

# Effective Features of the Maths in the Kimberley Inclusive Pedagogy Model

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The Maths in the Kimberley (MitK) project has been progressing for two years and so it was timely to evaluate the Inclusive Pedagogy model that underpinned the study. The data presented in the first paper in this symposium indicated that some aspects of the model worked well. Primarily the areas of improvement were related to the intellectual quality of the lessons. These pedagogical dimensions are outlined and discussed here by drawing on the broader data set of the project.

Sullivan and Niesche presented an analysis of the lesson-video data earlier in this symposium, and the results indicated that some of the pedagogical dimensions of the Inclusive Pedagogy model worked well. These were aspects of the new approach to mathematics that were readily adopted by the teachers and seemed to be effective with the learners in the participating schools. In general, these aspects related to the intellectual quality of the lessons and features of the learning environment.

In this paper I will outline and discuss the aspects of the model that improved over the first two years of the project. These are generally in the upper right-hand section of Figure 1 (Niesche, Grootenboer, Jorgensen & Sullivan, this symposium).

## *Intellectual Quality*

The analysis of the video-taped lessons indicated that pedagogical aspects related to the intellectual quality of the classes (e.g., *higher order thinking, problem-based curriculum*) were scored relatively highly. Furthermore, the mean scores for these dimensions increased as the project progressed. This indicated that in the lesson reviewed the pedagogy was characterised by intellectual quality and high expectations, and, these qualities were more evident and in increasing depth as the project progressed. Apart from the lesson video data, these features have also been observed by the research team in the course of their visits to the classrooms during the first two years of the study. At the start of the project the mathematics lessons were largely characterised by rote learning and regular ‘drill and practice’. However, towards the end of 2009 (the second year of the project), the teachers employed more tasks that are rich and relatively complex.

For example, in the first year of the project one of the teachers video-taped one of his mathematics lesson and sent it into the research team for analysis. The lesson he sent in involved a hangman-type game where the students were trying to guess the teacher’s “secret number”. This lesson was entirely teacher-centred and it predominately involved a sequence of low-order questions that required very little mathematics. However, towards the end of the second year of the project, the same teacher submitted another video-taped lesson that involved a relatively open-ended task that required the students to think mathematically about a practical local situation.

This change in the teachers’ mathematical pedagogy has been significant and often difficult. It appears that they are developing a perspective that sees the students as capable of learning complex mathematics with appropriate scaffolding. In the project there has been an emphasis on scaffolding the teachers and providing rich mathematical tasks that

have high intellectual quality in the professional development part of the project. This has led to a shift in the teachers' views of their learners from deficit, low level thinking to a perspective that sees their students as capable and confident. Early in the project a number of the participating teachers commented on the "students' deficiencies" that "stop them from learning maths", whereas, in later conversations and interviews they made more comments like:

... there is no reason why they [their students] couldn't do things like that. Every other school can do it and other kids can do it. Sometimes I have thought that there is too much of a feeling or reliance on the fact that there's these great cultural differences that make things difficult. I am sort of a strong believer that these things that whilst there are these differences, there's no reason why they can't do these things.

It has been an important and positive outcome for the MitK project that the teachers seem to view the students in their classrooms as competent and capable learners of mathematics. Hayes, Mills, Christie and Lingard (2006) confirmed the critical importance of high academic expectations for all learners so educational outcomes are good and equitable can be achieved. To this end, the improvement in the intellectual quality of the video-taped lessons has been an endorsement of the 'inclusive pedagogy' model. This has been particularly pleasing because mathematics is the subject where the content can often be reduced to the memorisation of basic facts and algorithmic efficiency.

### *Significant Mathematical Content*

A major issue facing the project team is the relatively weak mathematical identities (personal knowledge, skills and attitudes) of many of the participating teachers. Most of the participants involved with the project are primary teachers, and in the schools where there is a secondary class, the teachers (who teach all subjects) are not mathematics specialists.

For me I've always just struggled with mathematics. So I always find it a tough gig myself. I guess there have been some PDs that we've done ... and it was only this time that I am starting to understand it.

Therefore, it is fair to say that the teachers as a group have fairly limited mathematical knowledge and understanding, and generally it would not be their favourite subject. Of course, this is not peculiar to remote Aboriginal schools. An important aim of this project has been to enhance the quality and depth of the mathematical content in the teachers' mathematics lessons. The data from the video-taped lessons, and the other sources, show that there have been distinct improvements in the mathematical integrity of the lessons being presented in the classrooms of these remote Aboriginal community schools. To illustrate, the video-taped lesson data (see Niesche, et al., this symposium) revealed an increase in the quantity and quality of pedagogy that had *connections beyond the school* (mean score of 1.4 in 2008, mean score of 2.8 in 2009), *depth of knowledge* (2.4 to 3.5), and *depth of understanding* (2.3 to 3.4).

