The teacher then drew on the students' knowledge of the symbolism of the art to talk about the humps in the snake, the number of waterholes which could be defined differently by different students, and other objects represented through the artwork.

Using the Home Language in Mathematics

At Strelley Community School, the home languages of the students have at least ten counting words. These are used in mathematics lessons, particularly in the early years of schooling. This helps the students to make connections between their home language and that of school mathematics. Some of the teachers have learned some of the home language terms, but the main strategy is for the AEWs to bring the home language into the mathematics classroom.

The Aboriginal Education Workers (AEWs) have made resources that incorporate the home language (of counting for example) and that of school mathematics. The AEWs also help teachers by saying the home words for mathematical concepts. This helps to promote the home language of the children as being a valued language that has synergies with school mathematics.



Our Daily



Journal


Experiential Learning – Using the Students' Environment

At the other end of the school, the secondary teacher drew (and relied heavily) on the students' knowledge and interests. For this cohort of students, motivation and engagement were critical to keeping the students on task, and attending school. The teacher had recently taken the class (predominantly boys) fishing. They used the fish to record data – the types of fish caught, their length, weight etc. The data was all recorded (along with photographs) and then the data was discussed in various ways. Using the fish as the data source, the students were more engaged in the mathematical activity than if artificial data were used. At another time, the teacher combined science and mathematics so that a lot of small fish were caught and kept in tanks. The students nurtured the fish and monitored their progress (data keeping) until they reached maturity.

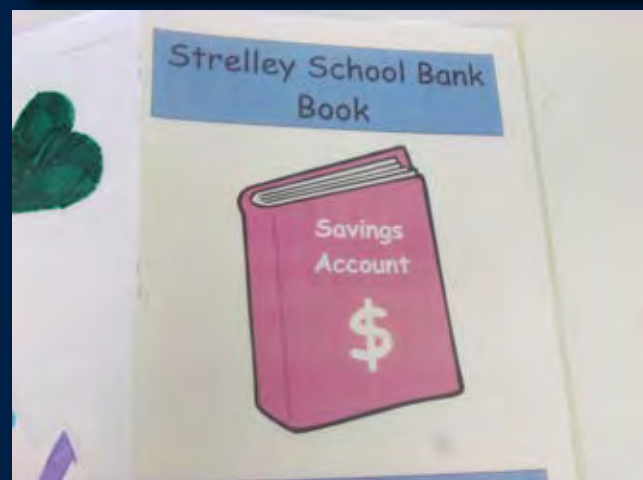
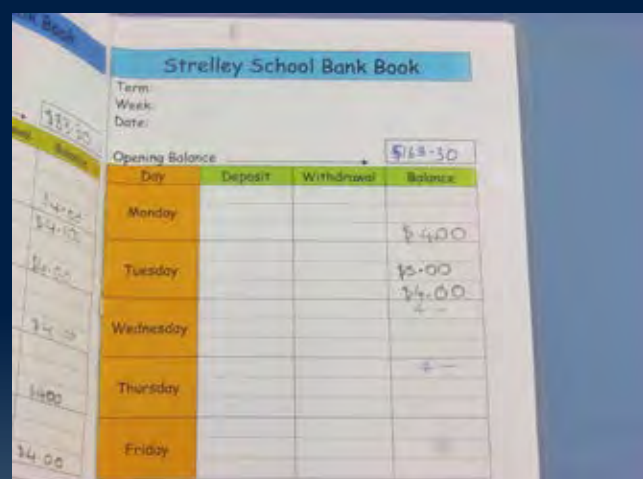
The provision of real-life experiences for the basis of mathematics activities was used by the teachers across the years. This could range from using objects in the natural world of the students and through cross-curricula activities – such as the leaves on particular plants or flowers found in the region; using pebbles for counters (rather than plastic disks) and so on.

Teachers also drew on the lives of the students to talk about mathematical concepts – such as how many people lived in their homes, how many bathrooms/toilets in their homes – as this helped the students to engage with mathematics as the topic of discussion was centred on their worlds.

