



UNIVERSITY OF  
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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  
Robyn Jorgensen

2014



## Leadership in Mathematics Education

### *Halls Creek District High School*

Halls Creek is the most inland town in the Kimberley region, located on the Great Northern Highway some 686kms east of Broome and 380km south of Kununurra. It is a mining and pastoral service town of approximately 1500 people. The famous Argyle Mine is 2 hours away and offers employment for local people. Halls Creek is a central point in the Kimberley and acts as a crossroad to many of the other key sites in the region – it is the starting point for the famous Canning Stock Route that is 1600km long; and the Tanami Track that offers four-wheel drivers the shortest route to Alice Springs. It is the final stop before the world famous Bungle Bungle, and is 200km from Wolfe Creek Crater. There is a strong building program operating in the town with over 100 new homes being built during 2014. The original Halls Creek, an old gold-mining town, is located

14.5km out of town. The current town was established in the 1954. The town has had a chequered history in terms of social issues. Alcohol restrictions were introduced in 2009 and many of the serious problems have since been reduced. This is evident in the decreasing crime rate in the town. It was reported in 2011 that police callouts and the number of assaults had both halved and drink driving charges were three times lower since introduction of the restrictions.

Most students at Halls Creek District High School come from the town of Halls Creek and nearby family communities. A small group travels by bus from Koongie Park Station (20km) and Lamboo Station (40km). The school has a strong focus on literacy and numeracy. Since 2011, the current leadership team has been building a very strong culture of learning and positive behaviour. The school has a core group



of students who attend regularly. The leadership team has been fostering a culture at the school that is underpinned by the belief that students who attend regularly are entitled to be exposed to a mathematics curriculum that is commensurate with their year level.

In schools that have significant attendance issues there is a tendency for teachers to provide students with a curriculum that is significantly below students' current year level. Trying to cater to students who are sporadic attenders often results in repetitive lessons and lower expectations for the whole class. The ethos of the school now is that every child who attends regularly has the right to be exposed to a curriculum that is appropriate to their year level – students in Year 9 should be exposed to the Year 9 Curriculum as outlined in the Australian Curriculum. The content may initially be beyond the students, however, developmentally, they are able to deal with the cognitive demands of the content, and they need to be exposed to it in ways that make the concepts accessible and can accelerate their learning. It is not acceptable to offer an impoverished curriculum that is developmentally below the student, as this can create negative learning. Since the school adopted this approach, there have been significant gains in both mathematics learning opportunities and positive behaviours for many of the students. In recognition of the fact that some students may need more support, there has been considerable input from curriculum leaders to support teachers to develop expertise to scaffold student learning.

## Defining Success

The school has been building a culture of learning in mathematics that has required sustained input and effort in managing the change process. The data below show some positive changes in students' achievements in the National Assessment Program in Literacy and Numeracy (NAPLAN) numeracy tests over time. The Halls Creek data shows a general upward trend in the percentages of students achieving at and above the National Minimum Standard and a reduction in the percentages of students achieving below this benchmark.. These results suggest that the practices being adopted by the school are making positive changes in spite of the difficulties comparing NAPLAN results from year to year in a school that has around 60% student transience each year . Furthermore, a number of Aboriginal students, scattered across the school, have achieved scores around the National average, whereas previously only non-Aboriginal students appeared to have scored in that range.

**NAPLAN Data for Year 3 Numeracy**

	2010	2011	2012	2013
% above NMA	23	11	13	31
% at NMA	50	56	42	44
% below NMA	27	33	46	25

**NAPLAN Data for Year 5 Numeracy**

	2010	2011	2012	2013
% above NMA	0	21	22	0
% at NMA	26	42	17	56
% below NMA	74	38	61	44

**NAPLAN Data for Year 7 Numeracy**

	2010	2011	2012	2013
% above NMA	7	0	0	10
% at NMA	15	32	38	50
% below NMA	78	68	63	40

A further measure of success is the increase in the number of students who are completing the NAPLAN tests. Prior to the changes being implemented, many students stayed away from school when NAPLAN testing happened and those who attempted the tests required constant assistance and support to keep them focussed on completing the test. In 2014, approximately 90% of Year 3 students took the test and there was a percentage increase of more than 20% in the number of students sitting the test in the other years. The Year 7 and 9 students in particular were fully engaged in the testing and few asked for any help. It seems that because the students had been exposed to the range of content that is in the NAPLAN tests, they were more confident and willing to attempt the test items. This has been encouraging for the staff to see.

