

>> TWO CASE STUDIES FROM MELBOURNE

Assisting Teachers to Implement Standards?

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Background

In March 1997 Australian Education Ministers agreed on a new National Goal:

'...that every child leaving primary school should be numerate, and be able to read, write and spell at an appropriate level.' To support this goal a National Literacy and Numeracy Plan was endorsed. This Plan consisted of several inter-related elements including the professional development of teachers. National benchmarks in literacy and numeracy were also developed to support the National Plan. The benchmarks are a set of indicators or descriptors which represent nationally agreed minimum acceptable standards for literacy and numeracy at a particular year level (Curriculum Corporation 2000).

Along with the standards for students are national standards for teachers which are subject specific. For example, the Australian Association of Mathematics Teachers (AAMT) developed Standards for Excellence in Teaching Mathematics in Australian Schools (AAMT 2002). These standards describe what teachers should know and do. "The AAMT standards relate to the specialised professional work of teaching mathematics. They do not aim to describe the characteristics and attributes of teachers in general" (AAMT 2002, 1).

Combined with national standards for both teachers and students there are state standards. A new curriculum document, The Essential Learning Standards, has been developed through consultation and collaboration with education sectors and the broader community (VCAA 2005) as the basis for curriculum and assessment in Victorian schools. These standards provide a whole school curriculum planning framework that sets out learning standards for schools to use to plan their teaching and learning programs, including assessment and reporting of student achievement and progress. This curriculum is currently being trialled in Victorian schools and is to be implemented in 2006. As with any new curriculum, teachers are going to need extensive professional development to assist them to interpret and implement these standards. Providing this professional

development will be the responsibility of the three educational systems in Victoria: state, catholic and independent.

Teacher educators need to consider state and federal standards for both teachers and students when providing professional development for teachers. The pedagogy employed by teachers for any subject must exist within a broad framework of educational practice. Defining pedagogy as being constituted from the combination of strategies used to teach and the organization of learners, we will use Shulman's (1987) model of pedagogical reasoning as a basis for examining issues and problems related to teacher professional development in mathematics. This model focuses on teacher knowledge, which Shulman categorises as knowledge of content, pedagogy, curriculum, pedagogical content, learner characteristics, educational contexts, and educational purposes.

When the authors began their primary school teaching careers, curricula were sometimes described as being 'teacher proof'. This meant that teaching materials and learning resources were developed by subject specialists, and presented to teachers to implement in their classrooms. In general teachers were not expected to be experts in subject knowledge or pedagogy. As higher qualifications became required to become a teacher, teachers studied for longer and developed a deeper knowledge and understanding of the content they would later teach. However Schulman realised that knowledge of content on its own was not sufficient for effective teaching – every teacher also has to be able to go beyond their personal understanding of a topic and be capable of representing concepts in a form and at a level appropriate for their students. Schulman termed this pedagogical content knowledge, and argued that it occurred at the intersection of a teacher's knowledge of a subject and their knowledge of pedagogy. *It also includes an understanding of what makes the learning of specific topics easy or difficult: the conceptions and preconceptions that students of different ages bring with them to*

learning (Schulman 1987, 9).

In this paper we will present two case studies. In both case studies a teacher educator works very closely with both teachers and students from schools in Melbourne. One teacher educator is a university lecturer, the other works with the catholic school system but had previously worked in a university and still does some sessional work at another university. In working with a whole school staff as a 'critical friend' these teacher educators will describe the similarities and differences they have experienced in their quest to support teachers professionally in developing the standards appropriate for them as teachers and assist them implement 'best practice' to develop standards for students.

School A

School A is located on the outskirts of Melbourne in a new growth area about one hour's drive from the central business district. The student numbers are growing rapidly and the teachers have a range of experience from three to 30 years. Several teachers from the school have participated in professional development offered by the Catholic Education Office, Melbourne. This program, Success in Numeracy Education, was developed by the Catholic Education Office in response to the introduction of the Australian National Plan.

