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The Fitzroy Valley Numeracy Project: Assessment of Early Changes in Teachers' Self-Reported Pedagogic Content Knowledge and Classroom Practice

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Abstract. The Fitzroy Valley Numeracy Project (FVNP) was designed to improve numeracy outcomes for Indigenous students by developing a systematic, co-ordinated approach to teaching primary school mathematics. In this study, using early project data, we examine FVNP teachers' self-reported pedagogic content knowledge and classroom practice from initial and follow up questionnaires, as well as interviews from case study teachers. After the first FVNP year, teachers reported being better able to plan focused mathematics lessons and to monitor student learning. On the other hand, teachers also felt less able to make mathematics explicit to students and their confidence in providing engaging activities declined. With the caveat that these findings are preliminary, we discuss possible reasons for these changes and implications for teachers' professional learning.

Introduction

In 2008, the Council of Australian Governments (COAG) set ambitious targets for improving education and employment outcomes for Indigenous Australians (see http://fahcsia.gov.au/sa/indigenous/progserv/ctg/Pages/targets.aspx). One of these is to halve achievement gaps between Indigenous and non-Indigenous students in reading, writing and numeracy by 2018. Despite concerted effort and expenditure, however, improving numeracy outcomes for Indigenous students, particularly those in remote regions, continues to be a major challenge for teachers, school principals, and policy makers.

For example, the most recent National Assessment Program – Literacy and Numeracy (NAPLAN) report, for years 3 and 5, the percentage of Indigenous students who achieved below the national minimum standard is more than twice that of non-Indigenous students. Further, there has been no net change in Years 3 and 5 numeracy achievement for Indigenous students between 2008 and 2012 (Australian Curriculum, Assessment and Reporting Authority (ACARA), 2012). Similarly, for older students there remains substantial difference between the performance of Indigenous and non-Indigenous students as shown in the 2009 PISA mathematical literacy assessment. Australian Indigenous students recorded a mean score of 441, compared to a mean score of 517 points for non-Indigenous students. This difference in mathematical literacy performance equates to more than one proficiency level or almost two years of schooling. Indigenous students also performed significantly lower than the OECD average, by 55 score points (Thomson, De Bortoli, Nicholas, Hillman & Buckley, 2011). In addition, Bradley, Draca, Green and Leeves (2007) suggest that an achievement gap of almost two years exists between Indigenous students in rural/remote areas and their English Speaking Background (ESB) counterparts. In attempting to explain these gaps, a multitude of factors have been documented that impact the formal learning of Indigenous students in remote communities including school attendance, transience and retention (e.g., Jorgensen & Niesche, 2011). As well, learning mathematics can be a complex task for students whose dominant language is different from the language of instruction. Further, school environments—including expected ways of interacting and communicating—can be quite removed from students' home environments.

Overlapping the challenges experienced by Indigenous students are those faced by teachers in remote communities. Often, in the Australian context, these teachers are new graduates with little experience living remotely or living amongst Indigenous peoples. Additionally, in smaller remote schools, opportunities for mentoring new teachers or for face-to-face professional learning are often limited (Jorgensen, Grootenboer, Niesche & Lerman, 2011). The Australian Bureau of Statistics (ABS) has estimated that about one third of the Indigenous population reside in *major cities* (32%); 21% in *inner regional* areas; 22% in *outer regional* areas; 10% in *remote areas* and 16% in *very remote* areas (ABS, 2010). It is also the case, however, that "the Indigenous proportion of the total population increased with geographic remoteness, from 1% of the total population living in Major Cities to 48% living in Very Remote areas" (ABS, 2010, para. 2). That is, the highest concentrations of Indigenous students tend to reside in rural and remote communities (Sullivan, Perry & McConney, 2013). Thus, it could reasonably be argued that the responsibility for working with substantial, concentrated proportions of Indigenous students to meet ambitious targets for improved education outcomes—including numeracy—rests largely in the hands of the least experienced group of teachers, new graduates initially assigned to schools in regional and remote Australia. Many of these teachers are still developing the skills and confidence needed for teaching mathematics—even in classrooms that do not face the same challenges as those in remote communities—yet it is mainly this cohort of teachers that has been charged with improving, and even accelerating, mathematics learning outcomes with Indigenous students.

To improve teachers' classroom skills and confidence, the National Numeracy Review Report (Commonwealth of Australia, 2008) recommended extending exemplary professional learning programs for teachers. This included the use of specialist numeracy teachers, and enhancing teachers' pedagogical content knowledge (PCK) as the focus of professional learning. One such program was the Western Australia Department of Education's (WA DoE) *Getting it Right—Literacy and Numeracy Strategy* (Ingvarson, 2005; Meiers, Ingvarson, Beavis, Hogan & Kleinhenz, 2006). In *Getting it Right–Numeracy* (GiRN), the role of numeracy specialists was to work with teachers to plan and model effective mathematics teaching strategies in the classroom. For teachers training to become specialists, the professional learning component spanned 21 days across two years and was based on *First Steps in Mathematics* resources and associated professional learning (Commonwealth of Australia, 2008). GiRN's purpose, through the work of the specialist teachers, was to develop teachers' capacity to make judgements about what their students know, what mathematics they need to learn and to provide effective learning experiences that focus students on particular mathematics ideas.

Some larger schools in the Kimberley region of northern Western Australia have had access to GiRN. However, for reasons related to staffing, funding and housing, many smaller, more remote schools had little access to specialist numeracy teachers. Policy changes at the central office and district levels reduced even further the opportunities for professional learning or DoE support for teachers in remote schools. Nevertheless, the principals of seven schools in the Fitzroy Valley, supported by their district office, had a history of working together and had developed a shared *language and literacy* plan that took account of students' Kriol-speaking home backgrounds and the transience of students moving between schools. The development of a shared numeracy plan was thus a logical extension to processes already in place to overcome challenges associated with teachers' high turnover and low confidence about teaching mathematics. The Fitzroy Valley Numeracy Project (FVNP) was thus established in order to develop a systematic, co-ordinated approach to numeracy teaching in Fitzroy Valley schools. The intended outcomes for FVNP included: (1) improved numeracy for Indigenous students; (2) improved instructional practice through professional learning that extended GiRN strategies; (3) a whole-school approach to numeracy teaching and learning that recognised the English as a second language/dialect (EAL/D) and cultural backgrounds of Indigenous students; (4) a shared FVNP plan that reflected the GiRN model; and, (5) processes and practices embedded in the numeracy plan that translated into school organisation and classroom teaching (Kimberley District Office, 2009).

