

Standards for Excellence in Teaching Mathematics

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Abstract: The Australian Association of Mathematics Teachers (AAMT) has, during the past four years, undertaken a major project to publish *Standards for Excellence in Teaching Mathematics in Australian Schools* (AAMT 2002). These *Standards* have been developed using teacher focus groups and teacher work samples, to ensure that they have practical validity and are owned by the profession. The *Standards* identify characteristics of excellent teachers of mathematics in terms of their professional knowledge, their professional attributes and their professional practice.

Mathematics Education in Australia

Mathematics education in Australia has, in recent years, undergone many of the same changes evident in mathematics education throughout the world. Curriculum documents have emphasized mathematics as a creative endeavour, have placed high value on problem-solving and mathematical thinking, and have promoted a technology-rich environment for mathematics learning. Australian-produced teaching resources for mathematics have a high profile, and are well-regarded, both nationally and internationally. Yet when one looks more closely at the actual practice in mathematics classrooms, such as in the TIMSS 1999 video study (Hollingsworth, Lokan, & McCrae, 2003), it is often dominated by a rule-based, instrumental approach, in which skills take precedence over understanding, and breadth of content takes precedence over depth. Translating the rhetoric into practice remains a critical issue for Australia's teachers.

School education in Australia is a joint Federal Government and State and Territory Government (the term State is used to include Territories in the remainder of this paper) responsibility. Essentially the States administer school education within their borders, define curriculum frameworks and expectations, provide support to enable teachers to undertake professional development, fund schools in both the public and private sectors, and employ teachers to work in the public sector.

The Federal Government provides funding from taxation to the States to support their role, and directly funds private schools. The Federal Government also develops national policies and strategies for education, and conducts various reviews and enquiries into education.

While the States are primarily responsible for curriculum development and support, the level of specificity varies from State to State. However in all States each individual school must interpret the centrally developed document for its own context. In recent years States have begun to develop curriculum documents that take into account both traditional content domains such as mathematics, science, and English, and alternative documents such as the New Basics Project (Education Queensland, 2002) that focus on generic skills such as life pathways and social futures, multiliteracies and communications media, active citizenship, and environments and technologies.

Increasingly in recent years the Federal Government has played a less direct but no less influential role in setting curriculum priorities through the development of a national literacy and numeracy plan (Department of Education Science and Training (DEST), 2004), which requires all States to report performance of students against agreed national benchmarks. Although these benchmarks do not constitute the curriculum, they naturally impact upon what teachers teach and how they choose to assess students in their classes.

Twenty years ago Stephens (1984) identified seven key issues impacting on mathematics education in Australia. These were

- Cuts in education expenditure;
- Downgrading or disappearance of positions of State-wide responsibility for mathematics education;
- An acute shortage of qualified teachers of mathematics;
- The lack of a coherent national project in mathematics education;
- The gap between traditional tertiary-oriented senior secondary mathematics courses and the needs of young people who are, in increasing numbers, remaining longer at school;
- Interstate isolation and rivalry that prevents the effective sharing of resources; and
- The need to reconsider the content and teaching methods of mathematics to take advantage of major technological changes.

One could argue that all of these remain significant challenges in 2005. One might add to these two issues particularly pertinent to the current educational climate. These are the need to ensure that where school curricula focus on generic skills they also retain a rigorous mathematics content base, and the problem of the potential mismatch between State-wide testing of numeracy and approaches to teaching and learning mathematics promoted in contemporary curriculum documents.

The Australian Association of Mathematics Teachers (AAMT)

AAMT is a national professional association, made up of affiliated associations from each Australian State and Territory. It has some 5500 members from all levels of education from early childhood through to the tertiary sector. Given the structure of education in Australia, particularly with State-based curricula, maintaining a national focus and profile are significant challenges for AAMT. It does this through a variety of activities and projects, which include

- Marketing of resources not readily available in conventional bookstores;
- Publication of three journals, one at each of the primary, middle school and senior secondary levels;
- Provision of national professional development such as a biennial conference and internet-based discussions;
- Conducting national student activities;
- Providing informed and critical response to government enquiries and liaising with Federal Government departments; and
- Conducting projects that promote excellent mathematics teaching and learning.

