



QUALITY MATHEMATICS
in the middle years

COMMUNIQUÉ

Preamble

This Communiqué has been prepared for leaders in the wider educational community by The Australian Association of Mathematics Teachers Inc. It provides a brief summary of the contemporary context and important directions for mathematics in the middle years of schooling.

Many of the ideas come from the conference *Quality Mathematics in the Middle Years* held in Perth in 2005. This Conference brought together key leaders in school mathematics from education authorities, classroom teachers and mathematics educators from the tertiary sector. The results of their discussions have been incorporated into the *QMMY Conference Summary*. This Communiqué summarises that document.

Middle years mathematics...

and students

Young people in the middle years are in transition from being children to becoming adults. Quality mathematics for these students requires a range of well-known general challenges in their education to be addressed. The importance of positive relationships, choice and voice in their learning are key findings in the research about middle years students. These findings need to be at the forefront of planning for quality mathematics in the middle years, given that many students' current experience with mathematics is characterised by disengagement, negative attitudes and a quest for purpose and relevance in their learning. There are also some issues specific to mathematics. These include expectations of more abstract thinking within the discipline, and the transfer of mathematical knowledge and problem solving skills to contexts outside of mathematics in order to support their development in numeracy as well as in mathematics. These factors combine to magnify the demands on teachers and schools as they strive to provide quality mathematics.

and teachers

Teachers of mathematics in the middle years are a diverse group. In the primary years the "maths teacher" takes their class for most (or all) curriculum areas. They will usually have had some preparation to teach mathematics in their pre-service teacher education pro-

gram. Few would have undertaken any tertiary study of mathematics outside of this. In secondary schools they range from well-prepared specialists in mathematics to teachers from other discipline areas with little or no preparation to teach mathematics. There is a similar range in dedicated middle schools. This diversity means that there is no single strategy for supporting the teaching profession to meet the challenges of creating quality mathematics — a variety of strategies is needed. Continuing programs of teacher professional learning in line with the framework of the *AAMT Standards for Excellence in Teaching Mathematics in Australian Schools* (2006) are necessary to meet the needs and aspirations of individuals and groups of "maths teachers".

and the knowledge era

Today's middle years student will live and work in the so-called knowledge era. Technologies will be pervasive in their lives. Their economic and social prosperity — and that of the nation — will depend to a large degree on their capacity to work with technologies. They will need to work in teams and to continually learn and adapt to new situations. Quality mathematics in the middle years will acknowledge these realities in students' lives and will directly contribute to the development of the necessary skills and dispositions for successful participation in society.

Key directions for...

curriculum

The content of the curriculum for mathematics in the middle years needs to respond to the needs of students as future participants in the knowledge economy. For example, significant work with data and data sets, codes and encryption, iterative processes, and other areas of mathematics clamour for inclusion as part of quality mathematics. There are also substantial and critical conceptual developments such as proportional reasoning and the foundations of formal algebra that are located in the middle years. These, too, need careful attention in the curriculum of middle years mathematics into the future. The structure provided by the curriculum must provide opportunities and encouragement for students to exercise choice, and for their voices to be heard as they negotiate and co-construct (with their teacher) the teaching and learning program. The curriculum must provide for the building of mathematical capability in the diverse range of students. It can only do this through an emphasis on building understanding, drawing on and responding to students' interests and aspirations, making connections between mathematical ideas and between the mathematics of one context and another, and creating and working with mathematical models of reality.

teaching

The spirit of such a quality mathematics curriculum will be realised by teaching that engages students and promotes learning. Effective teaching of mathematics in the middle years teaches students how to learn and apply mathematics and encourages a “risk-taking” culture in supportive learning communities. Mutually respectful student-teacher relationships are oriented towards success and productive learning. Effective teaching of mathematics at this level provides opportunities for peer, cooperative and individual learning and cross-age tutoring; focuses on depth of understanding rather than superficial coverage of content; enables students to make choices and evaluate and refine results; explicitly develops critical thinking skills, problem-solving strategies and the capacity to reflect on learning; uses tasks and contexts that cater for diversity; enables students to connect their mathematics with their local and wider communities through authentic tasks and investigations; and purposefully and innovatively uses information and communication technologies as an integral component of students' learning programs.

