One Teacher School: Teaching Mathematics from Prep to Year 6

Wanalirri Catholic School

Wanalirri Catholic School is located on Gibb River Station in Western Australia some 470kms from Derby, which is about half-way along the Gibb River Road. The station is owned by the Ngallagunda people and is a working cattle station. The community serves about 50 or more people. Gibb River Station is located off the main Gibb River Road and offers minimal services to passing tourists.

After negotiations with the Bishop of Broome, representatives of the Sisters of Our Lady of the Missions, and members of the Ngallagunda community, Wanalirri school was opened in 1991. The school serves members of the Ngallagunda community where it is based. The school is very small with around 12-15 students in attendance.

The values of the Sisters of Our Lady of the Missions and their foundress Euphrasie Barbier flow throughout the school. The school has been variously led by Sisters (RNDM) or by teaching partners over the period of its operation. Set in a lovely bush setting abutting the Gibb River station and within the community, the two classroom building was opened in 1993, with the 3 bedroom home for the teachers being opened in 1995 and extra accommodation for support staff built by the Catholic Education Office in 2003. The school is well-resourced and has been able to provide a quality learning environment for the students. Wanalirri Remote Catholic School currently has a full-time teacher and a 0.5 teacher. The 0.5 teacher takes responsibility for the...
teaching of literacy and numeracy. The principal takes all other lessons, and the school seeks to offer a comprehensive curriculum for the students. All students participate in whole class learning so the teachers incorporate a wide range of activities to target learning for the diverse range of learners within the classroom. The teachers have worked across many states and sectors so are able to draw on a wide range of practices to inform their practice.

The school also accesses School of the Air lessons for some students who are working at or above benchmark. The principal works with students undertaking these lessons. Internet connection is unreliable so often lessons are not possible over the air, so the student/s undertake the paper-based support materials provided by School of the Air.

Defining success

Wanalirri is a small school and with student numbers varying in different year levels, so NAPLAN data is not reliable for reporting in this study. The school has many students who are working at benchmark levels (albeit it as the lower ends). The students who attend regularly are achieving well.
As a small school, all students are in one class so the teacher needs to work with all the students in the numeracy teaching block. The numeracy block is for two hours and is a highly structured period. The block starts with the whole class working on a particular orientation to the lesson, and then progressively the students work on activities targeted for their particularly learning levels.

Wanalirri teachers use a range of mathematics/numeracy tests to identify the current levels of their students’ performance. Using a growth points approach, the teacher identifies where students are working and then how to move the student towards the next growth point. Each student has an individual learning plan but there are some students who may be different in age, but will be working on the same levels.

The school is well-resourced and the teachers use these resources to support the teaching activities. Each student has their own laptop computer which is set up at the back of the room. As they complete their nominated tasks, they move to the computers to undertake further targeted activities. The lessons are carefully orchestrated so that there is a sense of community by having the lesson commence with a common activity, followed by very targeted activities for each student.

Drawing on the Environments and Experiences of the Students

There is a strong focus on trying to incorporate the worlds of the students in teaching of mathematics. For example, in a lesson on shapes, the teacher drew on photographs taken from an environmental walk undertaken by the students. The photographs acted as a stimulus for the language of shape. The teacher then created different activities from these stimuli to meet the needs of particular students—basic shapes (square, rectangle, etc) for the younger children, and more complex shapes embedded within other shapes for the older, more advanced students who had to identify a range of shapes within the stimulus photographs.

Differentiated Activities

The primary focus of the lesson remains for the whole class but activities are differentiated for learners, depending on their learning needs. While the initial lesson commenced with spatial activities, as the students completed tasks designed for their individual levels, other activities were incorporated into the tasks to be undertaken by the students that may be in other strands of the mathematics curriculum.
Use of Digital Tools

A key strategy was the use of digital learning tools. The school has adopted one program that has a strong emphasis on staged learning activities, with an emphasis on the language of mathematics. That is, the instructions are spoken to the students, and the language (in this case, of space and shape) were constantly revised for the students. This was seen to be important for the students since their home language is different from that of Standard Australian English. The program is levelled so the teacher can target the activities for the individual students, and at the content that is being taught. The students engaged with the computer activities. This was incorporated at the end of the lesson so that as students completed their set tasks, they could consolidate their learning on the concepts and processes that had been a feature of the lesson. The activities reinforced their learning. The better activities also had spoken language so that the students could hear the mathematical terms.

Independent Learners

The teacher needs to work with students on their different tasks, so a high level of independence has been fostered among the students. All students remain on task for the duration of the lesson. The teacher has developed a culture within the class that dispositions the learners to work independently.