Standards for Excellence in Teaching Mathematics in Australia

One initiative which involved the participation of the AAMT has been the development of a set of standards for teaching mathematics in Australian schools. The development of the *Standards for Excellence in Teaching Mathematics in Australian Schools* (AAMT, 2002) was set within a national and international context in which professional standards have become an increasingly important element in describing and promoting excellent teaching (National Council of Teachers of Mathematics (NCTM), 1991; Ingvarson, 1995; Ramsey, 2000; Commonwealth of Australia, 2003). The AAMT *Standards* were developed over a period of three years as a Strategic Partnerships with Industry Research Grant, in which Monash University was the research partner and AAMT was the industry partner. The project used a 'grounded' research methodology, continually seeking the views of teachers, synthesising them and reflecting the synthesis back to the teachers for confirmation and/or modification as the result of further discussion and debate. Teacher Focus Groups (TFGs) were established in four of the eight states and territories (New South Wales, Victoria, Tasmania and South Australia), and these people (approximately 50) formed the core of the practitioner/researcher team. They met for approximately 12 days over the three years. Synthesis and other tasks were undertaken by a Project Team consisting of representatives of the TFGs, the university researchers, and key officers of the AAMT with responsibility for the project. There was also a Steering Committee consisting of representatives of a wide range of education stakeholders including employers, unions, principals, teacher educators and others.

An example of the primacy of the views and input of the Australian teachers in the TFGs in the project was the approach to the issue of different standards for different levels of schooling. The National Board for Professional Teaching Standards in the USA identifies four overlapping levels of schooling (Early Childhood, Middle Years, Early Adolescent, and Adolescent and Young Adult) and has developed different standards and credentials across these in order to reflect the different contexts of teaching. However the AAMT TFGs were consistently determined that these kinds of distinctions did not fit their views and experiences. Their view was that the essence of good teaching of mathematics is not dependent on the age of students. The challenge was to reflect this in the final materials. The commitment to the principle that these were to be “standards by teachers, for teachers”, and to the basic methodology, has therefore resulted in the AAMT *Standards* being K-12 in scope.

There are ten *Standards*, arranged in three domains:

Domain 1 — Professional Knowledge		Domain 2 — Professional Attributes		Domain 3 — Professional Practice	
1.1	Knowledge of students	2.1	Personal attributes	3.1	The learning environment
1.2	Knowledge of mathematics	2.2	Personal professional development	3.2	Planning for learning
1.3	Knowledge of students' learning of mathematics	2.3	Community responsibility	3.3	Teaching in action
				3.4	Assessment

The following example is used to illustrate the style of the AAMT *Standards*. It shows that this work — by teachers, for teachers — goes to the very heart of what it means to be a teacher of mathematics.

2.1 Personal attributes

The work of excellent teachers of mathematics reflects a range of personal attributes that assists them to engage students in their learning. Their enthusiasm for mathematics and its learning characterises their work. These teachers have a conviction that all students can learn mathematics. They are committed to maximising students' opportunities to learn mathematics and set high achievable standards for the learning of each student. They aim for students to become autonomous and self directed learners who enjoy mathematics. These teachers exhibit care and respect for their students.

As can be seen, the *Standards* consist of high order statements with dense text. An extensive and growing quantity of material is accessible online in ways that best suit readers' needs. The following is an example of this material.

What Does Eric Know?

