



# Numeracy, mathematics and Indigenous learners

## Project Summary

The Australian Association of Mathematics Teachers Inc. (AAMT) undertook the *Make it Count: Numeracy and mathematics for Indigenous learners* over the four years 2009-12. The project was funded under the Australian Government's *Closing the Gap* Strategy. The Association has provided national leadership for the project by supporting locally developed initiatives, designed by schools to address factors contributing to the differences in achievement between Indigenous students and their non-Indigenous peers – the 'achievement gap'.

## Conduct

Eight Clusters of between three and six schools each were established in five states. These were the 'working units' for the project (35 schools in total; with over 1500 Indigenous students among about 15,000 total enrolments). On previous advice from senior Indigenous educators and community groups, AAMT focussed *Make it count* in metropolitan (6) and regional (2) locations. With the support of the AAMT project team, each Cluster designed a program of professional learning and classroom research and development directed at improving Indigenous students' engagement, achievement and attitudes in mathematics, and for engaging parents and the wider community in Indigenous students' learning of mathematics. A characteristic of the project is that of diversity, both among the schools and between the approaches taken within the Clusters.

Each Cluster was teamed with one or more Critical Friends – mostly university academic researchers in the fields of mathematics education or Indigenous education. Their role evolved to be instrumental in supporting the gains made in the Clusters. According to needs and circumstances, they provided input around 'content', support for professional learning and networking, advice and expertise about collecting and analysing data, and assistance in writing reports and academic papers.

An Expert Advisory Group (EAG) consisting of eminent Indigenous and mathematics educators was established at the start of the project. Through meetings and individual contact, the EAG played an important and active role throughout the project by providing advice and acting as a 'sounding board' for the project team. In particular, they supported the AAMT project team to build and grow strong connections with relevant communities across education and beyond.

## Work in the Clusters

Each Cluster had its own focus and the range of these reveals the diversity of communities and schools involved in the project.

**Alberton:** The role of mathematisation and contextualisation in developing mathematical resilience and transfer of learning for Aboriginal students. The pedagogy developed from four quadrants of learning mathematics: Pure Mathematics, Numeracy, Contextualisation and Mathematisation.

**Swan Valley:** In addition to designing and using everyday projects involving mathematics; development of students' use of, and understanding of, the language of mathematics; improving student 'test literacy' (ie familiarity with the genre of tests and test questions); making resources designed to provide specific help to students in key areas such as place value, there was also a focus on building the capacity of Aboriginal and non-Aboriginal teaching assistants to provide support for students' learning in mathematics.

**Dharug:** Worked on teaching and learning strategies to enhance the mathematics learning outcomes of Aboriginal students in Kindergarten to Year 3, including the development of the Monday ‘Maths Mob’ concept; enhancement of prior to school and early years mathematical knowledge of Aboriginal students; strengthening of cultural identity and understanding of Aboriginal students; problem-solving using metalanguage related to numeracy.

**Gladstone:** Worked on investigative approaches to learning mathematics in Years 5-9 as means to improve engagement of Indigenous students in senior mathematics subjects?

**Healesville:** Develop staged response to upskill teachers to meet the needs and provide programs for Aboriginal students who are wide ranging in their academic performance. The staged response includes: cultural awareness training for teachers; enabling student access to mathematics intervention programs or ‘frontloading’ students in preparation for the mathematics they are about to learn in the classroom; professional development to develop maths pedagogy.

**Nerang:** Built the capacity of middle managers to empower teachers to improve their pedagogy in mathematics.

**Noarlunga:** Adapted the highly scaffolded pedagogy of Accelerated Literacy and incorporated the framework of “Big Ideas in Number” to improve mathematics for Aboriginal Primary Years students.

**Orange:** Developed an explicit approach through professional learning in mathematical content knowledge and embedding ‘8 Ways of Aboriginal learning’.

## Findings

The seven Key Findings below were synthesised from the findings from the detailed work in the Clusters (Cluster Findings). There are more than 40 Cluster Findings that are supported by an evidence base that is captured in the resources of *Make it Count*. More detail is available on request.

The summary Key Findings (below) reflect the new Australian Professional Standards for Teachers (Australian Institute for Teaching and School Leadership; see <http://www.teacherstandards.aitsl.edu.au/>). This ensures that work to specifically improve the teaching of mathematics to Indigenous young people fits with the overall expectations for teachers’ work.

### **Professional Knowledge**

1. Know Indigenous learners and know how they learn.
2. Know the mathematics content and know the different ways to teach it effectively to Indigenous learners.

