Port Augusta is located 322km north of Adelaide, at the head of the Spencer Gulf in South Australia and in close proximity to the magnificent Flinders Ranges. The population of this seaport city is about 14,000. Port Augusta is in a region which is used for sheep farming and wheat growing, and contains various mines including gold, copper, lead and precious stones are located nearby.

The Barngarla people are the traditional owners of this coastal region. Port Augusta was an important meeting place for many Aboriginal groups who met to trade goods, and share skills and information. Port Augusta still has a very rich Indigenous culture and many artefacts are displayed in the town’s galleries and displays. Adnyamathanha is the name of the traditional language spoken in this region.

Captain Matthew Flinders was the first European to explore the area in 1802. Many pastoral leases were established over the next forty years and the harbour was surveyed and the town established in the mid 1850s. There have been many periods of decline in the industrial history of this town which were caused by droughts, poor cropping seasons, decreasing copper prices and whether or not the railway was under construction. This has caused various periods of unemployment and hardship for the town’s people.
Defining Success

Carlton School has been proactive in building a positive culture at the school that focuses on the students. Carlton School has worked to build a culture of learning and resilience. The emphasis for the past two years has been to create a culture where students feel safe in expressing their feelings so that teachers are better able to cater for how students are feeling at a particular point in time. Many strategies have been used to enable this open discussion. Students are able to express their feelings and teachers acknowledge this. There is a strong emphasis on moving forward and that the emotional dimensions of learning (and social life) can impact on learning per se. This approach is very evident across the school, within classrooms and in the daily interactions with the students.
Empowering Learners

Carlton School has a program built on the five keys for success in school. There has been a concerted effort to create learning spaces for students to build resilience, confidence, persistence, getting along and organisation in learning mathematics. A lot of time and effort has gone into building a culture at the school based on these five keys to success and the staff share a language of success based on this.

Carlton School has developed a well-being program that underpins the work across the school and curriculum. Emotional well-being is part of that program and this helps students to better understand the processes (and challenges) of coming to learn new knowledge. This is particularly the case for mathematics where there is often a lot of anxiety associated with mathematics learning.

Recognition of the Emotions of Learning

Carlton School has undertaken processes to create opportunities for students to recognise their emotional dimensions of learning. Feeling anxious or happy or frustrated or angry as a consequence of learning mathematics is recognised as a legitimate way to feel. Each classroom has an emotions tree and emotions cushions. Discussions on how students feel as they come to learn mathematics is a part of the classroom dialogue.

One of the strategies is for students to create characters to represent themselves and they can place that on the tree to show how they are feeling. The tree can help teachers identify students’ reactions to learning as well as formally recognising and legitimating how students feel at particular points of the day. In addition to mathematics the emotion tree is used for all other curriculum areas.

As part of the overall well-being program of the school, an important aspect of the classroom culture is to talk about emotions and also for teachers to articulate to students that learning can be challenging, fun, difficult, etc., but that for learning to occur, it cannot always be easy. This helps students to understand that effort is required for learning and thus helps to build confidence and resilience in the learners.
Growth Mind Sets

As part of the empowering learners approach, the school emphasises the notion of Growth Mind Sets. Throughout mathematics lessons (and other lessons as well), teachers constantly remind students that they can achieve and that it is possible to achieve if they put their minds to it. There is a lot of reference to how the students may be challenged by work but that helps them to learn that with effort, they can do anything. Similarly, there is a lot of directed praise that names the achievements of the students. Emotions associated with learning are also named so that students can express their feelings rather than be overwhelmed by feelings and potentially disengage. Teachers use comments and strategies such as:

- To the student who achieved 4/20, that this was great and better than 2/20 and that she would be able to get 6/20 next time if she keeps trying.
- This might hurt your brain but you can do it and learn.
- Learning might be hard, but with effort and trying, you can do it.
- Mistakes help you learn.
- What strategies do we know that might help us with this problem?
- What do we know that will make it easier to do this?
- You don’t know it yet, but you will.
- Write down your mistakes as that is how you learn.
- Put your ideas down so that we can share the ideas and we can grow together.
- Stop everyone and listen as <student name> has learned something special and is going to share it with us.
- Writing thoughts on the board as to why students thought that something was important but also allowed other students to see other’s ways of thinking and working.
- I really like the way you are doing something or thinking about that.
- Encouraging the students to share their different ways of working out problems so that it can be modelled and shared with other students.
- Some students ask the teacher not to tell them how to work out a problem but rather to work it out themselves.
Support for Teachers

There has been a considerable portion of the school budget allocated to supporting teachers through extra staff. Class sizes have been made smaller than what is usually expected in a school. Staff who have clearly defined roles to support teachers have been employed at the school to work in classrooms or through targeted teacher release time.