During the first two weeks of the year I have a diverse range of maths activities and investigations for the purposes of finding out what the students know and can do in mathematics. This year by the end of the first week I knew nothing about what Eric knew or could do. Eric was in Year 5 in a Year 5/6 composite. Every time I observed him he was "preparing" to start. All of his work was incomplete. I decided to frequently observe and note Eric's behaviour for a lesson. My observations confirmed that Eric never actually engaged in the mathematics activity. I was relatively new to the school and asked some other teachers about Eric. Their comments described Eric as "lazy", "not very bright", "slow", and "unobtrusive". During a relief from teaching time, I decided to interview Eric as we worked collaboratively on a construction task. He revealed to me that he could not do very much mathematics and was very slow to do it. Also he preferred to be thought of as "lazy" rather than "stupid". Therefore, he had developed a whole range of strategies so that he never disrupted the class but was always "getting ready" to start whenever the teacher might question him. If he didn't start, he couldn't be called dumb for not finishing. I changed my tasks for the following two weeks. Rather than give the students a set of investigations of which they could select to do some, I organised for every student to start every investigation. They were given insufficient time for any of them to finish. I also explained to them that we would be focussing on how we start solving problems, and at the end of the first week each student would choose one investigation to undertake for a week. As that next week progressed and Eric noticed that no one was finished, I noticed that he was getting more involved in the investigations and doing more mathematics.

These narratives are used as exemplifications of what they (the *Standards*) mean 'in practice'. In this way they provide models to show how teaching can be analysed in terms of the framework provided by the *Standards* as follows:

Comments	Relevant <i>Standards</i> Excellent teachers...
This teacher spends two weeks at the start of the year finding out what students can already do. She also talks to previous teachers, and she recognises and attends to lack of confidence.	<i>1.1...have a thorough knowledge of the students they teach. This includes knowledge of how confident students feel about learning mathematics.</i>

She demonstrates that she has a range of techniques by arranging for every student to start (and not finish) every investigation, so that Eric becomes one of the group. Consequently his attitude to mathematics began to improve.	<i>1.3...aware of a range of effective strategies and techniques for teaching and learning mathematics and promoting enjoyment of learning and positive attitudes to mathematics</i>
She exhibited care and respect by attending to Eric's situation, rather than judging him as some previous teachers had done.	<i>2.1...exhibit care and respect for their students 2.1... a conviction that all students can learn mathematics</i>
Eric's difficulty was more psychological / emotional than mathematical. It prevented him from learning mathematics.	<i>3.1 ...maximise students' learning opportunities</i>
Eric might have learned nothing if this teacher had not intervened to change his behaviour.	<i>3.3...their teaching involves strategic intervention</i>

It is instructive that this analysis identifies that even this small example needs to be linked to several standards across the three domains. This underlines the complexity of good practice — having the *Standards* as a common language to discuss it can only be positive in the face of such complexity.

The *Standards* are intended to serve at least two major purposes: enabling a transparent and defensible method of accrediting teachers of mathematics as highly accomplished teachers, and providing a framework for effective professional development. Popkewitz (1987, p.23) questions the use of standards, claiming that standardization can serve as a ritual of differentiation and homogeneity, thus reducing the potential for diversity and the development of individual identity. However, rather than providing a recipe for what constitutes excellent teaching, the AAMT *Standards* encourage diversity rather than advantaging a particular style of teaching. Statements such as “Excellent teachers of mathematics plan for coherently organised learning experiences that have the flexibility to allow for spontaneous, self-directed learning” force teachers to wrestle with ways to enact this in their own classroom, and hence to develop their own identity. Thus the *Standards* provide a description of one high-level step along a teacher’s professional journey, and a vision of teacher identity at this point.

The following three snapshots provide a glimpse of how these Standards have been used to frame professional learning and assessment.

Standards as a Framework for Assessment in Pre-service Teacher Education

In the study described below pre-service teachers were required to reflect on their knowledge and practice in the context of the *Standards* described above. The study involved fifteen students who were in their final year of training to teach mathematics to high school children. The students undertook one subject of 36 hours duration in which they looked specifically at how students learn mathematics, at mathematics curriculum, and at different approaches to teaching mathematics. They also undertook a four-week period of Professional Experience in a secondary school.

It is noteworthy that many, but not all, of the students involved in this class were mature-aged students, who already had varied life experiences and a strong sense of personal identity. These students had a strong sense of why they wanted to become teachers and what they hoped to achieve. In general they “wanted to make a difference”. They were also very aware of their own experiences as students in mathematics classes, and while they had been successful, they felt that their school experiences had not engaged them, and had not promoted the development of deep mathematical understanding. In the words of one student “I don’t think I will make a very good maths teacher, because I have just begun to realise that I don’t really understand anything I learned at school – I was just good at it.”