Success in Numeracy Education [SINE] has several components but the main professional development relies on the Train the Trainer model. The components include: SINE P – 4, SINE 5 & 6, SINE 5 – 8. The SINE P – 4 program is a 5 day program specifically designed for teachers teaching in the early years of schooling. In the SINE P – 4 program teachers are introduced to the assessment instruments, current research about the way children learn mathematics, the mathematical strands and the Three Year Plan. SINE 5 & 6 is a 3 day program for teachers in the last two years of primary school (elementary school). The focus for this program is on the mathematical topics of Fractions and Decimals, Number Patterns and Relationships, Space, Measurement and Chance and Data. SINE 5 – 8 is for teachers in the middle years of schooling and includes teachers from the last two years of primary school and the first two years of secondary school. SINE 5 – 8 is 8 days of professional development offered over two years: five days in the initial year and three in the following year. This program includes presentations from mathematics educators from all over Australia chosen because of their expertise in particular areas. For example, Alistair McIntosh talks about Mental Computation, Peter Sullivan presents work on open-ended problems and Vicki Steinle presents her work on decimals. Because of the similarities in the programs the SINE 5 & 6 program has now been incorporated into the SINE 5 – 8 program.

For all the SINE programs two focus teachers are nominated by their schools to attend the spaced professional development. Teacher replacement costs, to allow teachers' attendance at the professional development, are covered by the Catholic Education Office. The teachers are usually set tasks to attempt between sessions and time is given every session for results to be shared. Two extra days funding for teacher replacement is given to schools to allow teachers to complete these tasks. At the conclusion of the program the two Focus teachers are expected to share their knowledge with the rest of their staff. They are given a comprehensive set of support materials to assist with this process. This also includes a suggested plan for presentations including black-line masters for overheads.

School A has had an ongoing relationship with the first-named author. Initially two teachers attended the SINE P – 4 program. One of those teachers attended with another

colleague the SINE 5 – 6 program. The Principal and four staff members attended a full day professional development program on Assessment. At this day the Principal suggested a more comprehensive involvement on an ongoing basis as she was concerned about the difficulty of whole school implementation of the SINE program.

At the beginning of the 2004 school year the school organised for the students to commence school two days later than gazetted. In this two days every teacher interviewed their students using the appropriate mathematical interview. A week later teachers were given time to meet with their 'critical friend' in their grade levels. At this meeting the results from the mathematical interviews were discussed in detail. In particular, the common difficulties, the individual results and how the teachers were going to use the results from the interviews to plan their teaching. This process was repeated at the beginning of the 2005 school year.

Because the role of the critical friend at School A has not been defined, but has evolved, it has many facets. She works with the leadership team which includes the principal, focus teachers, mathematics co-ordinator and four teacher representatives. This group is called the Mathematics Working Party and meets about six times a year. The main role of The Mathematics Working Party is to monitor the mathematics programs, progress of students, and to highlight and document any concerns of teachers that have arisen since the previous meeting. For example, at one of the meetings the Mathematics Co-ordinator expressed her concern that teachers, and consequently their students, in Grades 5 and 6 were struggling with the topic of fractions. The Working Party decided that one staff meeting would be devoted to professional development about fractions for the whole staff by the critical friend. This professional development focussed on the current research about the difficulties experienced by students (and teachers) and a successful model for teaching students about fractions. The Grade 5 & 6 teacher representative requested that the critical friend demonstrate a lesson in each of the Grade 5 and Grade 6 classrooms. At the following meeting the teacher representative commented on the usefulness of having the professional development followed by demonstration lessons. She said that the benefit was seeing the theory backed up by practice and of most value was the "language modelled by the 'critical friend' used to elicit responses from the students".

At the beginning and end of each school term the critical friend works with all the teachers from each level. The teachers are released from teaching for half a day and are replaced by casual replacement teachers. This cost is met from the school budget as the principal considers these meetings to be part of the priority for ongoing teacher professional development for mathematics. The main purpose of the meetings at the beginning of each term is to analyse the initial interview data particularly in relation to the mathematical content to be covered in the term. At this time the teachers co-operatively plan the term's mathematics with particular priority given to pre-requisite skills needed by students and the appropriate sequencing of the content. Planning includes discussion about pre and post assessment tasks. At the end of each term the meetings focus on the success of the planned programs and implications for future programming.

