

Now I'm teaching the children: Changing from Assessment of Learning to Assessment *for* Learning in Fiji.

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A Numeracy Strategy was trialled in 30 at-risk schools in Fiji. A Training Needs Analysis and a review of the Fiji Islands Literacy and Numeracy Assessment helped decide on the focus of the trial. Teachers were introduced to Classroom Based Assessment and child centred pedagogy, which they used over a four-week period. Students showed considerable improvement in their mathematics knowledge and attitudes. Teachers' knowledge and confidence in using classroom based assessment to improve students' numeracy also improved.

The Fiji Education Sector Program was funded by the Government of Australia and managed by Cardno Emerging Markets, in association with the Department of Education and Training, Western Australia and Curtin University of Technology. The goal of the program was to assist the Fiji Ministry of Education to deliver quality education services to children especially in disadvantaged and remote communities. The program began in 2003, finished in 2009 and included supporting Fiji's Ministry of Education to develop the Fiji Islands Literacy and Numeracy Assessment (FILNA) and a National Curriculum Framework. As a result of these two developments the Ministry decided that they needed to develop a Literacy and Numeracy Strategy to improve teaching and learning in rural, remote and disadvantaged schools around Fiji.

Background

Hawley and Valli (cited by Ingvarson, 2005) summarised research into models of professional development that foster improvement in student learning. They created a list of nine principles for the design of effective professional learning. This included suggestions that professional development should:

- Focus on what students are to learn and how to address the different problems students may have.
- Be based on analyses of the differences between (a) actual student performance and (b) goals and standards for student learning.
- Involve teachers in the identification of what students need to learn and in the development of the learning experiences in which they will be involved.

The Australian National Numeracy Review (Commonwealth of Australia, 2008) noted that "assessment is central to the teaching and learning process ... current research shows clearly that ... high quality classroom-based assessment ... is an integral part of the teaching and learning cycle". This view is supported by Groves, Mousley and Forgasz (2006),

By teachers becoming involved in researching pupils' mathematical understandings, teachers' own understandings of how children think mathematically and learn mathematics are enhanced, enabling them to develop teaching approaches and strategies to effectively help children to develop numeracy skills and understandings. (p.)

The Australian National Numeracy Review showed that many Australian numeracy strategies, (such as Count Me In and the Early Numeracy Research Project) have included

classroom-based assessment in their professional development. The New Zealand Numeracy Strategy (Ministry of Education, 2006) also included classroom-based assessment as an integral part of their professional development, and supporting documents.

First Steps in Mathematics Professional Development (WADET, 2004) included many Diagnostic Assessment Tasks as a central focus of discussion. Teachers were asked to initially analyse work samples provided. Later they analysed their own students' work samples and determined what mathematics students knew and what they had yet to learn. Teachers were supported to write a series of lessons to accommodate the needs of their students.

The Fiji National Curriculum Framework (Ministry of Education, 2008) acknowledged the importance of assessment and suggested a change in focus from assessment *of* learning to assessment *for* learning. Fiji's National Policy for Curriculum Assessment and Reporting (Ministry of Education, 2008) stated:

There is a need for a more balanced approach to assessment with a related emphasis on school based assessment of students. Such assessment provides more immediate feedback to students and can provide information to teachers as they teach. They can then better design learning programs that will lead to improvements in students' learning. (p.)

Prior to this, Fiji had an emphasis on external exams at Years Four, Six and Eight, and unit tests at the end of each term. School-based or classroom-based assessment was not common.

Beginning the Trial

The terms of reference for the Numeracy Strategy included a Training Needs Analysis, the development of Curriculum Resource Materials, a series of workshops and an in-school trial period.

Establishing the Focus and Direction of the Strategy

FILNA data was analysed and a Training Needs Analysis survey and workshop were conducted to ascertain the current status of mathematics teaching in primary schools and to establish the focus and direction of the strategy. The survey was developed, trialled with teachers, modified and then used in the workshop with a group of invited professionals, including District Education Officers, head teachers (principals), teachers and maths lecturers from Teacher Training Institutions. The survey included sections on Numeracy, Planning, Assessment, Pedagogy and Teacher Beliefs.

The results of the survey and the workshop discussions suggested that primary teachers needed support to:

- change from teacher centred to child-centred pedagogy; and
- use Classroom Based Assessment to plan activity based lessons to accommodate the needs of their students.

