

# SEMINAR PROGRAM

February 27 - March 2, 2019 | Portland, Oregon

Agenda, Speaker Biographies & Session Summaries





# seminar **AGENDA**

## WEDNESDAY FEBRUARY 27

3:00 pm – 6:45 pm	Registration and Seminar Check-In	Mount Hood Foyer
5:45 pm – 6:45 pm	Reception & Social (heavy hors d'oeuvres, no host beverages)	Mount Hood Foyer
6:45 pm	Welcome	Mount Hood Ballroom

Ruth Heaton

Opening Keynote

Mount Hood Ballroom

Robert Q. Berry III

*Catalyzing Change: Identity, Agency, Positionality and Equitable Instructional Practices*

## TEAM COLLABORATION DURING THE SEMINAR

To capitalize on the potential of Team Collaboration, several spaces throughout the hotel have been designated specifically for Team Collaboration throughout this Seminar:

*Garden A,B,C, Garden Foyer, Cascade Foyer, Saint Helens Foyer  
(also check with Seminar registration to reserve a meeting room during non-session hours)*

If your team wishes to reserve one or more tables in one of the above areas for specific windows of time, or wishes to reserve a room during non-session hours, please see staff members at the Seminar Registration Desk. If you are attending alone or with a team that seeks input from others, feel free to reach out to fellow participants to form a team (or to join their team) because you have shared needs or interests related to equitable mathematics teaching, learning, and/or professional learning.



## THURSDAY FEBRUARY 28

6:45 am – 8:00 am Breakfast &amp; Team Collaboration

Mount Hood Foyer

8:00 am – 10:00 am Concurrent I

Mandy Jansen *"We are all works in progress": Incorporating Rough Draft Thinking to Re-Humanize Mathematics Learning (repeats Concurrent III & V)* Saint Helens AB

Elizabeth Phillips and Yvonne Slanger-Grant *Inscriptions: Developing and Communicating Deep Learning of Mathematics (repeats Concurrent VI)* Saint Helens CD

Susan Jo Russell and Deborah Schifter *Who Can Think Mathematically? Insisting on Significant Math Thinking in Urban Classrooms (repeats Concurrent VII)* Mount Hood A

Peg Smith and Miriam Gamoran Sherin *The 5 Practices in Practice: What it Takes to Anticipate Student Responses (no repeat)* Mount Adams

Grace Kelemanik and Amy Lucenta *Routinizing Effective Designs for Interaction so that ALL Students have Access and Success (no repeat)* Mount Hood C

10:00 am – 10:15 am Break

Mount Hood Foyer

10:15 am – 12:15 pm Concurrent II

Imani Masters Goffney *From Oakland to Wakanda: Transforming Mathematics Classrooms to Become Equitable and Empowering Spaces for Black and Brown Students (repeats Concurrent VII)* Saint Helens AB

Robert Berry III *Catalyzing Change in High School Mathematics: Initiating Critical Conversations (repeats Concurrent V)* St. Helen's CD

Virginia Bastable *Looking for What is Right: Honoring the Mathematical Thinking of Each Student (repeats Concurrent IV)* Mount Hood A

Eva Thanheiser and Amanda Sugimoto *Access to Learning Opportunities as a Teaching Routine (repeats Concurrent VII)* Mount Adams

Amy Lucenta and Grace Kelemanik *Structural Thinking and the Urgency to Teach it to ALL Students (repeats Concurrent IV)* Mount Hood C

12:30 pm – 1:30 pm Lunch ~ Team Collaboration ~ Networking

Mount Hood Ballroom



*Thurs. cont'd*

1:30 pm – 3:00 pm Plenary A Mount Hood Ballroom

Miriam Gamoran Sherin and Peg Smith

*The 5 Practices as a Tool for Supporting Equitable Mathematics Classrooms*

3:00 pm – 3:15 pm Break Mount Hood Foyer

3:15 pm – 5:15 pm Concurrent III

Mary Alice Carlson and Beth Burroughs *Fostering Empathy in Mathematics through Mathematical Modeling (repeats Concurrent VI)* Mount Hood A

Mandy Jansen *"We are all works in progress": Incorporating Rough Draft Thinking to Re-Humanize Mathematics Learning (repeats Concurrent I & V)* Saint Helens AB

Mark Driscoll and Johannah Nikula *Language Strategies for the Mathematics Classroom: Important Features and Common Pitfalls (repeats Concurrent V)* Saint Helens CD

Deborah Lowenberg Ball *Disrupting Patterns of Injustice in Mathematics Discussions (repeats Concurrent IV)* Mount Adams

Hilda Borko and Anthony Muro Villa III *Building Teachers' Capacity to Promote Students' Access to Rigorous and Meaningful Mathematics Through Video-Based Discussions (repeats during Concurrent IV)* Mount Hood C

5:15 pm – 6:30 pm Team Collaboration ~Networking ~ Social Mount Hood Foyer  
(no host beverages)

6:30 pm Banquet & Networking Mount Hood Ballroom  
*Drawing for an iPad Mini!*



## FRIDAY MARCH 1

6:45 am – 8:00 am Breakfast and Team Collaboration

Mount Hood Foyer

8:00 am – 10:00 am Concurrent IV

Peg Smith and Miriam Gamoran Sherin *The 5 Practices in Practice: What it Takes to Monitor Student Work (No repeat)* Mount Adams

Deborah Lowenberg Ball *Disrupting Patterns of Injustice in Mathematics Discussions (repeats Concurrent III)* Mount Hood A

Hilda Borko and Anthony Muro Villa III *Building Teachers' Capacity to Promote Students' Access to Rigorous and Meaningful Mathematics Through Video-Based Discussions (repeats during Concurrent III)* Saint Helens AB

Virginia Bastable *Looking for What is Right: Honoring the Mathematical Thinking of each Student (repeats Concurrent II)* Saint Helens CD

Amy Lucenta and Grace Kelemanik *Structural Thinking and the Urgency to Teach it to ALL Students (repeats Concurrent II)* Mount Hood C

10:00 am – 10:15 am Break

Mount Hood Foyer

10:15 am – 12:15 pm Concurrent V

Robert Berry III *Catalyzing Change in High School Mathematics: Initiating Critical Conversations (repeats Concurrent II)* Mount Adams

School District Leaders & Teachers Development Group Professional Development Specialists *Voices from the Field: Stories of Professional Development Attentive to Access and Equity for ALL (no repeat)* Mount Hood A

Mandy Jansen *"We are all works in progress": Incorporating Rough Draft Thinking to Re-Humanize Mathematics Learning (repeats Concurrent I & III)* Saint Helens AB

Mark Driscoll and Johannah Nikula *Language Strategies for the Mathematics Classroom: Important Features and Common Pitfalls (repeats Concurrent III)* Saint Helens CD

Deborah Schifter and Susan Jo Russell *Using Representations to Explore Structure of the Operations (no repeat)* Mount Hood C



*Fri. cont'd*

12:30 pm – 1:30 pm Lunch ~ Team Collaboration ~ Networking

Mount Hood Ballroom

1:30 pm – 3:00 pm Plenary B

Mount Hood Ballroom

DEBORAH LOWENBERG BALL

*Disrupting Injustice through the Discretionary Power of Teaching*

3:00 pm – 3:15 pm Break

Mount Hood Foyer

3:15 pm – 5:15 pm Concurrent VI

Mike Shaughnessy *Revising the NAEP Mathematics Framework: What Changes Should Occur in America's Report Card on Mathematics? (no repeat)* Saint Helens AB

José Franco *Cultivating Equity-based Mathematics Classroom Practices (repeats Concurrent VII)* Mount Hood A

Megan Franke *Taking up Children's Partial Understandings: Pressing on our CGI work together (no repeat)* Mount Adams

Elizabeth Phillips and Yvonne Slinger-Grant *Inscriptions: Developing and Communicating Deep Learning of Mathematics (repeats Concurrent I)* Saint Helens CD

Mary Alice Carlson and Beth Burroughs *Fostering Empathy in Mathematics through Mathematical Modeling (repeats Concurrent III)* Mount Hood C

5:15 pm Team Collaboration ~ Networking ~ Dinner On Your Own



## SATURDAY MARCH 2

6:45 am – 8:00 am Breakfast &amp; Team Collaboration

Mount Hood Foyer

8:00 am – 10:00 am Concurrent VII

Susan Jo Russell and Deborah Schifter *Who Can Think Mathematically? Insisting on Significant Math Thinking in Urban Classrooms (repeats Concurrent I)* Saint Helens AB

José Franco *Cultivating Equity-based Mathematics Classroom Practices (repeats Concurrent VII)* Mount Hood A

Peg Smith *The 5 Practices in Practice: What it Takes to Select, Sequence and Connect Student Responses (no repeat)* Mount Adams

Imani Masters Goffney *From Oakland to Wakanda: Transforming Mathematics Classrooms to Become Equitable and Empowering Spaces for Black and Brown Students (repeats Concurrent II)* Saint Helens CD

Eva Thanheiser and Amanda Sugimoto *Access to Learning Opportunities as a Teaching Routine (repeats Concurrent II)* Mount Hood C

10:00 am – 10:30 am Break

Mount Hood Foyer

10:30 am – 12:00 pm Closing Keynote

Mount Hood Ballroom

MEGAN FRANKE

*More Than Turn and Talk: Supporting Student Engagement in Each Other's ideas*

12:00 pm – 1:00 pm Lunch ~ Team Collaboration ~ Networking ~ Closing  
*Drawing for an Apple Watch and Speaker book raffle!*

Mount Hood Ballroom



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# SPEAKERS

## about Deborah Lowenberg Ball

Concurrent III & IV     *Disrupting Patterns of Injustice in Mathematics Discussions*  
 Plenary B                 *Disrupting Injustice through the Discretionary Power of Teaching*

Deborah Lowenberg Ball is the William H. Payne Collegiate Professor at the University of Michigan, an Arthur F. Thurnau Professor, and the director of TeachingWorks. She taught elementary school for more than 15 years, and continues to teach mathematics to elementary students every summer. Deborah studies the practice of teaching as the active work of building relationships with children to support their learning and flourishing. She uses elementary mathematics as a critical context for investigating the challenges of helping children develop agency and understanding, and of leveraging the power of teaching to disrupt racism, marginalization, and inequity. Deborah's current work focuses on improving the quality of teacher education. Deborah has authored or co-authored more than 150 publications and has lectured and presented around the world. She has also developed distinctive collections of video records of practice that are broadly used to make practice visible and to study the work of teaching. Deborah is the immediate past president of the American Educational Research Association, an elected member of American Academy of Arts and Sciences and the National Academy of Education, and is a fellow of the American Mathematical Society and the American Educational Research Association.