While the traditional assessment tasks undertaken by the students in this subject, such as lesson-planning and micro-teaching have immediate and obvious practical value, it is debatable to what extent they promote life-long learning or assessment described by Boud (2000) as sustainable assessment, nor to what extent they promote the development of teacher identity (Shulman, 2002). Yet for these students, this is their only pre-service experience in mathematics education, hence it is critical that they are well positioned to become life-long learners of the art and craft of teaching mathematics.

In 2003 a new assessment task, based on the AAMT *Standards* described above, was introduced. This task required students to develop a focused portfolio and to attend a 20-minute individual interview. During the interview they were asked to explain their rationale for including parts of the portfolio, and to evaluate their knowledge of, practice of, and beliefs about, teaching. Pre-service teachers were asked to answer three questions, one focusing on their own perceptions of their knowledge against the *Standards*, one describing and reflecting in a focused way on their teaching during Professional Experience, and one discussing a critical issue in mathematics education.

Two mathematics educators interviewed the students, made notes during the interview, referred to the portfolio for any further clarification, and provided feedback within thirty minutes of the completion of the interview. Students were informed that the interview process was an experiment, and that it was being used as an attempt to make the portfolio more focused. Each student also agreed to have the interview taped for future reference.

As might be expected in any assessment task, there was a wide range of student responses and levels of performance. A few students were unprepared, had done little reading, and did not focus their answers or portfolio. At their best, however, the interviews were remarkable. They showed a capacity to be reflective of their own teaching, to be critical and constructive and to ask informed questions of the status quo. They provided a vivid and tangible image of pre-service teachers developing a very strong sense of teacher identity.

John, for example, focused on professional knowledge in his discussion of the *Standards*. He drew parallels between a constructivist approach to teaching and his background in human communication theory. He noted that a key principle of communication was that “the receiver makes the message”, and concluded that it was thus the teachers’ roles to know their students, their culture and their idiom well enough to enable each student to make the message in a productive way.

Melissa described how, in teaching fractions to a year 7 class, her supervising teacher had asked her to split the class into three groups based on results in a pre-test. On reflection she felt that, while they had worked diligently through the work assigned, the most advanced students had not been challenged in any significant way, and that, in general, the lowest achieving students remained the lowest achievers. However one student who had been placed in the lowest achieving group was able to complete the post-test with only one error. This was exciting for both the student and his teacher, who had not expected such a result. In reflecting on her experiences with, and reading about, setting students based on their perceived ability levels in mathematics, Melissa concluded by saying “I haven’t got an answer, I’m still sitting on the fence”.

The pre-service teachers in the study had thought deeply about their teaching, about what they had read and talked about in their academic studies, and about how it related to their practical experience. Like Melissa and John they did not provide glib answers, but saw knowledge of teaching as developing through reflection over a long period of time. As Melissa said “putting it all together (for the interview) ... touched on layers of other issues”.

The interviews provided strong evidence of developing teacher identity, in particular characteristics such as skepticism, the capacity to reflect on experience to link theory and practice, and a sense of self as a learner. The pre-service teachers' core beliefs about teaching, and about themselves as teachers, were challenged. They recognised their existing professional knowledge and highlighted their shortcomings; they evaluated their own and their supervising teachers' practice honestly and critically; they revealed a developing sense of what they valued in learning.

However the most surprising outcome was the sense of community generated through the process. The pre-service teachers e-mailed each other after the interview to discuss their feelings about the task. This e-mailing was an entirely self-motivated undertaking – I had not asked them to share their reflections and had expected that, like every other assessment task I had ever set, students would just be glad that it was over. On learning of this e-mail exchange, I requested a copy with names removed, and the students were happy to provide their reflections.

“Probably the most I got out of the whole process was how analysing, reading articles and reflecting continued to challenge me about my teaching... While I was preparing for an assessment item, I think I got more out of the exercise than the mark Steve gave me.”