Prior to the commencement of the FVNP, a proposal was made to the principals and district administrators to research the effectiveness of the project as it unfolded. This paper describes one aspect of that larger research effort; and in particular addresses the research question: *What are the early impacts of the FVNP on primary teachers' self-reported pedagogic content knowledge (PCK) and classroom practice?* In answering this question, the study examines early data gathered from teacher participants using a pre-FVNP questionnaire and a similar follow up questionnaire conducted one year into the project. The findings reported here identify aspects of teaching primary mathematics in which this group of teachers became more confident. As importantly for school teachers, administrators and curriculum leaders, however, this study also identifies aspects of PCK and classroom practice for which concerns remain.

We fully recognise that meaningful pedagogical change for teachers takes a number of years of continuous engagement and support (Saunders, 2012), and so the value of reporting on the FVNP after only its first year of operation must be viewed with considerable caution. We also note, however, that the FVNP is unfolding at the same time as a number of other new initiatives. One of these is the recent development of graduate teacher standards that describe what beginning teachers should know and be able to do so that their "developing professional expertise is recognised and fostered" (Australian Institute for Teaching and School Leadership [AITSL], 2011, p. 2). In keeping with AITSL's efforts to articulate standards for novice teachers, the data reported in this study provides early indications of beginning teachers' mathematics knowledge and practice *in challenging environments*, and also details the kind of mathematics pedagogic content knowledge and practice that nonetheless still needs to be fostered. Given the watershed of efforts coming together around teacher education and the urgency to improve numeracy (and other) outcomes for Indigenous students, this study's data, in our view, should be shared, with appropriate restraint, sooner rather than later.

Literature Review

Demands on teachers' knowledge have increased in step with moves to teach mathematics concepts for understanding rather than for knowing facts and procedures only (Commonwealth of Australia, 2008; Australian Curriculum and Reporting Authority [ACARA], 2012). This is reflected in Hill, Ball and Schilling's (2008) model of *mathematical knowledge for teaching* (MKT), the dimensions of which include general or *Common Content Knowledge* and perhaps more salient for this study, *Specialised Content Knowledge* that enables teachers to represent, explain and understand unusual problem solving strategies. Hill et al.'s model (2008) also combines *Knowledge of Content and*

Teaching that enables teachers to select appropriate tasks, pose questions and move between mathematical representations. Furthermore, the model includes *Knowledge of Content and Students* which involves knowing how students develop mathematically and how they think about and learn particular mathematics.

Knowledge about students' thinking that draws on research informed frameworks has been credited with contributing to improved teaching practice and student outcomes (Commonwealth of Australia, 2008). Frameworks such as *First Steps in Mathematics Diagnostic Maps* (Department of Education and Training, 2004) have been used effectively to diagnose student learning, particularly in Western Australia. In addition, there appears to be consensus that professional learning is more likely to improve teacher practice and student outcomes if it increases teachers' knowledge of mathematics content, how students learn that content and how to teach it (Desimone, 2009; Desimone, Porter, Garet, Yoon, & Birman, 2002; Ingvarson, Meiers and Beavis, 2005). However, research also suggests that for teachers of Indigenous students, additional considerations of each of Hill et al.'s MKT dimensions (2008) needs to occur. Those additional considerations cluster around students, the mathematics to be taught and the pedagogy used to teach it.

Teachers' Knowledge of Indigenous Students

The need for teachers to discover what students know and understand in order to plan for learning that builds on existing knowledge is well established. However, finding out what Indigenous students know and understand can be challenging for teachers. Diagnostic tasks may not provide opportunities for Indigenous students to show what they understand unless teachers are prepared to contextualise those tasks in some way. For example, in working with remote students in the Goldfields of Western Australia, Treacy and Frid (2008) described how they modified a *First Steps in Mathematics Diagnostic Task* called the *Ice Cream Task* to the *Maku Task* in order to explore students' strategies for making equivalent sets. An Aboriginal research assistant who grew up in the community, knew the students well and spoke the same language helped with the task design and carried out student interviews in Aboriginal English. The local shop sold "lolly" versions of grubs which were substituted for ice creams and pictures of groups of people were constructed from pictures of Aboriginal people that were found in books in the school. Indigenous students also may prefer oral communication and thus may appear reluctant to write things down (Warren, Young & de Vries, 2007). This can affect how teachers find out what students know because diagnosing through oral communication requires that teachers are skilful in using questioning strategies if they want their students to provide thoughtful answers. This task can be assisted if Aboriginal and Islander Education Officers (AIEOs) are involved in the diagnostic process (Treacy & Frid, 2008).

In several studies, when students were questioned in a large group they tended to call out answers which were often incorrect. Probing incorrect answers may not be appropriate, however, and if students cannot answer, they may experience feelings of shame (Perso, 2005; Sullivan, Youdale & Jorgensen, 2011; Warren, et al., 2007). Sullivan et al. (2011) suggested that the use of Kriol for communication among students enhances dialog and allows students to articulate their thinking. In addition, Indigenous students may bring to school a rich knowledge that nevertheless may not match early mathematics curriculum expectations and may go unnoticed by teachers. Even young Indigenous children may have understandings of complex family and social relationships, networks and groupings that would challenge the thinking of many non-Indigenous adults. Young children can enter school with knowledge about quantity that goes unrecognised if teachers have restricted views of how children develop early understandings of number (Treacy & Willis, 2003; Willis, 2002). In addition, a view held by many is that teachers need to learn about students' interests, goals, everyday activities within their households, and communities if they are to provide relevant and accessible learning experiences that build on the lived experiences that students already carry with them to school (Hogg, 2010; Sullivan and Grootenboer, 2010).

Teachers' Knowledge of Mathematics Content

Teachers also need a deep understanding of mathematics content if they are to build on what students already know and choose learning experiences and contexts that are familiar and engaging to students. When making judgements about mathematics, one such challenge is recognising that Indigenous students may have many more words and ideas that describe certain mathematical situations, such as location and direction, than those commonly used in Standard Australian English (SAE) (Sullivan & Grootenboer, 2010) but fewer words for other situations such as measurement attributes and comparisons (Warren et al., 2007). Enabling students to negotiate meaning in their Indigenous home languages, yet use appropriate mathematics words in SAE, is one of many challenges that teachers face as they teach for mathematical understanding (Niesche, 2011). Further, teachers need to have a wide repertoire of ways of representing mathematical ideas that students can engage with, talk about and understand.

Warren et al. (2007) examined teachers' use of mathematical representations and language with a group of Indigenous students in far north Queensland. In one class of year 3/4/5 students the mathematical focus of the lesson was solving a comparison problem: *If Wally is 120 cm tall and Ado is 100 cm tall how much taller is Wally than Ado?* After using a range of representations (stick diagrams, then two lines with horizontal bars to represent 120cm and 100cm) and physical gestures, students could not think of the problem as a difference problem and hence use subtraction for its solution. To assist their understanding, the teacher substituted a money problem: *If you had 120 dollars and gave away 100 dollars how much is left?* In the process of moving to a more familiar context, the mathematics focus of the lesson changed from a comparison problem to a change or take away problem. This simple example illustrates that a secure knowledge of mathematics content is required if teachers are to use real life contexts that draw from students' out of school environments, while at the same time maintaining the intended mathematics focus.