# Leading Change

In 2011 there was little evidence of short-term or long-term planning. Individual teachers chose their own curriculum content. Many teachers relied on worksheets and most content was appropriate only for the lower-achieving students. Teachers typically repeated content for the whole class to accommodate students who missed many days. Students were often engaged in busy work, such as colouring in, and there was little evidence of deep learning. There was no consistent monitoring of progress in mathematics (or any other area). The new curriculum leaders had a strong background in mathematics, and pushed to break the practices of the past and, over time, introduce learning experiences in mathematics equivalent to those offered to students in urban settings.

Change needs to be managed carefully and be well supported to bring teachers along. As with many remote schools, Halls Creek DHS also experiences turnover of staff, so there is a need for on-going

support and induction of new staff. The school was fortunate to have two Curriculum Leaders trained as Getting It Right in Numeracy (GIRN) Specialist Teachers as well as a deputy who was a writer of the First Steps in Mathematics resources and GIRN professional Learning program. These key personnel have led a focused reform at the school, drawing on best practice in numeracy/mathematics. In spite of reductions in funding for 2014, the school has retained a numeracy curriculum leader in the primary area and a secondary curriculum leader responsible for both literacy and numeracy to support teachers in their mathematics teaching, planning and assessment across the school. These roles are invaluable in developing consistency across the school with changing staff numbers. The curriculum leaders are engaged in inducting staff and providing professional learning opportunities to improve teachers' skills in providing explicit focussed mathematics learning activities for students.





# Timeline

Managing change has required the leadership team at Halls Creek to develop a timely strategy to support staff and the community in moving forward. The following timeline gives an overview of the change process since 2011 and how the school has supported change in mathematics.

## 2011

Increasing expectations about the learning experiences to which students are exposed – focus on pedagogy in professional learning

- Provide professional learning in mathematics, English, Australian Curriculum in general, and cooperative strategies. Emphasis on increasing expectations.
- Set targets for 2013.
- Numeracy: Introduced the Numeracy Monitoring Tool to monitor progress. Diagnostic tasks were implemented across the school.
- Literacy: Introduced reading boxes and directed reading program. The 400 club was implemented to develop sight vocabulary. Daily running records were kept for reading and number tasks.
- Literacy and numeracy specialist teachers worked shoulder to shoulder with teachers.
- Curriculum Team Leaders supported class teachers with innovation and change management.
- Behaviour management focus – CMS professional learning.

## 2012

Teachers becoming aware of necessity to plan for learning – discouraging busy low-level learning activities and colouring in.

- Introduced weekly planning sheets for mathematics.
- Familiarised teachers with Australian Curriculum expectations and organisation in preparation for move to the Australian Curriculum for planning in 2013.
- 400 club for mathematics– Trained AIEOs to work with students.
- Positive Behaviours in School initiated.

## 2013

Teachers submitting weekly planning schedules to curriculum leaders for feedback and support.

- Mathematics Curriculum Schedules created with links to First Steps in Mathematics for combined classes, and all teachers used the Australian Curriculum at year level to guide planning, with backtracking to earlier years if necessary, but with a focus on accelerated learning.
- Meetings with Regional Curriculum Officer to assist with strategic/operational Plan for 2014.
- Necessity for longer-term planning discussed, and teachers asked to begin writing term overviews to guide their weekly planning.
- Systematic development of IEPs and BMPs for students deemed at risk.

## 2014

Teachers to produce term overviews and weekly plans, based on Australian curriculum

- All teachers to develop term overviews for all teaching areas – collaboration with colleagues encouraged and facilitated.
- All teachers to use Australian curriculum at year level for starting point in planning.
- Focus on challenging students who are regular attenders, and acceleration and differentiation to accommodate achievement range in each class.
- Teachers to assess themselves against National Professional Standards for Teachers as part of performance management process – focussing on extra support for teachers at risk.
- Reporting to parents using Australian curriculum for English, maths, science and history.





## Providing Students Access to Year-Level Mathematics

The impetus behind the reforms at Halls Creek DHS is the belief that students have the right to be exposed to an age-appropriate curriculum. For example, some students in Year 9 who have had high absenteeism may struggle with basic number concepts, but the class should still be exposed to algebra. It is not acceptable to use absenteeism to justify offering an impoverished curriculum that effectively locks students out of mathematics and, in the process, gives rise to negative attitudes to schooling. Consequently, the teachers' task is to design activities that will bring the student forward in their mathematical thinking and reasoning. This is not easy in the secondary years, because most of the lower secondary teachers teach outside their discipline area, and none are maths trained. In addition, as is often the case, many of the primary teachers are not confident with mathematics. Many of the teachers are new graduates or are new to remote teaching. However, these challenges are not new to remote education.