Individual Learning Plans

Each student is assessed using various assessment tools, but most notably is that which focuses on growth points. From this knowledge, lessons and activities are targeted for individual students. Questions in the whole lesson are targeted for specific students, depending on where they are in the learning continuum. The teacher needs to have a strong understanding of each students’ needs and strengths.

The teacher draws on a range of resources to build learning experiences suitable for moving students to new growth points. The activities are structured carefully to build understandings.

Peer Tutoring

Depending on the lesson and the activities, there are times (and opportunities) for the older (or more advanced) students to help their peers through peer tutoring.
No Time Should be Wasted

One of the drivers behind the approach adopted at the school is that there should be no time wasted in lessons. Students are not exposed to busy work, but are expected to engage in learning mathematics. The teacher carefully plans the lessons so as to have a range of activities that suit the needs of the students. Often the activities are similar in design but, for example, the numbers with which the students are working maybe different in terms of place value or operations. The teacher is adamant that there should not be any busy work in the classroom as learning time and engagement was essential for progressing the students.
Mathematics Boxes

Because of the highly individualistic learning, the teacher needs to ensure that during any lesson, students will be able to access substantive learning activities. The teacher has devised a ‘maths box’ system. These are boxes for each individual student. The box is a file box (magazine holder) that has the student’s name on the front and includes the activities that the student has been doing. This part of the “maths box’ means that the students know where their last materials were placed and the teacher is able to go to the box at any time to see what the student/s are doing in terms of the activities.

The teacher also uses the boxes in which to place further activities so that if a student finishes ahead of time, or if the teacher is tied up with other activities, then the student can go to his/her maths box for another activity to complete so that the lesson intent is being continued. Often the activities can be of a game nature or of a problem-type learning. This reinforces what has been learned and is designed to engage the students.

Integrating Mathematics across the Curriculum

Incidental mathematics teaching occurs consistently across the daily routines. For example, cooking is undertaken regularly so students experience measurement activities while learning lifelong skills. The school provides lunches each day, and students help with the preparation of foods as well as cooking other foods. The kitchen is a rich source of experiences as well as a source of recipes being placed on the walls and fridges so that students can see the literacy and numeracy components of cooking.
Rewards System: Shopping

As a small school, in a small community located on a cattle station, the families purchase their goods through the store on the station. Their purchases are made through their supply cards (a type of credit card provided through the government) so there is very little (if any) exchange of money. To model the monetary exchange processes, the school has adopted a rewards system to provide a sense of money and the purchasing processes.

The school, over an extended period, has developed a reward system whereby students receive reward points for achievement. These are kept as a tally system on the white board, on a daily basis. This process also helps to consolidate mathematical ideas (data representation and tally marks) in an incidental and consistent manner. At the end of the week, the students convert their points into dollars. The dollars are those from popular game Monopoly. As the students convert their points to dollars, the teacher offers a strong commentary on the money so that exchanges are made meaningful and mathematical. For example, if a student had 39 points, the conversation would focus on what is the best way for the student to have this money. They may have a dollar in their wallet so could get $40 from the teacher and give him $1. Alternatively, where the student had no money in the wallet, they would have to suggest ways to receive the $39.

Students can then 'spend' their dollars on items in the school shop. The items are varied and range in price from $10 through to $200. The goods are items that are sought by the students (skateboards, games, drink bottles, digital games, etc). Students keep their dollars in a plastic wallet and are given change. As they make their purchases, they discuss with the teacher how they can pay for the items from their wallets.

Data are stored on a spreadsheet and as data are entered, the students talk about how much they had, how much they spent, and what their change was. This activity provided a lot of conversation about the exchange economy, and in the process helped students to gain a sense of money, and the relevance of what they were learning in maths to a (contrived but meaningful) context.
Homework

A long term culture has been established at the school where there is an expectation that homework will be sent home. The homework is sent home on Mondays and can be returned during the week but must be completed by Friday. Students who complete their homework are given 5 rewards points that contribute to their weekly shopping money.

The homework focuses on mathematics activities but also includes some literacy activities. Most students receive support from their families to complete the homework, and there is a very high return rate – ie very few students do not return their homework. As this is a well-established culture within the school and community, newcomers to the school adopt the practice readily. For example, the incoming staff were asked by community members to send homework home.

The homework activities are ones often copied from commercial resources and glued into the homework books. They contain a range of different mathematics exercises so that concepts being taught at school are further reinforced.
Benefits for Learning and Learners

The approach taken at Wanalirri supports students at their individual levels. This requires considerable planning by the teacher to ensure that the practices adopted within the mathematics classroom are targeted for the appropriate levels, and are also engaging for the learners. This means that every student has numeracy experiences that meet their needs.