Another recommendation for teachers of Indigenous students is the need to learn about and to be able to draw on the extensive mathematics funds of knowledge that exist within students' households. "Funds of knowledge are historically accumulated bodies of knowledge and skills essential for household functioning and well-being" (González, Andrade, Civil & Moll, 2001, p. 116). Examples include knowledge of shopping, hunting and fishing, cooking in the bush, socialising and communicating with wider family and community members, and participation in sports, music and art activities (Hogg, 2010). Conceptualising the kinds of mathematics that are part of the everyday household activities and social practices of the local community is an important challenge for teachers. They need to be able to recognise and model everyday experiences using mathematics in ways that are meaningful and purposeful and that help students see themselves as mathematicians doing mathematics in their everyday lives (González, et al., 2001).

Teachers' Knowledge of Teaching

Effective pedagogies have continued to be examined in terms of what works for Indigenous students, including specific advice about what works in mathematics. For example, the *National Numeracy Review* (2008) provided an extensive list of program characteristics that lead to improvement in mathematics outcomes for Indigenous students. Some of these included: valuing the culture, language and richness of what students bring to the classroom; valuing different pathways to learning; having high expectations; having first language speakers (e.g., AIEOs) in classrooms to assist learners elaborate and scaffold their mathematical thinking; recognising and paying attention to cultural differences in teaching and learning styles; and, the use of relevant and meaningful contexts to situate learning in students' lived experiences. As part of the *Mathematics in the Kimberley Project*, research focused on a pedagogical approach termed *interactive pedagogies* (Sullivan, Jorgensen & Youdale, 2011) "founded on the belief that all students can learn mathematics when the pedagogy is appropriate" (p. 66). The key elements of interactive pedagogy included: group work; use of home language; high interactivity in terms of good questions from the teacher and questions posed by students; varied representations of mathematics; reporting back as part of the lesson; and rich tasks and activities. The activities were based on what students already knew, and the teacher having a clear idea about what to teach.

Recent studies have also reiterated the need to link home and school environments using mathematics lessons that are relevant, purposeful and connected to students' home lives (González et al., 2001; Jorgenson et al., 2011; Sullivan & Grootenboer, 2010). While Perso (2003) has provided some practical suggestions, making those connections while trying to focus on explicit teaching of particular mathematics is not an easy task. This challenge is currently being taken up through the national project *Make it Count* that has reiterated the need for a teaching approach that takes account of Indigenous culture, students' existing mathematics understandings and explicit mathematics teaching. The approach has been termed a *Culturally Responsive Mathematics Pedagogy* (Morris & Mathew, 2011).

Theoretical Framework

The conceptual framework for this research closely reflects the everyday decision making and work of teachers. Consistent with the key components of the literature described above, Figure 1 portrays important relationships among teachers' judgements about students, mathematics and pedagogy (Willis & Treacy, 2004). As teachers plan for student learning, they make judgements about each of these dimensions based on their knowledge, experience and the evidence available. In Figure 1, double-headed arrows indicate that teachers' experience and circumstances will guide the starting point and direction of subsequent decisions. For example, a teacher may be aware of what mathematics their students know and the intended focus of the lesson, but need help in deciding on suitable instructional activities. At other times, teachers may be clear about the mathematics focus but not sure what their students know. In that case, a teacher might try activities that focus on the particular mathematics as a way of finding out what students already know. Put another way, "different teachers working with different students may make different decisions about what to teach, to whom, when and how" (Willis & Treacy, 2004, p. 32).

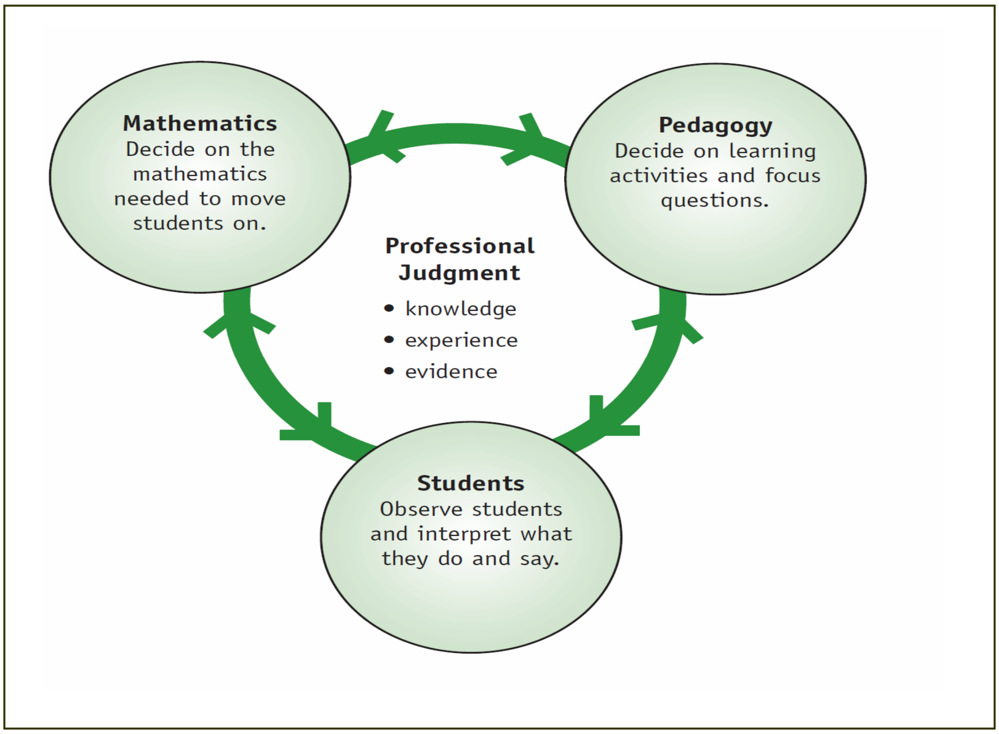

Figure 1. Pedagogic Content Knowledge Framework for Teaching Mathematics (Willis & Treacy, 2004, p.32)

This framework foregrounds the importance of teachers' awareness of the knowledge that students bring with them to the learning experience as well as deep knowledge of the mathematics to be taught. The framework provides an appropriate scaffold for conceptualising the approach to professional learning taken by *First Steps in Mathematics*, by the GIRN strategy and by the FVNP. Consequently, it provides an appropriate framework for analysing and interpreting the data gathered in this study.