## about Virginia Bastable

Concurrent II & IV     *Looking for What is Right": Honoring the Mathematical Thinking of Each Student*

Virginia Bastable recently retired from the Mathematics Leadership Program (MLP) of Mount Holyoke College. MLP conducts a set of coordinated professional development seminars examining the learning and teaching of mathematics each summer, offers academic year on-line courses for math coaches and classroom teachers, provides math consulting and programs to school systems, and offers a Masters of Arts in Mathematics Teaching (MAMT) for practicing teachers and teacher-leaders. With Deborah Schifter and Susan Jo Russell of TERC, Virginia is an author of the *Developing Mathematical Ideas (DMI)* professional development curriculum published by NCTM and two books on mathematical reasoning about the operations published by Heinemann: *Connecting Arithmetic to Algebra*, and *But Why Does it Work: Mathematical Argument in the Elementary Classroom (BWDIW)*. She also contributed to the third edition of *Investigations in Number, Data and Space*. Virginia is currently working with teachers and administrators of the Los Angeles Unified School District through a project with the UCLA Math Project to examine how students develop ideas of algebraic thinking in grades 4 through Algebra I. She facilitates the online course, Developing Mathematical Reasoning, as part of the MAMT program and offers workshops based on the DMI and BWDIW materials.



## about Robert Q. Berry III

Concurrent II & V     *Catalyzing Change in High School Mathematics: Initiating Critical Conversations*  
Keynote                 *Catalyzing Change: Identity, Agency, Positionality and Equitable Instructional Practices*

Robert Q. Berry III is president of the National Council of Teachers of Mathematics (NCTM), a 50,000-member international mathematics education organization. Robert is a Professor in the Curry School of Education at the University of Virginia. Robert teaches mathematics methods courses in the teacher education program as well as graduate level mathematics education courses and courses for in-service teachers seeking a mathematics specialist endorsement. He is a former middle school teacher and was twice named Teacher of the Year in Virginia. Equity issues in mathematics education are central to Robert's research efforts within four related areas: (a) understanding Black children's mathematics experiences (mathematical identities and agency); (b) measuring standards-based mathematics teaching practices; (c) unpacking equitable mathematics teaching and learning; and (d) exploring interactions between technology and mathematics education. Robert has collaborated on the Children's Engineering Initiative in the Curry School of Education to use digital fabrication to incorporate engineering design principles into mathematics education. His most recent work has focused on using qualitative meta-synthesis as an approach to understand the mathematics experiences of learners. He has published nearly 100 articles, book chapters, and proceedings. Robert served on the Board of Directors of the National Council of Teachers of Mathematics 2011–2014 and is a two-time recipient of NCTM's Linking Research and Practice Publication Award. He was recognized as the 2011 Mathematics Educator of the Year by the Virginia Council of Teachers of Mathematics (VCTM), and received the University of Virginia's All University Teaching Award in 2011. Robert is a member of Teacher Development Group's Board of Directors.

## about Hilda Borko

Concurrent III & IV     *Building Teachers' Capacity to Promote Students' Access to Rigorous and Meaningful Mathematics Through Video-Based Discussions*

Hilda Borko is a professor of education at Stanford University, where she serves as Chair of the Curriculum and Teacher Education program area. Her research explores the process of learning to teach, with an emphasis on changes in teachers' knowledge and beliefs about teaching and learning, and their classroom practices, as they participate in professional development programs. With colleagues Karen Koellner and Jennifer Jacobs, Hilda developed the Problem-Solving Cycle (PSC) model of mathematics professional development and Mathematics Leadership Preparation (MLP) model for preparing PSC facilitators. Their book, *Mathematics Professional Development: Improving Teaching Using the Problem-Solving Cycle and Leadership Preparation Models* (Borko, Jacobs, Koellner, & Swackhamer, 2015), describes the two models, summarizes key research findings, provides detailed examples of workshop activities, and shares lessons learned. It is written for an audience of school leaders and other professional development providers. Hilda's current NSF-funded project with Janet Carlson, *Refining a Model with Tools to Develop Mathematics Professional Development Leaders: An Implementation Study*, is a partnership with a local urban school district to adapt the two models and build district capacity to implement



the PSC at school sites. Hilda served as President of the American Educational Research Association. She is a member of the National Academy of Education and on its Executive Board. She has been editor of the *American Educational Research Journal* and *Journal of Teacher Education* and is the 2014 recipient of the Excellence in Scholarship in Mathematics Teacher Education Award, AMTE.

## about Elizabeth (Beth) Burroughs

Concurrent III & VI *Fostering Empathy in Mathematics through Mathematical Modeling*

Elizabeth (Beth) Burroughs is Department Head and Professor in the Department of Mathematical Sciences at Montana State University in Bozeman, MT. She has served on the Mathematical Association of America's (MAA) Congress as the Representative for Teacher Education and as chair of the MAA Committee on the Mathematical Education of Teachers. She was a lead writer for MAA's recently-released *Instructional Practices Guide* (2018) and on the writing team for the Association of Mathematics Teacher Educators *Standards for Preparing Teachers of Mathematics* (2017). She has directed NSF-funded projects focused on grades K-8 classroom coaching, mathematical modeling in elementary grades, and the creation and use of materials for teacher preparation in undergraduate mathematics courses. Before earning her Ph.D. in Mathematics at the University of New Mexico, Beth was a high school mathematics teacher in Atlanta, Georgia.

## about Mary Alice Carlson

Concurrent III & VI *Fostering Empathy in Mathematics through Mathematical Modeling*

Mary Alice Carlson is a former elementary and middle school teacher and current Assistant Professor of Mathematics Education in the Department of Mathematical Sciences at Montana State University in Bozeman, MT. There, she works with preservice and inservice elementary, middle, and high school teachers and studies teacher learning, teacher leadership, and mathematical modeling. Mary Alice's involvement in two NSF-funded projects focused on mathematical modeling has given her opportunities to study modeling activities that reflect students' community-based knowledge and practices, the ways teachers develop and implement modeling tasks, and the affordances and challenges of modeling in K-8 settings. Mary Alice's work has been published in venues such as *Mathematics Teacher Educator*, and in chapters of edited volumes including NCTM's Annual Perspectives in Mathematics Education 2016: Mathematical Modeling.

## about Mark Driscoll

Concurrent III & V *Language Strategies for the Mathematics Classroom: Important Features and Common Pitfalls*

Mark Driscoll has directed a range of teacher education, leadership, and materials development projects at Education Development Center. Recently, he has been Lead PI on Analyzing Diagrams: Support for English Learners, a research and development project funded by the Institute for Education Sciences; Lead PI on Visual Access to Mathematics, an NSF-funded research and development project; co-PI on Fostering Mathematics



Success of English Language Learners, an NSF-funded research project; and co-PI on Mathematics Coaching Supporting English Learners, a research and development project funded by the Institute for Education Sciences. He received his Ph.D. in mathematics (differential geometry) from Washington University in St. Louis. From 2003-2007, Mark served as Editor of *Mathematics Education Leadership*, the journal of the National Council of Supervisors of Mathematics. In 2010-2011, he was on the development team for the *What Works Clearinghouse Practice Guide on Mathematical Problem Solving*. In April 2010, he received the NCSM Ross Taylor/Glenn Gilbert National Leadership Award. Mark is a member of Teacher Development Group's Board of Directors.

## about José Franco

Concurrent VI & VII *Cultivating Equity-based Mathematics Classroom Practices*

José Franco is an instructional coach at WestEd. He supports educators to design powerful instruction to meet the needs of all learners, and promote parent engagement in support of their children's education. José is also Co-Director of Math Pathways & Pitfalls (MPP). MPP showcases instructional practices and materials to improve students' mathematics achievement and academic language development. Prior to joining WestEd, Franco was the EQUALS Director, an equity in mathematics education program, based at University of California. At EQUALS, he directed various grant-funded projects including: Bridges to Excellence: Achievement in Mathematics, English Language Development in Mathematics Institute, Family Advocacy in Mathematics Education, Science and Math in Spanish-language Media, and After School Mathematics and Science. José has conducted presentations on family involvement, equity, mathematics education, and second language acquisition. He has also written articles for *Thoughts and Deeds: Equity in Mathematics and Science*, *Changing the Faces of Mathematics: Perspectives on Latinos*, and *Advocating for Equity and Diversity Within the Context of Standards-Based Reform*. José was a K-8 bilingual teacher in Colorado and California.

