

# Deepening Teacher Knowledge

Summer Math Program  
at the  
University of Ottawa

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# Summer Math Program

- n 1-week Summer Math Program for prospective elementary teachers (piloted in August 2004)
- n Five full days of engaging mathematics activities for 75 incoming teacher candidates (5 groups of 15)

# Purpose

- n Focus on developing prospective elementary teachers' mathematical understanding & provide beginning teachers with a unique teaching setting
- n Provide positive mathematics learning and teaching activities to help to shift attitudes and understandings of mathematics

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- n Research - provides a research setting to examine how teacher knowledge and practice is developed
- n Program - provides an additional optional component for prospective teacher candidates who would like to increase their understanding of mathematics

# The Program : Start-Up

- n When the offer of admission was sent to P/J and J/I teacher candidates, information was sent to them offering this 1-week program in August
- n We were hoping to have at least 75 applicants – in fact, 192 teacher candidates wanted to take part. Due to resources we had to limit it to “first come – first served” in this first year

# The Program:

## What did the week look like?

- n Series of group activities incorporating a variety of strategies:
  - n Small group problem solving
  - n Open-ended investigations
  - n Use of manipulatives
  - n Focus on sharing solutions
  - n Introduction to use of technology for math investigation
  - n Outdoor activities - Math trek in Ottawa

# Math Trekking in Ottawa



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# Program Team

The framework of the program was developed by the 2 professors but the full team planned and implemented the schedule of activities, and de-briefed each day.

- n Two professors
- n Five facilitators (carefully selected 2004 I/S Math graduates from U of O)
- n One Teaching Assistant
- n One Research Assistant

# Research: Overview of the Study

A longitudinal study to gain a rich description of the processes involved in developing teachers' foundational mathematical knowledge in conjunction with appropriate pedagogies which they can apply to implementing reform-oriented mathematics programs.

# Research suggests that:

Teachers need to experience communities of mathematical inquiry both as learners and as teachers in order to shift practice.

# Experiences in Inquiry-based Learning

- n Experiences as learners:
  - n to deepen their understanding of mathematics and to experience models of inquiry-oriented pedagogy.
- n Experiences as teachers:
  - n To be supported in exploring new ways of teaching.

In both cases, as learner and as beginning teachers, they should be experiencing a collaborative environment supporting a community of learners engaged in mathematical inquiry.

# Addressing both learners and teacher

- n Mathematics learners - Prospective elementary teachers before they enter the Teacher Education Program
- n Beginning Mathematics Teachers – the facilitators were recently graduated math teachers

# Research Methods

- n Participants -prospective elementary teachers and recently graduated secondary mathematics teachers
- n Instruments – Questionnaires during math program and in first year of teacher education program; de-briefing sessions with facilitators; focus groups will continue through the next 3 years



# Research Questions

- n What knowledge and beliefs do prospective elementary teachers have of mathematics?
- n What experiences will help to deepen prospective elementary teachers' understanding of the important mathematical concepts that they are going to teach?
- n How does participating in a community of teachers/learners support the development of mathematics teaching?
- n How do newly certified teachers of mathematics deepen their own understanding of mathematics in the context of teaching?

# Very Preliminary findings

- n At this point we have collected data from:
  - n a pre- and post-program questionnaire for teacher candidates
  - n Written submissions from problem solving activities
  - n Reflections of teacher candidates
  - n Facilitator journals
  - n Videotaped debriefing sessions with facilitators
- n The analysis of the data is in its initial stages. However there are some preliminary observations. Some of these are on the following slides.

# Some Preliminary Findings

n The **facilitators** (newly graduated secondary teachers) began to see the value in teaching through problem solving

“I used to think Chris was crazy when she said you could teach most of the course through problem solving. But now I think you can do it.”

“I was surprised that students could learn much more using these activities than you could if you were standing at the board talking.”

# Some Preliminary Findings

## n Prospective elementary teachers

### n Made mathematical connections

“Before, area and perimeter was all about memorizing a bunch of formulas. Now I see the connections between area, perimeter and volume and I don’t need all those formulas.”

“I never connected multiplication with area but now it make so much sense.”

# Some Preliminary Findings

- n **Prospective elementary teachers**

- n Recognized that there are multiple ways to solve problems

“It really helped to share our solutions. I saw many different ways to look at the same problem.”

# Some Preliminary Findings

- n Prospective elementary teachers
  - n Gained new perspectives on mathematics

“I used to think that math was rules and procedures but now I see it is a way of thinking.”

“Math is everywhere, it’s in everyday life, it’s related to the real-world.”

# Some Preliminary Findings

- n Prospective elementary teachers

- n Began to see mathematics more positively

- “There are very innovative ways to make math exciting.”

- “Math is not as scary, impossible and intimidating as once thought and I’m not as “stupid” with math as I previously thought.”

# Next Steps

- n Further analysis of data gathered during program
- n Follow-up questionnaires and focus group interviews