Mathematics Teachers Conference 2008

Abstracts of Keynote Lectures

Primary School Section

Keynote 1

Using good questions to enhance learning
by Professor Peter Sullivan (Monash University, Australia)

Abstract

The richness of an answer is a function of the quality of the question. If we hope that students will think, make connections, persevere, justify, communicate, and create mathematics, then we need to pose questions that allow the possibility of such responses. This presentation describes characteristics open-ended questions that that are suitable for students from a range of abilities, that prompt the seeking of patterns and connections, that are readily adapted to the teachers' specific curriculum goals, and that foster the forming of generalisations. The presentation also examines some of the actions teacher can take to support the learning of students experiencing difficulty and to challenge those who respond readily.

Keynote 2

Infusing thinking skills in mathematical problem solving
by Juliana Ng (Master Teacher, Singapore)

Abstract

Problem solving is an integral part of mathematics learning. In Singapore, the primary goal of mathematics learning is to be able to logically and creatively solve problems. Every mathematics teacher plays a key role in developing his or her students' problem-solving dispositions. By infusing thinking skills into the learning of mathematics, teachers can help students to strategically grow in their problem-solving abilities. This lecture highlights the explicit development and use of thinking skills in learning mathematics in the primary school. Participants will engage in minds-on activities to experience how thinking skills can be explicitly infused into problem-solving.

Secondary School Section

Keynote 1

Problem Solving as a Vehicle for Teaching Mathematics: A Japanese Perspective
By Professor Yoshinori Shimizu (University of Tsukuba, Japan)

Abstract

Japanese mathematics teachers often organize an entire lesson by posing just a few problems with a focus on students' various solutions to them. They seem to share a belief that learning opportunities for their students are best raised when they are engaging on a challenging problem. Why do teachers in Japan consider teaching mathematics through problem solving beneficial? How do they achieve their goal of teaching mathematics content through the process of problem solving? In this lecture, Japanese approach to teaching mathematics through problem solving is overviewed with a description of typical organization of mathematics lessons in Japanese schools. The fundamental assumption that underlies the Japanese approach is discussed. In particular, how teachers plan a lesson by trying to allow mathematics to be problematic for students, to focus on the methods used to solve problem, and to tell the right things as the right times. Examples of textbook problems and anticipated students' solutions to them are presented to show how teachers share and analyze the

solutions in the classroom discussion for achieving their goal of teaching mathematics. Finally, some practical ideas in the classroom shared by Japanese teachers are presented.

Keynote 2

Curiosity in mathematics and mathematical problem solving

by Dr Toh Tin Lam (MME/NIE)

Abstract

Problem solving is at the center of the Singapore mathematics curriculum framework. While communicating to students the various problem solving heuristics and thinking skills is important, it is equally important to arouse the students' curiosity into the various mathematics concepts before the students could see the urgency to learn the problem solving strategies. In this lecture, different approaches to arouse the students' curiosity in mathematics, together with the effort to link school mathematics and "interesting" mathematics, are discussed.

Junior College Section

Keynote 1

Using Extended Problem Solving Tasks in Classroom Assessment: A Story from the Japanese Senior High School Classroom

By Professor Yoshinori Shimizu (University of Tsukuba, Japan)

Abstract

Although it is recognized as important to instruct and to assess students in problem solving and modeling, these assessment practices are not implemented sufficiently in Japanese senior high schools partly because of severe constraints placed by entrance examinations to university. In this lecture, the trends and issues in teaching problem solving and modeling in senior high school in Japan are reviewed. Then, a story from a Tokyo high school, where eleventh grade students engaged on an extended problem solving task, is described to ask questions such as the followings: How the extended task encouraged the students to think more deeply about mathematics? How did the assessment enhance the students' mathematics learning and what was learned about the range of their thinking and their abilities? By working on the extended problem solving task and preparing a report of their work, the Japanese students experienced a learning opportunity that could never have come through a traditional paper and pencil tasks.

Keynote 2

Problem solving and mathematical modeling

by A/P Ang Keng Cheng (MME/NIE)

Abstract

Mathematical modeling is commonly regarded as the art of applying mathematics to a real world problem with a view to better understand the problem. As such, mathematical modeling is obviously related to problem solving. However, they may not mean the same thing. In this talk, various aspects of mathematical modeling and problem solving will be discussed. Using concrete examples, some of the basic ideas and processes of mathematical modeling will be introduced and described as an approach to problem solving. Although the focus is on deterministic modeling involving differential equations, examples will be drawn from different areas of applications.