## about Megan Franke

Concurrent VI *Taking Up Children's Partial Understandings: Pressing on Our CGI Work Together*  
Keynote *More than Turn and Talk: Supporting Student Engagement in Each Other's Ideas*

Megan Franke is a Professor of Education at UCLA. Megan's research focuses on understanding and supporting teacher learning for both preservice and inservice teachers. She studies how teachers making use of research-based information about the development of children's mathematical thinking support students to learn mathematics. She is particularly interested in how teaching mathematics with attention to students' mathematical thinking (Cognitively Guided Instruction) can challenge existing school structures and create opportunities for economically marginalized students and students of color to learn mathematics with understanding. She has been engaged in a series of studies with Dr. Webb that link classroom practice and student outcomes in elementary mathematics classrooms. In addition, she is studying with her CPC colleagues the impact of field-based methods for preservice teachers. She is a member of DREME (Development and Research in Early Mathematics Education) where she is studying prek-2 coherence and designing resources for early childhood teacher educators. She is currently partnering with LAUSD to support teachers in preK-5<sup>th</sup> grade across 120 elementary and preschools.



Her research work to support teachers, schools and communities was recognized with the AERA Research into Practice Award and she was elected to the National Academy of Education.

## about Imani Masters Goffney

Concurrent II & VII *From Oakland to Wakanda: Transforming Mathematics Classrooms to Become Equitable and Empowering Spaces for Black and Brown Students*

Imani Masters Goffney currently works as an Assistant Professor of Mathematics Education at the University of Maryland- College Park. She earned her MA in Curriculum Development and PhD in Mathematics Education and Teaching and Teacher Education both from the University of Michigan. Her research focuses on mathematics instruction and on interventions designed to improve its quality and effectiveness, especially for students not traditionally served well by our educational system. In particular, she studies the ways in which teachers use mathematical knowledge for teaching in equitable ways. Her research contributes to a growing body of work that strives to better understand the role of content knowledge for improving student achievement and expands an understanding of how issues of race, culture, and social class intersect with students' opportunities for learning mathematics. She currently manages her own research projects with funding from NSF and private foundations. She recently co-edited a book published by NCTM entitled, *Re-humanizing Mathematics for Black, Indigenous, and Latinx Students* (2018). She is an active member in AERA, NCTM, and AMTE serving in leadership roles for each of these organizations.

## about Ruth Heaton

Welcome, Introductions, Closing

Ruth Heaton is the Chief Executive Officer (CEO) of Teachers Development Group (TDG) since August 2017. TDG is a nonprofit provider of professional development for K-12 teachers and leaders nationwide, whose mission is to improve all students' mathematical understanding and achievement. Ruth and her TDG colleagues collaborate with districts, educational service units, universities, and various public and private funding agencies to design, provide, and study professional development projects nationwide. TDG is currently serving teachers and leaders in 10 states, 41 school districts and 1 international location. While the professional development design and implementation takes a variety of forms depending on the particulars of teacher, leader, school, and district contexts, all services provided by TDG are built on the belief that every student is a capable mathematical thinker and has the right to have access to rigorous learning opportunities of the highest quality. As CEO, Ruth continues to work at the intersection of research and practice, the intellectual space that has been the site of Ruth's teaching and scholarship over her entire academic career. Ruth holds an affiliated faculty appointment with the Department of Mathematics and Statistics at Portland State University. She was the Gilmartin Professor of Mathematics Education at the University of Nebraska-Lincoln, where she held a faculty appointment for more than 20 years in the Department of Teaching, Learning, and Teacher Education. Ruth is a recipient of the Nadine Bezuk Excellence in Service and Leadership Award from the Association of Mathematics Teacher Educators.



## about Amanda (Mandy) Jansen

Concurrent I, III, & V *“We are all works in progress”: Incorporating Rough Draft Thinking to Re-Humanize Mathematics Learning*

Mandy Jansen is a Professor in the School of Education in the mathematics education program area at the University of Delaware. She is a former junior high mathematics teacher. She taught grades 7 – 9 (general mathematics and Algebra 1) in Mesa, Arizona (outside of Phoenix). Currently, she teaches pre-service elementary and middle school mathematics teachers at the University of Delaware, and she conducts professional development at the secondary level state-wide in collaboration with the Delaware Mathematics Coalition. In her research, she studies how teachers can create motivating and engaging mathematics learning experiences for students. This research is currently funded by the National Science Foundation, and her project is titled SMILES: Secondary Mathematics in-the-moment Longitudinal Engagement Study. Mandy has appreciated the engagement with rough draft talk and rough draft thinking among the TDG community over the years. She is excited to say that she is in the process of writing a book, *Rough Draft Math*, that will be forthcoming from Stenhouse publishers. Mandy is a member of the Teachers Development Group’s Board of Directors.

## about Grace Kelemanik

Concurrent I *Routinizing Effective Designs for Interaction so ALL Students have Access and Success*  
Concurrent II & IV *Structural Thinking and the Urgency to Teach it to ALL Students*

Grace Kelemanik, co-founder of Fostering Math Practices, has more than 30 years of mathematics education experience. A frequent presenter at national conferences, her work focuses on fostering mathematical thinking practices in all students. She is a former urban high school mathematics teacher and Project Director at Education Development Center. Grace has also worked extensively with new and preservice teachers through the Boston Teacher Residency program. Grace is the coauthor of *Routines for Reasoning: Fostering the Mathematical Practices in All Students*. She is a mathematics education consultant and professional development provider. Follow Grace on Twitter @GraceKelemanik.

## about Amy Lucenta

Concurrent I *Routinizing Effective Designs for Interaction so ALL Students have Access and Success*  
Concurrent II & IV *Structural Thinking and the Urgency to Teach it to ALL Students*

Amy Lucenta, co-founder of Fostering Math Practices, has extensive K-12 mathematics experience with a focus on developing the standards for mathematical practice in each and every student. She supports teachers, districts, and educational collaborative organizations as they refine their curriculum and pedagogy to reflect current mathematics education research through professional development and coaching. A former middle school and high school teacher and elementary math coach, Amy recently worked as a secondary mathematics Clinical Teacher Educator for the Boston Teacher Residency Program. Amy is the co-author of *Routines for Reasoning*.



*Fostering Mathematical Practices in All Students*, published by Heinemann. Follow Amy on Twitter @AmyLucenta

## about **Johannah Nikula**

Concurrent III & V     *Language Strategies for the Mathematics Classroom: Important Features and Common Pitfalls*

Johannah Nikula is a Senior Project Director at Education Development Center, where she conducts research, collaborates with teachers, and develops resources focused on mathematics teaching and learning for students with varying English language proficiency levels. She directs projects focused on developing and studying resources for mathematics teachers with students who are English learners in their classes, including development of the Visual Access to Mathematics professional development program and of the *Analyzing Diagrams: Supports for English Learners Grade 6* fraction division lessons with built-in supports for students who are ELs. She received an Ed.M from Harvard University with a Technology in Education focus. She is co-author of the books *Mathematical Thinking and Communication: Access for English Learners*, *Fostering Geometric Thinking*, and *A Mathematics Leaders Guide to Lesson Study in Practice*, in addition to numerous articles and blog posts focused on mathematics teaching and learning.

## about **Elizabeth Phillips**

Concurrent I & VI     *Inscriptions: Developing and Communicating Deep Learning of Mathematics*

Elizabeth Phillips has on-going interests in the teaching and learning of mathematics with a special interest in teaching and learning algebra. In addition to authoring numerous papers and books, she is a co-author of *The Connected Mathematics Project (CMP 1)*, an NSF-funded project to write, test, and implement a complete mathematics curriculum for the middle grades (1991–1997) and *CMP 2* (2000-2006) and *CMP3* in 2014. She is working on a number of professional development and research activities to support teachers and students learning of mathematics around problem-centered curricula. Currently the focus of her research is on student work, formative assessment, the Arc of Learning Research Project, and the role of digital collaborative environments on students' disciplinary engagement.

## about **Susan Jo Russell**

Concurrent I & VII     *Who Can Think Mathematically? Insisting on Significant Math Thinking in Urban Classrooms*  
 Concurrent V     *Using Representations to Explore Structure of the Operations*

Susan Jo Russell began her career in education as an elementary classroom teacher and coach. She is currently at the Education Research Collaborative at TERC, where she has directed research and development projects in mathematics education for over 30 years. She co-directed the development and revision of the National Science Foundation-funded elementary curriculum, *Investigations in Number, Data and Space*, and the professional



development materials, *Developing Mathematical Ideas*. Her current work focuses on understanding how practicing teachers can learn more about mathematics and about children's mathematical thinking and on how young students articulate, represent, and justify general claims in the context of ideas that arise naturally from their study of number and operations. In particular, Susan Jo is interested in collective mathematical agency – how students with a history of poor achievement in grade-level computation, students with a history of excelling in grade-level computation, and all their classmates engage in these ideas together. She is co-author, with Deborah Schifter and Virginia Bastable, of a book for teachers in grades 1-6 (with accompanying study guide for teacher educators) about these ideas, *Connecting Arithmetic to Algebra*, and of the resource, *But Why Does It Work?: Mathematical Argument in the Elementary Classroom*, which includes a book, video, and lesson sequences.

## about Deborah Schifter

Concurrent I & VII      *Who Can Think Mathematically? Insisting on Significant Math Thinking in Urban Classrooms*  
Concurrent V              *Using Representations to Explore Structure of the Operations*

Deborah Schifter is a consultant in mathematics education. She has worked as an applied mathematician; has taught elementary, secondary, and college level mathematics; and, since 1985, has been a mathematics teacher educator and educational researcher. She authored *Reconstructing Mathematics Education: Stories of Teachers Meeting the Challenge of Reform* and edited a two-volume anthology of teachers' writing, *What's Happening in Math Class?* She was a writer for The Mathematical Education of Teachers as well as the second and third editions of the K-5 curriculum, *Investigations in Number, Data, and Space*. With Virginia Bastable and Susan Jo Russell, she produced the professional development series, *Developing Mathematical Ideas* (a revised version now published by NCTM). In recent years, Deborah has been working with colleagues to investigate algebraic thinking at the elementary level. They have produced two books based on this work—*Connecting Arithmetic to Algebra* (Russell, Schifter, & Bastable) and *But Why Does It Work?* (Russell, Schifter, Kasman, Bastable, & Higgins).

