COMMENTARY

1980s

An Agenda in Action, A Decade of Change

A. Craig Loewen

In 1980 the National Council of Teachers of Mathematics (NCTM) published a document entitled *An Agenda for Action.* The eight recommendations in that document became one of the most significant collections of ideas for mathematics instruction of the decade, and have since shaped both research directions and thinking about mathematics instruction specifically and mathematics education generally. The agenda was widely adopted across North America, and the recommendations wound themselves inextricably into mathematics classrooms and academia alike.

The eight recommendations can be found on the NCTM website (nctm.org). Since 1980 they have been further developed in the NCTM journals and the 1983 NCTM yearbook, *The Agenda in Action.* At the close of the decade, the NCTM publication *Curriculum and Evaluation Standards for School Mathematics* (1989) defined new standards for mathematics instruction. The original eight recommendations (copied from www.nctm.org/standards) are that

Selected Writings from the Journal of the Mathematics Council of the Alberta Teachers' Association, pages 229–233

1. problem solving be the focus of school mathematics in the 1980s
2. basic skills in mathematics be defined to encompass more than computational facility
3. mathematics programs take full advantage of the power of calculators and computers at all grade levels
4. stringent standards of both effectiveness and efficiency be applied to the teaching of mathematics
5. the success of mathematics programs and student learning be evaluated by a wider range of measures than conventional testing
6. more mathematics study be required for all students and a flexible curriculum with a greater range of options be designed to accommodate the diverse needs of the student population
7. mathematics teachers demand of themselves and their colleagues a high level of professionalism
8. public support for mathematics instruction be raised to a level commensurate with the importance of mathematical understanding to individuals and society

The ten articles selected by the editors to represent the 1980s for this commemorative issue of *delta-K* publication address one or more of these recommendations.

PROBLEM SOLVING

The first item of the agenda was the recommendation to "let problem solving be the focus of school mathematics for the 1980s." The recommendation stems from the idea that effective problem solving is ultimately the purpose of mathematics instruction, and that problem solving is also a process whereby mathematics can be learned. It is in engaging the exploratory experiences of solving problems that the applications of mathematics come to life and students come to see purpose in their learning. And with purpose comes enjoyment. The inherent importance of problem solving both as a goal and a process implies that the mathematics curriculum itself should be organized around it. In the article by Sigurdson, "A Constructivist Approach to Teaching Mathematics," the theories of constructivist principles of teaching and learning are applied to mathematics classrooms. Sigurdson presents problem solving as a way of "knowing content." D'Entremont's article, "Readability: A Factor in Textbook Evaluation," contests that the readability of classroom textbooks may limit students' understanding of content and their ability to solve problems. She argues that readability should be considered in the selection of classroom resources and she provides an example of an Alberta-approved grade 10 classroom text written at the grade 12 or

early postsecondary reading level. Percevault's article "The Development of Problem-Solving Skills: Some Suggested Activities" (the second of two parts) directly addresses problem solving as it provides a range of exploratory activities that encourage the development of certain problem-solving skills and strategies while teaching addition, subtraction, and commutativity.

UNDERSTANDING

The second of the eight recommendations of *An Agenda for Action* is that "basic skills in mathematics be defined to encompass more than computational facility." This recommendation addresses the common misconception that mathematics is ultimately about formulas, numbers, and the ability to find the right answer consistently, immediately, and efficiently. But what does it mean when we say a concept is *understood?* There are many dimensions to understanding that include the ability to connect new knowledge to existing knowledge, mastery of the language about a concept, the ability to create and interpret representations of the concept, the ability to apply new knowledge, and so forth. Each of these dimensions of understanding needs to be part of a robust mathematics curriculum and evident in the acquired abilities of our students. In "Statistics in the High School," Haack addresses the question of understanding statistics, the abuses of statistics, and the misuses of the language of statistics. He also discusses the structure of knowledge, the interconnection of ideas, the role of student awareness (metacognition) in learning, and the importance of knowledge transfer as indicators of learning. Yvon and Zaitz, in "Combining Literature and Mathematics," suggest that children's literature provides a context for the learning of mathematics as students see characters engaging in mathematical tasks. Finally, Ediger, in "Psychology in Teaching Mathematics" discusses the structure of mathematical knowledge and the role of engaging behaviorist and humanist principles in the development of effective learning and teaching environments.