### **Professional Practice**

3. Plan for and implement Responsive Mathematics Pedagogy for Indigenous learners that is culturally, academically and socially inclusive
4. Create and maintain learning environments in which Indigenous learners feel safe and supported.
5. Develop and use tools that assess both affective and cognitive learning outcomes specific to Indigenous learners, provide feedback, and report on student learning.

### **Professional Engagement**

6. Engage with colleagues - in professional learning communities in ongoing, action oriented, professional learning - who are prepared to push the boundaries and move outside their comfort zone. Strive for collegial innovation in both Indigenous education and mathematics and numeracy education Engage with Indigenous parents, families and community.
7. Engage with Indigenous parents, families and community in two-way dialogue.

## Evaluation data

In addition to the collection and analysis of data by the Clusters, the project engaged a number of external evaluators to collect, analyse and report on data about the Clusters' performance. Many of the evaluators came to the project with substantial reputations within mathematics education and Indigenous education nationally and internationally. Evaluation components included student achievement through NAPLAN and other measures; student experiences in mathematics; their attitudes, beliefs and self-concepts; teacher and school change; cultural competency of teachers and schools; and school-community partnerships.

Their reports are extensive – two snapshots are included to provide an indication of the evidence that supports the Cluster Findings.

### Student Achievement

Evaluation included analysis of NAPLAN Numeracy data for 2008-2012.

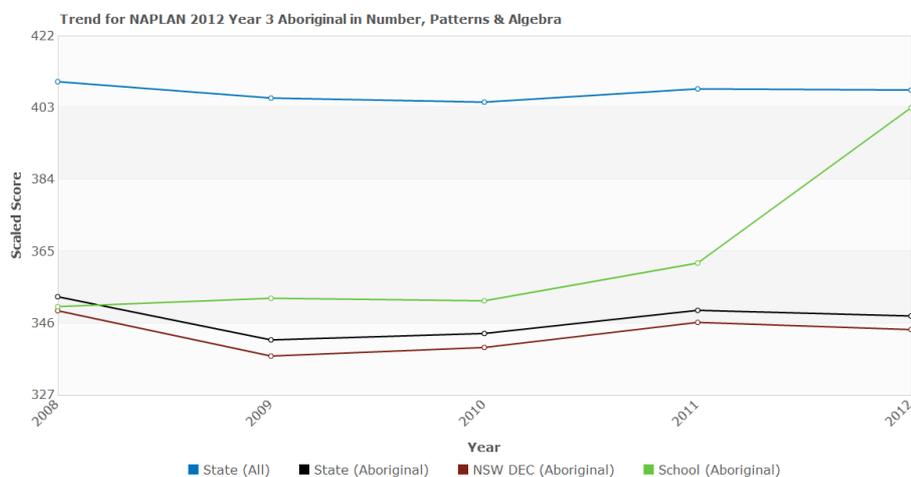
The Evaluators advised that inferences were not readily drawn from the data since:

- Many mean scores are based on information from only a small number of students – in some cases on a single score.
- Not all data from schools was provided.
- Mean values are affected by outlier scores – particularly in small samples. Thus cross year comparisons must be made with extreme caution.

The evaluators provided summaries of comparisons of performance national of Indigenous students by geolocation for Years 2008-2012 for Years 3, 5, 7 and 9. Their conclusion was:

*...that the performance of the Indigenous Make it count students on the NAPLAN tests at each grade level and for each year, 2008-2012, was within the range of the mean scores for the national cohorts of Aboriginal and Torres Strait Islander students in Metropolitan or Provincial regions (Leder, G. & Forgasz, H. 2013. Unpublished Evaluation Report to the Make it Count project).*

Snapshots from a number of Clusters on NAPLAN results show some very encouraging improvements. For example, the **Dharug Cluster** believes that graph below is evidence of the effects of the *Make it count* Monday 'Maths Mob' which the school began to implement in 2009 in their Kindergarten class. The school's Year 3 Indigenous students' results in 2012 show a significant improvement over the school's previous Year 3 results. These are the students (around 30 in the cohort) who had the benefit of the Monday 'Maths Mob' and associated changes in the teaching of mathematics they experienced during their first few years of school – a small but significant example of 'closing of the gap' that the school is determined to maintain.



At Swan View Primary School in the **Swan Valley Cluster** there have been 20 Aboriginal students involved in the project for its duration. These students had a targeted numeracy program over the last two years of *Make it Count*. The Cluster reported on data measured over the past two NAPLAN tests showing results ‘worth noting’ for their current Years 5, 6 and 7 students (note: Year 7 in primary school in WA). These students made “moderate” or “high” progress which represented significant improvement; and 9 of the 20 students are now above the National Standard in NAPLAN.