These pre-service teachers saw the exercise as an important part of their on-going development as teachers of mathematics. They saw themselves as part of a community, and were keen to share their experiences and thoughts with others. Unprompted, they thoughtfully evaluated the validity of the interview process and made links with assessment practices beyond their current course. In this sense, the portfolio and interview did “double duty” (Boud, 2000) by focusing on both the immediate and the future, by transmitting what is valued as well as making judgments, and by giving students the reflective skills to attend to their on-going development as excellent teachers of mathematics. In providing both the responses during the interview and the unprompted reflections following the assessment task, these pre-service teachers exemplified many of the qualities of excellent teachers of mathematics described in the Standards. In particular, they showed the capacity to be reflective, and an enthusiasm for and commitment to their own on-going development as professionals. The assessment task showed that the Standards could be used as a valuable framework within which to frame an assessment task that could meaningfully assess pre-service teachers' capacity to become reflective professionals.

Standards and teacher professional learning

The use of professional standards to frame and guide teachers' professional learning was recognised in the *Report of the Review of Teaching and Teacher Education* in its Agenda for Action (Commonwealth of Australia, 2003), which recommends that "professional learning opportunities provided by employers of teachers, higher education institutions and teacher professional associations be directed to the achievement of the standards to be established for advanced teaching competence...". Thus the AAMT has sought to establish the *Standards* as the common language for talking and thinking about high quality teaching in the Australian context, and, as a consequence, the framework for professional development of teachers of mathematics throughout their careers.

The program *Engaging with Excellence in Mathematics Teaching: Creating Excellence in the Learning Environment*, a series of teacher professional development workshops held during the middle part of 2004, was developed and conducted jointly by the Australian Council for Education Research (ACER) and the AAMT.

The catalyst for the partnership was the release of some classroom videos from the *1999 Third International Mathematics and Science Study (TIMSS)* video study. The videos are acknowledged as an outstanding resource for teacher development, especially when the software tools and other resources that are associated with them are taken into account. Given the finalisation of the AAMT *Standards* it was agreed that these would be used as the framework for the teachers' investigations. Standard 3.1 deals with the learning environment, and this was the focus area for this professional development program, given that the videos capture learning environments (physical, intellectual, emotional) in mathematics classrooms in a variety of countries. In the *Engaging with Excellence in Mathematics Teaching: Creating Excellence in the Learning Environment* professional development program, participants used the AAMT *Standards* to

- self identify their learning needs in mathematics;
- analyse, describe and discuss the learning environments represented in selected videos;
- express their particular learning goals for this program in terms of the learning environment of their classroom; and
- monitor progress and celebrate success.

Feedback from the participants — all of whom had no previous detailed exposure to the *Standards* — indicated that they found the document useful to very useful in identifying their professional learning needs. "The Standards self-evaluation form in

particular was identified as a most useful instrument.’ (Peck, Hollingsworth, & Morony, 2004)

They reported that the *Standards* assisted them in working with colleagues who were not in face-to-face sessions and as a means for focusing their learning. ‘Overwhelmingly, all teachers felt that they had significantly improved their awareness and appreciation of the AAMT *Standards* and were able to identify ways that their practice (or that of their colleagues) had moved closer to the *Standards*’ (ibid.). "

Standards and Assessment of Highly Accomplished Teachers of Mathematics

In 2003/2004 the AAMT conducted a pilot program to assess teachers of mathematics as Highly Accomplished Teachers of Mathematics (HAToM). This program was intended to develop and trial a rigorous and defensible model that could be sustained into the future. This model was reviewed and finalised in the early stages of the project. It was based on clear principles that the assessment process would be

- rigorous and valid;
- adaptable to and applicable in all teaching contexts;
- fair to all candidates no matter what their teaching situation;
- equally accessible to teachers across the country;
- controlled by the candidate insofar as this is possible; and
- oriented towards contributing to professional growth of the candidate.

