Successful Mathematics Lessons in Remote Communities: A Case Study of Balargo

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This paper describes the lesson practices at one very remote school that has been highly successful in numeracy. Drawing on a significant body of diverse research that promotes quality teaching and learning, this case study describes the features of the practice that have been implemented across the school. Teachers' voices provide both justification for the adopted practices and insights into why the practices have been effective within the context of the school. Finally, consideration is given to the on-going sustainability of changed practices within the school.

This paper draws on the exemplary work of one site, Balargo, in very remote Australia in bringing about success for First Australians – both Aboriginal and Torres Strait Islander students – in numeracy. The paper is structured differently from the traditional research paper as it is a case study (Stake & Savolainen, 1995) and so seeks to describe the practices of this school. As with the larger project, the case study approach adopted in the project sees the research team enter the school context to document the practices of the school. Interviews are conducted with key personal (leadership team, teachers, other staff), along with lesson observations and document analysis. A synergy between the interviews and observations is sought so as to build rigour and triangulation among the data sources. A story is developed by the research team at the completion of a site visit and then negotiated with the school until a final story is approved and shared via a public space. The intent of the overall project is to develop (and share) case studies of exemplary practice in numeracy education and to celebrate the success of quality teaching in remote areas.

Contextual Statement of the School

Balargo School (a pseudonym for the school in accordance with the University's ethics guidelines) is located in a remote, isolated region located near the sea and the area abounds with much flora and fauna, including crocodiles. There are five communities in the region that are made up of both Aboriginal and Torres Strait Islander people. Culture is very strong in the region with people retaining many of the ancestral traditions in daily living. Being close to the coast, fishing is a major recreational activity as is hunting. The area is popular destination for 4WD adventurers in the dry season with 80% of tourists arriving in the two months either side of the mid-year school holidays. The communities are connected by bitumen roads, but once out of the region, the roads are dirt, and accessible by 4WD only. The largest community has a supermarket, bakery, hospital, police station, hotel, and a range of service providers.

In 2008, Balargo decided to build a culture of learning through a focus on literacy and numeracy. Through the use of explicit teaching methods, students have come to understand the goals of teaching and the approaches being taken. This understanding is believed to support a re-engagement of students in learning by allowing them to experience success. The approach also aims for students to develop understanding of the purposes of schooling leading to consequent improvement in attendance. Since introducing this focus, Balargo has progressively built on developing teacher skills in explicit teaching as a pedagogical

2015. In M. Marshman, V. Geiger, & A. Bennison (Eds.). *Mathematics education in the margins* (Proceedings of the 38th annual conference of the Mathematics Education Research Group of Australasia), pp. 317–324. Sunshine Coast: MERGA.

framework, refining and expanding methods to improve the mathematics teaching practices across the school. The impact of this approach is now filtering into the high school as the students advance, identifying themselves as successful learners and entering the high school ready for learning. The school is trialling many strategies to bring about consistency across the three campuses and to build sustainability of the successful practices that have been developed by Balargo. There is a strong cohort of regular attenders, particularly at the main campus, with many of the students achieving 80% or more attendance.

Balargo operates as an urban school and prides itself in this. Being remote is not seen as a valid excuse for lower standards. There are high expectations of learners, teachers, leaders, and community. Teachers are expected to provide a quality education for the students, and the school actively seeks to build a strong learning culture. Building this culture has taken time and has been sustained over the past two successive principals. Many of the teachers and leadership team remain in the school for extended periods of time. A number of teachers have been at Balargo for more than 10 years. This has built a very stable staff, particularly for a very remote site.

Defining Success

Balargo has achieved consistent success in NAPLAN for many years. Since implementing the changed practices at the school, Balargo has increased success in NAPLAN from the lower band to Bands 3 and 4. Now that there is fluency across many aspects of mathematics, the school is focusing on taking student achievement into the higher bands. Balargo also uses a range of assessment tools to monitor student achievement and growth. These data are used to inform teaching and also to track success at the school level. Teachers meet with their Head of Curriculum to discuss data against the agreed goals for the class, to discuss plans for numeracy (and literacy) for the whole class based on the data, and to develop individual plans for particular students who require differentiation. In the following sections, descriptions are provided with regard to the principles and strategies used by Balargo to bring about success in numeracy learning.

Principles for Learning

In the next two sections, I outline the principles that have underpinned the approach adopted by Balargo, and then the specific strategies that have employed to build quality numeracy lessons.