## about Mike Shaughnessy

Concurrent VI              *Revising the NAEP Mathematics Framework: What Changes Should Occur in America's Report Card on Mathematics?*

Mike Shaughnessy first became interested in mathematics during his high school years in upstate New York, and majored in mathematics at Le Moyne College. He completed his PhD at Michigan State University, joined the faculty of the Mathematics Department at Oregon State University (1976 to 1993), and subsequently the Department of Mathematics and Statistics at Portland State University (1993 –2008). At both OSU and PSU, Mike taught mathematics and statistics courses for preservice and inservice teachers, directed professional development experiences for K – college teachers, and was director of Doctoral Programs in Mathematics Education. Mike served on the Board of Directors of the National Council of Teachers of Mathematics from 2001 – 2004, and was President of NCTM from 2009 – 2013. From 2013 – 2017 he was co-PI of the NSF DRK-12 grant Enhancing Mathematics Teaching and Learning in a large urban school district jointly administered by Portland State University and Teachers Development Group. Mike's principal research interests are in the teaching and learning of statistics and probability, the teaching and learning of geometry, and mathematical problem solving. Of his more than 70





articles, books, and book chapters, nearly 50 of them are on issues related to the teaching and learning of probability and statistics.

## about Miriam Gamoran Sherin

Concurrent 1	<i>The 5 Practices in Practice: What it Takes to Anticipate Student Responses</i>
Concurrent IV	<i>The 5 Practices in Practice: What it Takes to Monitor Student Work</i>
Plenary A	<i>The 5 Practices as a Tool for Supporting Equitable Mathematics Classrooms</i>

Miriam Gamoran Sherin is Associate Provost for Undergraduate Education and the Alice Gabrielle Twight Professor of Learning Sciences at Northwestern University. Miriam studies teacher noticing, how teachers identify and respond to significant events in the moments of instruction. She is particularly interested in how teachers learn to attend closely to student mathematical thinking as they teach. Miriam also examines the role of video in teacher education and professional development. For over 20 years, she has organized and facilitated video clubs in which teachers watch and discuss video excerpts with peers. In addition, she explores the use of new digital technologies for professional development and the ways that teacher-captured video can be a resource for teacher reflection. In 2016, Miriam, along with her colleagues K. Linsenmeier, J. Walkoe, and M. Mulligan were awarded the Outstanding Publication Award for Linking Research and Practice from the National Council of Teachers of Mathematics.

## about Yvonne Slinger-Grant

Concurrent I & VI	<i>Inscriptions: Developing and Communicating Deep Learning of Mathematics</i>
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Yvonne Slinger-Grant is currently an Academic Specialist and the Professional Development Coordinator for the *Connected Mathematics Project* (CMP) office at Michigan State University. Yvonne has held various roles in her many years in education including middle school mathematics teacher, elementary teacher, instructional coach, professional development consultant, developer and field test teacher of *Connected Mathematics*, and more. Yvonne has assisted school districts and systemic initiatives in many states with the implementation of standards-based curricula. Yvonne's goal in education has always been to find ways to enhance mathematics learning and teaching.



## about Margaret (Peg) Smith

Concurrent 1	<i>The 5 Practices in Practice: What it Takes to Anticipate Student Responses</i>
Concurrent IV	<i>The 5 Practices in Practice: What it Takes to Monitor Student Work</i>
Concurrent VII	<i>The 5 Practices in Practice: What it Takes to Select, Sequence and Connect Student Responses</i>
Plenary A	<i>The 5 Practices as a Tool for Supporting Equitable Mathematics Classrooms</i>

Peg Smith is a Professor Emerita at University of Pittsburgh. Over the past two decades she has been developing research-based materials for use in the professional development of mathematics teachers. She coauthored over 90 books, edited books or monographs, book chapters, and peer-reviewed articles including the *Taking Action: Implementation Effective Mathematics Teaching Practices Grades 6-8* (co-authored with Michael Steele and Lynn Raith) and *Five Practices for Orchestrating Productive Discussions* (co-authored with Mary Kay Stein). Her latest book, *The 5 Practices in Practice: Successfully Orchestrating Mathematics Discussion in Your Middle School Classroom* (co-authored with Miriam Sherin) will be published in March 2019. She was a member of the Board of Directors of the AMTE (2001-2003; 2003 – 2005), of the NCTM (2006-2009), and of TDG (2009 – 2017). She was the founding editor of the journal *Mathematics Teacher Educator*, which is co-published by NCTM and AMTE. In 2006 she was selected to receive the Chancellor's Distinguished Teaching Award given annually to honor outstanding faculty at the University of Pittsburgh. In 2009 she received the award for Excellence in Teaching in Mathematics Teacher Education from AMTE. In April 2019 she will receive the Lifetime Achievement Award from NCTM.

## about Amanda Sugimoto

Concurrent II & VII     *"Access to Learning Opportunities" as a Teaching Routine*

Amanda Sugimoto is an assistant professor in the elementary Graduate Teacher Education Program at Portland State University. She completed her PhD in teaching and teacher education at the University of Arizona, and specializes in preparing elementary teachers to work with linguistically diverse students in socially just ways. She has extensive experience working with linguistically diverse students both in the United States and abroad. Her research focuses on improving the educational experiences and access of linguistically diverse students in schools, particularly in mathematics.

## about Eva Thanheiser

Concurrent II & VII     *"Access to Learning Opportunities" as a Teaching Routine*

Eva Thanheiser is an Associate Professor in the Fariborz Maseeh Department of Mathematics and Statistics at Portland State University, board member of the Association of Mathematics Teacher Educators (AMTE), AMTE board liaison to and editorial board member of the journal *Mathematics Teacher Educator* (MTE), and steering committee member of the *Psychology of Mathematics Education – North America* (PME-NA). At Portland State University, Eva teaches mathematics content courses for elementary and middle-school teachers as well as courses for PhD students in



mathematics education. Eva's research has focused on several avenues. Avenue 1: Examining teacher knowledge, the development of that knowledge, and teacher motivation to learn. Avenue 2: Understanding how teachers think about equity and social justice in the context of teaching mathematics and how contexts of equity and social justice can be used to teach mathematical content. Avenue 3: In collaboration with Teachers Development Group (TDG) (and funded by two NSF DRK-12 grants) examining in-service teacher professional development experiences and working with tools for teachers to implement best practices in the mathematics classrooms. With others working on these projects, she researched the efficacy of TDG's Math Studio model of professional development implemented in a large urban school district and is now continuing, based on that work, with the development and validation of TDG's Math Habits and Routines Tool.

## about Anthony Muro Villa III

Concurrent III & IV *Building Teachers' Capacity to Promote Students' Access to Rigorous and Meaningful Mathematics Through Video-Based Discussions*

Anthony Muro Villa is a doctoral candidate in the Curriculum and Teacher Education program, with an emphasis in mathematics education, at the Stanford Graduate School of Education. He currently studies student thinking and interactions during small-group mathematical tasks, with special attention to authority and legitimization of student voices. Anthony works with Hilda Borko and Janet Carlson on their current NSF-funded project, focused on building a large urban school district's capacity for teachers to lead professional learning within their own school sites. He is an instructor in the Stanford Teacher Education Program, teaching courses on curriculum and instruction in mathematics, equity and schooling, and secondary credentialing for mathematics instruction. Anthony was also recently awarded DARE (Diversifying Academia, Recruiting Excellence), a two-year fellowship for promising scholars aspiring to the professoriate. Prior to Stanford, Anthony taught high school mathematics for eleven years, teaching courses from Algebra to AP Calculus

## about District Leaders and Teachers Development Group

Concurrent V *Voices from the Field: Stories of Professional Development Attentive to Access and Equity for ALL*

SCHOOL DISTRICT PARTNERS: Wendy Rider, Middle School Principal, Beaverton School District, Beaverton, OR; Greg Therrien, High School Assistant Principal, Beaverton, OR; Maureen Callahan, Executive Director, Teaching and Learning, North Clackamas School District, Milwaukie, OR; Alyssa Engle, Associate Director, Teaching and Learning, North Clackamas School District, Milwaukie, OR; John Hellwich, Assistant Superintendent, Peninsula School District, Gig Harbor, WA; Nicki Opp, Middle School Principal, Roseburg School District, Roseburg, OR; and Cary Cermak, District Math Coach and Teacher Leader, Roseburg School District, Roseburg, OR. TEACHERS DEVELOPMENT GROUP: Jill Board, Oakridge, OR; Becky Bogert, Phoenix, AZ; Cheryl Cameron, Portland, OR; Carolyn Choi, Portland, OR; Bill Feeley, Richmond, VT; Julie Fredericks, Portland, OR; Murrel Hoover, Elkview, WV; Jen Kallenberger, Gig Harbor, WA; Lori McMullen, Highlands Ranch, CO; Kathy Pfaendler, Beaverton, OR; Melissa Plummer, Roseburg, OR; Fred Rectanus, Portland, OR.



# about the **OPENING KEYNOTE**

Wednesday 6:45 pm

ROBERT Q. BERRY III

## *Catalyzing Change: Identity, Agency, Positionality and Equitable Instructional Practices*

This session makes connections between equitable instructional practices and identity, agency and positionality. Specifically, the session uses a vignette to examine how high cognitively demanding tasks provide opportunities to engage learners in meaning discourse, positioning learners as mathematically competent. The session uses 'mathematical discourse community' as a framework for connecting mathematics norms of discourse to identity and agency. While this session highlights *Catalyzing Change for High School Mathematics: Initiating Critical Conversations*, the discussions of teaching practices that cultivate identity, agency, and positionality are appropriate for all K-12 educators.