### **Teacher and School Change**

Evaluation included an audit of schools using the AAMT Standards, a Teacher Profile Survey, interviews and focus group discussions. The evaluators’ reflections on Teacher and School Change as a result of *Make it count* include (Callingham, R. & Serow, P. 2013. Unpublished Evaluation Report to the *Make it Count* project):

*Make it count was a large, well-funded project that focused on Aboriginal and Torres Strait Islander students’ mathematics. It was unique, and has added considerably to understanding of pedagogy and provision for Aboriginal and Torres Strait Islander students.*

They add that a different cohort was involved in the exit survey which is the likely result in the survey not showing change:

*Measuring change in intervention studies of this type is notoriously difficult. The generally positive trend in the area of community involvement, however, does suggest that the findings of the initial survey that this was an area of concern were taken on board. The site visits confirmed the sense of connectedness with the Aboriginal and Torres Strait Islander population and community. The final questions on the survey indicated that teachers felt that participation in Make it count had been highly beneficial and had enhanced their practice in every area of teaching mathematics. This was borne out by the site visits, which showed teachers being thoughtful and deliberate in their practice.*

Regarding the role of the Critical Friend (mentioned in Section 1) in change in schools:

*Critical Friends were essential. They provided support, access to skills and theoretical perspectives and practical help and undoubtedly helped the project start well. It was important to maintain the support of the Critical Friend for the duration of the project.*

Data about changes in practice reveal that:

*Teachers did make changes to their practice, particularly in being more thoughtful about their teaching and about Aboriginal and Torres Strait Islander students. In every school visited there was pride in Aboriginal heritage and a conscious focus in the school on improving outcomes for Aboriginal and Torres Strait Islander students. The approaches taken were varied, reflecting the very different organisational structures, governance and cultures of the schools involved. Even within a Cluster that was working together, there were considerable differences in approach in the schools.*

*The extent to which changes made by teachers are sustainable is less clear. The unstable nature of school staffing and the comments about change happening all the time suggest that although there may be some intrinsic understanding which teachers have developed about Aboriginal and Torres Strait Islander students’ mathematics, the extent to which these will continue to impact on pedagogy and practice may be limited by the school in which they work.*

In conclusion, Callingham and Serow noted that:

*The project had added value to Australian understanding of mathematics teaching and pedagogy, the complexity of bringing about sustained long-term change and the challenges associated with managing and evaluating complex projects of this type. As such Make it count has provided pointers to success for future programs.*

## Some other important findings

1. The development of a framework for responsive mathematics pedagogy that has three critical dimensions: academic inclusion, cultural inclusion and social inclusion. None of these is enough in its own right – all three elements need to be present in effective teaching of Indigenous students.
2. The project benefitted greatly from using research-informed strategies in classrooms, and from schools using responsive mathematics pedagogy. The collaboration between educators in schools and critical friends/researchers as partners in designing, developing, evaluating and implementing approaches was also powerful.
3. All learners benefit from paying attention to Aboriginal and Torres Strait Islanders' ways of knowing and learning – the practices that emerged and were used in the schools are intrinsically more inclusive.
4. Professional learning communities (PLCs) were integral to the success of the project. The project created these communities to work at the intersection of Indigenous education and mathematics education. These PLCs served many purposes. They provided educators with opportunities for the exploration and generation of new knowledge, including appreciating the value of collecting and sharing information from people with a range of expertise and experience. PLCs were dynamic and networked through a complex of interconnections both locally and nationally. Having clusters from around the country working together was an important aspect of the project. Through analyzing the work of the PLCs *Make it Count* has also identified key parameters for their success – how they function best; resources and support from leadership required; building sustainability; and dealing with staff turnover.
5. The development of leaders at the intersection of Indigenous education and mathematics education was a powerful contributor to the success of the project. This is a new domain of leadership in schools – *Make it count* has developed a 'leaders pack' to share the processes and findings from the Clusters.
6. Encouraging and enabling Aboriginal academics and mathematics education academics to work together created a space to learn from each other. It has also generated new knowledge about mathematics education for Aboriginal and Torres Strait Islander learners.

## Contact

Caty Morris

National Manager: Indigenous Programs

Australian Association of Mathematics Teachers Inc. (AAMT)

E: [cmorris@aamt.edu.au](mailto:cmorris@aamt.edu.au)

P: 08 8363 0288

M: 0432 277654