School Support Officers: Second Pair of Hands, Second Pair of Eyes

Carlton School has invested in the employment of School Support Officers (SSO). This role is to support the teacher in the classroom. The SSO works closely with the teacher in the classroom. There is an SSO in each classroom and often there is another teacher support person also in the room such as the Leader of Curriculum or an NIT teacher (see below). This helps considerably in allowing for small group work, and working closely with students.

Non-Instructional Time

Carlton School has employed two NIT (non-instructional time) teachers whose role is to support other teachers through providing non-contact time. This time away from the classroom helps with teaching preparation and development. It is particularly the case with the diversity in the multi-age settings that teachers need to cater for the diverse learners within their classrooms.

Small Classes

There has been an active approach to keep and maintain small classes across the school. This means that within any classroom, groups are kept to a small size so that the teacher and SSO are able to work closely and provide quite intense interactions with the students.
Building Mathematics Vocabulary

The students at Carlton School come from the local area as well as from areas such as The Lands. As such there is quite a large diversity in language backgrounds with most of the local students speaking Aboriginal English and some their home language while others who come from The Lands will speak traditional languages such as Pitjantjatjara or Yakunytjatjara, while the local language is Adnyamathanha. Coming to learn mathematics requires scaffolding in learning mathematics as much as learning the language of mathematics. Carlton has developed a range of strategies to build mathematics language skills.

Word Walls

Word walls are created in the classroom. When a topic is commenced, words that the students encounter are placed on the wall so as to create a highly visible stimulus. Meanings of the words are also put alongside the term. A key part of this strategy is for teachers to make reference to the words so that students can develop independence as well as fluency in the mathematical register.

Metalanguage in the Classroom

Within the context of the mathematics lessons, teachers draw attention to specific mathematics terms. The teaching of the mathematics vocabulary in the context of the lesson helps to build better understandings of the highly nuanced mathematics discourse. Writing lesson objectives on the board at the commencement of a lesson also helps students build a mathematics vocabulary.

Word Investigations

In small groups, students are given problems to solve. As part of the problem solving process, students also undertake a process to build their mathematical vocabulary. This process involves the students highlighting words in the problem that they may not understand and then entering these words into a table such as the one below. In this process the student identifies their familiarity (or not) with the word. They then create a meaning for the word as to what they think it means before looking the meaning up in a dictionary.

<table>
<thead>
<tr>
<th>Word</th>
<th>I have never seen this word before</th>
<th>I have seen this word before</th>
<th>I think it means … because …</th>
<th>Expert definition (taken from dictionary)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</table>
Maths Recipe: Lesson Format

Carlton School has designed a ‘recipe’ for teaching mathematics. Recognising the needs of their students, there has been a strong focus on automaticity and fluency in basic mathematical processes – such as number facts. Students are encouraged to build a strong working knowledge of number that comes quickly so that they can undertake basic operations and then move into more complex, multi-step processes.

The intent of a lesson is made explicit to the students so that they are aware of what they will be learning. This is usually displayed on the board.

Open-ended problems – there is a school-wide emphasis on using open-ended questions within the classroom. Teachers have worked with the students over time to build their familiarity and confidence to know that mathematics problems can have more than one answer that is correct.