In the project the teachers have been encouraged to use rich mathematical tasks that have strong academic quality and that facilitate deep mathematical learning (Grootenboer, 2009). For this to occur, the lessons needed to have opportunities for students to engage in the activities and practices of mathematicians such as hypothesising, making conjectures, rationalising, and justifying ideas and findings (Burton, 2004).

To illustrate, late in the second year of the project a lesson with a Year 2/3 class was observed where the focus was on number patterns – in particular multiples of 5. After an

introduction using a 1-100 number board and open questions about “any patterns they could see”, the teacher went on and posed the question, “how many fingers are in our school today?”. The students were placed in groups and together they developed at least one strategy to solve the problem. After briefly sharing and discussing their strategies, they then visited the other classes to gather their data. On their return, they worked in their groups using “any equipment they needed” to work out their solution and then prepare a presentation for the class. Throughout the lesson the teacher rarely gave direct answers, but she often asked questions that encouraged the students to think mathematically and more deeply about their work.

In the example above, the teacher facilitated forms of mathematical thinking that involved more than memorisation and recall. By employing such an approach, Boaler and Staples (2008) found in their *Railside* study, that students “regarded mathematical success much more broadly” (p. 629), and they performed well in the standard assessments. At this stage there is evidence (somewhat anecdotal) that the students are showing similar gains, and despite many confounding factors, there is an expectation that the results of their external testing (e.g., NAPLAN) will reveal markedly better results.

As the teachers developed the substantive mathematical content of their pedagogy, there was also a more focussed consideration of the broader mathematical identities of the students. In their lessons the participating teachers more regularly tried to consider and address the students’ mathematical attitudes and beliefs, and their emotional responses to the subject. This was evident in many overt and subtle ways in the lessons video-taped and observed. One teacher tried to provide a pertinent and connected context for the students by employing the idea of a ‘story shell’:

The story shell, that’s my...yeah relating the mathematics to life through the story shell so that we can provide a context, I really put a lot of effort, that’s one of my main focuses, and it’s really worked cause I enjoy telling stories. And that’s something that I’ve put a greater focus on. I used to do it every now and then, whereas now I try and do it each and every maths lesson, each thing they’re attempting has got some sort of context that the students can relate to.

### *Assessment for Learning*

Another pedagogical aspect that appeared to improve throughout the project was the teachers’ use of *assessment for learning*. Again, this is evident in the data from the analysis of the video lessons where the mean score rose from 1.9 in the first year to 2.8 in the second year (see Niesche, et al., this symposium). This indicated that the teachers have moved from relying primarily on low level assessment techniques to introducing some assessing of higher order mathematical thinking. A number of the teachers have commented that thoughtful questions judiciously used throughout their mathematics lessons have been powerful in accessing their students’ knowledge, ideas and understandings. This enabled them to then pose further questions to facilitate the students’ mathematical learning and growth.

Recently, one-on-one diagnostic interviews have been undertaken with many of the students, so the teachers can prepare and teach their mathematics lessons more cognisant of their students’ capabilities. One of the new teachers (commenced in 2009) commented;

... doing the student interviews has been really useful. Useful for me to find out where the kids are actually at, because I felt like I’ve spent a term kind of going, ‘oh my God, what is going on here, where is everyone at, how do I cater for that?’ But with the individual interviews, you can systematically really find out, and then build on that.

Overall, there has been a notable increase in the use of assessment to understand what students do know and can do, rather than what they do not know and cannot do, and this has led to improved pedagogy.

### *The Learning Environment*

It is worth noting that throughout the project the data have indicated that the teachers are generally providing a learning environment that is supportive and regularly characterised by quality interactions between the teacher and the students. However, this cannot be necessarily attributed to the interventions of the project because there have been no notable increases in the data related to these pedagogical features over the initial two years (e.g., the *social support* mean score went from 3.0 in 2008 to 3.2 in late 2009). Nevertheless, this also indicated that while the teachers have been able to improve intellectual quality of their lessons and increase the significant mathematical content, they have also been able to maintain a supportive learning environment.

### Concluding Comments

The implementation of the Inclusive Pedagogy model in the remote Aboriginal schools of the Kimberley region was in many respects a major intervention. It required the teachers to reconceptualise their mathematical pedagogy while dealing with many professional and personal issues that arise for the generally young and inexperienced teachers in these schools. Furthermore, the model was developed from the findings of studies conducted in quite different contexts, and while it was based on sound practice and substantial research, there were no guarantees that it would be appropriate or effective in the context of very remote Aboriginal schools. The evaluation of the model after two years indicates that a number of the dimensions of the model are working well and are effective for these particular teachers and learners. Indeed, as the model is now being revised, these features relating to intellectual and academic quality will be reiterated and reinforced in order to facilitate increasingly improved educational outcomes for these disadvantaged learners.

### References

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