



Significant Episode: Leading From The Middle Project

Helen Pryor
Nerang State High School
Nerang Cluster

Finding 4.4: Risk taking

Encourage risk taking - this is an integral part of mathematics learning - in an environment that prepares students adequately for an ultimately successful outcome from risks taken.

Overview

The main focus at Nerang State High School was assisting students with solving worded mathematical problems in a variety of contexts. This focus was predominantly aimed at students in Years 8 and 9 and stemmed from evidence of limited or no attempt by students, and associated poor results, in thinking and reasoning in classroom and assessment tasks.

The aim of this project was to:

- Improve the results/ability of students to think and reason and/or model and problem solve mathematically.
- Provide a consistent pedagogical approach to problem solving that was used by all teachers – a common language/framework.
- Develop a better understanding of WHY students were performing relatively poorly with these question types.

The Strategy

After research and consultation an acronym was developed to give students and teachers a clear strategy to follow to assist them in teaching/answering these modelling and problem solving questions. The *RESCUE* (see attachment) acronym was presented in poster format, illustrated on the following pages, and put up on walls in all mathematics classrooms.

To facilitate teachers in implementing the consistent approach to problem solving, a series of worksheets was developed based on a template that included the acronym. This was designed to encourage students to respond to each of the steps in the process in a systematic way so that such strategies would be internalised and become automatic in problem solving situations. When considering the design of a worksheet, teachers identified literacy requirements of tasks as a 'stumbling block' for many Indigenous and non-Indigenous students. A focus for students to reflect on ease of answering both before and after the task was built into the task sheet.

Specific time was allocated each week to focus on problem solving tasks. All classes in the cohort were involved in the project.

Resources in the form of a series of worksheets were designed for each of the year levels being targeted i.e. year 8 and year 9.

A sample worksheet is included (see attachment) to illustrate the improved template used in working through the *RESCUE* acronym in a systematic way. During the implementation, staff followed an 'I do', 'We do', 'You do' philosophy to demonstrate the process in a variety of contexts to encourage students to at least attempt the questions.

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After regular weekly/fortnightly use of targeted teaching around use of the *RESCUE* acronym and the poster, the specific worksheets were replaced with solving problems using the strategies in student notebooks.

Outcomes

- A majority of students indicated through verbal feedback and their written responses that they are more comfortable and confident in attempting worded problems.
- A progression in the responses of students, in terms of detail provided, strategies used and progression of students through each step was observed. Some Indigenous students have progressed from not attempting the questions to 'Solving' and even 'Explaining'. This is illustrated in the example in the attachment of the development of a student's response.
- The process was adapted in the later stages to measure and provide feedback on student progress/outcomes as shown in the Task 7 student response sheet (see attachment). Boxes allowed teachers to tick the steps which were correctly completed.
- Heightened teacher awareness of the importance of language and reading strategies as major factors contributing to student achievement. Pedagogical practices designed to embed literacy improved.
- Deliberate targeted pedagogy to improve student thinking and reasoning strategies with teachers talking about pedagogical practices and sharing successes.

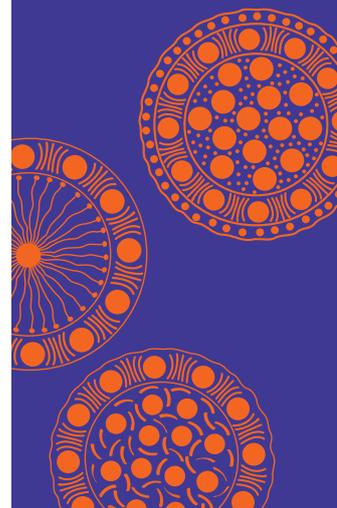
Positive learning outcomes were evident in both male and female Indigenous students. Whilst the example shown in the attachment is that of a year 8 boy, the following sample responses to tasks in week 4 and 5 of the project (see attachment) provides evidence of the positive outcomes also being achieved by female Indigenous students and by year nine Indigenous students.

Reflection/Development

- Providing students with a set of internalised steps to follow in solving mathematical problems makes them more confident about making a start and more likely to have success. The importance of success for Indigenous and/or low achieving students was highlighted during this project.
- Incorporation of questions with contexts that would have more relevance to Indigenous students should be explored and extended. Given the League for Life program in our schools, use was made of a number of league or union contexts but attempting to connect to their world, interests and experiences could increase the effectiveness of the strategy.
- Further work on evaluating strategies and outcomes over time for Indigenous and/or low achieving students in the Thinking and Reasoning criteria under assessment conditions is also needed.
- In 2012 the Australian Curriculum and the extensive resources available through Curriculum into Classroom initiatives in Queensland to support implementation in years 8 to 10 have meant considerable time constraints on teachers. Resources and teaching strategies based around the *RESCUE* acronym for improving thinking and reasoning strategies need to be re-evaluated and embedded in the school's new programs.

Some questions to prompt discussion:

1. *How did the RESCUE approach support students' learning?*
2. *What other interesting or important aspects are in this Significant Episode?*



RESCUE POSTER

MATHEMATICS

PROBLEM SOLVING

STRATEGIES

Read the **question** at least twice. Do you know what the question is asking for?

Extract the **information**: What information is in the question? Highlight and list the information.

Solve the **problem**: Use an appropriate strategy e.g. create a table, draw a diagram, look for a pattern, work backwards from the answer, eliminate, simplify the problem, use a formula, guess and check.

Communicate the **solution**: Your solution needs to be clear and concise, with correct mathematical terms and appropriate diagrams.

Use **mathematical reasoning**: When you have solved the problem, use mathematical reasoning to verify that your answer is correct and your method is justified.

Evaluate the **solution**: Have you answered the question and checked your answer is reasonable? Ensure you have written a sentence conclusion.

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