In some classes, the teachers operate a banking system where the students earn reward dollars, but can also lose dollars for various behaviours. This is seen to help the students learn mathematics in an applied way as the students must keep a 'bank book' with deposits and withdrawals. Students can earn money for attending, or lose money for being late. They also can lose or gain money for the usual behaviour programs that operate in schools. At the end of each term, the students are taken into Port Hedland and are given an amount of money commensurate with their bank book. If the student has \$250 in their account, he/she would be given \$25 to spend. The teachers work with the students as they go about their shopping (usually in a store such as Kmart) so that they must add their spending until they reach or exceed their total amount. Those who exceed their amount must work out what they can't have to ensure they are within their budget.

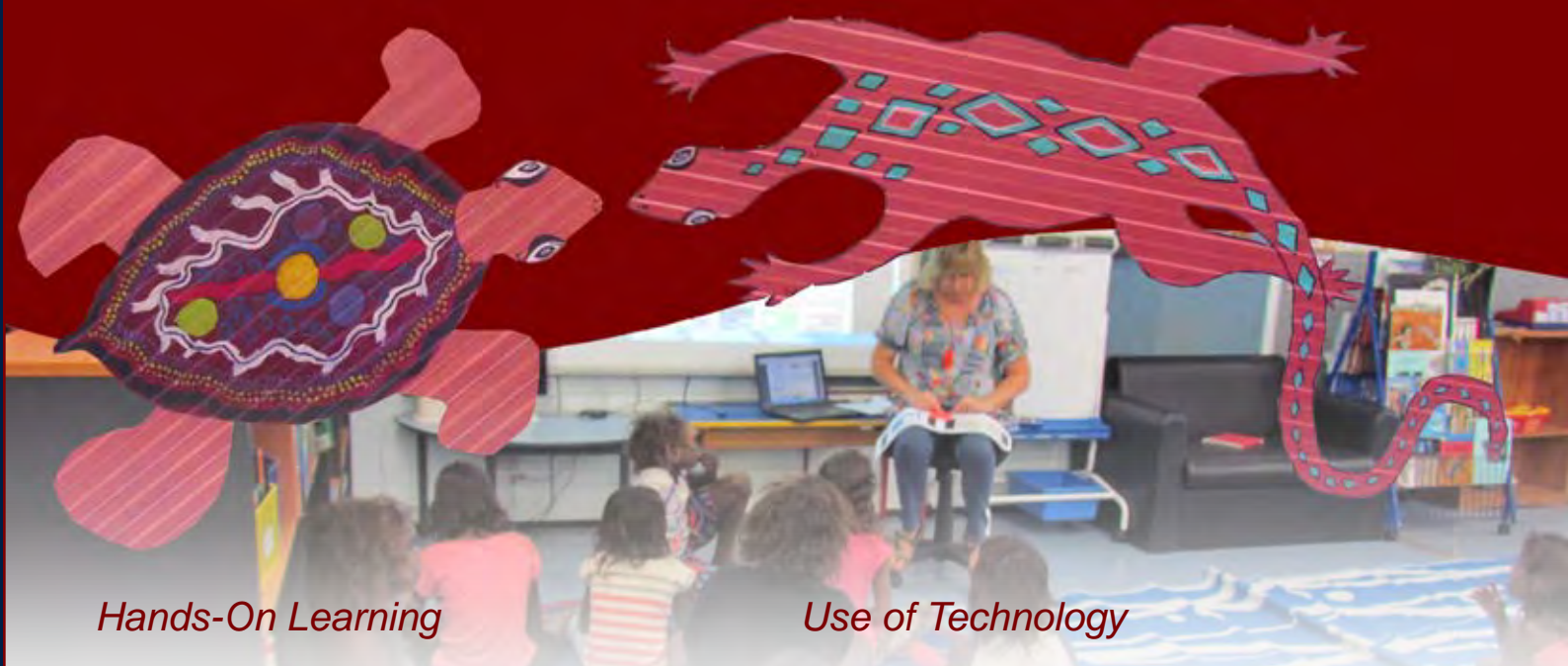


Strelley School Bank Book	
Deposits +	
Attendance	\$ 3.00
Being an Active & Caring Citizen	\$ 1.00
Demonstrating Good Character	\$ 1.00
Withdrawals -	
Absence	\$ 3.00
Late Arrival	\$ 0.50
Swearing	\$ 1.25
Displaying a Bad Attitude	\$ 1.50
Fighting and Teasing	\$ 1.75

Strelley School Bank Book			
Term:			
Week:			
Date:			
Opening Balance	\$13.50		
Day	Deposit	Withdrawal	Balance
Monday			\$4.00
Tuesday			\$5.00
Wednesday			\$4.00
Thursday			
Friday			





Hands-On Learning

Across the school, there was a strong focus on hands-on learning. Students are seen to learn best when they are able to manipulate objects and make sense of actions. For example, the abstractness of $2+4$ is better grasped when the students are able to combine a set of two objects with another set of four objects. Similarly the rainbow numbers can be understood by having the counters or objects at hand (10 objects) and students are able to place some on one side of a card and the remainder on the other side so that they can see how the objects add to 10 regardless of how they are combined.