These connected ideas were represented by the diagram in Figure 1, which became a central focus of the Numeracy Strategy.

An analysis of the FILNA test items showed that students were experiencing difficulty in all areas of mathematics, number, measurement, space, and statistics. As there were many more items on number than in the other content areas, this suggested the focus of the strategy should begin with number. Forty percent of the number items at the Year Four level were

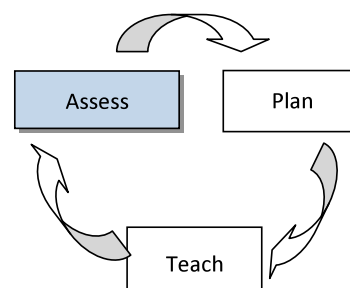


Figure 1. Diagram developed from Training Needs Analysis

assessing students understanding of the numeration system, which suggested that the Numeracy Strategy should start with this section of the curriculum.

Developing Numeracy Curriculum Support Materials

Curriculum Support Materials were written for Classes One to Four focusing on the Numeration System. The books included sections on:

- Classroom Based Assessment tasks to help teachers to find out what their students knew and what they needed to learn.
- proformas to assist teachers to record the information from the assessment tasks.
- the mathematics that students needed to learn, including common misconceptions.
- activities that could be used to teach students the mathematics

The materials were developed using action research methodology, beginning with the development of the Classroom Based Assessment Tasks. These were trialled by Curriculum Officers in a range of primary schools and the information used to modify and develop the tasks further. On the basis of the information gained from the student work samples, the mathematics sections and activities were written for each class.

The mathematics in each of the books was broken up into the following sections: subitising, counting, partitioning, number sequences (including forwards and backward sequences, comparing numbers, reading and writing numbers), and place value.

Methodology

Class Four and Six FILNA data from 2008 were used to select thirty at risk primary schools in which to trial the Strategy. To do this, the schools data were ranked using the average for both Class Four and Class Six. The schools with the poorest average in each of the four geographic divisions were selected. Some of the poorest performing schools were on the eastern islands, and with limited time and high travel costs, it was not possible to include these schools in the trial. Most chosen schools were from rural and remote regions, with the remaining being at-risk urban schools. A teacher and head teacher from each school were invited to participate in the trial and to attend two, three-day workshops. District Office staff were also invited.

Data were gathered from a number of different sources throughout the trial including: teacher and head teacher surveys at the beginning and end of the trial; evaluation rating scales after each workshop; interviews with teachers, head teachers, parents and students; and observation of lessons, samples of students' work, and teachers' planning and recording documents. Teachers were also asked to share their stories in Workshop Two. The stories were monitored using checklists.

Training Teachers and Head Teachers

Two, three day workshops were held in five different locations around Fiji for teachers and head teachers from the 30 schools. The locations were Suva, Nausori, Tavua, Labasa, and Namalata Bay. The workshops were focused on using the Curriculum Support materials to help teachers use information from the Classroom Based Assessment tasks to plan to meet the learning needs of their students and to improve teachers' content/pedagogy knowledge. The workshops included:

- How to use Classroom Based Assessment tasks to identify the needs of students.
- Work samples that exemplified typical difficulties students experience.

- Supporting teachers to write plans to meet the needs of all students.
- Pedagogy to support students learning.
- The layers within the mathematics of the Numeration System.

Teachers were introduced to the new content through examples of students' work from the Classroom Based Assessment tasks, for example see Figure 2. These samples showed typical difficulties and misconceptions held by students. They were used to highlight the critical mathematics concepts that teachers needed to focus on to improve students' mathematics. Teachers were supported to use the Curriculum Support Material to write plans to accommodate the needs of students.

Name MARETA

a) 17, 18, 19, 20, 21, 22.

b) 66, 67, 68, 69, 06, 61.

c) 88, 89, 90, 81, 82, 83, 84.

Figure 2. Class 3, forwards counting by ones.

In- School Trial

At the end of Workshop One, teachers and head teachers were asked to assess, plan and then teach in their own class for a period of four weeks. Participants choose assessment tasks appropriate for their class and completed a contract naming these tasks. They assessed their students at the beginning of the trial period and then again at the end of the period, using a modified version of the same task. Teachers and head teachers were asked to record the information on the proformas provided within the Curriculum Support materials, and to bring examples of students' work and their planning documents to the second workshop.