The model required candidates to

- respond to unseen questions that simulate teaching decisions through an *Assessment Centre*;
- submit a *Portfolio* of their work and achievements as a teacher, consisting of a Professional Journey (reflective essay), a Case Study of one of two students’ learning, an example of Current teaching and Learning Practices, Validation (report of a classroom observation or video of their teaching) and Documentation (awards, references, testimonials etc.) ; and
- take part in an *Interview*.

The model involved a ‘team consensus approach’ to assessment. Individual assessors accumulated evidence from what the teacher had presented to make holistic judgments directly against each Standard. Assessors then met to reach consensus about whether they had identified sufficient evidence in to be confident that individual *Standards* have been met. To be recommended to receive the HAToM award the teacher had to meet all ten *Standards*.

An independent external evaluator used a 'participant-observer' methodology to report on the project. Observations, document analysis and interviews with feedback from participants of all kinds provided the data for an extensive Evaluation Report. Some key findings follow.

The Assessment Model

The Teaching Standards Assessment Evaluation Project (TSAEP) found that the Assessment Model works — candidates are validly and reliably identified as HAToMs. Importantly, the assessment process is able to discriminate among teachers, as not all candidates were successful in meeting all ten Standards. Furthermore the model and the associated guidelines provided to candidates are transparent and flexible in allowing teachers to exercise some control over the form of their submissions.

The Assessment Strategies

All three components of the assessment appear important to provide a sufficient picture of the candidate's knowledge, skills and attributes. Although requiring all components may lead to some redundancy of information about how a candidate meets the *Standards*, there are other benefits such as increased internal reliability of data.

The Assessment Centre tasks developed were searching but fair, and candidates' responses predictive of their ability to meet the array of *Standards*. A sample question from the Centre is provided below.

This simulated teaching in action decision scenario is posed to teachers of Middle School students to elicit responses that would demonstrate the teacher's community responsibility.

You run into a parent of a child you had a year or two ago and she tells this story. The teacher concerned is a very experienced and traditional teacher - a colleague you have known for several years. This is what they say:

As you know, Amy is in now Year 5. She has been learning about division. For homework the other night she was doing loads of practice exercises set by the class teacher of the type $23/7$ to yield an answer of the type $3r2$, the remainder of 2 being identified by the "r".

She said to me that this doesn't make sense ...she thinks the answer should be 3 groups and 2 out of 7 pieces for another group. I said she could talk to her

teacher about it. She did discuss it with the class teacher, only to be told she got it wrong and she was "corrected".

Using your knowledge of mathematics and the learning of mathematics respond to the following questions:

1. What is surprising about the context?
2. What might you say to the parent and the child?
3. What strategies might you provide to the teacher professionally to deal with this situation?

The Portfolio provided critically important evidence about a candidate's knowledge, capability and commitment as a teacher of mathematics. Importantly, the experience of assembling a Teaching Portfolio was considered by candidates as a worthwhile professional development experience in its own right. It provided an opportunity to compile a broad picture of one's teaching and to reflect on this towards one's further development as a teacher. The advice to candidates insists that they identify both the actual *Standards* to which they believe the material is relevant and how the evidence provided demonstrates their achievement of the *Standards*. The following is a small extract from a sample case study that describes a teacher who has found that a student has serious deficiencies in relation to graphs and the equation of a straight line:

I believed that Anthony needed to develop a link between equations, tables of values and their graphs. This type of work would have been encountered in earlier years but for some reason or other this has not been successful for Anthony. I believed that a fresh approach was necessary so I decided to make use of the graphical calculator that Anthony owns to do some work that required him to enter an equation, look at the graph and look at the table of values generated to establish the relationships. This work was done prior to commencing the work on bivariate data as it is necessary background to be able to calculate equations of lines of best fit. This was also good revision for the rest of the class so it was done as a part of the teaching and learning sequence. When ever possible I allowed Anthony to print his graphs from his calculator rather than producing them by hand as I thought that this may appeal to him as he would not have to produce neat work by hand - something that he finds difficult. I believe that this demonstrates Standard 1.3 and Standard 3.2 as it establishes an appropriate sequence of learning for this student based on the skills they already have established and the technology available to them. It is important to establish which skills the student already has in order to be able to develop further skills.