# about the **PLENARY SESSIONS**

Plenary A Thursday 1:30 pm

MIRIAM GAMORAN SHERIN and PEG SMITH

## *The 5 Practices as a Tool for Supporting Equitable Mathematics Classrooms*

The 5 Practices (anticipating, monitoring, selecting, sequencing, and connecting, along with setting goals and selecting tasks) are widely known as a valuable approach for K-12 teachers who want to use classroom discourse as a mechanism for supporting meaningful mathematics learning. Less attention, however, has been given to the role that the 5 Practices play in establishing and maintaining equitable mathematics classrooms. This session provides an overarching frame for understanding how the 5 Practices align with current calls for attention to access and equity in teachers' daily practices, as well as a detailed look at how each practice supports teachers in purposefully supporting an equitable learning environment.

Central to the 5 Practices is a dual focus on mathematics and students. Teachers are explicit about what mathematics they want students to learn and carefully select a task that will provide opportunities to learn that mathematics. At the same time, the 5 Practices is inherently about students, and about what students bring to the task, and about using students' own work to move learning forward. It is this joint focus on mathematics and students that we believe is at the heart of an equitable learning environment—students' ideas about the mathematics must be taken as seriously as the mathematics itself.

Consider, for example, the practice of “anticipating.” Anticipating encourages teachers to “get inside a task” and consider different ways students might engage with the mathematics. Teachers also prepare questions to ask students to assess their understanding and to advance their thinking. While key to the work of anticipating is to think broadly about what students might do, teachers will certainly not anticipate all approaches. Yet doing so can reduce the cognitive load on teachers so that when a student is using an approach that the teacher has not anticipated, the teacher will recognize that and be able to use assessing and advancing questions to understand the reasoning behind the approach.

Similarly, when “selecting” what student work to share with the class, the teacher attends to both the “what” and the “who.” The goal is not simply to move the class along a pre-determined learning trajectory. On the contrary, the teacher is looking for a range of student work that will provide access to the mathematics, and to purposefully choose students to share their work in order to support all students' identities as contributing members of the mathematics community. Video and student work will be used throughout the session to allow participants to engage directly with the ideas discussed.



Plenary B Friday 1:30 pm

DEBORAH LOWENBERG BALL

*Disrupting Injustice through the Discretionary Power of Teaching*

This session focuses on how teaching can be leveraged to disrupt classroom patterns that reproduce racism and other forms of oppression. First, participants will examine these patterns and where they come from, and then explore a framework and tools to support deliberate work to disrupt them. Key to this session is to see how teaching is filled with discretionary spaces and that, in these spaces, teachers' choices and actions matter. We will look at specific cases and consider how to support learning to use the discretionary power of teaching to disrupt habits of practice that contribute to the persistence of racism and other dominant forms of oppression. Among the patterns that we will examine are ones involving interpretations of Black girls, racialized and gendered conceptions of "ability" in math, reductive views of mathematics, and marginalization of Black and Brown children through subjective "readings" of their behavior and interactions. To break with these habits of practice requires "seeing" in new ways but also orientations to children's brilliance, specialized mathematical sensibilities and understandings, and an evolving repertoire of things to do differently.



# about the CLOSING KEYNOTE

Saturday 10:30 am

MEGAN FRANKE

## *More than Turn and Talk: Supporting Student Engagement in Each Other's Ideas*

This session will engage participants in new research findings about how teachers support student participation in elementary mathematics classrooms where teachers attend to the details of children's mathematical thinking. The findings will focus on how teachers support students to explain and engage with each other's ideas and how that varies across the different segments of the lesson. The findings will be drawn upon to consider what it means for each student to participate and implications for professional development across the K-12 continuum.



# about the CONCURRENT SESSIONS

## about Concurrent Sessions I (Thursday 8:00 am – 10:00 am)

MANDY JANSEN

*“We are all works in progress”: Incorporating Rough Draft Thinking to Re-humanize Mathematics Learning*

In a mathematics classroom where rough draft thinking is promoted, initial ideas or unfinished ideas are recognized as having value to support everyone’s learning of mathematics. During rough draft thinking, students engage in continual improvement and revision of their ideas, solutions, reasoning, and justifications. We can humanize the process of learning mathematics as we actively work to change the perspective that smart people are those who get it right the first time. This perspective is fundamentally untrue; we can continue to grow our understanding about mathematics even when we know how to obtain a correct answer or a convincing argument. Teachers can promote multiple ways of demonstrating competence by giving students opportunities to revise thinking. Mathematical smartness can include sharing unfinished thinking and pushing for further opportunities to grow thinking through revising. Both students and teachers can learn from sharing rough draft thinking about mathematics and revising the ideas.

In this session, we will explore various routines for revising mathematical thinking, from lesson structures to protocols for peer-to-peer discussion, and discuss a range of goals for revising, going beyond correcting mistakes to include creating more precise or illuminating explanations. We will also explore and experience processes for revising our teaching practice and protocols for engaging in revision of teaching together. Then we will reflect together how promoting revision opportunities provides opportunities to re-humanize learning among students and teachers.

For those who have attended a session on rough draft thinking in the past (at a TDG leadership seminar or elsewhere), new ideas in this session include an introduction to explicit structures and processes for incorporating revision opportunities into mathematics classrooms and stronger connections to equity through reflecting together on re-humanizing the mathematics classroom. The grade level emphasis of this session is 4-10, however, if this is not your main interest, you will be given opportunities to consider the session’s applicability to your particular context.





## ELIZABETH PHILLIPS AND YVONNE SLANGER-GRANT

### *Inscriptions: Developing and Communicating Deep Learning of Mathematics*

As Franke and Kazemi observe, “focusing on students’ mathematical thinking remains a powerful mechanism for bringing pedagogy, mathematics, and student understanding together” (2001, p. 108). Inscriptions are external representations of thinking that students use to develop, record, and communicate their mathematical understandings and vital for creating inquiry-based, student-centered classrooms.

Inscriptions imply a social nature to learning where meanings of the student work are publicly shared and negotiated among students. Essential to the development of inscriptions is an environment that is centered on building from current student understandings, and from there, moving the mathematics forward. This embodies the necessary means to make the mathematics more accessible while building student authority and agency. The focus on inscriptions has the potential to improve the depth, breadth, and productivity of mathematical learning while making problem-based learning more accessible. As students use inscriptions to build, represent, negotiate, justify, and recall their conceptual understandings, students cultivate identities as knowers and doers of mathematics. Meaningful experiences with inscriptions require that students have opportunities to build on their prior experiences in ways such that their thinking gets picked up, elaborated, and used in future work.

Research suggests that inscriptions are an integral part of classroom instruction for both individual cognition and social practice (e.g., Lehrer & Shauble, 2012; Medina & Suthers, 2013; Stylianou, 2010.) Creating inscriptions goes well beyond simply copying what one sees or hears. It involves inventing or adapting conventions of a representational system to “select, magnify, fix, compose, or transport information and to recruit it in the service of disciplinary argument” (Lehrer & Shauble, 2002, p. 168). Inscriptions can push inquiry forward and co-evolve as students develop deep mathematical understandings.

We will report on current research activities involving the *Connected Mathematics Project (CMP)* curriculum. One current NSF design research project involves designing and developing digital collaborative environments that support students to make their thinking visible using digital inscriptional resources. By embedding *CMP* units into the digital environment, we investigate the kinds of student inscriptions that are developed, recorded, and communicated in individual, small group, and whole-class digital spaces and classroom discussions.

We will discuss the opportunities and challenges teachers face with the interplay between the constructions of student inscriptions and the development of mathematical understandings. This discussion will connect to ways in which mathematics educators can design and enact professional learning for teachers of mathematics. The grade level emphasis of this session is 5-9, however, if this is not your main interest, you will be given opportunities to consider the session’s applicability to your particular context.



SUSAN JO RUSSELL AND DEBORAH SCHIFTER

*Who Can Think Mathematically? Insisting on Significant Math Thinking in Urban Classrooms*

Who can think mathematically? Especially for students seen as “not yet ready” for engaging with significant mathematical ideas, an overly simplified view of a progression from “concrete” to “abstract” can restrict access to cognitively demanding tasks. Do you have to know algorithms for adding and subtracting before you can think about additive structures? Do you have to know your multiplication facts before you can think multiplicatively? In our work over the last decade, we have been learning how work on generalization and mathematical argument in the elementary classroom opens up opportunities for students with a range of strengths and needs to engage in rigorous and meaningful mathematics.

Generalization and mathematical argument are at the heart of the discipline. Students in the elementary grades can engage in these fundamental practices in the context of core grade-level content. In several NSF-funded projects, we developed an approach to integrating mathematical argument into the classroom (Russell, Schifter, & Bastable, 2011; Russell, Schifter, et al., 2017). Our teaching model comprises several phases of student work: noticing regularities and patterns about the operations; articulating conjectures about those regularities; using representations in order to understand the mathematical structure underlying the conjectures; and constructing representation-based arguments.

In our current work, we have been exploring how to engage the range of learners in significant mathematics, while, at the same time, ensuring that each learner starts with what they know and is challenged to move forward. In particular, how can a pre-written sequence of lessons on mathematical argument support all students to grow in both mathematical content and practices? In order to pursue these questions, we are partnering with urban classrooms in grades 1-5 in schools that have traditionally done poorly on state mathematics assessments but have a commitment to engaging all of their students in rigorous and significant mathematics.