The format of the lesson can vary depending on what is being taught but there is a basic ‘recipe’ that teachers follow in the structure of the lessons.

| Part One | Build a competency in mental routines. | Students are taught various strategies to support their mental routines and then practice these. The activities are differentiated to cater for the diversity within a classroom. |
| Part Two | Build students’ fluency and automaticity with concepts. | Again the activities are differentiated to meet individual needs. A common activity used in this part of the lesson is the use of the 100s board. Many activities around number can be incorporated. Depending on the fluency and confidence of the students, single or multistep problems may be posed. For example, all students will have a 100s board – some may be identifying a number lower than 10; others may be identifying a number between 34 and 39; others may be identifying a number between 47 and 52; while others may be identifying any of these numbers with an extra parameter imposed (such as being an even number). There is discussion of not only the numbers students chose but also how they went about choosing the number. |
| Part Three | Problem solving. | In small groups, students rotate through various carefully planned activities that build on the intended learning of a lesson. All activities focus on the learning intent but will be quite different in format – one activity will be hands-on, another focusing on language and a third will use technology of some kind. The problems used in this part of the lesson are often open-ended so as to cater for the diversity within the class and to help foster problem solving attributes within the students. Careful scaffolding helps the students to realise that there are multiple answers and pathways as part of the open-ended process. |
| Part Four | Reflection and evaluation. | As part of the wrapping up of a lesson (or as they complete their group activity), students are required to talk about their learning and how they went about solving problems. Evaluation of a lesson is often undertaken using the thumbs up/down/in between but with the requirement that students talk about what they felt was easy or difficult and why. |
Group rotations

As part of all mathematics lessons, students are broken into small groups. SSOs work with one group, the teacher with another and often a third group works independently. Fostering a capacity to work without teacher support is a skill that is seen to be important. Activities are carefully designed to create the opportunity for the students to work without teacher support. The activities are chosen to align with the learning outcome that was expressed on the board or white board at the start of the lesson.

All lessons include one group that work on ICTs of some sort whether it is computers or iPads. This helps to engage students in an activity that is fun, focused and uses ICTs. It is often the case that the only time the students use ICTs is at school, so there is a strong emphasis on the productive use of ICTs/mobile technologies in the classroom. It is also the case that this rotation activity helps to build independence in learning since there is no adult supervision for this group.

Questioning

The teacher works closely with the students and the SSO often assists in a teaching mode. Questioning within the group is a key strategy used by the teachers. Questioning is used to promote deep understandings so the questions posed are more probing than recall questions. Students are asked to talk through their thinking processes and share with their group. This becomes a focal part of the lesson as students come to see other ways of working mathematically.

Students are asked to explain their thinking, justify their answers, share and compare their processes with their peers, evaluate their answers and processes. Collectively such strategies help to build robust learners as well as mathematical understandings.

It is important when using questioning as a teaching technique to allow sufficient time for students to formulate responses. A technique used by the teachers was to increase wait time to at least 5 seconds giving students sufficient time to consider and formulate their answer.
Carlton School has developed a Professional Learning Community (PLC) culture where teachers undertake regular professional learning (as part of the weekly staff meetings), through observations and feedback from the leadership team, peers, and also students from the Student Representative Council (SRC).

The school has worked consistently to build a culture where teachers and SSOs work collaboratively in the classroom but also undertaken shared professional learning so that all staff are learning the same content. The SSOs are seen to be an integral part of the teaching teams so are seen to be part of the Professional Learning Community.
Benefits for Learning and Learners

The well-being program has focused on building many skills and dispositions in Carlton School learners. Most notably is their emotional well-being and resilience. This has enabled students to develop healthy attitudes towards learning, recognizing when there are challenges for them and how to deal with the challenges. This has helped to engage the students in learning and to develop positive attitudes towards learning mathematics.

The Growth Mind Sets and emotional well-being of students has created spaces in classrooms for students to develop an awareness of their emotional well-being and how this impacts on learning, as well as developing positive dispositions towards learning mathematics.

The maths recipe for lessons has helped to build a whole school approach to teaching mathematics. This has helped students develop a schema for what constitutes a good mathematics experience as well as helping students to gain a sense of what to expect in a lesson.

The explicit teaching and supporting of language learning in and through mathematics has assisted students to gain a deeper understanding of mathematical concepts and processes.

Advice to Teachers

Learning mathematics can be difficult for some students so building up confidence, persistence and resilience requires teachers to support student to understand and recognize the emotional dimensions of learning so that they can address their feelings – both positive and negative ones. Create spaces in the classroom where students are able to express how they are feeling in mathematics (and school more generally). This can help students to recognize (and name) their feelings and so avoid many behavioural challenges. It can also help teachers to know how students are feeling and to address these feelings.