Prioritising Numeracy Learning

In many remote schools, there has been a priority for literacy learning, where literacy blocks have been established to take up the first session of the day, and where approaches such as the Accelerated Literacy Program (AL) has been forthright in promoting uninterrupted learning for the first session of the day. The research behind AL has shown that it is critical for learning to occur in uninterrupted blocks and in the early part of the day. There have been many schools in the broader study that dedicate two hours to literacy and then one hour to numeracy. However, Balargo has dedicated two hours each day to each of literacy AND numeracy. In its early days of reforming Balargo, the leadership team had taken a very strong view that literacy and numeracy were the core business of the school so that a significant component of the day was dedicated to the teaching of these core areas. The final session of the day is dedicated to other curriculum areas. But, it is also

noted that numeracy lessons can also be the practical application of mathematical ideas, concepts and processes to other curriculum areas (such as science and social science).

Two-Hour Numeracy Block

The Numeracy Block is conducted in the second block of the day – from 11.40am - 1.40pm – and is divided into four main activities (see Table 1). The activities can vary in structure, form and length depending on the teacher, the student needs, and the topics. So while the block appears to be long, it is divided into smaller, distinct phases so as to maintain student engagement.

High Expectations

Drawing on the work of Sarra and his leadership for learning model, the school has adopted the notion of high expectations for Indigenous learners. Sarra (2012) has consistently argued that teachers and schools must have high expectations of learners (teachers as well as students). The school adopts the national curriculum and the outcomes for the given year level so that students are expected to meet the national outcomes – so that there are no lower expectations for learning because of the backgrounds of the students.

Being Explicit

Balargo has adopted a school-wide structure to mathematics lessons. Teachers follow an explicit teaching model where, through careful and explicit scaffolding, students are able to complete tasks independently and build a strong sense of success and pride in their accomplishments. The Explicit Teaching model (Archer & Hughes, 2011) adopted at the school is the "I do, we do, you do" model. This model has been implemented at the school for seven years and underpins the approaches in all curriculum areas, including mathematics. In this model, the teacher also makes explicit the learning intent for a lesson.

> Teacher: By telling the students what they are expected to learn, then they know the focus and point of the lesson. I often take the intent from the curriculum and then work on it so that it is meaningful for the kids.

Teachers also make the criteria by which they will judge the success of learning. This is written alongside the learning intent so that the students can see not only what they are expected to learn, but also how they will know if they have been successful.

> Teacher: The success criteria is important as it helps the students know how they have to show me they understand what it is we are learning in maths.

Whole School Approach

All teachers at Balargo are expected to adopt the same consistent model. All mathematics lessons are the same format. The rationale:

> Teacher: The kids need to have the same model so that they can come into class each day and know what is happening, what to expect. You know, their lives are often chaotic, so they need consistency at school. They can walk into the classroom and know exactly what to expect. Then they can get on with the task of learning.

The whole school approach is proactively supported by the leadership model that has been enacted across the school. This ensures that there is support and compliance with the vision of Balargo, particularly in terms of curriculum and pedagogy.

Table 1
Numeracy Block Activities

Phase of Lesson	Description of Practice
Consolidation	The teacher revises many of the concepts that are foundational to mathematics. These are concepts that are usually assumed to be known by students but it is recognised that this may not be the case. Topics such as time, calendars, conversions, fractions etc. are revised in this session. The rationale for this session is that the foundational mathematical concepts need to be built into long-term memory so that students then understand basic mathematics concepts and can build automaticity with these both. The Consolidation phase of the lessons adopt a '*recite, recall, apply'* approach where students will often engage with group chanting of mathematics facts (or readings), then the teacher will ask various questions to elicit students' knowledge and understandings; and then the concepts are applied to problems. The pacing of this aspect of the lesson is brisk. All students are expected to respond to questions, so strategies are used for students to display their work (e.g., individual recording on boards that are displayed; ladders are used for counting work), which allows teachers to assess students' understanding immediately and to give feedback or address problems as they appear.
Mental Maths	Mental maths is a strong feature of the maths block. Teachers scaffold students (in the first four days of the week) so that students are able to complete the exercises around various concepts. This builds success and confidence, and prepares them for the Friday test. The practice activities prior to the Friday tests help teachers identify areas where students may need further support in order to comprehend the item and be able to respond correctly. Students are expected to achieve at least 80% in the mental maths quizzes. Their data are displayed on data walls.
Digital Maths	Students access Mathletics and other digital programs (such as apps) to support a range of their mathematics skills. The digital environment appeals to the students and they actively engage with this medium. Prior to the Mathletics activity (usually 2-3 times a week), students are scaffolded in the concepts in which they will be engaged online. The digital learning also supports independence and engagement.
Explicit Teaching	Depending on the year level, various (commercial) programs have been implemented at the school. There has been an explicit alignment of programs used at the school with the Australian National Curriculum (and state documents) so that teachers are confident that they are delivering learning experiences that align with National Guidelines. In the early years of schooling, the school has recently adopted a commercial program as a model and aligned this with the National Curriculum and C2C learning outcomes. In the middle-to-upper years, the school has adopted the Queensland curriculum (C2C) as the basis for this component of teaching. The school has sought to ensure that the students are exposed to curriculum that aligns with national expectations for all Australian students.

