

**Australian
Association of
Mathematics
Teachers Inc.**

Post GPO Box 1729

Adelaide SA 5001

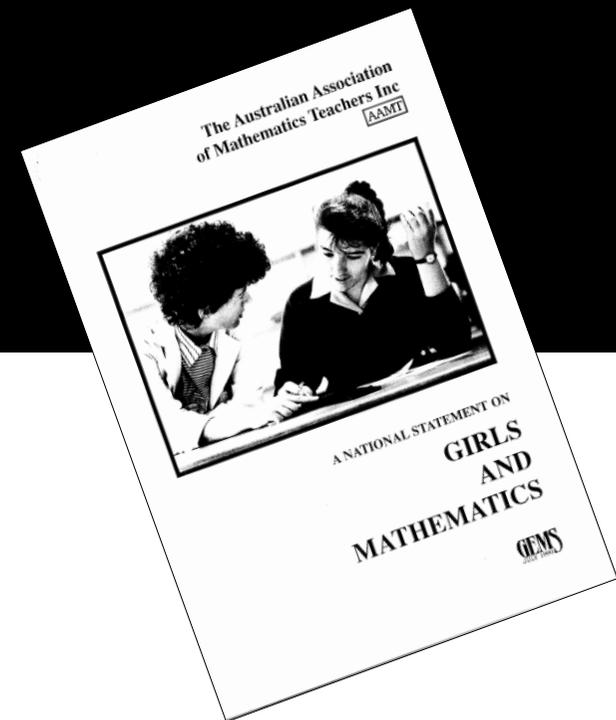
Telephone (08) 8363 0288

Facsimile (08) 8362 9288

E-mail aamtinc@nexus.edu.au

Web <http://www.aamt.edu.au>

Making decisions ...



... about Mathematics

Making decisions about Mathematics

Students and their parents are required at different times to make important subject and course selection decisions which can affect future course and career options. Unfortunately, the criteria which are used to make the decisions for girls are not always the same as those for boys. The importance of and reasons for continuing further study (and at the highest possible level) are the same- irrespective of gender.

Parents and teachers can influence students' final choices by the way they talk about and encourage mathematics and mathematical thinking from the early years. **This is the first action which needs to be taken by teachers and parents!**

This brochure has been prepared for parents and teachers to use when considering the issues relating to the continued participation of girls in mathematics courses. Some possible actions are also suggested.

The problem highlighted ... for girls

- As soon as mathematics ceases to be compulsory, fewer girls than boys choose to continue with the subject.. The participation rate for girls is lower than that for boys. This is particularly so in the more demanding courses.
- Where there is a choice of alternative mathematics courses, girls more frequently underestimate their ability and shy away from the more demanding courses, thus limiting their options in schooling and hence career choice. Those girls who choose the most demanding courses achieve, on average, the same level as boys in the same course.
- At the tertiary level, female students are under-represented in courses in mathematics and related subjects, such as the physical sciences, engineering, information technology, commerce, economics and architecture. However, girls who choose these courses achieve, on average, an equal standard to that of the male students in the same courses.

Where gender differences in achievement have been noted:

- they appear to relate more closely to the relative contextual familiarity of the tasks for boys and girls than to the level of difficulty;
- girls tend to do better in number, algebra, logic and statistics, and boys in ratio, measurement and geometry;
- girls are found to be under-represented in the top achievement band — that is the top 1% as identified by examination which rank students in national and international competitions.

Towards solutions ...

- **Girls are more likely than equally-achieving boys to express uncertainty in their mathematical ability.**

and

- **While boys are more likely to overrate their achievement levels across all areas of school work, girls are more likely to underrate their achievements.**

Action for Teachers

- Give students specific rather than general praise: not 'well done', but 'You explained the process very clearly' or 'Your choice of graphical representation showed that data very clearly.'

Action for Parents

- Show that you have confidence in students' ability, application and achievement.

- **There is some evidence that girls tend to be less content to work with concepts they have not fully understood.**

Action for Teachers

- Use teaching methods which cater for a variety of approaches to learning.
- Emphasise achievement in mathematical thinking rather than in rote learning or routine application.
- Incorporate applications of mathematics with important social issues to present mathematics as a human, creative endeavour.

