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Making a positive difference in numeracy

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Summary

In 2009, Two Wells Primary School set out to make a positive difference to students' learning in Numeracy, using a coaching model supported by the Smarter Schools National Literacy and Numeracy Partnership project. This was an 18-month, whole-school program that focused on Number as the area of learning to be improved. The Big Ideas in Number program (Siemon 2006) was selected as the basis for the improvement strategy, along with a Numeracy Coach who worked with teachers to develop expertise and knowledge in the Big Ideas in Number program; demonstrated how to administer the associated diagnostic tools; and showed how to use students' data to design and plan teaching programs.

From diagnostic data collected between 2009 and 2011, a continual increase was clearly identified in students' ability in Number as a result of this strategy. There was also improved engagement of Indigenous students in their learning community. The school has continued to implement aspects of the strategy beyond the initial phase described in this report.

Target student group

Two Wells Primary School is a school north of Adelaide, South Australia. It has an enrolment of 320 students from Foundation (Reception) to year 7. The school includes a school leadership team and 14 classroom teachers. Some of the children, their families and carers have Indigenous heritage. This strategy focused on all students at the school.

'There was a wide variety of ability across the 80 students in the three year 6/7 classes. Many of the students struggled, and lacked the confidence and willingness to give mathematics a go. All students, three teachers, the Numeracy Coach, three School Service Officers and the School Counsellor worked weekly in targeted groups. Each group was based on the Big Ideas In Number diagnostic-testing results. The students really engaged well with their groups and with the tasks. They looked forward to mathematics sessions each week. Each term, data identified that most students had progressed to the next stage of Big Ideas in Number, with a 15 to 50 per cent improvement across all year 6/7 students. Along with the significant improvement in mathematical ability, students' confidence and willingness also improved markedly.'



Method

The strategy

NAPLAN results and local assessment of student performance led to the development of this strategy. Students were surveyed and the results showed that some students did not feel confident or engaged during maths lessons. Number was selected as the area of learning to be improved.

Big Ideas in Number (Seimon 2006) was selected as the basis for the Numeracy improvement program to be implemented across the school. A Numeracy Coach was appointed through National Literacy and Numeracy Partnership funding to train staff about Big Ideas in Number, demonstrate how to administer the associated diagnostic tools, and show how to use students' results to design and plan teaching programs. The coach provided in-class support to implement the Big Ideas in Number approach, guide curriculum delivery and pedagogy, and support lesson planning.

Teaching staff were consulted and decisions were made as a team, eg deciding which tools to administer when assessing Place Value and Multiplicative Thinking.

Weekly parent workshops and acquaintance evenings were arranged to help parents using Big Ideas in Number at home with their children.

New initiatives

A number of new initiatives were introduced into the school as part of this program:

- Teachers developed an Agreed Numeracy Practices code, which provided a common language for professional discussion about numeracy learning.
- Teachers' professional learning focused on the work and improvement in Numeracy across the school.
- NAPLAN data were analysed to identify students who did not meet the National Minimum Standard or who were just above the standard. These students received intervention support.
- An Online Placement Instrument (OPI; see below) was introduced into the school for Numeracy assessment. It was used to provide additional diagnostic data for monitoring progress before and after NAPLAN testing.
- Intervention was provided to all students who were not able to do 'Trust the Count', which is the first big idea in the Big Ideas in Number program. This activity involves developing flexible mental models of numbers.



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- Intervention groups were established based on different learning needs, eg an Aboriginal and Torres Strait Islander learning community for Indigenous students and an Upper-primary Girls Group.
- Additional lessons were provided two to four times a week in small intervention groups by a teacher or School Service Officer. (These were in addition to regular class lessons.)

The Online Placement Instrument (OPI)

The Online Placement Instrument (OPI) offers a series of tests. The tests are designed to provide information that will help teachers make informed decisions about students' mathematical knowledge. The OPI measures student performance in the generic skills that underpin the teaching of mathematics to students in years 3–10.

The OPI tests are online. As students complete the online tests, teachers are able to access reports on each student's performance relative to the expected performance at that year level.

The OPI tests knowledge in these strands:

- Number
- Measurement
- Space
- Chance and Data.

Further information about OPI is available from [ACER](#) .

Sample intervention program

- The Numeracy Coach worked with the leadership team to identify students requiring learning support. This was done using 'Trust the Count', NAPLAN results and OPI data.
- Intervention was planned and implemented for students at all year levels, targeting students below or just above National Minimum Standard. The Numeracy Coach worked with School Service Officers (SSOs) to look at NAPLAN, OPI and 'Trust the Count' results and design maths intervention programs. There was ongoing reflection on intervention and the need to redesign teaching to improve learning.
- All year 3–5 Indigenous students were tested with 'Trust the Count' and 'Place Value' diagnostic tools, as well as OPI and NAPLAN tests.



- Teaching and learning plans were built around Big Ideas in Number. These plans targeted students' levels of skill development. The Aboriginal Community Education Officer, Numeracy Coach, Literacy/Aboriginal Education Coordinator and leadership staff worked with students for 45 minutes each week. Follow-up discussions were held with teachers, and SSOs to help with class planning.
- Ongoing data collection was undertaken to map progress.
- Year 6/7 intervention used 'Trust the Count' data. It was discovered that a significant number of year 6/7 students were underperforming in Number.
- Data revealed that some of the year 7 girls were significantly underperforming in maths. Individual data determined their skill level in Number. The Numeracy Coach worked with groups of girls to reach specific learning goals, helping the girls improve their skill levels and build their confidence in mathematics.
- Mathematical lunch activities were provided for students.
- A literacy and numeracy homework centre was established for Indigenous students.
- A maths focus person led curriculum focus and data-analysis discussion.
- Staff used – and added to – the digital resources library on the school server.
- Resources purchased reflect constructivist learning principles.
- Staff meetings included sharing, joint planning and data analysis.