Often cultural and environmental activities or events can be part of the hands-on learning. In one case the teacher focussed on the grouping of 4s. One of the students talked about goanna prints where the four feet made a particular pattern in the sand. The student repeated the four-feet pattern, and then talked about this being a group of four.

Music and Singing

The students have a strong enjoyment of singing, particularly in the early years. The challenges of language differences between home and school can be alleviated through song. The early years teacher had a song for almost any concept so the students were constantly singing. This also helped to keep the students calm, on-task and engaged.

Group Work and Differentiation

As multi-age classrooms, the diversity in any one classroom at Strelley Community School is quite high. Not only are there age differences, but some students attend regularly while others may be sporadic or transient, so teachers needed to have differentiated activities to cater for all of the students in a classroom. Lessons generally started with a common whole group orientation that activates prior knowledge and then moves to explicit teaching (modelling and practice) and then broken into smaller groups or individual (but differentiated to the needs of the individual) activities. The teacher may work with one group, and the AEW/s with other group/s.

Use of Technology

Across all classrooms, teachers used digital technologies to support learning in mathematics. The digital tools were particularly useful in differentiated activities as it allowed some groups to be engaged with activities with the teacher and/or AEWs worked with other groups or individuals. Classrooms had iPads and students were able to play/work on these depending on what the teachers were intending from the activity. In some cases, the iPads were part of the differentiated activities, in other classes they were for targeted Maths games that the students could use when they had finished their other work. In the latter case, it kept the students engaged in learning mathematics and was enjoyable enough to act as an incentive for completion of work.

Teachers reported that the students enjoyed using technology which included interactive whiteboards, cameras, computers and iPads. The students were motivated and engaged when using these media and so were an effective repertoire of tools in the classrooms.

Repetition, Repetition, Repetition

The teachers used a range of strategies in their classrooms to continually revise and refresh learning. Each day, teachers begin lessons with revision of concepts previously covered. This not only helps students to remember what has been learned previously but also helps them to retain the concepts and processes themselves as these are often applied in latter parts of a lesson.

All lessons had an orientation or beginning where concepts are revised, refreshed and repeated. This helps the students to remember many of the basic mathematical concepts – numbers, shapes, etc.

Each lesson should have some story problem within it, particularly in the upper years of the primary school, and in the secondary school. Language was an issue among the students as the home language was different from school mathematics. Supporting the students to understand the demands – linguistic and mathematical – of word problems or stories was an integral part of lessons. This helps the students to learn the discourse of language or story problems, particularly the nuanced language of mathematics.

Benefits for Learning and Learners

There are two main approaches being taken at Strelley Community School. First, there are a range of pedagogical approaches adopted in the teaching mathematics that recognize the cultural dimensions of learning and this brings with it higher engagement in the learning activities. Secondly, time is given to developing confidence in the students which in turn develops competence and a willingness to 'have a go' at the NAPLAN tests.

The approaches adopted by Strelley Community School in the preparation of NAPLAN testing has not only resulted in very positive results for the school, but over time, the students have gained in confidence in taking the tests, and have built up a resilience to complete tests.

The approaches adopted by the school have created a positive learning environment for the students.

Attendance is generally very high, often greater than 80%.

The food program has not only enabled students to remain focused on learning mathematics (and other areas) but has also built the overall health of the students. The focus on the whole child has meant that teachers focus on the cognitive, social, physically and emotional well-being of the students. Collectively these enable students to engage with mathematics.

The Aboriginal Independent Community Schools numeracy consultant has supported teachers in their learning about mathematics - teaching, learning, assessment, curriculum and pedagogy. This has built a common approach across the school (through the use of the Numeracy Portal) that has been a valuable tool for the teachers.