Although students are expected to be exposed to age-appropriate material, they may need to be taught content of a lower level in order to close gaps in their learning. For example, a Year 9 student may be exposed to the concept of algebra, but might still be being taught Year 3 content. However, the pedagogy that is appropriate for a Year 9 student is quite different from the pedagogy used for a Year 3 student. The Year 9 student has a right to experience pedagogy suitable for an adolescent (or suitable for an adult man, if the male student has gone through men's business). The task of the leadership team has been to build the skill base of the teachers so that they can provide age-appropriate pedagogy to support and accelerate student learning.

The school has three key staff to scaffold teachers' learning and guide implementation of mathematics practices in the school: a primary school numeracy curriculum leader, a secondary curriculum leader responsible for literacy and numeracy; and a deputy principal, who has a very strong background in mathematics.



# Managing the Change Process

Implementing the significant changes at Halls Creek has required considerable support and input at two levels. There has been a need for considerable input into staff development. Halls Creek DHS has had a number of focused PD days, making use of the First Steps in Mathematics resources.. In addition, the GIRN Specialist Teacher and the deputies have supported teachers through modelling good pedagogy and through assisting teachers to develop high-quality long-term curriculum plans (term/annual) so that students receive a curriculum appropriate for their needs.

There has been a need to change students' experiences in mathematics. Raising expectations of learning and changing the pedagogy used in classrooms has required scaffolding from the teachers (and support staff). For the secondary students to become familiar with lesson structures involving group work, initially three teachers were in the classroom (classes contained more than 20 students) to introduce expectations. Managing the small group rotations initially required more support in the classroom so that the students could shift from the more teacher directed instruction to which they were accustomed to being more independent in their learning. Each teacher worked with one group so that students became accustomed to working in the smaller groups within the whole class. Once this was achieved, the teacher alone and often an AIEO, could manage the on-going rotations, confident that the independent groups can engage with assigned learning activities with little supervision. The group rotation process enabled the teacher to focus on one group at a time and provide explicit teaching

according to each group's particular learning needs. Students have become accustomed to small groups and collaborative learning, and most work well within this context. Indeed, when new students arrive, the students help induct them into the practices of the classroom.

Sustainability of practice is a key consideration in remote schools. The curriculum leadership team since 2011 have included relatively older teachers who are not at the school to build a career; rather, they have already had strong and successful careers and are there to make a real difference. All are keen to embed the changes in the school to make them sustainable beyond their time at the school. They have been cognizant of the good things that were established at the school, aware of the problems at the school, and have been dedicated in their commitment to change. The appointment of a highly qualified mathematics leader with exceptional skills, knowledge, and history in mathematics education, professional learning of teachers, and education department policies, as well as a GIRN Specialist Teacher who is skilled in the process of working shoulder to shoulder with teachers, has enabled strong leadership in the mathematics learning area. These skills have been invaluable in supporting teachers to build best practice in mathematics education and to engage in the change process.

The reforms in the school have focused not only on high expectations of the students, but also on pedagogy and planning. An important part of the pedagogical reform has been the structuring of lessons to cater for diversity. This is achieved through what secondary teachers in the school refer to as "group rotations," which is different from group work, as the rotations are built on the collaborative learning structures advocated by Kagan which have been widely adopted by the school.





## Differentiation and Group Rotations

Differentiating for a very broad spectrum of learners can be challenging. Being able to break content into component parts in order to provide targeted explicit teaching that builds towards the intended learning and that is developmentally appropriate requires a skill set that many of the teachers did not have. The secondary curriculum team leader helped scaffold the teachers to break the content into chunks for the rotation activities.