Strong and Supportive Leadership

There is a strong leadership team who provide a well-articulated vision of the school and have developed support structures to enable the vision to be realised. An important factor enabling the school to achieve its current level of success has been the successive leadership of two principals who have built and developed the whole of school vision and practices. The leadership team explicitly articulate that there is a vision and detail the practices with which staff need to comply. This is not negotiable and compliance with the vision and associated practices are made transparent to the staff. All staff work on the common approach across the school. Initially commenced at the primary campuses, it is now becoming embedded at the secondary campus. The leadership team is structured to both support teachers to build their skills and knowledges around the approaches adopted at Balargo as well as to maintain a high standard of professional practice across the school.

Each campus has a Head of Campus who works with the Principal as part of the Executive Leadership team. Four curriculum leaders (Head of Curriculum) are also employed across the school. The Curriculum Heads assume responsibility for the leadership at the grassroots level of the classroom and work closely with the daily practice of teachers – supporting teachers with the development of their teaching skills, classroom management, lesson planning and data collection/analysis.

Practices

In this section, I outline some of the specific strategies that teachers have adopted in the classrooms. These align with many of the principles outlined in the preceding sections.

Hands-On Activities

Balargo has adopted practices that focus on the use of hands-on activities in mathematics lessons. There is a strong belief that students learn best through hands-on activities so there is an emphasis on providing a range of activities to engage the learners. This is particularly the case in the early years.

> Teacher: The students here are very tactile learners so we try to make learning maths very hands-on for them. It helps engage them with learning.

Language

As the students come from an English-as-Second language background, there is a strong emphasis on linking mathematical language with Standard Australian English language and the mathematical concepts so that the students can make sense of the concepts and interactions in the classroom. Teachers focus on many aspects of language and have many and rich resources displayed around the classroom. The environmental prints in the rooms also support students with various mathematical terms and concepts, and are displayed to deliberately prompt the students.

Recite, Recall, Apply

A key strategy used by the teachers is the ‘recite, recall, apply’ strategy. A key objective for using this strategy on a daily basis as part of the consolidation phase of the lessons is to build long-term memory. Teachers reinforce the need for students to learn many concepts in mathematics so that these are lodged in long-term memory providing the base for success in later years. The focus of the fast pacing of this aspect of the lesson is

also to cue students into concepts that could be covered in later segments of the numeracy block. This helps to refresh students learning as they build confidence through experiencing success.
Recite: This part of the strategy can include a number of processes used by the teachers. Students may use group reading of information that is provided on the Interactive Whiteboard (IWB), or they may sing songs. This aspect of the lesson is undertaken as a group.
Recall: The recall component of the strategy is a fast paced questioning by the teacher where simple recall questions are presented so that the general facts are reinforced.
Apply: Apply questions are posed so that students either demonstrate that they can apply the knowledge or successfully address questions that are different in structure but require the use of the same knowledge or concept.
Feedback: Students use resources to provide feedback to teachers. Whiteboards were used on which students wrote their responses and teachers could scan the responses to assess for learning.
Praise: When praise was offered, the behaviour being praised was named.

Seeking and Providing Feedback

Formative assessment of student understanding is a feature of all lessons. All classrooms have adopted a range of processes where students are able to provide individual responses to teacher questions. These are typically displayed in some form:

- Individual whiteboards where the student writes his/her answer and then shows these to the teachers.
- Ladders that are laminated and so can be written on where students can display number (or other) sequences
- Other resources appropriate for the year level of the students

The teacher is able to scan the classroom and assess students' level of understanding. Individual students may display mis/understandings and teachers are then able to work with individual students. The whole class may also show that they have mis/understood a key concept and then the teacher can make an informed decision as to where/how to move the lesson based on the feedback the students have provided to them.