'I was involved in the whole-school training of Big Ideas in Number and worked closely with the Numeracy Coach. This gave me the confidence to help students develop a deeper understanding of Number. We developed a shared language with the teachers and the students; this enabled us to continue developing students' knowledge across all year levels from Foundation (Reception) to year 7. I have seen an improvement in student's level of engagement and confidence, and they now participate more openly in maths group activities.'

(School Service Officer)



Results

Analyses of the impacts of the Big Ideas in Number program were derived from qualitative data – in the form of questionnaires and interviews with teachers; teacher-designed student surveys; peer observation and feedback (Buddy Watch); parent/ caregivers surveys – and quantitative data, collected from tests administered at the beginning and the end of each school year.

Comparisons of all student results were made before and after implementing the Big Ideas in Number program.

Analysis of the changes in Numeracy learning mainly relied on the students' OPI data and, where applicable, NAPLAN Numeracy results. Teachers worked collaboratively to analyse the data and use the information to guide programming for intervention.

The following tables identify changes in students' NAPLAN results; they show continual growth in mean scores from 2009 to 2011.

Table 1: Numeracy NAPLAN scores for year 3 at Two Wells Primary School

Year	2009	2010	2011
Mean score	360	390	408

When the program started in 2009, the year 3 mean score was well below both South Australian mean and national means. By 2011, the mean score had risen 48 points and was above state and national means.

Table 2: Numeracy NAPLAN scores for year 5 at Two Wells Primary School

Year	2009	2010	2011
Mean score	448	475	489

Mean scores for year 5 2009–2011 also showed Two Wells Primary School improving. The 2011 mean score was above the state and national means. The percentage of students



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who achieved the National Minimum Standard continued to improve throughout the program. 2010–2011 results show a three per cent improvement in year 3, and a two per cent improvement in year 5.

When the project began, a high percentage of the students were in low progress, with a very low percentage in high progress between tests. In 2010 this changed, and by 2011 this pattern showed zero per cent in low progress, 42 per cent in medium progress and 58 per cent in high progress between years 3–5 and 9 per cent in low, 65 per cent in medium and 26 per cent in high between years 5–7. From diagnostic data collected between 2009 and 2011, a continual increase was clearly identified in students' ability in Number. There was also improved engagement of Indigenous students participating in their learning community. In addition, the teachers know and use the Indigenous students' learning outcome data more effectively.

Students were engaged in Numeracy tasks that resulted in enjoyment, a sense of achievement and improved confidence. They quickly demonstrated an increased level of engagement in mathematics.

Response from the National Partnership Implementation Working Group meeting in Canberra:

'Congratulations to Two Wells Primary School for your outstanding progress, as measured by the 2010 NAPLAN results. Last week, each National Partnership project was asked to nominate two exemplars of outstanding progress which could be showcased at today's National Partnership Implementation Working Group meeting in Canberra. Nominees may also receive a visit by the Prime Minister when she next comes to South Australia. I am delighted to report that Two Wells Primary School has been nominated as a showcase school ... I am informing the School Principal and the Regional Director of this special mention.'

(Graham Francis, Literacy and Numeracy National Partnerships)



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Lessons learned

A whole-school approach requires long-term whole-school commitment and strong school leadership. Substantial resources are initially required to release staff for training, for support staff in classes, and to provide materials for the strategy.

The professional learning required is considerable, and staff need to be prepared to learn new approaches to teaching numeracy and engaging in teamwork. Teachers require training to understand and use evidence-based diagnostic assessment, and to be able to analyse the resulting data and use it effectively to design and plan teaching and intervention programs.

‘Due to the improved outcomes of our students on 2010 NAPLAN Numeracy tests, our school was selected in July 2011 to feature in a Federal Vodcast, published on the Department of Education, Employment and Work Relations website.’

Next steps

The whole-school focus and commitment to building Numeracy confidence in teaching and learning continues. A school-based coordinator was appointed in 2012 to provide leadership in Numeracy initiatives.

Ongoing improvement in data (NAPLAN, school-based data, student surveys) has demonstrated the sustainability of the initiative to keep improving students’ skill levels and engagement. Sustainability also includes the use of the Agreed Practices Document for Numeracy in Two Wells Primary School.

The teaching staff continue to refine their skills in investigating student data and creating intervention and class programs. Using data collection and analysis for planning effective numeracy learning programs is now established in the school.

Two Wells Primary School will continue to:

- link performance development to curriculum priorities
- provide induction and training for new staff
- train teachers in Big Ideas in Number
- administer Big Ideas in Number diagnostic tools to check students’ progress regularly
- purchase resources that reflect constructivist learning principles
- use and add to the digital library on the school server.



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Research base

Big Ideas in Number, developed through Di Siemon's research, was selected as the appropriate influence for this strategy. Big Ideas in Number is a model for developing number concepts sequentially to improve student achievement across primary year levels.

Further reading and links

Australian Council for Educational Research (ACER), [The online placement instrument \(OPI\)](#), accessed May 2012.

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Contacts

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