The teachers have sought to develop practices – such as the shop, the homework, and integrated learning throughout the day – so that students come to see the relevance of mathematics in the world, and to share this with the families. In remote communities, the need for mathematics is less obvious than in urban settings, so teachers have developed these approaches so that students can engage with meaningful and purposeful activities that are akin to the experiences they are likely to encounter in their later life. Without these experiences, mathematics could remain abstract and with little connection to the worlds the students could encounter as adults or when they move to boarding schools.

In a multi-age classroom, the teacher worked with the students to build independent learning skills. This is essential given the diversity within the classroom – students need to be able to work alone. The independence of learning mathematics enables the students to work through their activities and build their mathematical understandings. They have also learned to be independent learners.
Advice to Teachers

One classroom for the full contingent of primary school-aged student requires careful and targeted teaching and activities. All students should be engaged in substantive learning for the full mathematics lesson, so it is imperative to have solid planning to cater for the broad diversity of learners, including those who are transient. Such planning can be identified in the following steps:

- Identify the learning levels/needs of each student
- Develop activities that meet (and extend) the learners.
- Commence lessons with an orientation activity to engage the class so that there is a sense of the whole class being involved as a group, individual learning can be achieved through the questions posed to learners so that it meets and challenges the students in the class
- Create activities to meet various aspects of the mathematics curriculum
- Create opportunities in other cross-curriculum and incidental learning activities to consolidate mathematical concepts.
- Class time should be focused on learning at all times.
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<thead>
<tr>
<th>General Principle</th>
<th>Implications for Mathematics</th>
<th>Focused Strategies</th>
</tr>
</thead>
</table>
| Whole-school teaching | There is great diversity in a whole school classroom so teachers need to have targeted mathematics teaching/learning activities for students. | • Identify students’ learning needs and develop activities to consolidate and extend learners.  
• Include resources developed from the local experiences of the students to support engagement and recognition of the home worlds.  
• Target questions to the levels of the students. |
| Include digital resources so that mathematics learning is maximised. | • Careful selection of digital tools is critical – to meet the needs of the students while maintaining mathematical integrity.  
• Tools that support the development of mathematical language is important.  
• Digital tools can be used to ensure engagement of students for the full duration of the mathematics lesson if they have been carefully selected (not for babysitting) for mathematics learning, and language support. |
| Teaching time should not be wasted | The entire mathematics lesson should be focused on the learning of mathematics (not busy work). | • Incorporate a range of activities the build mathematical understandings relevant to the learning needs of the students.  
• Incorporate digital tools that can be built into the final phase of the lesson so that students can move to these as they complete their work. Careful selection of digital resources is critical as many are games that can distract learners who ‘cheat’ rather than engage with the substantive mathematical content. |
| Create activities that will build relevance for mathematics | Activities should be targeted for the students’ learning levels, but also build their understanding of the relevance and importance of mathematics. | • Create activities that can incentivise learning, while creating meaningful contexts for mathematics – such as a shopping context where they can use money in a (pseudo) real context.  
• Create cross-curricular activities where they students can see the application of mathematics – such as cooking. |
Key messages – summary

In a multi-age setting with one teacher, the teacher needs to be very organised and plan learning activities to engage learners, to foster independence of learning, and to ensure that there is no time wasted on activities that have little or no (deep) mathematical content.

There needs to be plenty of opportunities provided for the students to build cross-curricula learning and the provision of activities where students are able to apply mathematics to the activities. This helps students to see the application and relevance of mathematics to learning.

Independence in learning needs to be scaffolded and practices built so that students can remain on-task and engaged with mathematics learning. The mathematics boxes can serve as a reference point (rather than the teacher) so that students can go to the mathematics boxes when they complete activities.

Having digital activities can act as an incentive for students as they complete their set work, while also fostering independence of learning. The digital activities should be carefully selected initially so that the students engage with the mathematics rather than the digital aspect (such as the game, including finding ways to ‘cheat’ rather than engage with the mathematics). Digital activities need to reflect the learning intent of the lesson so that there is the possibility of consolidation or extension of learning.

It is important for teachers to ensure that there is good planning in lessons so that students are substantially engaged in mathematics learning throughout the nominated learning period.

School demographics

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<th>Year range</th>
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<th>FTE teaching staff</th>
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<tbody>
<tr>
<td>Total enrolments</td>
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<td>Non-teaching staff</td>
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<tr>
<td>Location</td>
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<td>FTE non-teaching staff</td>
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<tr>
<td>ICSEA (school)</td>
<td>838</td>
<td>Indigenous students %</td>
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<tr>
<td>ICSEA (distribution of students)</td>
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<td>Enrolments: Girls/Boys</td>
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<td>(bottom quarter to top quarter)</td>
<td>31%</td>
<td>Language background other than English</td>
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<tr>
<td>Teaching staff</td>
<td>2</td>
<td>Student attendance rate %</td>
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