Building a culture in the classroom where the students see that learning can be a challenge and that they need to accept the challenge and practice skills, can help build deep understandings as well as a positive attitude towards mathematics.

It is important for students to have a sense of what it is they are going to learn, so putting up the learning intent for a lesson makes this transparent to the students. It helps to keep a focus to the lesson and learning as well as develop the language of mathematics.

Small group work can help to keep students engaged and on task. The groups can be tailored to the needs of the students and allows greater input from the teacher – more one-on-one time with students. Having extra staff in the classroom also helps with the other groups. Using digital tools such as iPads or laptops or electronic whiteboards can be used for a group as well and these can be unsupervised so as to encourage independence in learning.

Mathematics is a language that needs to be learned, particularly for students whose language is not that of Standard Australian English. It is important to build strategies that help students to learn the language of mathematics. Language-rich resources for mathematics need to be part of the classroom environment. They help to build the language of mathematics as well as enabling students to use them as cues to support their independence in learning. Resources should be explicitly used and referred to so that students come to see their purpose and value.
## Model for Quality Learning

<table>
<thead>
<tr>
<th>Principle</th>
<th>Implications for mathematics</th>
<th>Focused strategies</th>
</tr>
</thead>
</table>
| Create a standard format for mathematics lessons | • Create a common approach across the school for mathematics teaching and learning. | • Build a competency with mathematical concepts.  
• Encourage and build the students’ fluency and automaticity with mathematical concepts and processes.  
• Be able to apply knowledge to problems and solve these effectively.  
• Reflect and evaluate learning – encourage the students to articulate their learning and how they felt about that learning. Sharing feelings and strategies are important parts of the learning process. |
| Build confidence, fluency and resilience in learners so that they can cope with mathematics anxiety | • Be explicit with the students that learning is achieved through work and effort. | • Be honest and name the emotional aspects of learning. Articulate these feelings – i.e. name them – so that students can recognize them.  
• Create emotional barometers or visual displays so that students can name their emotions – this helps students and teachers to recognize how learners are feeling.  
• Avoid using terms such as intelligent, smart or clever as these suggest a biological basis to learning mathematics – Growth Mindsets. |
| Build the metalanguage of mathematics | • Most students have English as a second language so strategies need to be developed to support learning mathematical language. | • Create strategies where students can learn specific mathematics terms and meanings  
• Create a language-rich classroom where resources are made and displayed in the classroom.  
• Teach directly to the resources so that they act as prompts and supports for students. Students will know how to use the resources properly. |
Key Messages – Summary

Focusing on the well-being and attitudes of students towards mathematics helps to empower learners through a belief in their capacity to learn. Students need to be given the opportunity to express how they feel as learners as learning can be a challenging process. Being able to express their feelings and share their learning with their peers offers a positive learning environment in which students can grow.

Providing scaffolding strategies to help students learn the language of mathematics enables them to access, engage and learn mathematics.

Having a consistent and transparent approach to the teaching of mathematics, for example a ‘recipe’ for teaching mathematics, helps alleviate unknowns for the students so that they can more readily engage with the intent of a lesson.

Building a positive and supportive culture among the teaching staff and support staff – enables teachers and support staff to focus on the learning of students.

School Demographics (Carlton School)

<table>
<thead>
<tr>
<th>Year range</th>
<th>R-9</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total enrolments</td>
<td>96</td>
</tr>
<tr>
<td>Location</td>
<td>Provincial</td>
</tr>
<tr>
<td>ICSEA (school)</td>
<td>553</td>
</tr>
<tr>
<td>ICSEA (distribution of students)</td>
<td>100%</td>
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<tr>
<td>Teaching staff</td>
<td>10</td>
</tr>
<tr>
<td>FTE teaching staff</td>
<td>10</td>
</tr>
<tr>
<td>Non-teaching staff</td>
<td>13</td>
</tr>
<tr>
<td>FTE non-teaching staff</td>
<td>7.8</td>
</tr>
<tr>
<td>Indigenous students %</td>
<td>93%</td>
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<tr>
<td>Enrolments: Girls/Boys</td>
<td>46/50</td>
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<tr>
<td>Language background other than English</td>
<td>82%</td>
</tr>
<tr>
<td>Student attendance rate %</td>
<td>70%</td>
</tr>
</tbody>
</table>

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