During the second workshop the Numeracy Team worked through the data with participants using proformas. Participants were supported to define each of the categories: No Improvement, Minimal Improvement, Some Improvement or Considerable Improvement. The teachers and head teachers recorded the number of students within each category. The criteria for each varied according to the nature of the assessment task. For example, counting forwards and backwards in class three:

- No Improvement – no change from the beginning to the end of trial
- Minimal improvement - not able to count forwards by tens up to 100 at the beginning of the trial, could count forwards by tens up to 100 by the end.
- Some improvement - not able to count forwards or backwards by tens up to 100 at the beginning, can count forwards and backwards by tens past 100 at the end.
- Considerable improvement - not able to count forwards or backwards by tens up to 100 at the beginning, can count forwards and backwards by 10s beyond 200.

Students who had everything correct at the beginning and end of the trial were included in the No Improvement category.

Results and Discussion

Using Classroom Based Assessment.

The survey at the beginning of the trial asked teachers to list all the types of assessment they

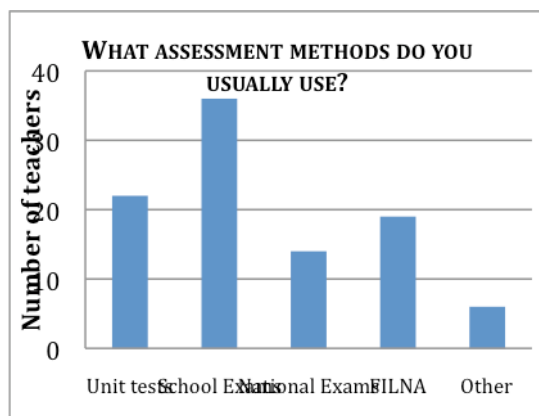


Figure 3. Assessment used before the trial (N = 64).

currently used. Figure 3 shows that before the trial, teachers were far more familiar with school exams and unit tests than other forms of assessment. (Note, teachers could choose more than one category)

The survey at the end of the trial period (Table 1) included the following questions: a) How confident are you in interpreting Classroom Based Assessment tasks? b) During the trial, how often did you consider students' existing knowledge and understanding in planning maths lessons?

	<i>Not Confident</i>	<i>Some Confidence</i>	<i>Confident</i>	<i>Very Confident</i>
<i>How confident are you in interpreting Classroom Based Assessment tasks?</i>	0%	3%	56%	41%
	<i>Never</i>	<i>Sometimes</i>	<i>Often</i>	<i>Very Often</i>
<i>During the trial, how often did you consider students' existing knowledge and understanding in planning maths lessons?</i>	2%	16%	53%	29%

Table 1

Use of Classroom Based Assessment from the End of the Trial (N = 64 teachers/head teachers)

The 2% who did not use assessment to plan lessons, were participants who were not in classrooms, e.g., non-teaching head teachers. The evidence above suggests that the majority of teachers were confident in using and interpreting the assessment tasks and they used the information to help them to work out the learning needs of their students.

Evidence from the interviews showed that teachers had assumed students would be able to do things like read and write numbers into the thousands. The teachers were shocked when they found that students could not do this. For example, a Class Seven Head Teacher applied the Class Four assessment tasks and found that some of his students could not read and write two digit numbers while others could not read or write three or four digit numbers. To address this, this teacher grouped his students according to their needs and modified the learning activities for each group. For example, the students constructed number charts and played dice games on them, which focussed on the numbers that they needed to learn. Some teachers reported that they found some of their most able students had the same difficulties as their less able students.

Teachers' knowledge.

The survey at the end of Workshop Two included many questions about teachers' knowledge and confidence (Table 2). The survey included the open-ended question: *One thing I learned in this workshop was.* Comments included:

- To first assess children before we do other activities not only for Numeracy but other areas, then plan and teach and go with the cycle again. I've learnt a considerable amount of solutions for the children's problems.
- The order in which we have to teach our children. The basics which have to be taught to the children before moving up to upper classes and the activities.
- The workshop had lots of information which we overlooked during our teaching of maths. We had been blaming students, not knowing we were at a fault.