The critical friend also supported an initiative suggested and trialled by teachers. At an initial meeting Term 1 2004 the teachers from Level 3 (that is, Grades 3 and 4) expressed concern about the huge range of mathematical abilities within each of the classrooms. Several suggestions were made and they decided to trial streaming by ability for mathematics only within the level. All teachers were in favour of the trial although some expressed their concern about catering for the student needs within a group that was not their own class

group. Concern was also raised about reporting to parents about students who came from a different class group. It was decided to trial the innovative mathematics program for one hour four days a week and on the fifth day teachers would teach mathematics to their own class. The mathematics planning then needed to cater for the different ability groups being taught by the individual teachers. The teachers decided to teach the same topics for the term but the expectations were different for each group. Initially teachers did not want to stay with the same group for longer than a term as they did not want to be labelled, for example, as the teacher for the "dummies". However when the program was reviewed after all teachers were very happy to remain with their designated groups as they found they had developed a different rapport with their mathematics groups than with their classroom groups. The students were always ready and waiting for the mathematics sessions and appeared disappointed when the mathematics sessions were cancelled. Students were constantly being monitored and when possible were moved in or out of groups to better cater for their needs. While the use of streaming in mathematics was not without its difficulties all students and teachers seem to enjoy the challenges and positive results that ensued. In particular, when the student results were being analysed at the beginning of 2005 the teacher who had taught the lowest achieving mathematics students in the previous year was very excited to find that not all of her students were at the lowest level. In fact these 2004 Grade 3 students were spread across a range of ability groups when tested at the beginning of their Grade 4 year in 2005.

While the initial Train the Trainer model of professional development allowed two focus teachers from School A access to intensive and valuable professional development the rest of the school staff relied on these focus teachers being able to impart their knowledge to their colleagues. The focus teachers felt very uncomfortable and ill equipped to work with their colleagues as they were concerned that they might not 'give the right message'. A critical friend can help focus the professional development on teacher knowledge, which Shulman (1987) categorises as knowledge of content, pedagogy, curriculum, pedagogical content, learner characteristics, educational contexts, and educational purposes. A critical friend working with an individual school can tailor the teacher professional development in mathematics to meet the needs of teachers and consequently this will impact on student learning.

School B

School B is a small inner city government primary school that has been on the same site for a century. Among the teaching staff, which usually consists of nine class teachers together with several part-time teachers in specialist areas such as art, music and physical education, the majority have always been experienced teachers with more than ten years practice. Student numbers have been stable at around 400 spread evenly over the seven years of primary schooling. However the nature and socio-economic mix of the student population is changing. Near the school are several blocks of high-rise public-housing apartments that are being used to house many refugee families, most recently mainly from Somalia and other Africa nations. On the other three sides of the school are what were originally homes built for workers in the factories that used to exist in this area. Today these houses have been renovated and bought by professional families. The school now has a student population representing a diverse combination of ethnic backgrounds, parental education, and socio-economic status.

In the mid 1990s Australian Federal Government funding

enabled university mathematics education staff to work with individual schools over half a school year. In their application to be part of this project, schools had to propose areas of mathematics teaching and learning they believed could be improved with the assistance of a "critical friend". The second author was offered the opportunity to work with School B as part of this project, and has invited by the school to continue in the role of mentor and critical friend. A particular focus of his involvement at School B has been in the development of skills and knowledge for both teachers and learners in a wide variety of computer applications relevant to primary school mathematics.

Because of the size of the school there are only three grades at each of the curriculum levels – Prep year or Level 1 (5 year olds), Level 2 (6 and 7 year olds), Level 3 (8 and 9 year olds) and Level 4 (10 and 11 year olds). It is therefore possible for a critical friend to visit the school for one morning each week and spend 50 minutes with three different classes. Early on in this relationship a pattern was established of working with different levels in each of the four school terms. For the critical friend two constants have been working with the upper grades, Level 4, in the first school term and with the Level 1 students and teachers in the fourth term.

Whenever possible the critical friend attended a planning day prior to the start of each term, and was involved in discussion and planning for the mathematical content and activities, especially with aspects that lent themselves to students using computers. The overall aim was to create three different learning environments for mathematics – the classroom, the school grounds, the computer room – and to weave the teaching and learning of mathematics into all of them. The teachers tended to completely organise the classroom activities, but worked with the critical friend to develop materials and experiences for the other environments.