In this session, we will be looking at videos from these classrooms in order to consider how the expectation that all students grapple with important mathematics supports students from groups that have been historically left out of mathematics learning. We will focus on three key aspects of this work: 1) articulating mathematical ideas and explanations; 2) representation-based argument; and 3) productive lingering on important math ideas. The grade level emphasis of this session is 1-5, however, if this is not your main interest, you will be given opportunities to consider the session’s applicability to your particular context.



## PEG SMITH AND MIRIAM GAMORAN SHERIN

### *The 5 Practices in Practice: What it Takes to Anticipate Student Responses*

Discussions that focus on tasks that promote reasoning and problem solving are the primary mechanism for promoting conceptual understanding of mathematics. Such discussions provide students with opportunities to share ideas and clarify understandings, develop convincing arguments, learn to see things from other perspectives, and develop positive identities as mathematical doers. Discussions, however, can be challenging for teachers who are trying to build on and honor students' thinking while at the same time ensure that the mathematical ideas that are at the heart of a lesson are clear and public.

Smith and Stein (2011, 2018) proposed the 5 Practices model to help teachers manage this complexity. The five practices – anticipating, monitoring, selecting, sequencing, and connecting – focus on planning in advance of a lesson, thus limiting the number of in-the-moment decisions that need to be made during the lesson.

This session will focus on the practice of anticipating. Anticipating involves carefully considering the strategies students are likely to use to approach or solve a challenging mathematical task; how to respond to the work that students are likely to produce; and which student strategies are likely to be most useful in addressing the mathematics to be learned. This session will provide a detailed unpacking of what is involved in anticipating and the identification of specific challenges teachers have faced related to this practice and how to address them, drawing on the work of Smith and Sherin (in press).

During this session, participants will have the opportunity to: 1) consider goal setting and task selection as a precursor to anticipating; 2) determine what it takes to effectively anticipate student responses; 3) discuss challenges associated with anticipating and how to overcome the challenges; 4) consider the ways in which careful anticipating can promote equity; and 5) reflect on how to support teachers' ability to effectively anticipate. During the session, participants will engage in anticipating – getting inside a task, planning to respond to student thinking, and planning to notice student thinking – and analyze artifacts from middle school classrooms – providing a shared experience on which to draw during the session. The challenges that will be discussed include: moving beyond the way you solve a problem, being prepared to help students who cannot get started on a task, and creating questions that move students toward the mathematical goals. The grade level emphasis of this session is 6-8, however, if this is not your main interest, you will be given opportunities to consider the session's applicability to your particular context.



## GRACE KELEMANIK AND AMY LUCENTA

### *Routinizing Effective Designs for Interaction So ALL Students Have Access and Success*

The same math activity with varying math practice goals and designs for learning impacts student experiences and outcomes. Math curricula makes use of common task types (e.g. sorting, error analysis, which one doesn't belong, etc.). In this session, we will explore how to leverage common task types to craft instructional routines with specific math practice goals and repeatable designs for learning that provide access and engagement in rigorous and meaningful math for all students and equitable teaching practices in buildings and districts.

As the field of math education learns more about the effectiveness of instructional routines, it's increasingly clear that their structured design can support teachers and school leaders working together to build equitable practices for all students to engage in mathematical reasoning. Routines that foreground reasoning as a goal and are designed with access in mind can serve as models for designing additional instructional routines. Shifting the focus from the tasks we give students to routinizing the high leverage designs for interaction we wrap around those tasks is essential if we want to ensure that each and every student is developing critical mathematical understandings and practices every day.

In this session, participants will explore how one problem type, a visual pattern, can be implemented in three different instructional routines in order to highlight the impact each math practice goal and the inclusive designs for ALL students' learning have on student experiences and outcomes. Then, participants will engage in a process to craft an instructional routine for another task type commonly found in curriculum. We will discuss how to leverage these routines in our roles as agents of access and equity. Participants will leave ready to test-drive their newly designed instructional routine and to share the process of designing instructional routines with K-12 colleagues.



## about Concurrent Sessions II (Thursday 10:15 am - 12:15 pm)

IMANI MASTERS GOFFNEY

*From Oakland to Wakanda: Transforming Mathematics Classrooms to Become Equitable and Empowering Spaces for Black and Brown Students*

In this presentation, we will use the context of the Marvel Movie *Black Panther* and our pedagogical imaginations to consider how we might transform mathematics classrooms to become equitable and empowering spaces for Black and Brown students. In particular, we will consider the character of Shuri to consider a few important questions: 1) What types of learning experiences must Shuri have had in mathematics classrooms? 2) How are Wakandan classrooms organized so that students become forward-thinking and willing to take mathematical risks? These questions allow us to re-imagine what types of mathematical learning experiences we should create for students, especially for Black, Latinx, and Indigenous students who are most disadvantaged by our current system and practices, that might produce more students like Shuri.

We will examine Shuri's actions in the movie that demonstrate the ways in which she is innovative, brave, persistent, and uses math and science to solve current problems, predict and plan to solve future problems, focuses on the use of resources to improve her community; values criticism and feedback to improve and open to new ideas. Leveraging existing mathematics education research on teaching, we will examine both the types of experiences that the students must have in mathematics classrooms and what the teacher needs to do to develop these qualities in an effort to rehumanize mathematics classrooms and help students develop positive mathematics identities. Using our pedagogical imaginations, we will also discuss what we do in teacher education and professional development to prepare more "Wakandan like" teachers who can help inspire more students to become like Shuri. The grade level emphasis of this session is K-8, however, if this is not your main interest, you will be given opportunities to consider the session's applicability to your particular context.

ROBERT Q. BERRY III

*Catalyzing Change in High School Mathematics: Initiating Critical Conversations*

This session will engage all participants in critical conversations using *Catalyzing Change: Initiating Critical Conversations in High School Mathematics*. We will review the key recommendations then participants will examine resources that can be used to support critical conversations with all individuals who have a stake in high school mathematics. The grade level emphasis of this session is 9-12, however, if this is not your main interest, you will be given opportunities to consider the session's applicability to your particular context.



## VIRGINIA BASTABLE

### *Looking for What is Right: Honoring the Mathematical Thinking of Each Student*

Providing access to significant math ideas for all students means helping teachers notice the good mathematics in students' intuitive or even non-conventional solutions. This session will focus on three aspects of teachers' practice as they work to support and honor the mathematical thinking of each of their students; noticing what is right in the student work, supporting students to understand each other's thinking and helping students make connections between their thinking and more formal ways of expressing their ideas.

The first aspect is to note the mathematical work teachers must do in order to look for and understand what is right in partially correct, incomplete, or unexpected solutions. The move from a deficit mode in which teachers identify student errors to one that focuses on determining what mathematics the students understand requires mathematical analysis on the part of their teachers. As students solve problems posed within a context, sometimes they interpret their diagram solutions in terms of the situation, bypassing not only the traditional arithmetic procedure but also the traditional arithmetic answer. We will examine the mathematical work involved in making sense of such responses.

A second aspect of honoring the math thinking of all students is the work teachers need to do to help students make sense of each other's approaches. We will examine how teacher practices, such as, making connections across representations and asking core questions, can support students to understand and learn from each other's solutions. Such discussions ensure all students' ideas are valued, not only by the teacher but by their peers.

Finally, when is it important to help students make the connections between their informal solution methods and the more traditional ways of expressing the answer? If that is a significant component of inviting students into the world of rigorous and meaningful mathematics, how do teachers help students see their own thinking as correct and, in fact, reflected in the more traditional responses?

In this session we will engage in these questions through discussion of a print case of second graders working on a subtraction problem, an examination of a set of student work of fourth graders working with a division situation, and a print case of sixth graders working with a division of fractions problem. While the mathematical examples of this session are drawn from elementary and middle grades, the overarching ideas are appropriate for all grade levels. The grade level emphasis of this session is K-8, however, if this is not your main interest, you will be given opportunities to consider the session's applicability to your particular context.



## EVA THANHEISER AND AMANDA SUGIMOTO

### *Access to Learning Opportunities as a Teaching Routine*

In this session, we will examine what it takes for mathematics teachers to give “access to learning opportunities (ALO)” to understand mathematical ideas and concepts for all students as a regular routine in K-8 math classrooms. Teaching for access to learning opportunities includes exposing mathematical content in different modalities, discussing the meaning of words and ideas, and keeping record of essential concepts, representations, and discussions. There is empirical evidence that suggests that these teaching routines have a positive and significant impact on providing equitable learning opportunities in the classroom, in particular, in linguistically diverse classrooms. Illustrations and discussion around these routines will be analyzed in the context of elementary and middle school math lessons, including geometry and fractions. The illustrations are from diverse classroom settings, including international and the southern US border.

We will identify essential components of such a teaching routine and discuss how each of those components can be enacted in the classroom. We will analyze video clips of K-8 math classrooms with a focus on evidence of the essential components of the ALO teaching routine. We will examine episodes of classroom teaching where access to opportunities to learn are limited as well as ones where access to learning opportunities may be evident. We will discuss the extent to which features of the opportunities are present and what counts as evidence. Through this work together, we will generate a common understanding of “access to learning opportunities” and consider how to use it as a tool in planning math lessons as well as something that is observable during math teaching. Session participants will be given opportunities to create an action plan to incorporate one or two specific “access to learning opportunities” routines in their own teaching context and consider what kind of professional learning support is necessary for teachers to develop and support students in developing these routines. Facilitators will present current research related to the topic and empirical evidence of promising effects of this routine on student achievement. The grade level emphasis of this session is K-8, however, if this is not your main interest, you will be given opportunities to consider the session’s applicability to your particular context.