	<i>Very little</i>	<i>Minimal</i>	<i>Some</i>	<i>Considerable</i>
<i>How much has your understanding of Numeracy changed as a result of the trial?</i>	0%	0%	11%	89%
<i>How confident are you with the mathematics of the Numeration System?</i>	0%	2%	78%	20%

Table 2

Teachers' Knowledge and Confidence at the End of the Trial (N = 64 teachers/head teachers)

During the interviews, teachers commented that the classroom-based assessment helped them to identify the learning needs of their students. They said that this helped them to plan effective lessons. For example one teacher said, "I'm no longer teaching the syllabus, now I'm teaching the children."

From the interviews it was found some teachers planned at the beginning of the trial, while others planned more regularly, every two weeks, every week, and some every day. While most said that they found it easy to write a plan, some said that they initially had difficulty in getting started. Those who initially had difficulty also said that they found the process easier each time they prepared a plan. They found the plan helpful and followed it in their teaching.

The evidence above suggests that teachers gained confidence in using and interpreting Classroom Based Assessment tasks with 97% of survey responses saying they were confident or very confident. The majority used this information to plan lessons for their students, with only 2% of respondents saying that they did not use this information to plan. This is a noteworthy change from the pre-trial survey, which showed that very few teachers used classroom based assessment to help them plan what they should teach.

Improved Student Learning.

The student data for each class group were amalgamated across all of the Classroom Based Assessment tasks according to how much improvement the students had demonstrated from the beginning of the trial to the end. The results are shown in Figure 4.

At the end of Workshop Two, teachers provided a copy of their written planning documents. Teachers' written reflections often showed the effectiveness of the activities. For example, one teacher wrote:

The first activity that was done with the class was 'Bundle Up'. After the activity, it was observed that the children were using the words 'bundle up' with their friends of other class and teaching them on the importance of counting in bundles (of 10, 100). During this activity a full class participation was seen throughout the lesson, something that is not usually seen in normal maths lessons.

After discussing the activity the students understood the purpose of bundles in counting. They were able to count a given number very quickly and effectively using the bundles. They also came to realise that 10 bundles of 10 makes 100. Shinal was heard explaining to Hamlesh that 'this is why we say $10 \times 10 = 100$ '. (Labasa teacher)

The first quote above indicated a positive change in students' attitudes, while the second indicated an improvement in students' understanding of place value.

The survey at the end of the trial (Table 4) included the following questions about students' attitude and engagement in lessons: a) Did students engage in mathematics activities/conversations outside of mathematics lessons? b) Did you notice any difference in student attendance during the trial?

