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A journey just begun

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Collaboration between several NSW schools and their local Indigenous community has resulted in a positive and productive partnership. The history, culture, ethos and spirituality of the Aboriginal community have been interwoven into a project designed to enhance students' mathematical learning, with many benefits for all involved.

Harry Langes has taught in north-west and central western NSW in Moree, Gulargambone and Gilgandra at schools with a high percentage of Indigenous students. He has taught at Gilgandra High School since 1982 and was appointed Head Teacher Mathematics in 1996. In 2003 he was a team member of the initial Maths in Indigenous Context Project, and both he and members of his faculty have been involved in other projects in 2004 and 2005, including the Maths in Indigenous Project at Warren Central School. In 2003 Harry was also the facilitator of the new stage 4 mathematics program for the Dubbo District. He is also involved in marking in the HSC and for the past three years have been part of the marking team for SNAP numeracy assessment.

In November 2002, Gilgandra High School was approached by the NSW Board of Studies Aboriginal Curriculum Unit, to invite us to undertake a Mathematics In Indigenous Context Project in partnership with Gilgandra Public School, involving Stage 3 (Years 5–6) and stage 4 (Years 7–8) students. Even though at first the questions: "Why us?", "What do we actually do?" and "How do we do it?" were major concerns, we felt that it would be beneficial and rewarding if it:

- produced closer links and a learning partnership with the local Indigenous community;
- enabled a greater and deeper involvement of the Aboriginal Education Aides (AEAs) in students' actual learning;
- improved the learning outcomes for all students; and
- produced a generic unit of work which could be used in other locations/schools.

The initial project started in 2003 and "officially" concluded in November 2003, but the learning units are still being used throughout our mathematics teaching programs. In 2004 a new team developed further units, and in 2005 we are continuing to build and refine the units already established and to use them within the classroom environment.

Each project involved a team of

- classroom teachers of students at Stages 3 and 4 (Years 5–8);
- Aboriginal Education Aides from both schools;
- NSW Board of Studies representative (the project manager);
- project mentors (critical friends);
- community members from the Indigenous population of the local area; and
- supportive school staff — regular updates were given at staff and faculty meetings.

Our initial meeting, involving all team members, was a valuable journey for all. The wealth of experiences, insights and knowledge shared by the local Indigenous community members was incredible, mind-blowing and diverse. It enabled the other members of the team to gain a deeper and richer understanding of the ethos of that community. Even though we were working on a mathematics project, as a team we believed that this rich history, culture, ethos and spirituality should be tightly interwoven within the project.

Our schools are not unique in that partnerships with the local Indigenous community in the past had been only minimal, and what contact had been made usually centred around students' behaviour and not their learning.

Goals and rationale

Following the open dialogue, we were able to develop a set of common goals and rationale:

- to develop a unit of work with an Indigenous context;
- to develop multi-stage units of work which would encompass a range of teaching and assessment strategies that would assist students to demonstrate their numeracy understanding; and
- to gain an appreciation, understanding and acknowledgement of the Aboriginal community within our local area.

In 2004 the new team decided to build on the initial project and developed the following goals and rationale:

- to extend the linkages between Gilgandra High School and Gilgandra Public School;
- to expand community involvement in the development and implementation of a contextual unit of work;
- to enhance student and teacher knowledge of Indigenous culture; and
- to address areas of weakness identified in state wide tests.

Finding a mathematical focus

The AEAs and classroom teachers spent time mapping the results of the state Basic Skills Test (for Year 5 students) and SNAP (Secondary Numeracy Assessment Programs, for students in Years 7 and 8) from previous years in order to identify the strengths and weaknesses of all the Indigenous students, and subsequently widened this to include all students in the cohorts. Areas of common concern were:

- Measurement: conversion of units; when and where to use certain units; perimeter and area; using scales and scale drawing.
- Mapping : reading directions; locating points on a grid and /or reading the coordinates of a given point.
- Enlargement: understanding the concept, and being able to apply it accurately.
- Estimates: in everyday mathematical situations, measurement, time etc.
- Directions: using compass directions; locating a point of interest from given directions.
- Volume: using volume — the actual meaning and finding the volume of a shape.
- Fractions: the understanding and application of concepts.

In 2003, linking these to an Indigenous component resulted in much discussion among the team. We decided to use a local area in Gilgandra which has great

Estimating "How close are you?"

Working in pairs, estimate the length of various objects/distances in the required unit of measure, then actually measure. Check the difference: how close is your estimate to the actual measure?

Estimates within the classroom of every day regular fixtures. Make estimates of length, width, etc., then measure.

Perimeter

Of desk, classroom, the maths block, the school; choosing which measuring tool to use and explaining choices, comparing and discussing results.

Mapping

Given maps of the town/rural area

- locating points of interest on the maps
- reading reference points, and giving reference points
- drawing routes from home to school; writing a description of the route; measuring it and using the given scale to determine the actual distance. Who lives the closest?

Mapping the changes in the uses of the land in the blocks around the school. A local community member described what it was like in the 1950s and 1960s, someone else outlined the changes by the mid-1970s, and we discussed and reflected on what is there today and why?

Enlargement

Understanding the concept, using it in class, going outside and enlarging a given boomerang on the ground by drawing the shape in the dirt and then enlarging again using sticks. Enlarging artefacts.