assessment

Assessment for learning — rather than assessment of learning — should be the overwhelming emphasis in assessment practice in middle years mathematics. Assessment for learning enables assessment to be integrated into the cycles of teaching and learning of quality mathematics — this is crucial in maintaining commitment to positive student-teacher relationships and student choice in learning programs. Assessment tasks within this paradigm need to be clear about intended outcomes and what is expected, expressed in ways that make this clear to students. Constructive, learning-focussed feedback is an essential component. Ownership of their learning grows when students are actively involved and given a meaningful voice in the assessment process through, for example, self-assessment, peer-assessment and development of rubrics for assessment. Teachers need opportunities to work together to achieve consistent professional judgements of students' achievements — this approach creates opportunities for professional learning and networking among teachers.

teacher professional learning

There is an urgent need to “harvest” the vast experience of the large number of teachers of mathematics nearing retirement, as well as nurturing and supporting those new to the profession. There must be adequate time for teachers to be involved in collaborative and reflective practice to develop their mathematical and “mathematics pedagogical” knowledges whether they are seen as mathematics “specialists” or not. The AAMT Standards provide the overall framework for the professional learning of all teachers of mathematics, including those in the middle years. Particular emphasis needs to be given to teachers working on several areas including their understanding of the mathematics middle years students bring to the learning context; their understanding of the needs of middle years students from a range of backgrounds, and how to meet these needs; their understanding of “mathematical transition points” in schooling and how to respond through their teaching; as well as previously mentioned issues such as “making connections”, assessment for learning and task design that enables connections with the community and takes account of students’ interests and voices.

school and system level actions

Schools and education systems need to provide an environment characterised by pressure and support. “Pressure” involves expectations that teachers will work individually and in collaboration with others to meet the challenges of quality mathematics for their middle years students. It also involves setting high expectations on students’ learning. “Support” for teachers’ professional learning, and for the teaching and learning of mathematics through provision of adequate ICTs, time and other resources is essential. A whole school approach that includes effective professional leadership is a critical component of the support that is needed. In addition to allocating resources, school level practices relating to such things as timetabling, the assignment of staff to classes and liaison and connection with local business, industry and community groups are important. Critical are the school policies that support teachers’ opportunities to keenly know their students and to create in them a sense of belonging. This involves among other things, seeking and responding to students’ input on key matters. All are important in making quality mathematics a reality in our schools.

research

The Early Years of schooling have benefited from targeted research that now forms the evidence base for policy, programs and practice in early years mathematics. Quality mathematics for middle years students requires a similarly focussed and productive research agenda. There is a broad range of areas in which evidence to identify effective practice is needed. These include student learning and engagement (particularly for groups such as Indigenous students, boys and students in rural locations; and in using ICTs in and for learning); curriculum content, structures and emphases; teacher preparation and career-long professional growth; and several “organisational” issues such as transition from primary to secondary, length of lessons, student grouping and potential for specialist teachers in the (formerly) upper primary years.

AAMT vision for quality mathematics in the middle years

The AAMT vision for middle years mathematics is that this is a space that students and teachers want to inhabit.

Students are engaged with the intellectual challenges of their work.

They experience mathematics as a coherent, meaningful and purposeful aspect of their schooling that is connected to their lives as learners and as adolescents developing into adults.

Teachers gain great satisfaction from meeting the intellectual and professional challenges they face, and working with colleagues and the community to turn into a reality their belief that all students can learn, do and enjoy mathematics.

About AAMT

The AAMT has approximately 5500 individual and institutional members throughout Australia. The AAMT does not have direct membership: members join their local state/territory association of teachers of mathematics, and then are automatically members of AAMT. Members are teachers of mathematics or those involved in mathematics education in all sectors – including government, independent and Catholic – and at all levels: early childhood, primary, secondary and tertiary. The AAMT facilitates the professional networking of teachers and mathematics educators, and acts as a consultant and lobbyist on mathematics education issues. It regularly publishes newsletters and academic journals, and supplies teaching resources via a mail order service. It advocates the use of its “Standards for Excellence in Teaching Mathematics in Australian Schools”. More information about the AAMT is available by contacting its office in Adelaide (open weekdays during business hours) or from its website at www.aamt.edu.au.



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