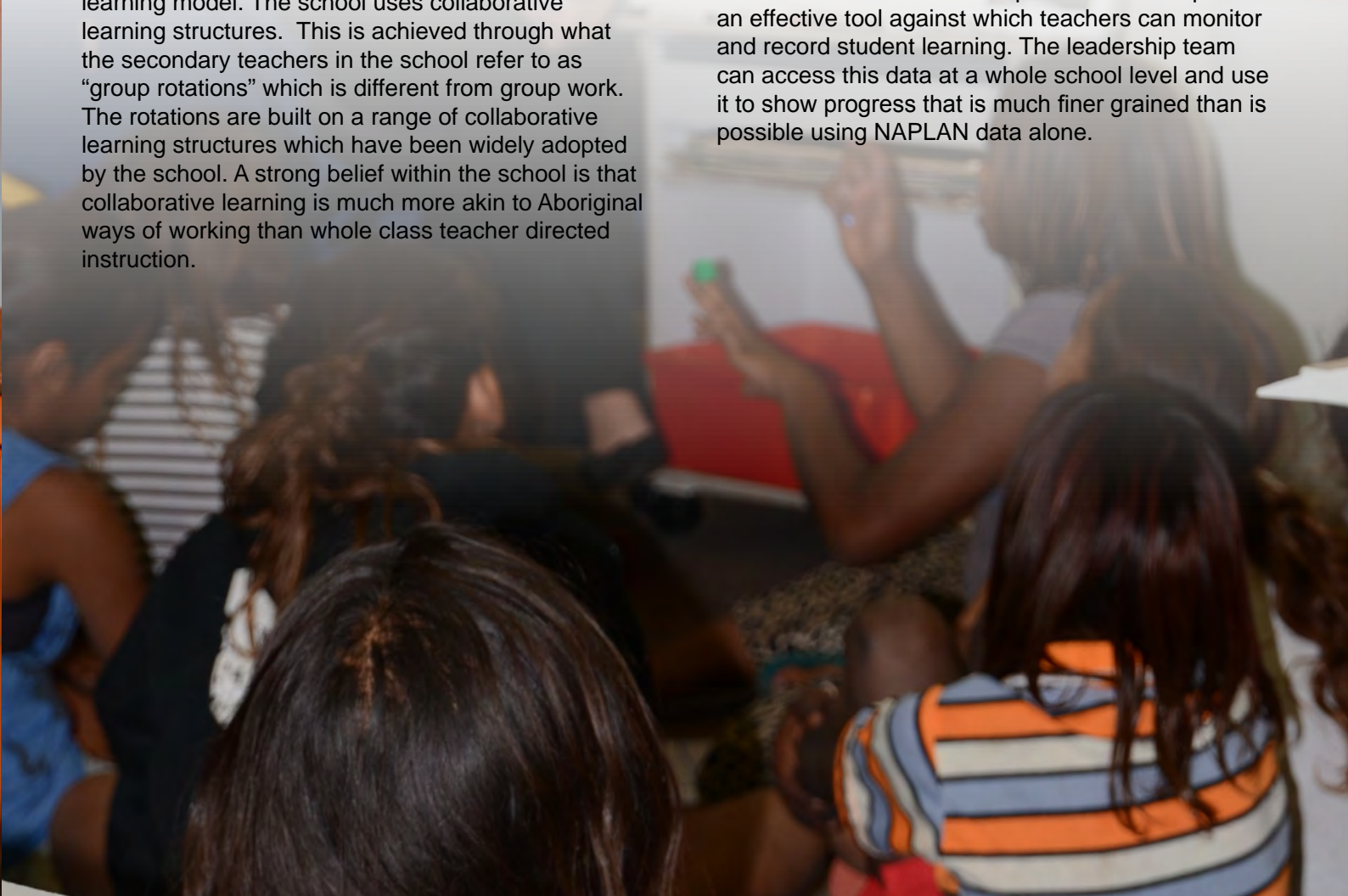
Using these rotations has been the key to differentiating in the secondary classrooms. In the middle phase of the lessons, students work in groups that are based on levels of understanding. All students work on the same mathematical content, and all tasks aim to push students to new levels of working, but the tasks are modified according to students' skills and needs. For example, students might be working on subtraction, but some may be working with large numbers or decimals, while others work with small numbers. Some may be working with regrouping, while others may not be regrouping. Groups rotate through doing independent work on computers, doing activities on the whiteboard with the teacher or AIEO, and doing hands-on activities. The students have come to enjoy this type of work because they all have a period of focussed time with the teacher, which is valued by the students. Working with small groups allows the teacher to build relationships with students and to assess their understanding.

The small groups are built around a collaborative learning model. The school uses collaborative learning structures. This is achieved through what the secondary teachers in the school refer to as "group rotations" which is different from group work. The rotations are built on a range of collaborative learning structures which have been widely adopted by the school. A strong belief within the school is that collaborative learning is much more akin to Aboriginal ways of working than whole class teacher directed instruction.

## Assessment of Student Learning

Teachers often believe that assessment means testing. The curriculum team leaders helped change this belief system. To help teachers move away from a reliance on pencil-and-paper testing, the Getting it Right Numeracy Monitoring Tool was introduced across the school. The checklists in the tool are very specific to the student's knowledge, so teachers were able to assess and monitor student learning in a much more meaningful way. Using the checklist, observations, and 'focus questions' (questions that draw out the mathematical ideas), teachers have been better able to assess meaningfully and in the context of the classroom. The movement away from pencil-and-paper testing towards a more diagnostic approach has been invaluable, because many of the students have low literacy levels so normal paper-and-pencil assessments do not give the students an opportunity to display their mathematical learning in a meaningful way.

To better monitor assessment and learning, the school has recently begun using the "Maths Tracker" which is a checklist that was modelled on the Getting it Right Numeracy Monitoring Tool, but contains Australian Curriculum content. It was developed by a coalition of government schools after the WA Education Department's funding cuts prevented the work being undertaken centrally. The Excel based final product is sold to government schools to offset costs. It is mapped against the Australian Curriculum Mathematics Content Descriptors and hence provides an effective tool against which teachers can monitor and record student learning. The leadership team can access this data at a whole school level and use it to show progress that is much finer grained than is possible using NAPLAN data alone.





