

## Topic Group 18

### Roles of calculators in the classroom

Chief organizer: Pedro Gómez (Colombia)

The Topic Group 18 “Roles of calculators in the classroom” centered its work on graphing calculators and new hand-held computers and their role in Mathematics Education. Its target population was secondary teachers with little experience with calculators. This group met on two occasions, each of 90 minutes duration. Between 100-150 attended each session.

The purposes of this Topic Group were:

- To inform, develop and support reflection and discussion concerning the roles that calculators have played and can play in the teaching and learning of Secondary Mathematics.
- To show both why and how teachers would want their students to use hand-held computer technology.
- To present the “state of the art” on calculators and hand-held computers and their role in Mathematics Education.

Each of the two sessions were divided into three activities: two plenary presentations (20 minutes each) in each session; short talks in which specific projects and experiences were presented; the last 20 minutes of each session were used for discussion and questions.

Themes from the plenary conferences

Graphing calculators and mathematics education in developing countries (Pedro Gómez)

By permitting students to experiment with “new” forms of learning and “seeing” mathematics, graphing calculators affect the learning process and, as a consequence, can put pressure on teachers and curriculum developers concerning the teaching process. In this way, when adequate conditions are given, this new technology can reinforce the change process that is taking place in the teaching and learning in some areas of mathematics. Nevertheless, in developing countries the necessary conditions to create this dynamic relationship between curriculum and the new technology does not necessarily exist. Therefore the use of calculators present a series of risks and opportunities. The effect that they can have on student behavior and, consequently, on the reflections that teachers make on their own practice, can be used in those countries as a means to initiate and consolidate a process of change through curricular innovation and teacher preparation. Developed countries and the international community can make important contributions in that sense.

Handheld technology & mathematics: Towards the intelligent partnership (Peter Jones)

The pace of technological change is so great that any attempt to focus our attention on a particular technology and its potential impact on the teaching and learning of a particular topic in mathematics is likely to be of transitional value only. Everyday a new and even more sophisticated version of the current technology emerges to take its place. How do we make progress in such a volatile situation? One way is to try and put the problem in a broader perspective by recognizing that we have always used some sort of technology to support mathematical activity in the classroom and to understand what this meant in the past and what are the implications for the future.

Calculators in the classroom: A look to the future (Bert K. Waits, Franklin Demana)

Computer symbolic algebra software on hand-held computers like the Texas Instruments TI-92 will likely become as popular as scientific calculators are today. Many paper and pencil computation methods learned today should become obsolete necessitating many changes in the mathematics curriculum of the future. The mathematics curriculum of the future can focus more on problem solving, applications concepts, and understanding.

Will elementary algebra disappear with the use of new graphing calculators? (José R. Vizmanos)

We begin with an historical look at the development of algebra by Diophantus, Al-Khowarizmi, Lucas Pacioli, Tartaglia, Descartes, etc. Then the relationship is established between the algebraic content and procedures necessary for students in secondary schools, which today can be solved very easily with a graphing calculator. A few examples will be given with the TI-92. Finally, we will insist that even if algebraic procedures will be obsolete in the near future, what will not become obsolete are the algebraic thinking strategies and the reasoning processes that permit us to model as equations situations that are given as verbal descriptions. These not only will not lose their importance with the appearance of graphing calculators; they should, much to the contrary, be the main objective of secondary teaching. Therefore, it appears that a profound revision of the algebra curriculum must be completed in order to adapt it to the future.

Themes from short talks

Short talks dealt with many different issues related to graphic calculators. Some of them were concerned with graphic calculators' use in specific areas of mathematics (Berry, Foley, Dick, Resek, Grant, and Lucas). Other short talks dealt with topics related to the mathematics curriculum and its relationship with technology (Scott, Broman, Watanabe, Quesada, Carvalho, and Kissane et al.).

The meetings were coordinated by Pedro Gómez and Bert Waits. Juan Manuel García and Nestor Aguilera helped with the local organization. We want to thank Patrick (Rick) Scott who translated from Spanish two of the papers.

The meeting attracted many people and was quite varied in the issues discussed. The contents of the plenary conferences and the short talks were published in the World Wide Web at the following URL:

<http://ued.uniandes.edu.co/roles-calc.html>