Method

Setting and Participants

This research involved teachers who taught mathematics in primary classes within one district high school (in Western Australia, despite the name *district high school*, these typically rural schools serve the full range (K—12) of primary and secondary age groups) and six remote community schools in the Fitzroy Valley in the Kimberley region of northern Western Australia. Although the schools are geographically clustered they are not in close proximity to each other. For example, one school is 15 kilometres from Fitzroy Crossing (the main town in the area) while the furthest school is approximately 350 kilometres away. In addition, as hinted previously, the teachers involved in the FVNP varied in the kinds of professional support they had typically received. For example, teachers in two of the larger schools may have had a regular weekly planning time and one or two lessons with a numeracy specialist working alongside them in their classrooms. New graduates or teachers new to those schools may have had preferential access to the numeracy specialist teacher over those who had been in the school longer. On the other hand, teachers working in the smaller schools typically shared a travelling numeracy specialist and had planning and classroom time regularly, but less frequently. Also, the larger schools had had a specialist teacher for many years whereas smaller Remote Community Schools only gained access to a specialist numeracy teacher during 2010 (Department of Education, 2010).

Teacher participants in this research were asked to complete an initial questionnaire and follow up questionnaires at the end of each FVNP year. Of the 35 teachers participating in the first year of the FVNP, 21 responded to the initial questionnaire, and 13 responded to the follow up questionnaire at the end of 2010; of the latter group, 9 had also completed the initial questionnaire. Additionally, with the support of school principals, graduate teachers in three smaller schools close to Fitzroy Crossing were invited to take part in the case study aspect of the research. Specifically, principals approached teachers in their first year of teaching to participate in the interview and lesson observation components of the study. Principals believed that these teachers would benefit most and also be more likely to participate across the life of the project. In the first year, one small school withdrew from the case study component for reasons unrelated to the project; however, a larger school participated in its place. Two teachers from each of these three schools volunteered to participate in the research. Whilst being quite new to the school, the teachers interviewed from the larger school were not new graduates.

Fitzroy Valley Numeracy Project

The FVNP involved the provision of professional learning in groups as well as specialist teachers working with individual teachers. Early in 2010, participating school staffs, including principals, teachers and Aboriginal and Islander Education Officers (AIEOs), gathered for one and a half days of professional learning to mark the project's commencement. FVNP participants were shown how *First Steps in Mathematics* resources (Department of Education and Training of Western Australia, 2004), could assist them in making decisions about their students, the mathematics to be taught and pedagogy appropriate to teaching that mathematics. They were shown how to use Diagnostic Tasks and the Diagnostic Map, focusing particularly on helping to advance students who were not doing well in the content area of *Number*. Sessions on planning and monitoring student learning were also provided. Participants were also introduced to the GiRN Mathematics Monitoring Tool. Developed by WA DoE central office's GiRN team and used extensively in GiRN schools, this tool employs teacher judgement and enables teachers to produce a fine grained record of what each student knows and understands. (Such evidence of learning may not be reflected in large-scale assessments such as NAPLAN.) The tool also assists teachers plan for learning by linking the mathematics to be learnt to particular *First Steps in Mathematics Key Understandings*.

The specialist teachers' role was to enact the FVNP approach to teaching mathematics as they worked with individual teachers. Their work together during both planning and lessons revolved around making informed judgements about students, mathematics and pedagogy (the three interconnected circles in Figure 1) using agreed upon resources and ways of working. In making judgements about what students know, teachers and specialist teachers could:

- Select appropriate diagnostic tasks for students;
- Analyse responses to diagnostic tasks and worksamples in order to plan for further learning;
- Interpret children's responses using the *First Steps Diagnostic Map* in order to consider conceptual hurdles to learning;
- Use the GiRN *Monitoring Tool* when sufficient evidence of students' learning was available;
- Plan focus questions to uncover what students know.

In working together to make judgements about the mathematics teachers could:

- Use *First Steps Key Understandings* to help decide on the mathematics focus of the lesson;
- Use *First Steps Background Notes* to gain a deeper understanding of the mathematics;
- Use the *Monitoring Tool* to ensure that children are exposed to the mathematics they need to learn.

In making pedagogical decisions they could:

- Use lesson planning *proformas* (consistent across the school) that required teachers to explicitly state the *Key Understanding* (big idea) and specify the mathematics focus for the lesson;
- Plan effective learning experiences;
- Use a common and consistent lesson structure across all year levels that students are familiar with even if they attended another school;
- Use questions and other means during the lesson to focus students on the mathematics.

Even if teachers did not have the opportunity to work directly with a numeracy specialist teacher there was, between and within schools, broad agreement about the pedagogical approach to be taken. However, an umbrella over all of this work was a *Two Way* approach that recognised and valued students' cultural and language backgrounds. An important aim for students was to develop the ability to code switch between Kriol or Aboriginal English (AE) and SAE in appropriate social and cultural settings. In many DoE schools in the Kimberley, code-switching was taught using the steps of a code-switching stairway described by Berry & Hudson (1994). Learning progresses from firstly becoming aware of language or dialect differences to finally being able to switch unconsciously between SAE and home language. It is acknowledged that progression up the stairway must draw on the cultural and linguistic expertise of SAE and AE/Kriol speakers, in particular AIEOs. Professional learning in Kimberley schools incorporated this two-way approach, with Indigenous staff contributing key information about language and cultural practices.

Instruments

For this study, data were gathered using pre- and post-one year FVNP questionnaires and interviews within teacher case studies. The questionnaires were adapted (with approval) from those used by the Australian Council for Educational Research (ACER) in its 2006 evaluation of the *Getting it Right Literacy and Numeracy Strategy* (Meiers et al., 2006). Two versions of the questionnaire were used. The first comprised three questions that assess teachers' self-reported confidence and levels of use of various research-aligned mathematics teaching strategies. The second had six additional questions that assess teachers' views on the impact of the FVNP on their knowledge, confidence and levels of use of recommended strategies. The questions included Likert-type closed items using a four point scale, as well as open-ended items.

As a compliment to the questionnaire data, interviews with six teachers provided rich qualitative data about their self-perceived pedagogic content knowledge and classroom practices. These teachers were interviewed for about 30 minutes prior to carrying out a mathematics lesson and for another 30 minutes after the lesson. The interviews were recorded with teachers' permission in a quiet space, outside of the classroom, such as the school library. Examples of the interview questions include: *What is the mathematics focus of today's lesson? What do the students know about that idea? How did you find that out? How did you select the activity that you are going to teach today? What practices have you put in place that recognise your students' ESL/ ESD and cultural backgrounds?* There were also several questions asked after the lesson, including: *What did you find out from today's lesson in terms of your planned mathematics focus? What would you change about that lesson now that you have done it? How will you follow up that lesson?* We emphasise, however, that not all interview or questionnaire data are reported in this study. Rather, we have chosen to focus on changes in teachers' self-reported confidence in aspects of mathematics PCK, and changes in their use of related pedagogical strategies, associated with participation in the FVNP.