## Maths 400 Club

The Maths 400 Club is a Halls Creek DHS initiative to build the number skills and fluency of the primary students. The catalyst for the Maths 400 Club was the diagnostic tasks administered in 2011 which showed that many of the students in the secondary school had progressed through the primary years without learning to count accurately past 100.

Extending counting knowledge beyond 100 was seen as a neglected area of mathematics. In addition, most students relied on inappropriate counting-on strategies when doing operations, so linking the number system to partitioning and quantifying was considered a priority.

The Maths 400 Club involves students working on their number skills in a one-on-one withdrawal context with an AIEO. The AIEOs have been trained to operate the Maths 400 (and Literacy 400), so this is a key responsibility for them. Tasks are based around four key counting and quantifying levels – 20, 50, 200, and 400. The tasks involve counting forwards and backwards, quantifying and understanding place value partitioning. The AIEOs keep records of achievement which are then passed on to the teachers and curriculum coordinator. When a student performs the nominated task successfully three times, the task is marked off for that child on the class profile, which is displayed in the classroom. It is easy to see which students complete the levels. When students complete the Literacy 400 and the Maths 400 tasks, they become members of the 400 club and have a lunch with the principal.

Taking students out of the class allows teachers to move other students forward, and the Maths 400 tasks develop students' fluency in number work (counting, partitioning, etc.) so that teachers can focus on big ideas in mathematics and application of number. Consequently, students are given greater access to the mathematics curriculum.





## Planning for Learning

There was no evidence of planning prior to 2011, so the leadership team had no clear knowledge of what was being covered in the mathematics curriculum across the school. There appeared to be a lot of use of worksheets that were used as busy work rather than structured activities that built up students' learning. Many of the activities were low level and were not encouraging growth in mathematical concepts or reasoning. In the secondary years, teachers teaching out of their specialised subjects area often neglected mathematics lessons in favour of their preferred learning areas.

Teachers now undertake extensive planning to ensure the outcomes from the Australian Curriculum are covered. Curriculum Schedules have been created for each of the subject areas in Phase One of the Australian Curriculum. In Mathematics, secondary teachers have analysed the mathematical content for their year level and then considered the basic mathematics that the content assumes students already understand. Where necessary, the planning is 'back tracked' to ensure the pre-requisite understandings. In line with the approach taken by the school, it is expected that students will be exposed to the expected learnings outlined in the Australian Curriculum for the nominated year level. The planning is undertaken in team groups which meet each week. Over the week, most teachers have allocated two days to number, one to measurement, one to space, and one to chance and data, while others focus on each strand for an extended period of time. Either way, the Curriculum Schedules assist teachers to be confident that they have exposed students to all of the expected curriculum content by the end of the year.

A term planner is established by each cluster group. The clusters are built around the year levels of the students. Most classes at the school are mixed year levels. This structure allows teachers to group students according to the levels of achievement, and according to their attendance and their behaviour, which are seen to be important factors in learning.