Action for Parents

- Show that you have confidence in students' ability, application and achievement.

Towards solutions ...

- ❑ ***Both girls and boys express the view that taking secondary mathematics is mainly to obtain credentials and is not sufficiently related to life and work.***

and

- ❑ ***Girls are less likely than boys to be concerned about mathematics as a credential for future education and occupations.***

Action for teachers

- Teachers should be proactive in the development and demand of accreditation boards that develop syllabuses and courses appropriate to the needs of students and explicit in links with life, work and life-long learning.
- Highlight the many applications of mathematics in everyday life as well as in a range of traditional and non-traditional occupations.

Action for parents

- Become informed about the nature of mathematics education to be better equipped to ask some tough questions of schools and accreditation boards. Participate in programs at schools in order to become acquainted with the mathematics taught, the methods used and the importance of the subject in today's society. Ask questions about the relevance of course structure and context.

- ❑ ***The competitive nature of school mathematics is seen by many as reflecting more closely the work environment of men.***

Action for teachers

- Make effective use of discussion methods and small group investigations, where the collaborative work and open-ended emphasis is on competition.
- Use a variety of assessment strategies — written, oral and practical tasks, etc..
- Be aware that some multiple choice tests do not necessarily measure mathematical achievement but might reflect a student's confidence or willingness to take risks.
- Focus on student achievement, application and motivation in mathematics.

Action for parents

- Highlight examples of the use of mathematics in a range of traditional and non-traditional occupations.

The problem highlighted ... for parents

Through lack of information and consideration of career options and pathways for their children, parents can unwittingly endorse course selections, which has the effect of closing future course and career options for their children.

Should we be concerned?

Those girls (and boys) who under-participate in post-compulsory mathematics may be disadvantaged by having less control over certain aspects of their lives and less opportunity to develop their full potential.

Specifically,

- their educational and occupational opportunities may be reduced because mathematics is an entry requirement of many post-secondary courses and careers;
- in the 21st century there will be fewer employment opportunities for unskilled workers. Future employment opportunities are more likely to be found in technology-based jobs which will demand higher levels of mathematical competence.

Australia needs to use its full pool of mathematical talent in order to develop new ideas, designs and devices.

Increasing girls' (and boys') participation in post-compulsory mathematics is a challenge for mathematics educators that needs to be addressed urgently .

Towards solutions ...

There are no simple explanations for gender differences in participation and achievement in mathematics. It is important to remember that there are considerable overlaps between the needs, concerns and interests of girls and boys. Research evidence suggests some general statements about the way students react to school mathematics —

Towards solutions ...

- ***Girls are more likely than boys to choose school subjects on the basis of interest and perceived social relevance.***

Action for teachers (and education systems)

- Wherever possible, ensure that the range of contexts within which mathematical concepts are developed and problems posed cater for the experiences and interests of girls.
- Provide opportunities for discussions about social aspects relating to mathematics, such as gambling, credit, etc..
- Present students with information about further study in mathematics and career options. Make sure they have the appropriate and relevant information.
- Let students know that industry, commerce and education use mathematics as a 'selection filter'. They need to know the facts.

Action for parents

- Be aware of, and positive about those aspects of Mathematics courses that girls indicate their preference for.
- Involve girls in activities and decision-making processes within the family situation that highlight the social aspects of mathematics such as holiday planning, or purchasing a car.
- Be active in demonstrating that mathematics is more than number. It is also about developing and using higher order thinking skills.

Towards solutions ...

- ***Fewer girls than boys perceive mathematics as relevant to their future lives***

and

- ***Both girls and boys perceive mathematics in the adult world as more important for men than women.***

Action for teachers and career counsellors

- Provide information and opportunities that allows students to explore and discuss the mathematical demands of different careers.
- Highlight role models for girls in careers which require mathematics.
- Ensure a fair distribution of the nature and amount of teacher attention across the whole class.
- Where appropriate, bring the issue of gender in classroom interaction into the open through class discussion.

Action for parents

Seek out information and demand of your school:

- an adequate level of career counselling for students, particularly in non-traditional careers for women, requiring mathematics.
- information and opportunities that allows students to explore and discuss the mathematical demands of different careers.
- That where choice of subjects is involved, school timetables make provision for girls to take mathematics along with other subjects of interest to them.