Both the initial and one-year follow-up questionnaires included three questions that assessed teachers' self-reported confidence in their ability to carry out particular tasks as well as the extent to which they implemented those tasks when planning and conducting mathematics lessons. For example, the first question of the initial pre-FVNP questionnaire asked:

> *You have recently commenced teaching mathematics with a new class of students. From your pre-service education and/or your previous teaching experience <u>how confident do you feel</u> about your ability to…*
>
> a. *Choose an appropriate starting point?*
> b. *Diagnose students' mathematics learning needs particularly those that seem to be behind the others?*
> c. *Select a specific mathematics focus for lessons based on your students' needs?*
> d. *Ask questions that focus students' thinking on the specific mathematics in the lesson?*
> e. *Help students with the literacy demands within the mathematics lesson?*
> f. *Provide engaging mathematics lessons that enable all students to learn?*
> g. *Monitor student learning in an ongoing way? And,*
> h. *Produce a plan of what mathematics you will teach and when you will teach it for the whole year?*

For each item, teachers were directed to respond on a 4-point scale ranging from "not at all confident" to "very confident." Similarly, the stem for the first question of the follow up questionnaire was: *Currently how confident do you feel about your ability to…*[carry out the tasks listed above]?

Question two of both the initial and follow up questionnaires focused on the extent to which teachers carried out certain activities as they planned and implemented their mathematics lessons. It asked:

> *Currently when planning and carrying out your mathematics lesson, to what extent do you…*
>
> a. *Use data for example, from diagnostic tasks or other records to decide on the mathematics needed to move your students forward?*
> b. *Clarify in your own mind and state clearly the mathematical focus of the lesson?*
> c. *Select activities that provide opportunities for your students to learn specific mathematical ideas?*
> d. *Use focus questions to draw out the main mathematical idea?*
> e. *Make the mathematical focus of the lesson clear to students?*
> f. *Plan for and cater for the range of student achievement levels in your lesson so that everyone is challenged?*
> g. *Focus on the literacy demands within the mathematics lesson?*
> h. *Use a range of classroom management strategies that will enable students to participate effectively in the lesson?*
> i. *Make judgments about students' achievement of specific mathematics based on valid and reliable evidence? And,*
> j. *Seek advice from the Aboriginal or Islander Education Officer (AIEO) as to the suitability of a resource or activity for the class?*

The 4-point scale to which teacher participants responded for this question ranged from "not at all" to "to a major extent."

Within questions one and two, the (self-reported) confidence and extent to which teachers addressed literacy demands in their mathematics lessons were interrogated. For the purposes of this paper the parts of question three selected for analysis allow further examination of how these teachers addressed literacy demands in their mathematics lessons as well as how they provided opportunities for students to talk and write about the mathematics being learnt. Specifically, question three asked:

Currently during your lessons how often do you provide your students with opportunities to…

a. *Code switch and/or talk about the meaning of mathematical words that will be encountered in the lesson?*
b. *Clarify what they need to do to complete mathematics tasks?*
c. *Listen and talk to the AIEO in home language to make sense of words, problems and tasks?*
d. *Practice using mathematical language in context?*
e. *Talk or write about the mathematics they have learned and what they still need to learn?*
f. *Work in pairs or small groups to solve problems?*
g. *Work in pairs or small groups to share how they solved problems? And,*
h. *Listen and talk using home language during student to student discussions?*

The 4-point scale to which teacher participants responded for this question ranged from "not at all" to "once a month or less" to "most weeks" and "most lessons."

Data Analysis

The analysis of data for this study involved both *a priori* and inductive methods. *A priori* (Willis, 2010, p. 419) or *in vivo* codes (Marshall & Rossman, 2010, p. 211) are described as codes developed through understanding of the literature or from researchers' knowledge or sense of what might occur in real life. The lens through which this study's findings were analysed is the *Pedagogic Content Knowledge Framework* (Willis & Treacy, 2004).

The research question, literature review, questionnaire items and the case study interview questions reflect the themes of this framework and were determined prior to data collection. However the nature of *a priori* coding did not unduly restrict the extent or type of categories or themes identified from the questionnaire or interview data. In analysing interview data the process was also inductive. Specifically, transcripts of teacher interviews were read thoroughly, and teachers' responses to each question were manually sorted into categories and subcategories, using an iterative process. Within some categories a hierarchy of knowledge and concepts became evident, which lead to the texts being ordered within a category. This process was continued until no new categories or themes emerged.

Findings

Three sets of findings were evident from teachers' responses to the questionnaire and interview items described above. The first reflect teachers' self reported confidence in carrying out certain pedagogical tasks. The term "confidence" rather than "self-efficacy" was used in the survey as it was felt that it would be more clearly understood by teachers. The second represents the extent to which teachers reported carrying out certain tasks during planning and in their lessons. Based on the data from questions 1 and 2, it seemed that teachers' confidence and the degree to which they addressed literacy demands within mathematics lessons increased over the year. Several sub-parts of question 3 were therefore selected for analysis in order to further explore that idea.

Teachers' Confidence

The frequency of teachers' responses to each sub-part of question one on the initial questionnaire, are given in Table 1. For comparison, frequencies for the same question on the follow up questionnaire are also shown.

At the start of the FVNP, participating teachers appeared to be relatively confident (more than 60% of the teachers reporting moderately or very confident) in:

- Choosing an appropriate starting point (67%);
- Selecting a specific mathematics focus for lessons (71%);
- Asking focus questions (62%);
- Providing engaging mathematics lessons (81%); and,
- Planning the content across the year (62%).

The parts of question one for which these teachers seemed to lack confidence (more than 40% reporting not at all or slightly confident) at the commencement of the project included:

- Diagnosing students' learning needs (43%);
- Helping students with the literacy demands of the mathematics lesson (48%); and
- Monitoring student learning (48%).

	Self-Reported Levels of Confidence[a]									
	Not at all		Slightly		Moderately		Very		Mean[b]	
	I[c]	**F**[d]	**I**	**F**	**I**	**F**	**I**	**F**	**I**	**F**
Produce a yearly plan	5	15	33	31	57	31	5	23	2.6	2.6
Monitor learning	0	0	48	0	52	100	0	0	2.5	3.0
Provide engaging lessons	0	0	19	46	76	38	5	15	2.9	2.7
Help with literacy demands	5	0	43	31	48	54	5	15	2.6	2.8
Ask focus questions	11	na	28	na	56	na	6	na	2.6	na
Select maths focus for lessons	5	0	24	23	57	62	14	15	2.8	2.9
Diagnose student learning	5	8	38	31	52	31	5	31	2.6	2.9
Choose a starting point	5	0	29	31	67	54	0	15	2.6	2.8

Note. [a]**values reported are in percentages;** [b]**Means are weighted using the scale 1 = not at all confident to 4 = very confident;** [c]**I = initial questionnaire (n = 21);** [d]**F = follow-up questionnaire (n = 13)**

Table 1. Mathematics teachers' self-reported confidence in enacting particular activities before and at the end of the first year of FVNP

By the end of the first FVNP year, the question 1 items that appeared to reflect some improvement in teachers' confidence in the short time the project had been operating were in relation to:

- Monitoring student learning (increase from 52% to 100% of teachers who reported being moderately or very confident); and
- Helping students with literacy demands of the mathematics lesson (increase from 53% to 69% who reported being moderately or very confident).