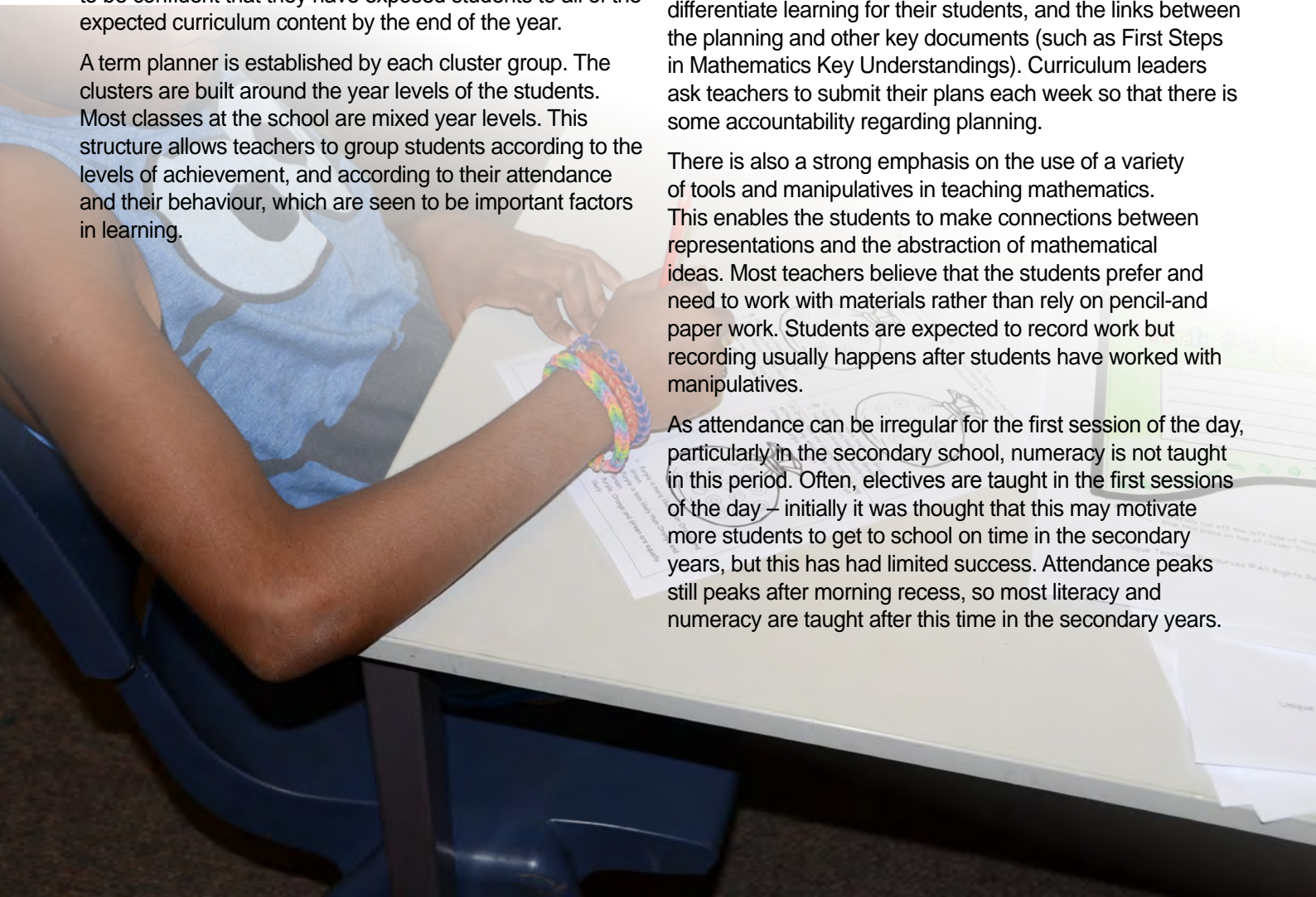
Each week teachers plan their teaching based on the items identified in the term planners. Each lesson typically contains a warm up; an introduction of the topic; explanation of success criteria; the main body of the lesson, which for some teachers involves rotations that pique interest and are targeted for learners; and a plenary to summarise the lesson and bring out key learnings. This is the standard lesson format used across the school. The lessons all have hands-on activities, which are favoured by the learners. Activities are often discovery-based. Number work can be a struggle for students, so, often, concepts are introduced spatially as this seems to help students engage and understand the relationships. Using spatial contexts to introduce topics allows students to engage with the topic and materials, and experience success.

The initial warm ups involve short activities such as magic numbers, pattern work or mental strategies. These activities can be differentiated for high and low learners. The use of rotations are making a substantial difference in secondary classes because they can be targeted and differentiated, and they allow for collaborative learning. Teachers report that the introduction of rotations by the Curriculum Team Leader made a very significant difference in maths in terms of learning, engagement, and behaviour. The rotations also allow teachers to assess students' understanding, because the teachers can hear conversations among students.

In the planning process, teachers are required to articulate focus questions that they will pose, the types of data they may collect on student learning, the ways in which they will differentiate learning for their students, and the links between the planning and other key documents (such as First Steps in Mathematics Key Understandings). Curriculum leaders ask teachers to submit their plans each week so that there is some accountability regarding planning.

There is also a strong emphasis on the use of a variety of tools and manipulatives in teaching mathematics. This enables the students to make connections between representations and the abstraction of mathematical ideas. Most teachers believe that the students prefer and need to work with materials rather than rely on pencil-and-paper work. Students are expected to record work but recording usually happens after students have worked with manipulatives.

As attendance can be irregular for the first session of the day, particularly in the secondary school, numeracy is not taught in this period. Often, electives are taught in the first sessions of the day – initially it was thought that this may motivate more students to get to school on time in the secondary years, but this has had limited success. Attendance peaks still peaks after morning recess, so most literacy and numeracy are taught after this time in the secondary years.