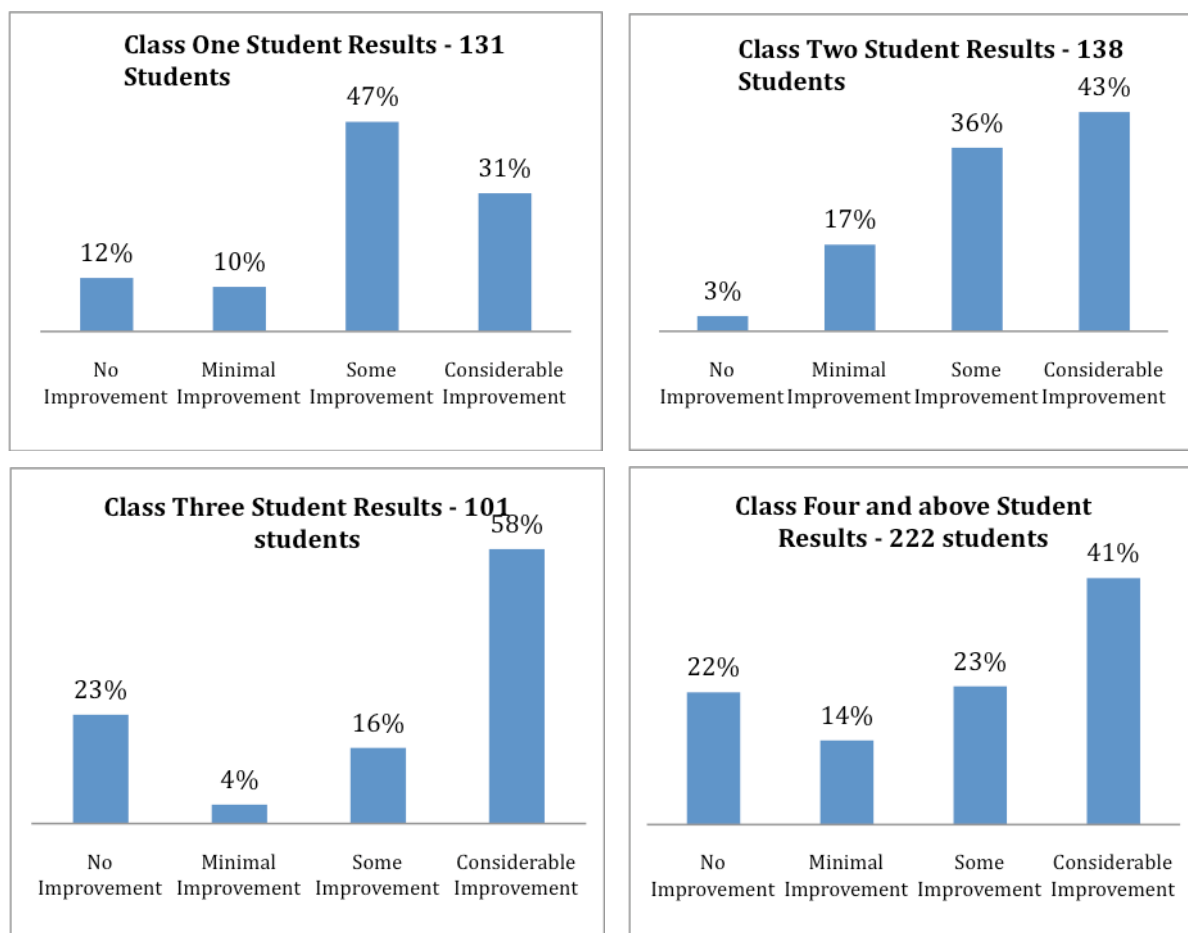


Figure 4 Student data from classes one to four

The evidence suggested that the four-week trial period produced an improvement in students' mathematics knowledge and an improvement in students' attitudes. 97% of participants noticed that students applied their new knowledge outside of the classroom mathematics lessons, indicating a significant improvement in students' knowledge and understanding. 91% indicated a positive change in student attendance during the trial period, with students attending school in the week prior to the term break, which was not usual.

	Yes	No
Did students engage in mathematics activities/conversations outside of mathematics lessons? Comments included:	97%	3%
Since games and activities were very enjoyable they don't want to stop doing maths they want it for the whole day. So they carry this through during their spare time.		
The concepts of counting were related to other areas they engaged themselves with especially during gardening and doing afternoon duties.		
Did you notice any difference in student attendance during the trial? Comments included:	91%	9%
I noticed a great difference in my students' attendance – full attendance, right through the last day of term. They were looking forward to take part in activities during maths lessons.		

Table 4
Students' Attitude and Engagement During Trial Period (N=64)

The evidence from class observations, interviews and written reflections suggested that teachers and head teachers found their student engagement, improvement in understanding and attitude inspiring. They said that this would encourage them to continue to use the processes and strategies in their classroom mathematics lessons after the trial. For example, one teacher said:

The enthusiasm and the happy faces I noticed in the children were quite overwhelming. It touched my heart when I realized that this is what a lesson should look and feel like instead of talk and chalk method we are used to. I have heard the term child centred education 30 years ago at training college. This is the first time I have come across a subject that has been designed and prepared to suit it.

Conclusion

The Fiji Numeracy Strategy pilot introduced teachers to Classroom Based Assessment, and child centred pedagogy. Teachers found the Curriculum Support Materials written and used during the trial period very helpful. However, time only allowed for materials to be written for Classes One to Four and this will need to be extended at some time in the future.

Teachers found using Classroom Based Assessment really helped them to plan for their students' learning needs. They also found that moving from teacher centred to child centred pedagogy resulted in students becoming more engaged in mathematics lessons. This shift in pedagogy enthused the teachers as they were able identify the mathematics their students needed to learn and to plan child centred lessons to accommodate them. As one teacher commented, "*I'm no longer teaching the syllabus, now I'm teaching the children.*"

As a result of the improved student outcomes demonstrated by this trial, the Fiji Ministry of Education has decided to implement the Strategy across Fiji.

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