On the other hand, the areas in which teachers seemed to lack confidence by the end of the first FVNP year included:

- Diagnosing students' learning needs (39%);
- Providing engaging mathematics lessons (46%); and
- Planning the content across the year (46%).

Nine teacher-participants responded to both initial and follow up questionnaires and it is the change for these few teachers that is perhaps most significant. Teachers in this small group reported improved confidence in:

- Choosing an appropriate starting point (5 teachers)
- Diagnosing students' learning needs (5 teachers)
- Selecting a specific mathematics focus for lessons (6 teachers)
- Helping students with the literacy demands (4 teachers)
- Monitoring student learning (4 teachers)

Similar to the overall group, 4 of these 9 teachers reported a decrease in confidence in providing engaging lessons for their mathematics classes. At the end of question one teacher-participants were invited to comment about aspects of teaching mathematics that they were either confident about or not confident about. One teacher commented "I don't know how to make maths fun and exciting." Also, a number of comments referred to the challenges of "Engaging the different levels in one class." Another teacher commented that she was not confident about "planning lessons in a sequence so that teaching and learning is scaffolded."

In addition to the questionnaire data, six teachers representing three schools were interviewed at the end of 2010. Most indicated that the GiRN *Monitoring Tool* had been helpful. They were asked: *How do you keep track of what your students have learnt so that if another teacher took over from you they would know what the students had already learnt?* Teacher A (new graduate, year 6/7 teacher) explained how she/he used the *Monitoring Tool* and needed to be convinced that a student knew and understood a certain aspect of mathematics before recording it as being learnt. When asked if she/he found the *Monitoring Tool* helpful, Teacher A responded:

> I find it really useful, not just for assessing but for my planning. Also because we're using the Monitoring Tool from year to year. Next year I'll get the Monitoring Tool from the teacher before. I can go "oh, these kids already know this stuff up to level one in Understand Operations." I don't need to look at that now. Let's look at these ones. It helps in setting targets…helps for my groupings. So I find the Monitoring Tool to be a highly effective tool.

Teacher interviewees were also asked "*Do you feel that you know what children in your class are expected to learn*? Teacher B, (second year teacher who takes the Aboriginal Tutorial Assistance Scheme [ATAS] class) said:

> I use the Monitoring Tool quite a bit but it will depend on the student so I'll see where the gaps are and then I'll take them and look at them and say this person here can't read numbers to beyond 100 so that's her goal when we're doing reading numbers, that's where she needs to be.

Some teachers were not as far along in their understanding and use of the *Monitoring Tool* and some were not totally convinced of its place. For example Teacher C (second year teaching K-3) said:

> Sometimes when I read um the syllabus or even the Monitoring Tool it sounds very sophisticated … it sounds fancier than it is. I think sometimes perhaps it could be worded so that…old fools like me understand. Oh! Is that what it means, oh yeah…they can do that already.

Both the questionnaire and interview data for this study indicated that diagnosing student learning continued to be a concern for about 4 in 10 teacher respondents. Perhaps this is not surprising given that the smaller schools have had less than one year of being involved in the FVNP and only about six months of professional support from a specialist teacher.

However, in another section of the follow up questionnaire most teachers indicated that they found the *First Steps Diagnostic Tasks* and *Diagnostic Map* useful or very useful. For some teachers the *Diagnostic Tasks* were new. Others had seen them but did not understand their purpose or how they were intended to be used. According to Teacher C,

> I downloaded all the stuff off the hard drive…but I had no idea what they were for. What am I meant to do with this? You know the *Hide the Jelly Beans* and even the *Emu's Games*, things like that. We've got all those but unless you know what they mean you don't even know how to conduct them properly. So I always knew where they were here at school to access but I had no idea what for. You don't know whether everyone else knows and you're the only one that doesn't, or if everyone else is pretending.

Teacher D (first year, pre primary teacher) said "I had no idea about them so when I came back from the PD I got all my kids tested and did them on the diagnostics. That would inform my planning and assessment and so I knew my kids better too." Thus, the case study interviews revealed that for some teachers, the *Diagnostic Tasks* served assessment purposes more than as a tool to understand underlying conceptual hurdles limiting students' progress. Further, in the interviews, no teacher nominated the *First Steps Diagnostic Map* as a way of interpreting children's responses to *Diagnostic Tasks* to pinpoint concepts limiting students' progress.

Teachers' Practice

Question two (questionnaire) focused on the extent to which teachers reported carrying out certain tasks as they plan and implement mathematics lessons. The frequencies of responses for each part of question 2 on the initial and follow up questionnaires are shown in Table 2.

At the start of the FVNP pedagogical tasks that teachers reported doing to a moderate or major extent (indicated by more than 60% of teacher participants) included:

- Using data from diagnostic tasks or other records to decide on a maths focus (86%);
- Clearly knowing the mathematical focus of the lesson (86%);
- Selecting activities that focus on specific mathematical idea(s) (96%);
- Using focus questions to draw out the main mathematical idea(s) (67%);
- Planning for and catering for the range of student achievement (81%);
- Focusing on literacy demands within the mathematics lesson (71%);
- Using a range of classroom management strategies (91%); and,
- Making judgments about students' achievement (76%).