## Benefits for Learning and Learners

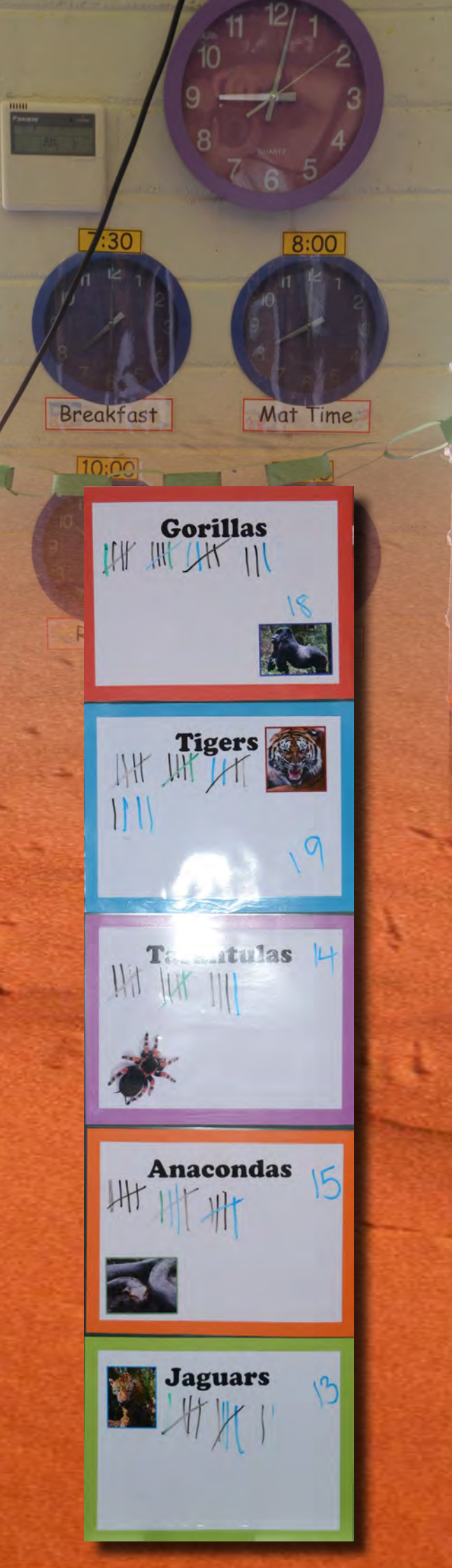
Having students work in small groups means that teachers are able to move around the classroom and spend time with individual learners. The students' value having periods of dedicated teacher time, which is not available during whole-class teaching. Having students work collaboratively in groups has resulted in much calmer classes.

With the changes to the pedagogy and levels of mathematics being offered, there has been an improvement in attendance (particularly for the core group of regular attenders), as well as a marked improvement in student behaviour in mathematics lessons. Students are more engaged in the lessons and are showing greater on-task behaviour in mathematics than before the changes.

Some independence of learning has come through the collaborative learning model and setting up group rotations, and the increased exposure to mathematical ideas commensurate with their age levels. Students are showing more interest in their mathematics lessons, appear to enjoy the challenges and are increasingly more, willing to complete the NAPLAN tests.

The support from the leadership team (Deputy Principals with particular experience in mathematics, the Numeracy Specialist Teacher in primary and a Curriculum Team Leader in secondary) has been invaluable in changing teachers' practice. Teachers are learning how to differentiate learning, plan for long term learning, focus on the correct year level curriculum for the age groups (rather than work from deficit models); and have learned how to create learning environments conducive to learning. Many have also learned how to structure their classrooms in small groups with expectations that some groups will work independently.

AIEOs have been well supported in their learning – for working with students in number and taking sole responsibility for working with students in the Maths 400 program.





## Advice to Teachers

Changing attitudes and establishing a routine will take a while. Time is needed for teachers to become confident with content and for students to respond to the expectations – so that initially the lessons may go less well than previously, but it is important to persist and keep trying to make it work. Once a routine is established, students enjoy it. Transient students may come into the class and not know the routine, but the regular students know the routine and help the others to engage with it. Transient students are not such an issue once the practice has become the norm.

It is important that teachers believe that the collaborative structures and/or rotations will work and keep persevering with them. Start with small changes so that there is success, as success creates more success. It is important to praise the students for their successes in the model so that they can learn the processes and see how it works.

Using collaborative groups and rotations enable teachers to plan for the diversity in the class. Activities can be tailored to meet the needs of the learners – effective teaching is about breaking the concept into smaller parts that build to the end product. This way, students are all working on the same content, but at the level of their needs.

Group rotations also facilitate more effective assessment, because teachers are able to work intensively with smaller groups and undertake assessment on the run. Students enjoy the rotations because they provide direct access to their teacher for an anticipated length of time.

Push the students harder. They know a lot more than we give them credit for, so finding ways for them to express their thinking and developing knowledge in mathematics is important.

## Key Messages – Summary

Aboriginal students are entitled to experience a curriculum commensurate with their age. The task of the leaders, teachers, and support teams is to find ways to enable students – those who attend regularly through to those who attend irregularly – to learn mathematics.

