

10:30 – 12:00 Breakout sessions

Session A: *Lesson Study Models: What Models of Mathematics Lesson Study Have Emerged in the U.S. and What Can They Each Contribute?*

Catherine Lewis, Ruth Cossey & Elizabeth Baker, Mills College; Aki Murata and Bindu E. Pothen, Stanford University; Jackie Hurd, Palo Alto Unified School District; Ben Ford, Sonoma State University; Stan Pesick and Marlene Wilson, Oakland Unified School District; David Foster, Silicon Valley Mathematics Institute, and Tracy Sola, Belmont-Redwood Shores School District.

In this session, we will hear from experienced organizers and participants of four different lesson study models: preservice, school-wide, district-based, and regional. Each model will be briefly described, with a focus on its particular niche within the improvement of mathematics instruction. Half the session will be devoted to Q & A with the audience, and suggestions will be provided for session participants who want to learn more about this model.

Several different lesson study models have emerged in the U.S. and have now been sustained, in some cases, for 5-10 years. Panelists will very briefly introduce examples of these different models of lesson study from the greater San Francisco Bay Area, focusing on the role each can play in building and spreading mathematical knowledge for teaching. Half of the session will be devoted to Q & A with session participants. Each presentation will (1) briefly describe the lesson study model; (2) illustrate what this model can accomplish (why it is important); and (3) provide references for session participants who want to learn more about this model.

Session B: Interactive session: Improving Teacher Education

Jim Lewis, University of Nebraska-Lincoln and Kristin Umland, University of New Mexico.

In this interactive session we will talk about efforts to improve teacher education. We will begin by discussing program development and partnership building efforts of the facilitators. Jim Lewis has many years of experience conceptualizing and implementing teacher education and professional development projects. Kristin Umland will share the struggles and triumphs of similar efforts at a less well-developed stage. The remainder of the time will allow for small and whole-group interaction between the participants and the facilitators.

Session C: Teacher education and professional development

Herbert Clemens, Ohio State University, *What does preservice math for middle school teachers look like? One perspective from a large state*

school.

We will discuss how the preservice program for middle school math teacher needs to differentiate itself from that for elementary teachers and from that for high school math teachers. One underlying premise will be that the middle school experience of students is arguably the most critical period in their mathematical development. One has the sense that that is where, to quote Robert Frost, "two roads divide in a yellow wood..."

James Madden, Louisiana State University, *Geometry: Traditions and Standards.*

A "modern American pedagogical tradition" is apparent in the most commonly used high school geometry textbooks. They share terminology, selection and arrangement of topics, conceptual flow, kinds of exercises, etc. The presentation is conceptually shallow, procedure-oriented and lacking in coherent themes, except in a small number of exceptions. What professional development do teachers need in order to acquire greater geometric understanding and proficiency and to be able to foster its development in young learners? How might the Common Core State Standards help?

Session D: Findings from mathematics education research

Anderson Norton, Virginia Tech, *Modeling Students' Mathematics*
Research on students' mathematical thinking can form the basis for educational decisions, including curricular design, professional development, and appropriate use of technology. We'll discuss examples stemming from teaching experiments on middle school students' reasoning with fractions. These teaching experiments reveal the roles of key mental operations (splitting and units coordinating) that are necessary for meaningful mathematical development.

Andrew Izsak, University of Georgia, *Teachers' Knowledge for Using Drawn Models of Fraction Arithmetic.*

The Common Core Standards emphasize the use of drawn models throughout the elementary and middle grades. Much more is known about how children reason with drawn models for fraction arithmetic than about how teachers reason with drawn models for fraction arithmetic. I will present research that uses results on children's reasoning to study teachers' reasoning about fraction multiplication and division and identify challenges for preparing teachers for the Common Core Standards.