The Interview provided opportunities for candidates to fill gaps in evidence, and to clarify and provide confirming evidence. The questions were open and positively framed, with clear links to what candidates had submitted earlier. Candidates were interviewed by teleconference, with the assessors assembled together. The assessors were impressed that candidates were able to readily communicate their enthusiasm for teaching via this medium. Each assessment team contained at least one primary and secondary school teacher, so as to provide further perspectives on the judgments being made.

The Candidates' Responses

Candidates felt positively about the assessment process, despite at times feeling frustrated or anxious, with reservations about the time available and the hard work required. Several stated that they felt the process helped to affirm their status as a good teacher and that it was valuable and confidence boosting. Indeed, in collecting documentation in the form of references, some candidates were genuinely and pleasantly surprised at how highly thought of they were in some quarters. They universally felt that the assessment process had helped to provide them with informed feedback about their teaching and an opportunity to document an accurate picture of their teaching. In other words the experience of undertaking the assessment was valuable in its own right.

There is also anecdotal evidence that those who engaged with the assessment tasks associated with the HAToM credential found them to be outstanding professional development activities. The teacher who prepared the sample Case Study outlined above commented:

“The process (of thinking about the issues, focusing in on a single student, collecting the bits and pieces) is fabulous P.D. and I had no trouble in carrying out that part (other than finding the time!)”

She went on, however, to highlight a dilemma for teachers dedicated to their students:

“...but when you get to the write up you feel that you are doing something for yourself rather than for the students which is probably a contradiction for the type of teacher that you are trying to attract. Some how we have to make this part of it have a more tangible benefit for either the teacher or their students. Sorry don't have the answer only the question!”

Addressing this concern, among others, is necessary to ensure that the assessment process, once established as a result of the TSAEP, will be a highly valuable professional development experience for those who engage with it.

As a result of the implementation of the assessment process there will be a range of ways in which that work will be useful to teachers who are not engaged with being assessed. The public release sample assessment centre items will also be a resource for teacher professional development. They are similar to the Case Methods approach to teacher professional development in mathematics (Barnett, Goldstein, & Jackson, 1994)

The Assessors' responses

The experience of assessing candidates was also highly positive for the Assessors. When asked about the assessment process, they used words such as 'revelatory', 'delighted', 'overwhelmed', 'amazed', 'impressed', 'inspiring', 'uplifting', 'humbling' and 'valuable' to describe their main reaction. They were impressed with the ability of the process to reveal the very high quality of the candidates' work as teachers, and were grateful for the opportunity to learn about talented colleagues in an 'interesting' way. They felt that assessing the candidates was a good learning process, as it forced them to reflect on their own professional status in relation to the *Standards*. In other words the assessment process proved to be an excellent professional development experience for the Assessors.

While the pilot project was successful in contributing to the development of a reliable and valid assessment process, its future sustainability is highly dependent on funding or incentives to teachers. This is highly uncertain; however there appears to be an increasing move towards recognition and celebration of teaching as a profession, in which the development and implementation of professional standards is a key element. Perhaps the greatest benefit of conducting the Teaching Standards Assessment Evaluation Project is that it locates a valid assessment and accreditation model firmly in the hands of the profession.

Conclusion

Professional Standards of Excellence, such as those developed by the AAMT which maintain the commitment to the principle of 'by the profession, for the profession' have the potential to enhance significantly the professional agenda of teachers of mathematics at all levels in Australia in the coming few years. They provide both a model and framework for teacher professional learning at pre-service and in-service levels, and valid criteria against which to evaluate excellence in teaching. In this way they have the potential to address many of the issues identified by Stephens (1984) at a truly national level, and to assist the AAMT to continue to promote the

importance of teacher knowledge as a critical component in the national mathematics education agenda. However the extent to which these *Standards* can impact upon the day-to-day experiences of children in Australian schools depends very much on the ownership of the *Standards* by teachers of mathematics themselves. Developing this sense of ownership is perhaps one of the key questions facing AAMT in the coming years.

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