Designing Professional Development
Workshop Outline

- What are your priorities for professional development in mathematics?
- What is the purpose of PD in mathematics?
- What are the characteristics of effective PD?
- What effective models of PD are there?
- What are the strengths and weaknesses of the different models of effective PD?
What are your priorities for PD in math?
What are your priorities for PD in math?

You have a set of cards containing possible topics for a professional development course.

• Organize the cards into two groups:
  – **Most important** for PD right now
  – **Not a priority** for PD right now

• If you think any important topics are missing, then add these using blank cards.

• Select **two topics of highest priority** and be prepared to justify why these are highest priority to the whole group.

<table>
<thead>
<tr>
<th>Adapting lessons to students' individual learning needs.</th>
<th>Developing norms and routines for classroom discourse and work.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Learning how to teach mathematical modeling.</td>
<td>Designing effective mathematical tasks for students</td>
</tr>
<tr>
<td>Learning about the progression of a topic in a commonly used textbook.</td>
<td>Working with parents.</td>
</tr>
<tr>
<td>Current changes in the curriculum.</td>
<td>Understanding how math is used in the world around us.</td>
</tr>
<tr>
<td>How to lead whole-class discussions.</td>
<td>Eliciting and interpreting students' reasoning.</td>
</tr>
<tr>
<td>Understanding and using formative assessment.</td>
<td>Learning how to teach a difficult concept.</td>
</tr>
<tr>
<td>Assessing student progress.</td>
<td>Building respectful relationships with students.</td>
</tr>
<tr>
<td>Specifying and reinforcing productive student behavior.</td>
<td>Asking questions that promote students' reasoning</td>
</tr>
<tr>
<td>Setting up and managing collaborative discussions.</td>
<td>Using students' cultural, and personal backgrounds as resources for instruction.</td>
</tr>
</tbody>
</table>
What is the purpose of PD in mathematics?
What is the purpose and content of PD?

- **Curriculum**: Goals for learning; organizing learning sequences; making connections between topics; recognizing progress.
- **Students**: Understanding how students learn math and common obstacles to learning (e.g. ‘misconceptions’).
- **Teaching**: Recognizing what effective teaching looks like, and designing, selecting and sequencing tasks and activities that further the content and process goals.
A Framework for Teaching Mathematics

- Knowing school mathematics in depth and breadth
- Knowing students as thinkers
- Knowing students as learners
- Crafting and managing learning environments
- Developing classroom norms and supporting classroom discourse as part of “teaching for understanding”
- Building relationships that support learning
- Reflecting on one’s practice

(Schoenfeld and Kilpatrick, 2008)
Effective PD doesn't attempt to change beliefs through persuasion from the outside, but by allowing teachers to reflect on their own experiences from the inside.

(Guskey, 2002)
The ideal PD experience – by teachers:

**Relevant**
“I can use the materials in my class now.”

**Sustained over time**
“PD needs to be something you work on for a semester or a year.”

**Delivered by someone who understands my experience**
Presenter explains how materials have helped to enhance her teaching practice and student learning.
“Fellow teacher in the classroom is best.”

**Interactive**
“Hands-on strategies for us to participate in”

**Treats us as professionals**
“We are treated as adults rather than children.”
What are the characteristics of effective PD?
Characteristics of Effective PD

• **Experiential** - stimulating and drawing on teachers’ own experiences as reflective practitioners.

• **Sustained** - involving cycles of planning, predicting, enacting, and reflecting.

• **Collaborative** - involving networks of teachers and administrators.

• **Informed** - by outside expertise and research.

• **Focused** - attentive to the development of the mathematics itself.

(Guskey, 2002; Joubert and Sutherland, 2009; Villegas-Reimers, 2003; and many others….)
What effective models for PD are there?
Different models of PD

1. **Training models**
   Transmission of information by an ‘expert’

2. **Coaching models**
   Coach and teacher work together one-on-one.

3. **Workshop courses**
   Courses mediated by a provider, that offer teachers opportunities to explore ideas in their own classrooms and report back.

4. **Professional learning communities**
   Teachers take over responsibility for setting their own research goals and collaboratively and systematically study them in their own classrooms.
The Coaching Model

- Assess needs
- Set Goals
- Plan
- Implement and reflect

Circular flow diagram with arrows connecting the steps.
Example of Coaching

Video extract from 'Divergent Questioning in 8th Grade Math' from TeachingChannel - [https://www.teachingchannel.org/videos/professional-development-teacher-evaluation](https://www.teachingchannel.org/videos/professional-development-teacher-evaluation)

Back to different models of PD.

Go to strengths and weaknesses.
Workshop courses

- Coherent, linked series of experiences.
- Mediated by an experienced teacher - leader.
- Elicits theory and design principles, not just activities.
- Uses research-based resources (videos, lesson plans)
- Offers opportunities for teachers to try out ideas in the classroom and report back.
- At least two from each school participate so that discussion is fostered between sessions.
- Expectation that teachers will share their learning with others in their own school through replicating the experiences (“The Cascade Model”)
A cycle of PD processes

Reflect on and value
Teachers’ evolving values, beliefs and practices and the reasons for them.