When the Maths in Schools project began in the mid 1990s only one teacher at School B, Marion, considered herself sufficiently competent to take her class to the computer room on a regular basis. Marion was a mentor to her colleagues, and invested significant amounts of her own time helping them adapt computer-related teaching materials to use with their students. Because the computer room was located in part of the library, most teachers allowed their students to use the computers during the timetabled weekly library session. Although teachers inferred that the computers were being used for educational purposes, students claimed they only played games.

Although it is not typical of teachers in School B, we will digress for a moment for a vignette that tells the story of one teacher and ICT. Betsy has more than 15 years teaching experience, including almost five years teaching as a volunteer in undeveloped countries. At School B she most often teaches grades 3 and 4, and is concerned that her students use ICT in their learning. Like many otherwise excellent teachers, Betsy has not had what she considers adequate and relevant professional development to enable her to use ICT with her students. This results in Betsy not being confident enough to use ICT with her students without some assistance.

The combination of a lack of clear direction within official documents and her own insecurities relating to teaching with and about ICT, has led Betsy to only use ICT when the critical friend or another teacher is on hand to help and guide. For the first three years of the critical friend's involvement with School B, Betsy was helped by Marion. However when Marion left the school, Betsy could not find anyone to provide the same level of assistance and so she only used ICT with her students when the critical friend was available to work with her class.

Guidelines for teachers (VIT 2003) and a new curriculum document (VCAA 2005) list skills required by all teachers and

topics to be taught, but do not describe how teachers are to achieve the skills. 'Standards of professional practice' (VIT 2005) consists of a matrix with three domains and eight standards. It is not until the sixth standard, in the domain of 'Professional Practice', that technology appears in the statement *Teachers use and manage a range of teaching and learning strategies, technologies, activities and resources*. It is questionable what meaning any teacher would give to this statement. The curriculum document is equally uninformative in clearly informing teachers what students need to learn and what should be taught. One example from the level appropriate for grades 3 and 4 is in the standard 'ICT for visual thinking': *At Level 3 students use ICT tools to list ideas, order them into logical sequences, and identify relationships between them. They capture these thinking strategies by saving the visual evidence to a folder, retrieving the files and editing them for use in new, but similar, situations. They explain how these strategies can be used for different problems or situations.* (VCAA 2005, 61). For many teachers, both beginning and experienced, statements such as these provide little practical assistance.

Marion and Betsy represent two extremes of teacher behaviour and are not typical of the majority of teachers. With the exception of Betsy, all of the teachers at School B developed confidence and competence in using ICT as an integral aspect of their teaching in most subject areas. For the three school terms each year when the critical friend was not working with them and their students, these teachers provided activities that enabled students to learn through using the computers in their classrooms. When necessary they used the fact that the critical friend was in the school every Thursday morning to discuss ideas or to seek advice. This represented a sound model of continuing professional development. It was interesting that in general teachers only used email to contact the critical friend with any problems that arose during the term the critical friend was working with them. At other times they put aside any problems until the critical friend's next visit. The exceptions to this related to parent information nights. These were based on grade levels, and if the use of ICT was to be a focus for an information night, the critical friend was invited to participate in the planning for the night, and often to run a hands-on session for parents using the computers in the computer room.

During the decade that this model has been in use at School B, there has been a marked increase in bookings and use of the computer room, as well as a reported increase in the use of classroom computers. Although it is not possible to quantify the effect of the regular and ongoing presence of a critical friend in the school, both the school leadership team and the classroom teachers are convinced that they are now able to integrate ICT into teaching and learning when it is appropriate, not just in mathematics as was the original intention, but across the curriculum.

Conclusion

When there is no "template" for teacher professional development it can be tailored to fit the need of individual schools. The two case studies described in this paper show very different initial approaches to all school professional development in mathematics. The "train the trainer" model used in School A was neither effective nor efficient, primarily because of the difficulty the focus teachers had with passing on their knowledge and skills to other adults. The "critical friend" model that has been in operation at School B for a decade might also be criticised as slow and inefficient, but it appears to meet the needs of individual teachers. It has only been since School A has moved to the "critical friend" model that the professional needs of all teachers at the school have been met. This ongoing professional development with the support of a "critical friend" has supported all teachers at both

schools to develop the standards appropriate for them as teachers of mathematics. This has allowed them to implement best practice to develop the appropriate standards for their students.

References

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