When teachers provide feedback to students, they are detailed in their responses – whether for mathematical understandings or processes, or for behaviours. The feedback is very specific so students are aware of why they are being praised: "I love how Daniel didn't go 'I don't know' – he thought about it and then worked out how many sides were in the pentagon."

Grouping Students

The organisation of Balargo is aligned with the learning needs of the students and attendance is acknowledged as a key factor in achievement. Year level classes are based on attendance, behaviour and achievement. Many of the students who attend regularly are working at minimum benchmark or above so these students are clustered into a class set where the teachers are able to pitch learning to meet their needs. Students whose attendance is less regular, and often have gaps in their mathematics learning, are placed in classes where there is a stronger emphasis on differentiation, while those whose attendance

is quite poor are in a class where there is an emphasis on Individual Learning Plans (IEPs) that meet the needs of the individual learners.

Environmental Footprints

Classrooms are rich with resources on the walls. Teachers provide a stimulating and rich learning environment with resources to support students in their learning. The intent of the resources is to support students to become independent learners and rely on the resources (rather than the teacher). To transition students to the use of the resources, explicit teaching is undertaken to alert students to how they might use the resources in the classroom. These can include the resources on the walls, and other resources that teachers may have made available to the students. These include *placemats* that contain a range of mathematical information (calendars, multiplication facts, units and conversions of various measures, basic geometric shapes, and solids, etc.). In the various components of lessons, teachers make explicit reference to where students might seek support.

Included in the environmental footprint is the display of student data. Students and families are able to see not only achievement but also are also able to track growth over the year. Students can readily see their progress and achievements – again reflecting the explicitness and transparency of practices valued at the school.

Building and Maintaining the School Model

In order to develop and maintain the whole school approach aligned with the vision for the school, and the specific teaching strategies, there is a heavy emphasis on professional learning within the schools. A strong focus on building a common culture across the school where all teachers adopt the same teaching practices in their classrooms is part of the school practices. Many of the teachers coming into Balargo are often recent graduates and are offered very strong professional development from their induction into the school (and remote education), and throughout their time at the school.

Initial induction into the model for mathematics teaching comes through the induction offered by State Authority's conference where teachers new to remote education receive a weeklong induction program into remote teaching (and living). This is followed by inductions into policies that are operationalised in the region and impact on the teaching at the school; and then a final induction offered by the school in the pupil-free days prior to the commencement of the school year. Teachers are provided with the first unit of work for the year when they commence at the school so that they can focus on teaching (rather than planning). This helps with the transition into the school model. Furthermore, the school has a comprehensive program offered each Tuesday in after-school meetings/forums. These focus on various practices that the school is adopting to improve the teaching and culture of the school. The school is developing a series of Standards of Practice (SoPs) that outline various practices that the College adopts across the three campuses. The SoPs are designed to cement practices at the school after current staff leave; that is, sustainability of practice.

At the Tuesday meetings, only two meetings per term focus on the operations of the school. Other meetings focus on professional learning of the staff. Teachers are expected to attend the meetings. In these sessions, the professional learning may be based on a particular SoP, a focus that the College leadership has nominated, a visiting professional, or a program that the College may have bought into. Collectively the diversity of professional learning not only builds the skills of individual teachers, but also builds a

strong culture of learning at the school. It also creates consistency of practice across the three campuses.

Individual teachers are supported by the Heads of Curriculum and the Executive Leadership team. It is usual practice for school leaders to conduct regular walk throughs of classrooms so that teachers are inducted into a culture of open classrooms where leaders can drop in and observe teachers at work, and provide constructive feedback in both structured and ad hoc formats. This helps teachers to build confidence in their teaching and allows the leadership team to ensure that the model of teaching is enacted.

Conclusion

This case study has been intentionally descriptive drawing on data collected and synthesised from the school. The descriptions provided here give a summary of key principles and strategies used at the school to build success in learning mathematics. There are numerous strategies being used, many of which intersect with others. Collectively, these provide a rich tapestry of practice at the school. It has been built and sustained over seven years, and is now embedded at the school. The school is refining and building the practices with constant monitoring to assess the effectiveness of changes. The intent is to enable students to experience success and to gain high levels of achievement (as measured through a range of tools and resources).

References

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