TECHNOLOGY

The third NCTM recommendation is that "mathematics programs take full advantage of the power of calculators and computers at all grade levels." It is simply evident that technology has changed dramatically since the 1980s. The availability of technology, range of applications, software, and cost have all changed beyond anything that could have been imagined in 1980, and those changes brought profound implications for classrooms, such as the introduction of virtual classrooms and virtual schools. Two of

the selected articles reflect the technology of the time. Le Maitre, in her article entitled "If this Is Television, Shouldn't My Intelligence Be Insulted?," speaks of the need to teach in the manner in which our students best learn (the enduring thesis) and extols the value of viewing videotapes to enhance lessons. An amusing moment in her article occurs when she encourages teachers concerned about their skills in working a videocassette recorder to "ask one of the children in your class to show the tape; after all, your students are growing up with VCRs as we did with radios." Burnett's article, "Logo: An Opportunity for Synthesis, Self-Control, and Sharing," addresses the opportunities for mathematical exploration inherent within the Logo environment. He argues that Logo matches well with what we know about how students learn.

MEETING THE NEEDS OF LEARNERS

The sixth agenda item speaks of the need for a more complete and flexible mathematics program that addresses the diverse needs of the variety of learners in our classrooms. Programs are needed that reach out to students, involve them, and impress upon them the importance of mathematics in society and in their lives. The article by Alton and Gersting, "An Alternative Course for the 'I Hate Math and I've Never Been Any Good At It Student,'" describes a course they developed and delivered at Indiana University–Purdue University at Indianapolis (IUPUI) for students who had negative perceptions of mathematics and saw it only as a mystical collection of formulas and numbers. In this course students were encouraged to see math as applicable to life, a way of interpreting and understanding the world, and even as something to be enjoyed. The article by Nicol, "Expecting Girls to be Poor in Math: Alternatively, Chance for a New Start," explores the NCTM position statement on gender and mathematics learning and recommends some useful materials for encouraging girls to study math.

As one reads these articles one cannot help but be struck by how they illustrate the character of *delta-K* and of the Mathematics Council of the Alberta Teachers' Association (MCATA) itself. The council has reached out across both sides of the border with its many international submissions. *Delta-K* has included articles written by students, professors, and classroom teachers. The articles themselves have both addressed big-picture topics and provided specific classroom activities for both upper and lower grades; the articles have included research results, theoretical musings, and practical activities. But each, at its heart, has this goal as its foundation: to gain and maintain improvement in mathematics teaching and learning. This is ultimately the purpose and intent of *delta-K* and its parent organization, the Mathematics Council of the Alberta Teachers' Association.

These ten articles provide a snapshot of our society at a time of great change and development. We see genuine efforts being made to focus on problem solving, address gender bias in classrooms, recognize learning as an act of meaning building, teach in a manner responsive to student needs, and incorporate technology fully into the learning/teaching process. Collectively, these changes have altered the nature of mathematics learning and teaching, as well as the content of the curriculum. A decade of change . . . an agenda in action.

Dr. Craig Loewen is currently serving as the Dean of Education at the University of Lethbridge (Alberta, Canada). His area of teaching and research is secondary mathematics education, a position he has held for over 25 years. He is particularly interested in alternative ways of teaching mathematics that inspire and influence understanding and problem solving behavior. Dr. Loewen previously served as editor of *delta-K* and has published more than a dozen articles with the journal.

REFERENCES

Krulik, S., & Reys, R. E. (Eds.). (1980). *Problem solving in school mathematics: 1980 yearbook.* Reston, VA: National Council of Teachers of Mathematics.

National Council of Teachers of Mathematics (NCTM). (1980). *An agenda for action: Recommendations for school mathematics of the 1980s.* Reston, VA: Author.

National Council of Teachers of Mathematics (NCTM). (1989). *Curriculum and evaluation standards for school mathematics.* Reston, VA: Author.

Shufelt, G., & Smart, J. R. (Eds.). (1983). *The agenda in action: 1983 yearbook.* Reston, VA: National Council of Teachers of Mathematics.