Gender issues and the promotion of effective learning

Helen Forgasz

Många lärare söker stipendier för att studera i och byta erfarenheter med andra miljöer. Författaren till denna artikel tillbringade sex veckor vid en svensk högskola. Artikelns begrepp innehåller från en seminarserieserie under denna tid.

Under the auspices of the Swedish Council for the Renewal of Undergraduate Education, I spent six weeks teaching at the Malmö School of Education (Lund University). As well as working with the students preparing to become teachers of grades 4–9, I ran weekly seminars for staff, local teachers and students. The theme of the seminar series was "Gender issues and the promotion of effective learning of mathematics". This article begins with a brief description of the theoretical basis for the seminar series and then the issues discussed with the participants are outlined.

Theoretical framework for the seminar series

In many countries, including Australia and Sweden, more males than females study the most demanding mathematics courses at school and in higher education. Gender differences in mathematics achievement are also found; their directions seem to depend on the form of assessment used. Females are often reported to outperform males on classroom grades; males are frequently found to score higher than females on standardised tests, timed examinations, and the most cognitively demanding mathematical tasks. The achievement measures taken as indicators of mathematical success or potential are usually those on which males excel over females.

Those concerned with gender equity in mathematics learning have sought explanations for the persistent patterns of gender difference favouring males (Fennema & Leder, 1990). Research has revealed a complexity of interacting factors that include:

- learner-related variables such as students' confidence and liking of mathematics, their beliefs about mathematics as a male domain, and the reasons given for success and failure in mathematics; and
- environmental variables such as society, parents, the peer group, the teacher, and the classroom learning environment (see Leder, 1992).

What takes place in the mathematics classroom can influence the development of children’s beliefs. The participants in the seminar series were introduced to several contemporary mathematics education issues which research has found can benefit the mathematical learning of all students.

Helen Forgasz arbetar vid La Trobe University, Melbourne i Australien. För närvarande innehar hon ett treårigt "post-doctoral fellowship" med placering vid La Trobe universitetet. I forskningsprojektet ska hon bli undersöka studenters attityder till matematik under den grundläggande utbildningen vid universitetet.
The seminar series

In the opening seminar, the gender issues in mathematics learning discussed above were brought to the attention of participants. Participation and performance statistics from Australia and Sweden were presented. Examples of recent research findings from Australia were discussed. They revealed that:

- Among grade 7 students:
  - males liked mathematics more than did females
  - males believed they were better at mathematics than did females
  - males stereotyped mathematics as a male domain to a greater extent than did females
  - males were greater risk-takers than females
  - males and females chose different questions as the easiest and most difficult to solve

- Among grade 2 students:
  - males believed they were better at mathematics than did females
  - males overestimated and females underestimated their achievements compared to their teachers’ ratings

- As young as four years of age, children can hold views that mathematics is a gender dependent field more closely associated with males’ than with females’ occupations, interests and achievements.

The next two seminars examined the following inter-related topics: cooperative learning, problem-solving, and assessment. Students’ descriptions and drawings of ‘typical’ mathematics lessons reveal common patterns which exemplify the "traditional mathematics classroom": lessons begin with a review of homework, the teacher does a few examples on the board, the teacher tells students which questions they should do from the textbook/worksheet, and students work on them till the lesson ends. That is, lessons are teacher-centred, students are often passive listeners and they work alone. Cooperative learning and problem-solving are usually absent from the descriptions. Research has shown that females like to learn cooperatively and that there are positive benefits for all students: achievements are enhanced and more positive attitudes and beliefs about themselves and about mathematics are fostered.

To qualify as a ‘true’ cooperative group task, the task needs to be appropriate and should not be able to be done alone. The process should require equitable input from all group members and the task context should be of interest to both males and females. Other factors associated with effective and productive group work include: recognition of status factors among group members, prior training for cooperation, group composition (number of members and sex mix), and assessment (if relevant).

Problem-solving has been recognised as an important aspect of mathematics learning. A ‘mathematics problem’ is viewed as a task for which the solution or the mathematical processes needed to complete the task are not immediately obvious. Appropriately chosen problems can be undertaken individually, in pairs, in small groups or as whole class activities. After attempting several ‘problems’, seminar participants became more aware of the relative merits and difficulties associated with problem-solving in the mathematics classroom.

Learning that is valued is assessed. Difficulties are associated with the assessment of problem-solving particularly those tasks completed collaboratively. If grades are to be given, a clearly developed set of criteria associated with each grade is needed. The general rubric developed by Grouws and Meier (1992) was illustrated with a specific example used in a research project with Australian grade 7 students.

As knowledge about how children learn mathematics has expanded, there has been growing awareness of the need to change the way in which mathematics is taught. In Australia, curricular innovation has taken place and a range of excellent
materials has been developed. In the next seminar, participants were shown several examples. Simply bringing good material into the classroom is not enough, however. Activities need to be used appropriately in order to optimise students’ learning outcomes. Video clips from Australian mathematics classrooms were used to illustrate some of the difficulties that can arise when teachers choose inappropriate activities or have not thought through the consequences of student engagement in particular tasks. The final seminar addressed one of Sweden’s ‘hot’ contemporary issues: whether students should learn mathematics in single-sex or mixed learning settings. Australia has a long history of single-sex schooling and the issue has been debated vigorously from time to time. Research results are not conclusive, however. Learning settings cannot be isolated from a number of other interacting factors; for example: school organisation; curriculum, modes of instruction and assessment issues; the attitudes and beliefs of teachers, parents, the peer group and students. Research findings from Australia were presented to participants which illustrated a number of these points. A recent evaluation of one co-educational school’s program of single-sex mathematics classes for grade 10 students illustrated the complexity of the issue:

- girls and mothers of daughters were more supportive of the program than were their male counterparts at the beginning and
- at the end of the school year boys’ beliefs about themselves as learners of mathematics were more positive than were girls’ and for some variables the gender gap increased as the year progressed (for example, beliefs about their achievement levels in mathematics)

- males’ and females’ choices of mathematics options for grade 11 showed no gender differences
- the students identified the teacher as the most important factor influencing how well they learnt mathematics.

**Final words**

The seminar series aimed to raise participants’ awareness of gender issues related to mathematics learning, to stimulate interest in the theoretical foundations of the directions of change evident in more contemporary mathematics curricula, and to provide practical suggestions, based on solid research evidence, for ways in which teachers can improve the mathematics learning outcomes of all students. Importantly, the complexity of the interacting factors associated with gender differences in mathematics learning outcomes was highlighted. It was suggested that there is no simple solution to overcome gender differences and that a multiplicity of approaches is needed. The strategies presented were founded in the premise that teachers strive to maximise the potential and learning opportunities of all students.

**References**