Scale drawing

Using aboriginal symbols, enlarging and reducing them to given scale

Directions

Describing the location of various artefacts from a central point

Fractions

Given a vegetable patch problem and using fractions to solve certain questions

Reach out

Measuring each student's height, reach, arm span and foot length, then completing a table to display the measurements. Using Excel and Chart Wizard to construct scatter graphs of height against reach, height against foot length and height against arm span. Constructing column graphs to compare class data.

What is my speed?

Estimate the distance of 10 metres by pacing; pace out 50 steps and by measuring calculate the distance walked. Time groups of students running 80m, then calculate the speeds of individuals and average speeds of groups.

The boomerang

A task involving comprehension and questions. Colouring a given boomerang: students made their own design which had to be symmetrical and geometrical. Local Indigenous artists assisted the students in this activity.

Figure 1. Some of the lessons used in the projects.

importance and significance to the Aboriginal Community and to adapt learning activities to fit into the local context. We chose "The Pines" area where the Aboriginal Community lived from the 1950s to the mid-1970s.

In 2004, we undertook an excursion to the Aboriginal Cultural Centre at Balladoran — a small hamlet 10 minutes drive from Gilgandra, which had previously been the site of a community mission. Students spent a day on a mathematical journey using various aspects of the centre and learning about the artefacts and their significance.

The units of work

Planning and writing of the units of work was our next task. In our planning we considered five central questions which would be the foundation stones for the development of the units of work.

- How well do we expect students to do the tasks we set?
- What do we want the students to learn?
- Why does this learning matter?
- What are we going to get the students to actually do?
- When will they need to know this and why?

Figure 1 provides brief outlines of some of the lessons used in these projects. The initial lessons occurred at school and in the surrounds of the school. It was decided that all units of work would be completed in our allocated mathematics lessons on Thursdays and Fridays. After our first lessons, students were asking on Mondays, "What are we doing on Thursday and Friday?" and "Why can't we do it today?". The students' enthusiasm and desire to learn increased weekly. I also found that absen-

teeism on Thursday and Friday was nil, whereas before undertaking the units I had regularly had the same students missing from class.

Visiting "The Pines"

The climax of all the units completed as part of the 2003 project was an excursion to "The Pines" — the area of earlier Aboriginal settlement. The Aboriginal community, as the traditional owners of the land, had to give permission for us to visit "The Pines" — thus ensuring their ownership of this part of the learning.

The excursion began with a traditional welcome by the community. They gave a very personal and honest account of their life whilst living in The Pines, including the joys, the hardships, the bonds of family and tribe, and the relationships with the non-Indigenous community.

The students then moved around seven stations with tasks involving the applications of skills already addressed in class. At each station, students had to work out strategies and select the appropriate measuring equipment. At two stations the Year 5/6 students taught the Year 7 students a concept they had learnt, and at another the roles were reversed, encouraging peer teaching and peer learning. One task required the students to create a piece of art depicting the area. The final task was to complete a reflective journal entry. Warren Central School students also played two games which the AEAs had researched and refined to suit the local environment.

The elders and community members were absolutely delighted with the day, pointing out that we were the first group of students and staff to actually visit and use the area for an educational purpose.

Assessment

We abandoned the traditional topic test at the completion of the unit. Instead, we used:

- classroom observations;
- classroom discussion within groups which the classroom teacher and AEAs were part of but did not run — the students motivated the discussion and formulated conclusions from that discussion;
- observations outside the classroom — noting the choice of measuring tool and unit selected by the students;
- asking students to explain what they were doing and what they achieved;
- mind mapping of concepts; and
- journal entries — at the end of each lesson or session students spent time writing down their thoughts on what they had done, what they had achieved, whether it was relevant and why, whether they enjoyed the lesson, any comment about the unit, etc.

What we gained

For students:

- Engagement of all students.
- Students able to achieve desired outcomes irrespective of their level of development.
- Promotion of student ownership, peer learning and peer teaching. Students taking an active role in their own learning — discovering and experiencing for themselves.
- Increased use of mathematical language (terminology).
- Incorporation of other KLAs within the school in the project — students could see connections and relevance.
- Deeper understanding and relevance of measurement and mapping.
- Increased self worth of aboriginal students — pride and ownership.
- Awareness amongst non-Indigenous students of Aboriginal culture and history.
- Improved performance by Indigenous students in SNAP results. The initial class involved in the project in 2003 improved greatly when their results were mapped with results in the 2004 SNAP Test.

For the community:

- Elders were able to share experiences with the students on their local history and site, connecting links from the classroom.
- Elders and community were significant stakeholders in student activities and learning.
- Improved dialogue and bonds between the Aboriginal community and the school.
- "The Pines" area being recognised by non-Aboriginal community as having significance.
- Aboriginal community members are more aware of what is happening and realise that mathematics is not just surrounded by four walls, a door and numbers.
- Students expressed ideas for the development of The Pines.
- Community awareness of the project and its outcomes from reports in school news and the local paper

For the staff:

- Team work involved in planning and implementation of the unit.
- AEAs' tremendous growth in their role within the school; they have greater confidence and are seen as equal shareholders in the development of units of work. AEAs reviewed the roles of all within the school framework.
- Opened doors: other departments within the school carried out projects using the basis set by these mathematical projects.
- Learning and understanding for all occurred.
- Mathematics can be fun.
- Allowed us to focus and discuss our current teaching methods and explore other options.

For all involved, we learnt

- to value other people's knowledge and experiences;
- that everyone is of value;
- that our history shapes us and we need to preserve it;
- that mathematical learning does not have to be confined to the classroom; and
- that we are all still on a learning journey — and we still have more to learn and discover.