## AMY LUCENTA AND GRACE KELEMANIK

### *Structural Thinking and the Urgency to Teach It to ALL Students*

Structural thinking provides the glue of mathematics for students. All too often, mathematics is taught as a series of disconnected topics and procedures, thereby leaving many students believing that mathematics is a set of rules to follow and procedures to memorize. In contrast, teaching through, in, and with structure leverages multiple representations, makes explicit conceptual connections, and develops students as problem solvers - 3 research-based recommendations for providing access to all students. In addition, teaching through, in, and with structure positions students to see mathematics as an interconnected discipline that makes sense, and is therefore doable with effort.

Mathematical structure spans all grade levels and makes explicit connections between and among



mathematical ideas. In this session, we will examine how middle school content extends and applies prior student understanding of mathematical structure and builds foundations for future mathematics. We will make connections between and among math topics, including, but not limited to, connecting counting to area and transformational geometry and connecting place value to fractions and algebra.

During the session, participants will explore two examples of trajectories of structural thinking spanning multiple grade levels and engage in an instructional routine designed to develop structural thinking, Contemplate then Calculate. We will begin by building a common understanding of and need for structural thinking by exploring a trajectory of structural thinking. Participants will experience the instructional routine and reflect on pedagogies designed to develop structural thinking and how one task can be mined for a trajectory of structural thinking based on teachers' decisions and goals. We will end by addressing participants questions and sharing resources.

Participants will leave understanding structural thinking trajectories and the urgency for developing structural thinking in ALL students across the K-12 continuum. In addition, participants will know about pedagogies necessary to develop it, and how an instructional routine can support teachers and students alike.





## about Concurrent Sessions III (Thursday 3:15 pm to 5:15 pm)

MARY ALICE CARLSON AND BETH BOROUGHS

### *Fostering Empathy in Mathematics through Mathematical Modeling*

Purposeful agents of access and equity foster the practice of empathy in the context of their daily work. Often, we frame empathy as something we feel for others – our friends, colleagues, and our students. Empathy helps us consider others' circumstances and may even drive us to action on their behalf. In this session, we will consider empathy as a practice that can and should be cultivated in students' mathematical work. We will explore the critical role empathy plays in how we, and our students, understand and solve authentic problems. That is, problems that make a difference in the lives of our students and their communities.

Mathematical modeling involves taking a real-world situation, translating that situation into the mathematical world where the modeler pursues a solution, and then interpreting the results in light of its original context. As such, mathematical modeling situates mathematical problems solving squarely in the middle of our daily, lived experiences. It forces us to consider the contextual features that give rise to problems and aid in developing their solutions. When students engage in mathematical modeling, they are decision-makers whose perspectives, values, and judgements are important. Students consider how their decisions affect others and wrestle with what it means to arrive at a solution that is not just correct, but also good for individuals and their communities.

Drawing on our experiences working with K-12 preservice and inservice teachers and their students, we will consider practices foster empathy in mathematics. Participants will have the opportunity to 1) Engage in an authentic mathematical modeling problem; 2) Consider the features of mathematical modeling problems that foster empathy; 3) Analyze teaching practices that contribute to a mathematics community where students seek and understand others' perspectives while solving problems; and 4) Reflect on ways empathy can play a more prominent role in the teaching and learning of mathematics. Each session's ultimate goal is to consider mathematics professional learning across the K-12 continuum. The grade level emphasis of this session is K-12. Within the session, you will be given opportunities to consider the session's applicability to your particular context.



## MANDY JANSEN

### *“We are all works in progress”: Incorporating Rough Draft Thinking to Re-humanize Mathematics Learning*

In a mathematics classroom where rough draft thinking is promoted, initial ideas or unfinished ideas are recognized as having value to support everyone’s learning of mathematics. During rough draft thinking, students engage in continual improvement and revision of their ideas, solutions, reasoning, and justifications. We can humanize the process of learning mathematics as we actively work to change the perspective that smart people are those who get it right the first time. This perspective is fundamentally untrue; we can continue to grow our understanding about mathematics even when we know how to obtain a correct answer or a convincing argument. Teachers can promote multiple ways of demonstrating competence by giving students opportunities to revise thinking. Mathematical smartness can include sharing unfinished thinking and pushing for further opportunities to grow thinking through revising. Both students and teachers can learn from sharing rough draft thinking about mathematics and revising the ideas.

In this session, we will explore various routines for revising mathematical thinking, from lesson structures to protocols for peer-to-peer discussion, and discuss a range of goals for revising, going beyond correcting mistakes to include creating more precise or illuminating explanations. We will also explore and experience processes for revising our teaching practice and protocols for engaging in revision of teaching together. Then we will reflect together how promoting revision opportunities provides opportunities to re-humanize learning among students and teachers.

For those who have attended a session on rough draft thinking in the past (at a TDG leadership seminar or elsewhere), new ideas in this session include an introduction to explicit structures and processes for incorporating revision opportunities into mathematics classrooms and stronger connections to equity through reflecting together on re-humanizing the mathematics classroom. The grade level emphasis of this session is 4-10, however, if this is not your main interest, you will be given opportunities to consider the session’s applicability to your particular context.

## MARK DRISCOLL AND JOHANNA NIKULA

### *Language Strategies for the Mathematics Classroom: Important Features and Common Pitfalls*

An essential part of providing equitable access to mathematical learning opportunities is ensuring that all students, including students who are English Learners (ELs), are active participants in classroom mathematical discourse. All too often the work of supporting EL communication is deemed a separate endeavor from the mathematical work of the lesson. Furthermore, when examples of language strategies are provided, they frequently lack specificity about integration into mathematics lessons. We have undertaken two studies in response to this dilemma, and will draw from that work in this presentation. Specifically, we will explore several strategies that can support access to and participation



in mathematical communication, including the co-constructed word bank, sentence starters, revoicing, clarifying terms, pairs work, and the use of diagrams as both thinking and communication tools. Planning for how best to use language support strategies to engage all students in a mathematically fruitful conversation is nuanced and complex. It is imperative to embed language strategies into the mathematical work of the lesson and to continually monitor for evidence that ELs have access to the mathematical conversation and evidence that they are actively producing mathematical talk and contributing to that conversation.

For each strategy, we will examine the purpose, key features, common pitfalls, and implementation tips related to using the strategy in mathematics lessons. We will explore mathematics tasks and student work examples drawn from our current studies to practice making decisions about how to use these strategies to enrich mathematical discussion with students' language proficiencies in mind. Examples of tasks and student work used during the session will focus on important upper elementary and middle grades content, including percent change and fraction division, both of which prove central to students learning how to think proportionally. Specifically, we will examine how to embed language support in: (1) tasks where proportional relationships are used to answer questions about percent increases and decreases, and (2) tasks where number lines can support understanding of fraction division. Participants will also be encouraged to consider how these same strategies can be used with tasks from their own grade levels and curricula and what would be different depending on the task and content. The session will also support teacher leaders in considering how to bring these strategies to other teachers as a means to deepen all students' access to rich mathematical thinking and learning. The grade level emphasis of this session is 5-7, however, if this is not your main interest, you will be given opportunities to consider the session's applicability to your particular context.

## DEBORAH LOWENBERG BALL

### *Disrupting Patterns of Injustice in Mathematics Discussions*

Classrooms that provide opportunities for rich mathematical discourse are nonetheless prone to patterns of injustice that are invisibly embedded in normalized practice. This session focuses on specific parts of the work of leading mathematics discussions and how these can be enacted in ways that are attentive to and disrupt these patterns. We will consider in particular the work of developing and using mathematical tasks, orienting students to one another, recognizing mathematical competence, and cultivating norms of respect and collective mathematical work. The grade level emphasis of this session is K-6, however, if this is not your main interest, you will be given opportunities to consider the session's applicability to your particular context.



## HILDA BORKO AND ANTHONY MURO VILLA III

### *Building Teachers' Capacity to Promote Students' Access to Rigorous and Meaningful Mathematics Through Video-Based Discussions*

Discussions about equity and access during professional learning opportunities should be context-based and address teachers' daily problems of practice. These discussions should be grounded in research and focus on practices that support all participants to become agents of change at their sites and in their classrooms. Video-based discussions can be a powerful tool for professional learning about equity and access by situating experiences in teachers' practices. They allow participants to closely examine authentic instances of learning and teaching, and support collaboration. Facilitators can focus video-based discussions on specific issues through the use of guiding questions.

In this session, participants will have the opportunity to participate in, and then plan, video-based discussions focused on issues of access and equity. They will first do mathematics together and then engage in a discussion of a video clip depicting a group of students working on the same mathematics task. Through a focal (launching) question and back-pocket questions, the presenters will guide the discussion to consider evidence of students' access to rigorous and meaningful mathematics and instructional strategies that can promote equitable classrooms. We will then share focal questions and learnings from our current work in a district whose priorities include access to rigorous mathematics for all students and building capacity for teachers to lead professional learning within their own school sites. During the second portion of the session, participants will get a chance to think deeply about their context and to identify issues they would like to engage in with their colleagues to address equity at their own sites. Together, we will contemplate various focal questions and discuss how those questions direct our attention to different aspects of a video and a variety of issues related to student engagement and learning. Participants will then plan a video-based discussion by selecting a 2-3 minute video clip and developing launching and back-pocket questions to focus a discussion on the issue(s) they have identified for their contexts. One group of participants will have the opportunity to rehearse a video-based discussion.

Afterward, we will collectively reflect on the facilitation moves and the potential of video-based discussions for deepening teachers' mathematical knowledge and expanding our understanding of equity in student learning. The session will close with a discussion of how video-based discussions can be used in the participants' various contexts to foster ongoing conversations with their colleagues focused on improving instruction and fostering all students' mathematical learning. The grade level emphasis of this session is 6-12, however, if this is not your main interest, you will be given opportunities to consider the session's applicability to your particular context.