	Self-Reported Levels of Implementing Various Pedagogical Tasks[a]									
	Not at all		Minor extent		Moderate extent		Major extent		Mean	
	I[c]	**F[d]**	**I**	**F**	**I**	**F**	**I**	**F**	**I**	**F**
Seek AIEO advice	10	23	45	38	35	23	10	15	2.5	2.3
Judge student achievement	0	0	24	23	62	62	14	15	2.9	2.9
Use classroom management	0	0	10	8	67	69	24	23	3.2	3.2
Focus on literacy demands	0	0	29	15	71	85	0	0	2.7	2.9
Cater for the range	0	0	19	15	67	69	14	15	3.0	3.0
Make maths focus clear	0	0	48	54	38	38	14	8	2.7	2.5
Use focus questions	0	0	33	23	67	77	0	0	2.7	2.8
Select focused activities	0	0	5	8	67	62	29	31	3.3	3.3
Know maths focus of lesson	0	0	14	23	57	46	29	31	3.2	3.1
Use data	0	0	14	15	57	54	29	31	3.2	3.2

Note. [a]values reported are in percentages; [b]Means are weighted using the scale 1 = not at all to 4 = major extent; [c]I = initial questionnaire (n = 21); [d]F = follow-up questionnaire (n = 13)

Table 2. Mathematics teachers' self reported levels of implementing various pedagogical tasks before FVNP and at the end of the project's first year

Table 2 also indicates the pedagogical tasks that teachers reported doing less frequently (more than 40% reporting not at all or to a minor extent) at the start of the project, which included making the mathematical focus of the lesson clear to students (48%); and, seeking advice from the AIEO on the suitability of a resource or activity for the class (55%). For the 13 teachers who responded to the follow up questionnaire there were a number of pedagogical tasks that appeared to increase in frequency from the start of the FVNP to the end of its first year, including:

- Using focus questions to draw out the main mathematical idea(s) (67% reporting moderate or major use on the initial questionnaire compared with 77% on the follow up); and,
- Focusing on the literacy demands within the mathematics lesson (71% to 85%).

However, there were also two tasks for which teachers reported decreases in use:

- Making the mathematical focus of the lesson clear to students within the lesson (54% indicating carrying out the activity to a minor extent); and,
- Seeking advice from the AIEO as to the suitability of a resource or activity for the class (61% indicating carrying out the activity not at all, or to a minor extent).

The 9 teacher-participants who responded to both initial and follow up questionnaires reported increases in their implementation of: using data from diagnostic tasks or other records to decide on the mathematics focus (4 teachers); clearly knowing the mathematical focus of the lesson (6 teachers); using focus questions (5 teachers); and, seeking advice from the AIEO (4 teachers).

The questionnaire also provided respondents the opportunity to comment further on their self-ratings. Following question two, teachers were asked to comment about those pedagogical activities they felt confident about and those that they would like to learn more about. Most often, (7 out of 13) teachers wanted to know more about "Making the mathematics focus of the lesson clear to students." In another section of the follow up questionnaire all teachers responded that they found the *First Steps Key Understandings* useful or very useful and most used them often or every day. It appears from these limited data that while teachers felt they were getting better at thinking about, formulating and then asking questions in class, they also felt that this was not helping to draw out the focus of the lesson. However, the fact that teachers have come to realise that their pedagogy is lacking in this way is a positive indicator that seems to suggest improvement in the degree of reflection that teachers are doing as they try to improve their pedagogy.

It would also seem from these preliminary data that AIEOs are not being used to their full potential. Many AIEOs participated in the professional learning days at the commencement of the FVNP. It is worth noting however, that six out of the thirteen teachers responding to the follow up questionnaire did not have support from an AIEO during their mathematics lessons. Also, the questionnaire may not have been broad enough to capture the full range of interactions between teachers and AIEOs.

Opportunities for Student Learning within Lessons

As a complement to questionnaire items 1 and 2, item 3 sought to assess the kinds of learning opportunities teachers provide for their students in mathematics lessons. From responses to the first two questions it seemed that teachers' confidence and the degree to which they dealt with literacy demands within mathematics lessons increased over the year. The items selected for analysis from question three further investigated this indication. The frequency of responses for each item on the initial questionnaire are presented in Table 3 below and for comparison, frequencies for the same items on the follow up are also given.

At the commencement of the project student learning opportunities that teachers reported providing frequently (done "most weeks" or "most lessons" by more than 60% of teachers) included:

- Code switching and/or talking about the meaning of mathematical words (81%);
- Clarifying the task (100%);
- Practicing using mathematical language in context (90%); and,
- Working in pairs or small groups (71%).

Table 3 also indicates student learning activities that teachers reported providing less often (more than 40% reporting "not at all" or "once a month or less") at the start of FVNP. These included: listening and talking with the AIEO in home language to make sense of words, problems and tasks (61%); and talking or writing about the mathematics (48%).

	Not at all[a]		Once a month or less		Most weeks		Most lessons		Mean	
	I[c]	**F**[d]	**I**	**F**	**I**	**F**	**I**	**F**	**I**	**F**
Use home language	25	15	15	23	40	23	20	38	2.6	2.6
Share solving problems	14	8	24	33	38	33	24	25	2.5	3.0
Work in pairs or small groups	5	0	24	23	38	23	33	54	2.9	2.7
Talk or write about maths	10	0	38	46	43	38	10	15	2.6	2.8
Practice maths language	0	0	10	0	57	38	33	62	2.6	na
Talk with AIEO in home language	17	15	44	15	28	46	11	23	2.8	2.9
Clarify task	0	0	0	0	38	23	62	77	2.6	2.9
Code switch	14	8	5	31	67	31	14	31	2.6	2.8

Note. [a]values reported are in percentages; [b]Means are weighted using the scale 1 = not at all to 4 = most lessons;[c]I = initial questionnaire (n = 21); [d]F = follow-up questionnaire (n = 13)

Table 3. Teachers' self-reported provision (in percentages) of various learning opportunities in mathematics lessons before and at the end of the first year of the FVNP

For the 13 teachers who responded to the follow up questionnaire the activities that seemed to increase by the end of the year included:

- Listening and talking to the AIEO in home language to make sense of words, problems and tasks (39% reporting most weeks or most lessons on the initial questionnaire compared with 69% on the follow up); and,
- Practicing using mathematical language (90% to 100%)

There were also a number of student learning opportunities reported by teachers that did not seem to increase, or in fact decreased, including:

- Code switching and/or talking about the meaning of mathematical words (39% indicating not at all, or once a month or less);
- Talking or writing about mathematics (46% indicating not at all or once a month or less); and,
- Listening and talking to each other in home language (38% indicating not at all or once a month or less).

The 9 teacher-participants who responded to both questionnaires reported increases in their provision of code switching and/or talking about the meaning of mathematical words (5 teachers), listening and talking to the AIEO in home language (6 teachers); and working in pairs or small groups to share how they solved problems (5 teachers).

Three of the teachers reported reductions in how often they provided their students opportunities to talk or write about the mathematics they were learning.

At the end of the FVNP's first year, three teachers described how the AIEOs assisted them to code switch. For example, Teacher A (a first year, 6/7 teacher) stated:

> I've also, with my AIEO, had a relationship that involves that if I'm explaining something or a concept that the kids aren't making sense of, I can go to the AIEO for support to help explain an idea or if I'm not recognising that the kids aren't understanding that they can step in and help explain in Kriol what that might mean.

Teacher E (five years experience, Year 1, four months at the school) described a similar way of working with the AIEO. However when asked *Do you think having children use Kriol helps with their understanding?* she/he was not convinced of the benefits of the approach:

> I actually think that Kriol/English is really confusing for them because I don't think they understand that it's different at this stage. I know that we're trying to [do]….I know it's *Two Way* and that we are a *Two Way* school, but I find that the kids are confused. I don't know if anyone else does. Maybe they don't. I'm not sure if at this stage I use a lot of ESL…or take that into consideration, when I probably should a lot more.

