## Mathematics Teaching, Problems, and Professional Development

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Presentation to Association of Teachers'/Education Centres in Ireland (ATECI) Conference on 20 October 2012

## **Overview of Presentation**

- Professional development in mathematics
- Problems of professional development
- 4 models of professional development
- Problems in professional development
- Questions to ponder
- Discussion

## My Background

- Primary teaching and primary teacher education
- Studied maths education in the United States
- Summer courses in mathematics for primary teachers since 2004
- Present to teachers about mathematics teaching

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# Summer Courses for Primary Teachers 1995-2005



Delaney (2005)



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## Problems of Professional Development

#### From California Dreaming

- "Effective professional development programmes must walk a fine line between respecting teachers' knowledge and beliefs and challenging them to learn more and change." (p. 85)
- Facilitating discussions in which teachers confront their own mistakes in public, among other adults, requires grace, skill, and respect (on the part of the teacher-participants and the teacher leaders."(p. 95)
- "Schools, especially elementary schools, are places in which teachers have little experience discussing their work and little time to do so. People tend to be polite, keep ideas to themselves, and avoid confrontation and debates....Teachers who disagree with decisions complain in private and ignore the decisions in practice." (p. 94)
- "More frequent were sessions like that led by Ally, chock-full of important information about instruction, reform, and assessment, and weak on mathematics." (p. 94)



## **Evaluating Professional Development**

- How do you evaluate professional development?
- What do you find out?

A research perspective:

- Do teachers Learn?
- Do teachers change their practices?
- Does student achievement increase as a result?

Desimone (2011)



## Characteristics of Effective Professional Development

- Sustained and intensive is better than shorter
- Focused on subject content
- Gives teachers opportunities for active learning
- Includes teachers from the same school, subject or grade encourages collegiality
- Integrates professional development into daily life of schools
- Develops buy-in among participants
- Acknowledges participants existing beliefs and practices
- Makes use of an outside professional developer

(Garet et al, 2001; Richardson, 2003)

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## Sustained and Intensive

### The case of a primary mathematics laboratory

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## Veterinary Lab Class (c. 1897)



## Teaching Lab Class, 1953

## **Primary Mathematics Laboratory**

- Children work on some mathematics
- Children's discussions are amplified and recorded on audio and video
- Classroom materials are collected
- 2 hours a day, 5 days
- Teachers' pre-briefing and debriefing sessions
- Not model teaching but public teaching
- Site for student learning, teacher learning and research



# Opportunities for Active Learning (by teachers)

### A case of developing curriculum materials

## Collaborative Curriculum Design

- Teachers learn by collaborating on designing and developing materials
- Collaboration with PDST
- Teachers, professional developers, initial teacher educator, mathematician
- Materials were developed from practice for practice
- Replacement unit piloted in schools and revised



## **Focused on Content**

#### Why the content matters

## Mathematical Knowledge for Teaching

# 35 x 2 5 875

## How Did this Student Get this Answer?

Example from Deborah Ball



**Cone:** A solid defined by a closed plane curve (forming the base) and a point outside the plane (the vertex).





#### Cone ?



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## How many corners has a cube?





## **Domains of MKT**



From Ball, Thames & Phelps (under revie

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## **Encouraging Collegiality**

#### The case of a teacher network

## **Teacher Networks**

- Primary Teachers' Mathematics Association
- "To support and promote quality teaching of mathematics in Irish primary schools in general" and "To support teachers in implementing the primary school curriculum for mathematics in their classrooms."
- Workshops, newsletter, 100<sup>th</sup> day of school, guest speakers, website
- Other possibilities: "Make and take" sessions; discussions; share stories from practice
- Fizzled out...



## Benefits for Teachers of Teacher Networks

- Encounter new instructional methods and new teaching materials
- Learn of new developments
- Learn about innovations in assessment
- Hear about education research
- Learn to listen and to participate in professional discussions
- But over time networks can also become inward looking and closed to ideas from other sources (Wilson, 2003)



## **Questions to Ponder**

- How can we build capacity in the system for providing professional development in mathematics?
- Could a teacher network for primary maths such as was envisaged by the PTMA grow from education centres into a national network?
- What interesting collaborations can you envisage for providing professional development in mathematics in your education centre? Teachers, teacher educators, mathematicians, researchers.
- What role can you play in making professional development developmental?
- How can you evaluate professional development's effect on student achievement?



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