Mathematics Council
NEWSLETTER
The Alberta Teachers' Association

Volume 16 Number 2 October 1997

Providing leadership to encourage the continuing enhancement of teaching, learning and understanding mathematics.

Special Issue

Interim Position Paper of the MCATA Executive Regarding Use of Calculators in Provincial Assessment Programs

Introduction

The executive of the Mathematics Council of The Alberta Teachers' Association (MCATA) has developed an interim position paper on the use of calculators in provincial assessment programs and wants to share it with the membership of MCATA. It is being circulated to you to get you involved in the review and its development. Please review this Interim Position Paper, discuss it with your colleagues and send us your feedback, responses, comments, suggested revisions and expressions of support/concern by **November 2, 1997.**

While this paper currently represents the interim position of the MCATA executive, we want it to eventually become not only the official position of MCATA but also of The Alberta Teachers' Association, following review by the Provincial Executive Council.

Those of you who will be attending the 1997 Annual MCATA Conference, November 1–2, in Edmonton, will have another opportunity to discuss this Interim Position Paper, as there will be a session dealing with this paper at the conference. We urge you to become involved in helping us develop this important position statement on the use of calculators in provincial assessment programs.

Please send your written feedback to Florence Glanfield, MCATA president, 8215 169 Street NW, Edmonton T5R 2W4; or fax 483-7515 or e-mail glanfiel@gpu.srv.ualberta.ca.

— Florence Glanfield

Draft 1997 10 01 **For Discussion Only**

Background

In May 1997 representatives of the MCATA executive attended a meeting with the Science/ Mathematics Unit of the Grade 12 Diploma Examinations of Alberta Education. The discussion surrounding that meeting was about the role of a calculator on diploma examinations.

Teachers who are attempting to adhere to the current Mathematics/Sciences Diploma Examinations Calculator Policy as stated by Alberta Education find it difficult to implement. Many of the calculators currently being used by students on the Diploma Examinations are alpha-numeric. The current policy indicates that programs to facilitate the computation of formulas on the Mathematics 30 and 33 formula sheets are allowed, as well as programs for graphing quadratic relations. There are many ways that students can store notes, however, in these calculators and it is becoming increasingly difficult to ensure that students are not using these calculators for storage of notes. As calculator technology continues to evolve, the issue surrounding storage of notes will not only affect the Grade 12 mathematics diploma examinations but also the Grade 9 mathematics achievement test. For example, there is a scientific calculator with graphing capabilities that is currently being marketed to junior high school students.

In further discussion with the entire MCATA executive, we felt it was necessary for MCATA, as a representative of the mathematics educators in Alberta, to develop a statement about the use of calculators and technology in provincial assessment programs. We felt that, with the advancing and evolving nature of calculators and computers, the diploma examinations would not be the only assessment program affected. There is a common belief among the executive members that as students increasingly use technologies in learning mathematics, they should also have access to the use of these technologies in assessment situations.

Beliefs

MCATA supports the role of technology as identified in the Western Canadian Protocol and the *Alberta Program of Studies for K–12 Mathematics,* 1996–97. Technology plays a role in mathematical processes where calculators and computers are used as tools to:

- develop concepts
- explore and demonstrate mathematical relationships and patterns
- organize and display data
- assist with solving problems and thus promote independence
- encourage students to be inquisitive and creative
- decrease the time spent on tedious computations
- reinforce the learning of basic number facts and properties
- develop an understanding of computational algorithms
- create geometric displays
- simulate situations. (*Alberta Program of Studies for K–12 Mathematics*, 1996, p. 11)

Along with the technology-related statements in the *Alberta Program of Studies for K–12 Mathematics,* 1996–97, MCATA also supports the following:

- Students engage in solving realistic problems using information and the technological tools available in real life and that skills, procedural knowledge, and factual knowledge are assessed as part of the doing of mathematics. (*Assessment Standards for School Mathematics*, National Council of Teachers of Mathematics, 1995, p. 11)
- The assessment of students' knowledge of *mathematics procedures* should provide evidence that they can: recognize when a procedure is appropriate; give reasons for the steps in a procedure; reliably and efficiently execute procedures; verify the results of procedures empirically (e.g., using models) or analytically; recognize correct and incorrect procedures; generate new procedures and extend or modify familiar ones; appreciate the nature and role of procedures in mathematics. (*Curriculum and Evaluation Standards for School Mathematics*, National Council of Teachers of Mathematics, 1989, p. 209)
- The assessment of students' knowledge of *mathematical concepts* should provide evidence that they can: label, verbalize, and define concepts; identify and generate examples and

non-examples; use models, diagrams, and symbols to represent concepts; translate from one mode of representation to another; recognize the various meanings and interpretations of concepts; identify properties of a given concept and recognize conditions that determine a particular concept; compare and contrast concepts. (*Curriculum and Evaluation Standards for School Mathematics*, National Council of Teachers of Mathematics, 1989, p. 223)

- The assessment of students' ability to use mathematics in *solving problems* should provide evidence that they can: formulate problems; apply a variety of strategies to solve problems; solve problems; verify and interpret results; generalize solutions. (*Curriculum and Evaluation Standards for School Mathematics*, National Council of Teachers of Mathematics, 1989, p. 228)

Recommendations

In light of the directions established by the *Alberta Program of Studies for K–12 Mathematics,* 1995–97, the statements about student assessment, the continued improvements in technology, and the way in which technology is changing the face of mathematics education, MCATA recognizes the importance of technology in provincial assessment programs.

Recommendation 1

Grades 3 and 6 Mathematics Achievement Testing Program

If the Grades 3 and 6 Mathematics Achievement Testing Program continues to be administered, then MCATA recommends that Alberta Education continue with the position that:

> Students may use manipulative materials and calculators. It is recommended that students use calculators only if they generally use them in their math program. Calculators are not needed to successfully complete the assessment. (*Grade 3 Mathematics Information Bulletin*, 1996–97, p. 9)
>
> Students may use manipulative materials and calculators when completing the multiple-choice component. (*Grade 6 Mathematics Information Bulletin*, 1996–97, p. 10)

Rationale

MCATA believes that these positions support the use of technology as a tool in the mathematics program.

Recommendation 2

Grade 9 Mathematics Achievement Testing Program

If the Grade 9 Mathematics Achievement Testing Program continues to be administered, then MCATA recommends that Alberta Education considers packaging the test into two parts; one part that students would write without the use of technology, and one part where students would require the use of a scientific calculator, or equivalent technology.

Grade 12 Mathematics Diploma Examinations Program

MCATA recommends that Alberta Education consider packaging the diploma examinations in two parts: one part that students would write without the use of technology and one part that would require the use of a scientific calculator with graphing capabilities, or equivalent technology.

Rationale

The rationale to consider a test and examination packaged into two parts is that it will provide an opportunity to assess a broader range of learner outcomes across strands and mathematical processes in the Alberta Program of Studies.

We would propose that both parts of these tests/examinations would assess mathematical thinking and processes, as described in the Alberta mathematics curriculum documents. For example, questions that ask students to show that they can visually identify the graph of a particular function or relation cannot currently be asked in Mathematics 30 because students with a graphing calculator are able to enter the equation of the function and plot the graph. Similarly, in Grade 9, to have students select the graphical representation of a box plot would not be an equitable question to ask because some students may have calculators that can produce a box plot, given a set of data.