Teacher E and Teacher D both noted that they needed to learn more in order to incorporate more of a *Two-Way* approach in their classrooms. However, there is a tension between students being able to talk to each other in home language in order to negotiate meaning of the concepts and using and understanding mathematical words in English. Teacher D, for example noted

> It's fine for them to say it in Kriol but we're trying to teach them to say it in English, and knowing what it is in English, because I'm going to ask them next week for this online assessment so I want them to have the English understanding of what I'm talking about.

It appeared that while students were encouraged to code switch for the specific purposes of coming to an understanding of specific mathematics words, concepts or instructions they were not encouraged to have more general conversations in Kriol about other aspects of the mathematics during the lesson.

Discussion and Conclusions

This study provides assessment of early changes in FVNP teachers' self-reported PCK and classroom practice, from project commencement to just after the first year of professional learning and support. The questionnaires used in this study were designed to capture teachers' confidence along with the degree to which they enacted a range of pedagogical tasks. In addition, the questionnaires sought to explore the kinds of learning opportunities teachers provided for their students during mathematics lessons.

The lens through which this study's findings were analysed is the *Pedagogic Content Knowledge Framework* (Willis & Treacy, 2004). This framework focuses on teachers' judgment-making about students, mathematics and pedagogy. For example, in relation to the students, teachers were asked to rate their confidence in diagnosing and monitoring their students' learning. In relation to the mathematics, teachers were asked to rate the extent to which they were clear in their own minds about the mathematics focus of the lessons, and the frequency with which they provided activities with a clear mathematics focus. In relation to pedagogy, teachers were asked about their use of focus questions to draw out the mathematics, as well as making the focus of the lesson explicit to their students. In addition, participating teachers were asked about the kinds of learning opportunities provided for students to work together, share solutions, talk and write about mathematics and use their home languages in mathematics discussions.

In making judgements about their students, it seemed that by the end of the year participating teachers were relatively confident that they could adequately monitor student learning through the use of the *GiRN Monitoring Tool*. As the literature has suggested, diagnosing Indigenous students' learning can be a complex task made more challenging by factors such as teacher inexperience and the EAL/D challenge for these learners. After one year of FVNP professional learning, however, diagnosing student learning was still a concern for many participating teachers in this study.

In terms of the mathematics, at the start of the project FVNP teachers reported that they tended to use data from diagnostic tasks or other records to decide on the focus of mathematics lessons. Teachers also tended to report being clear about the mathematics focus in the lesson and being able to select an activity that focused on particular mathematics. This did not seem to change over the course of the year. Many were already using *First Steps* resources and indicated the usefulness of the *First Steps in Mathematics Key Understandings* in helping make those decisions. The importance of this kind of knowledge cannot be underestimated. However, planning the mathematics they would teach across the school year was an area in which teachers were not confident. Prioritising important mathematics, thinking about the order of development of that mathematics as well as connections between mathematics ideas in order to produce a plan for the year is a complex task, especially for new teachers. This requires a deep understanding of mathematics content.

The pedagogy component of this study is as complex to analyse as it is for teachers to effectively implement in practice. In non-Indigenous classes the challenge for teachers is to be able to focus students on particular mathematics using a range of strategies including appropriate focus questions. As previous research suggests, more complex pedagogical decisions are required in Indigenous classrooms (Perso, 2005; Sullivan, Jorgensen, & Youdale, 2011). In this study, two themes about FVNP teachers' provision of mathematics lessons became apparent. The first addressed teachers' self-reported ability to provide engaging lessons in which students have a clear idea of the mathematics they are expected to learn. The second dealt with the place of student-to-student sharing, discussion and using home languages as vehicles for student learning.

In general, teachers' self-reported confidence in being able to provide engaging lessons seemed to decline slightly over the course of the first FVNP year. Catering for the range of achievement levels in the one classroom challenged some teachers. In addition while there was an increase in the extent to which participating teachers reported using focus questions, the frequency with which they reported making the focus of the lesson clear to their students also declined over the course of the project's first year. The fact that these teachers formulated focus questions as they planned their lessons was a significant achievement of FVNP professional learning. Also to be welcomed, however, was teachers' self-recognition that they were not yet making the mathematical focus clear to students. This may indicate that as teachers learn more they also become more aware and critical about their own pedagogy.

In relation to the second theme, FVNP teachers reported increased provision of several teaching and learning activities. Specifically, the degree to which teachers reported attending to the literacy demands of the mathematics lesson seem to have increased and all teachers in the study reported giving their students opportunities to practice using mathematical language. Participating teachers also reported providing more opportunities for students to talk with AIEOs in their home language. However, there were learning activities that did not increase, such as teacher participants indicating that they rarely provided opportunities for students to share answers and talk or write about the mathematics they were learning. Teachers also did not seem to be making effective use of the groups in which students were arranged.

Overall, these findings suggest that the work of the FVNP, and in particular the work of specialist teachers, has had an initially positive effect on teachers' self-reported PCK and classroom practice. The range of important pedagogical tasks and learning opportunities provided for students as reported by teachers supported this view. This study can only suggest that this important work needs to continue and provides some direction for continued focus. For example, there is clearly a need to continue to focus on the diagnosis of student learning, but perhaps with more emphasis on trying to understand the conceptual hurdles that can undermine student learning. Once those hurdles are understood, then addressing the relevant key understandings or "big ideas" across the *Number* strand would likely lead to improved learning.

Additionally, specialist and classroom teachers' 'shoulder to shoulder' work during lessons could attend more to making the mathematical focus of the lesson explicit to students. Implementing instructional strategies that provide more opportunities for students to talk to each other and the AIEO in their home languages may help build deeper understandings of mathematics. A 'funds of knowledge' approach that connects home and school mathematics in order to increase relevance and improve student engagement might provide one pathway of investigation for the future. For example, there may be opportunities to involve AIEOs with this type of approach.

Clearly, this is a study in progress, and there are sample size limitations that make it difficult to draw strong conclusions from the data. At the time that the follow up questionnaire was administered the project had been running for one year. Additionally, the number of teachers completing both questionnaires was quite small. For these reasons, the findings and conclusions reported here must be considered as preliminary, and with caution. However, as the larger study of FVNP progresses, questionnaire, interview and classroom observation data gathered across two additional years will provide additional insights about the effects of the FVNP for teachers' PCK and its relationship to changes in classroom practice. Certainly, the collaboration, consensus and early results of the FVNP provide hopeful indications for the success of focused professional learning and support in contributing to closing the numeracy gap for Indigenous students.

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