Enact and take risks
Challenge teachers to act in new ways, ‘as if they believed differently’.
Offer mentor and a network of support as they do this.

Contrast and challenge
Illustrate contrasting practices by working on tasks and observing them in classrooms or on video.
Where are teachers starting from?

- Teachers reflect on their beliefs and practices.
- They discuss the obstacles that often prevent them from working in the ways they would wish.

### Card set PD1.1 – Sorting belief statements

Discuss these statements and group them into categories: Agree, Disagree, Cannot decide. You may modify a statement if you wish.

<table>
<thead>
<tr>
<th>Mathematics is best learned through practice.</th>
<th>Mathematics is best learned through discussion.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Learners learn mathematics best when they work on their own.</td>
<td>Learners learn mathematics best when they work collaboratively.</td>
</tr>
<tr>
<td>Mathematics is a network of ideas.</td>
<td>Mathematics is a hierarchical subject.</td>
</tr>
<tr>
<td>It is best to begin teaching mathematics with easy problems, working gradually up to harder ones, otherwise learners make mistakes and lose confidence.</td>
<td>It is best to begin teaching mathematics with complex problems, or learners won’t appreciate why mathematics is necessary.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Mathematics is a creative subject. Learners learn best by creating their own questions and methods.</th>
<th>Learners learn mathematics best by working through carefully constructed exercises.</th>
</tr>
</thead>
<tbody>
<tr>
<td>It is better to spend time on fewer questions and solve them in more than one way, even if this slows the session down.</td>
<td>I always feel in a hurry when I teach mathematics. There is so much to cover in the time.</td>
</tr>
<tr>
<td>Learners are at such different levels of competence that I have to allow each one to work at their own pace.</td>
<td>I try to teach the whole group at once and keep them at the same pace.</td>
</tr>
<tr>
<td>I find out which parts of mathematics learners already understand and don’t teach those parts.</td>
<td>I start teaching mathematics from the beginning, assuming they know nothing.</td>
</tr>
<tr>
<td>I try to avoid learners making mistakes when learning mathematics.</td>
<td>I encourage my learners to make and discuss mistakes when learning mathematics.</td>
</tr>
</tbody>
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The MAP professional development workshops

- **Formative assessment**
  - How can I respond to students in ways that improve their learning?

- **Concept development**
  - How can I help students develop a deeper understanding of Mathematics?

- **Problem solving**
  - Do I stand back and watch, or intervene and tell them what to do?

- **Questioning**
  - How can we ask questions that improve thinking and reasoning?

- **Working collaboratively**
  - How can students learn from discussing mathematics?

- **Reflecting on learning**
  - What have we learned?
  - How can we share this with colleagues?
Teachers report back on their experiences

- Teachers interview each other on what happened in the classroom.
- Their views are synthesized and reported to the whole group.
- General issues are discussed by everyone.
- The leader asks teachers to help each other overcome difficult issues.

Sample interview questions

- What were your fears and expectations?
- How did you plan for the lesson?
- How did you introduce and organize the lesson?
- What happened during small group work?
- What happened during whole class discussions?
- What did you learn from this experience?
- What general issues have arisen for you?

Back to different models of PD.  
Go to strengths and weaknesses.
Professional Learning Communities

• **School-based**
  – Based in a single school or a cluster of schools.

• **Goal driven**
  – Focused on agreed, specific, common goals.

• **Collaborative inquiry**
  – Regular meetings among teachers.
  – Supportive, non-judgmental.

• **Evidence-based**
  – Lesson observations, student work, assessment data, professional literature are used to improve practice.

• **Challenged from outside**
  – Contributions from outside ‘experts’ provide a wider perspective.
Teachers’ activities to Improve Instruction

Find or write curriculum. Try to align with Standards. Develop local frameworks and articulation across grades.

Plan lessons individually.

Plan lessons collaboratively.

Watch and discuss each other's lessons.

Japanese Lesson Study Model

1. Identify research focus
2. Plan research lesson
3. Teach research lesson
4. Analyse research lesson
5. Review and revise

Flow:
- Identify research focus → Plan research lesson → Teach research lesson → Analyse research lesson → Review and revise → Identify research focus
A professional learning community

School A
- Teacher
- Teacher
- Lead Teacher

School B
- Teacher
- Teacher
- Lead Teacher

School C
- Teacher
- Teacher
- Lead Teacher

Coordinator

Outside expert

Back to different models of PD.
What are the strengths and weaknesses of the different models of PD?
Review

• Which of the characteristics of effective PD each of these models incorporates?
• What are the strengths and weaknesses of each model, in your view?
• How might these models be combined and organized in your schools?
• What immediate questions does this create for you?
Thank you!

<Insert contact details>