Rotation of activities in the body of the lesson assists teachers to differentiate learning to meet the needs of the learners.

Good knowledge of how mathematical skills and knowledge are built enables teachers to create activities that include developmentally appropriate content and explicit teaching strategies.

When students are supported and stretched with their learning they are more likely to engage with mathematics. Engaging students in learning reduces the need for behaviour management, so maths lessons flow more smoothly.

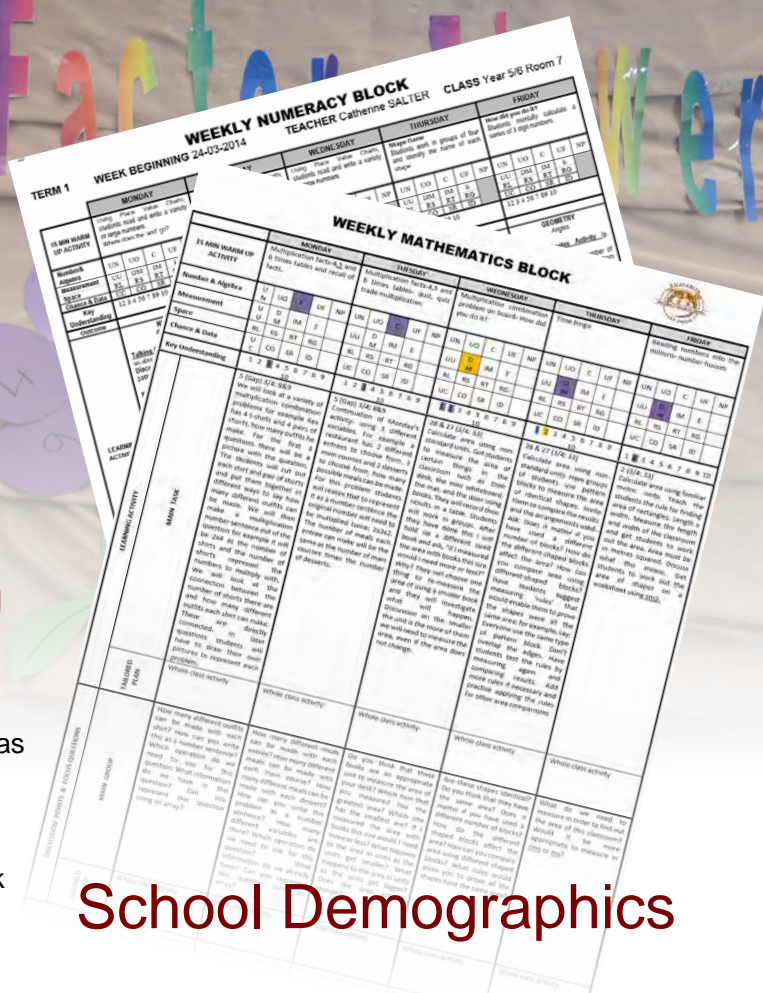
The curriculum leadership team provide support – both systems and personal – to build teachers' knowledge and skills. Good curriculum leadership scaffolds teachers' learning, just as teachers are to scaffold their learners' progress.





## Points of Differentiation

Halls Creek DHS uses the term “collaborative learning” rather than “group work,” as the former has particular strategies that enable interactions within groups and for all students to be actively involved in learning. Group work has the potential (when poorly organised) for some students to do the work and others not to do anything. Using collaborative learning structures mean that all students are engaged in the learning process. There are many collaborative structures that are used by teachers in the school, such as Kagan's Inside-outside Circles, Round Robin, Rally Robin, Quiz Quiz Trade and Rally Coach.. The Kagan materials are commercially available but many of the strategies are well known to teachers who practice cooperative learning (or group work). An important difference in the Kagan model is that it differentiates between structures and activities. So, for collaborative learning to occur, teachers need to teach students the structures before they can be effectively used in learning activities.



## School Demographics

The language background of student other than standard English is 85%. The My School data does not reflect the diversity of the language background of the students as many of the parents do not identify the language background of their children. The students may speak one of the local languages of Jara, Kija (Gidya) or Goonawani or the language spoken by most of the students – Kriol. The school is currently, and proactively, updating school files to reflect the language background of the students as most students speak Kriol as their first language. This has implications for schooling, education, and mathematics.

## School Demographics

Year range	K-12	FTE teaching staff	38
Total enrolments	418	Non-teaching staff	36
Location	Very Remote	FTE non-teaching staff	30
ICSEA (school)	716	Indigenous students %	95%
ICSEA (distribution of students)	69%   20%   10%   2% (bottom quarter to top quarter)	Enrolments: Girls/Boys	210/208
Teaching staff	38	Language background other than English	12%
		Student attendance rate %	58%