Advice to Teachers

School, language and mathematics are often foreign concepts for students so teachers need to develop a range of strategies to address differences between the home and school. This includes test taking, including NAPLAN, and the everyday practices in mathematics lessons.

Test Skills

The school focuses on the cognitive, physical and emotional well-being in the lead up to NAPLAN. The students are upskilled in test-taking skills to build their knowledge, confidence and resilience in test taking.

Students are rewarded for their completion of NAPLAN tests, with a very celebratory feel to their success.

Preparation for the NAPLAN tests includes familiarity with past tests and the genre of the mathematics test items – including those that are language-based. Students are also taught test taking processes – such as skipping items that they don't know, complete all test items as the test time draws to a close, and then adopt a 'have-a-go' approach.

Students need to be comfortable with the test taking process and have a nourished body to enable them to complete the test. Strelley Community School provides a very healthy program throughout the year so that the students are physically concentrate for the length of the tests.

Pedagogies

Across the school, there are many pedagogies used by the teachers to engage the students. These vary with the year level, the familiarity the students have with the practices and language of mathematics.

Strelley Community School has a school wide program but each teacher is able to adopt an approach that builds on the strengths of the teacher/s and the needs of the students.

Smaller class ratios are used in the lower years to help students with the transition into school and mathematics. As students gain familiarity with the processes and practices of school and mathematics, the class sizes increase.

Language, music, and hands-on approaches feature at Strelley, along with drawing on the knowledges and activities within community and the wider environment. These help to engage students.

Teachers keep lessons at a fast pace and with a range of activities so that students remain engaged with mathematics.

Model for Quality Learning

General Principle	Implications for Mathematics	Focused Strategies
Preparing test-taking skills	Students need to be able to access and be successful in test taking skills for numeracy testing in NAPLAN.	<p>An external facilitator supports students in developing test taking skills for numeracy.</p> <p>Students are encouraged to develop confidence and resilience in numeracy test taking skills.</p> <p>The process is not about teaching to the test but building test taking skills – cracking the test genre.</p>
Build home activities and culture into mathematics	Recognising and valuing home and cultural activities in mathematics is a powerful tool for engaging learners.	<p>Draw on activities from the community and the environment as the basis for mathematics activities.</p> <p>Draw on cultural resources, and the home language to create links between the lives of the students and mathematics.</p>
Using language, music and hands-on materials assist learning of mathematics	Create learning activities that draw on language of the students.	<p>Draw on the language of the students (such as counting) in mathematics.</p> <p>Create opportunities to make explicit the language of mathematics.</p> <p>Create opportunities that explain that there are concepts/processes that have many words that mean the same thing.</p>
	Use music and song in mathematics.	Students can learn many mathematics concepts through song. Include as much song as possible in lessons.
	Hands-on materials create visual representations of mathematical concepts and processes.	<p>Use a range of materials – formal mathematics (counters, unifix, MAB, etc) as well as materials from the environment (stones, feathers, leaves, art work) for materials for learning.</p> <p>Let the students play with materials before using them for teaching.</p>
External consultants build teacher knowledge in mathematics	Regular visits from a numeracy consultant to support teachers has built the quality of teaching mathematics.	The numeracy consultant works with teachers in the school context on matters relevant to the individual teachers.



Key Messages – Summary

Supporting students to succeed in NAPLAN testing is invaluable to bringing about success in NAPLAN. It also helps students to feel confident when they need to participate in tests, and also builds their resilience.

Focus on the whole child so as to include their cognition but also their well-being (physical, social, and emotional) as this will enable students to succeed in mathematics as their basic needs are being met.

Teachers need to be supported in their transition into remote teaching. Within school support as well as external support (such as consultants) can support teachers as they learn to teach, plan and assess in remote teaching.

School-wide plans can assist teachers in their overall planning but some scope is needed for teachers to develop strategies to meet the needs of their classroom.



School Demographics

Year range	PP-12	FTE teaching staff	7.5
Total enrolments	75	Non-teaching staff	39
Location	Very Remote	FTE non-teaching staff	16.3
ICSEA (school)	720	Indigenous students %	100%
ICSEA (distribution of students) (bottom quarter to top quarter)	71% 18% 8% 3%	Enrolments: Girls/Boys	33/42
Teaching staff	8	Language background other than English	97%
		Student attendance rate %	79%