## about Concurrent Sessions IV (Friday 8:00 am to 10:00 am)

PEG SMITH AND MIRIAM GAMORAN SHERIN

*The 5 Practices in Practice: What it Takes to Monitor Student Work*

Discussions that focus on tasks that promote reasoning and problem solving are the primary mechanism for promoting conceptual understanding of mathematics. Such discussions provide students with opportunities to share ideas and clarify understandings, develop convincing arguments, learn to see things from other perspectives, and develop positive identities as mathematical doers. Discussions, however, can be challenging for teachers who are trying to build on and honor students' thinking while at the same time ensure that the mathematical ideas that are at the heart of a lesson are clear and public.

Smith and Stein (2011, 2018) proposed the 5 Practices model to help teachers manage this complexity. The five practices – anticipating, monitoring, selecting, sequencing, and connecting – focus on planning in advance of a lesson, thus limiting the number of in-the-moment decisions that need to be made during the lesson.

This session will focus on the practice of monitoring. Monitoring involves listening in on what students are saying and observing what they are doing as they work on a task; asking questions to determine what students understand and to move them towards the goals of the lesson; and keeping track of the approaches that they are using. This session will provide a detailed unpacking of what is involved in monitoring and the identification of specific challenges teachers have faced related to this practice and how to address them, drawing on the work of Smith and Sherin (in press).

During this session, participants will have the opportunity to: 1) consider what it takes to effectively monitor student work during a lesson; 2) discuss challenges associated with monitoring and how to overcome the challenges; 3) consider the ways in which careful monitoring can promote equity; and 4) reflect on how to support teachers' ability to effectively monitor. Throughout the session, participants will engage in analyzing artifacts (e.g., video, samples of student work, completed monitoring charts) drawn from urban middle school classrooms to illustrate aspects of monitoring. The challenges that will be discussed include: trying to understand what students are thinking, keeping track of group progress, and involving all members of a group. The grade level emphasis of this session is 6-8, however, if this is not your main interest, you will be given opportunities to consider the session's applicability to your particular context.



## DEBORAH LOWENBERG BALL

### *Disrupting Patterns of Injustice in Mathematics Discussions*

Classrooms that provide opportunities for rich mathematical discourse are nonetheless prone to patterns of injustice that are invisibly embedded in normalized practice. This session focuses on specific parts of the work of leading mathematics discussions and how these can be enacted in ways that are attentive to and disrupt these patterns. We will consider in particular the work of developing and using mathematical tasks, orienting students to one another, recognizing mathematical competence, and cultivating norms of respect and collective mathematical work. The grade level emphasis of this session is K-5, however, if this is not your main interest, you will be given opportunities to consider the session's applicability to your particular context.

## HILDA BORKO AND ANTHONY MURO VILLA III

### *Building Teachers' Capacity to Promote Students' Access to Rigorous and Meaningful Mathematics Through Video-Based Discussions*

Discussions about equity and access during professional learning opportunities should be context-based and address teachers' daily problems of practice. These discussions should be grounded in research and focus on practices that support all participants to become agents of change at their sites and in their classrooms. Video-based discussions can be a powerful tool for professional learning about equity and access by situating experiences in teachers' practices. They allow participants to closely examine authentic instances of learning and teaching, and support collaboration. Facilitators can focus video-based discussions on specific issues through the use of guiding questions.

In this session, participants will have the opportunity to participate in, and then plan, video-based discussions focused on issues of access and equity. They will first do mathematics together and then engage in a discussion of a video clip depicting a group of students working on the same mathematics task. Through a focal (launching) question and back-pocket questions, the presenters will guide the discussion to consider evidence of students' access to rigorous and meaningful mathematics and instructional strategies that can promote equitable classrooms. We will then share focal questions and learnings from our current work in a district whose priorities include access to rigorous mathematics for all students and building capacity for teachers to lead professional learning within their own school sites. During the second portion of the session, participants will get a chance to think deeply about their context and to identify issues they would like to engage in with their colleagues to address equity at their own sites. Together, we will contemplate various focal questions and discuss how those questions direct our attention to different aspects of a video and a variety of issues related to student engagement and learning. Participants will then plan a video-based discussion by selecting a 2-3 minute video clip and developing launching and back-pocket questions to focus a discussion on the issue(s) they have identified for their contexts. One group of participants will have the opportunity to rehearse a video-based discussion.



Afterward, we will collectively reflect on the facilitation moves and the potential of video-based discussions for deepening teachers' mathematical knowledge and expanding our understanding of equity in student learning. The session will close with a discussion of how video-based discussions can be used in the participants' various contexts to foster ongoing conversations with their colleagues focused on improving instruction and fostering all students' mathematical learning. The grade level emphasis of this session is 6-12, however, if this is not your main interest, you will be given opportunities to consider the session's applicability to your particular context.

## VIRGINIA BASTABLE

### *Looking for What is Right: Honoring the Mathematical Thinking of Each Student*

Providing access to significant math ideas for all students means helping teachers notice the good mathematics in students' intuitive or even non-conventional solutions. This session will focus on three aspects of teachers' practice as they work to support and honor the mathematical thinking of each of their students; noticing what is right in the student work, supporting students to understand each other's thinking and helping students make connections between their thinking and more formal ways of expressing their ideas.

The first aspect is to note the mathematical work teachers must do in order to look for and understand what is right in partially correct, incomplete, or unexpected solutions. The move from a deficit mode in which teachers identify student errors to one that focuses on determining what mathematics the students understand requires mathematical analysis on the part of their teachers. As students solve problems posed within a context, sometimes they interpret their diagram solutions in terms of the situation, bypassing not only the traditional arithmetic procedure but also the traditional arithmetic answer. We will examine the mathematical work involved in making sense of such responses.

A second aspect of honoring the math thinking of all students is the work teachers need to do to help students make sense of each other's approaches. We will examine how teacher practices, such as, making connections across representations and asking core questions, can support students to understand and learn from each other's solutions. Such discussions ensure all students' ideas are valued, not only by the teacher but by their peers.

Finally, when is it important to help students make the connections between their informal solution methods and the more traditional ways of expressing the answer? If that is a significant component of inviting students into the world of rigorous and meaningful mathematics, how do teachers help students see their own thinking as correct and, in fact, reflected in the more traditional responses?

In this session we will engage in these questions through discussion of a print case of second graders working on a subtraction problem, an examination of a set of student work of fourth graders working with a division situation, and a print case of sixth graders working with a division of fractions problem. While the mathematical examples of this session are drawn from elementary and middle grades, the overarching ideas are appropriate for all grade levels. The grade level emphasis of this session is K-8,



however, if this is not your main interest, you will be given opportunities to consider the session's applicability to your particular context.

## AMY LUCENTA AND GRACE KELEMANIK

### *Structural Thinking and the Urgency to Teach It to ALL Students*

Structural thinking provides the glue of mathematics for students. All too often, mathematics is taught as a series of disconnected topics and procedures, thereby leaving many students believing that mathematics is a set of rules to follow and procedures to memorize. In contrast, teaching through, in, and with structure leverages multiple representations, makes explicit conceptual connections, and develops students as problem solvers - 3 research-based recommendations for providing access to all students. In addition, teaching through, in, and with structure positions students to see mathematics as an interconnected discipline that makes sense, and is therefore doable with effort.

Mathematical structure spans all grade levels and makes explicit connections between and among mathematical ideas. In this session, we will examine how middle school content extends and applies prior student understanding of mathematical structure and builds foundations for future mathematics. We will make connections between and among math topics, including, but not limited to, connecting counting to area and transformational geometry and connecting place value to fractions and algebra.

During the session, participants will explore two examples of trajectories of structural thinking spanning multiple grade levels and engage in an instructional routine designed to develop structural thinking, Contemplate then Calculate. We will begin by building a common understanding of and need for structural thinking by exploring a trajectory of structural thinking. Participants will experience the instructional routine and reflect on pedagogies designed to develop structural thinking and how one task can be mined for a trajectory of structural thinking based on teachers' decisions and goals. We will end by addressing participants questions and sharing resources.

Participants will leave understanding structural thinking trajectories and the urgency for developing structural thinking in ALL students across the K-12 continuum. In addition, participants will know about pedagogies necessary to develop it, and how an instructional routine can support teachers and students alike.





## about Concurrent Sessions V (Friday, 10:15 am to 12:15 pm)

ROBERT BERRY III

### *Catalyzing Change in High School Mathematics: Initiating Critical Conversations*

This session will engage all participants in critical conversations using *Catalyzing Change: Initiating Critical Conversations in High School Mathematics*. We will review the key recommendations then participants will examine resources that can be used to support critical conversations with all individuals who have a stake in high school mathematics. The grade level emphasis of this session is 9-12, however, if this is not your main interest, you will be given opportunities to consider the session's applicability to your particular context.

SCHOOL DISTRICT LEADERS AND TEACHERS DEVELOPMENT GROUP

### *Voices from the Field: Stories of Professional Development Attentive to Access and Equity for ALL*

In this session, experienced school district leaders from four school districts in the Northwest will share stories of their journeys of leadership with regard to improving math learning, supporting instruction through teacher professional development and leading math reform and change in their systems. They will share professional development events in their districts that have made a significant difference for students, teachers, and leaders including both successes and challenges. They will discuss the long-term impact they are seeing on math teaching, learning, and leadership within their systems.

Presenters will highlight their efforts to change and refine mathematics teaching, learning, and leadership to better meet the needs of ALL students. In particular, they will share how their teachers and leaders are working day in and day out to meet the math learning needs of the diverse learners in their schools. They will also discuss how they manage the challenges of systemic wide change, including how they manage multiple initiatives within a school or district while focusing on math instruction and how they have created buy-in from teachers and leaders. Specifically, they will discuss actions they have taken to support the improvement of math teaching and learning over time instead of "one time" professional development events.

Teachers Development Group PD Math Specialists will give a short overview of the Math Studio Program (which has been key professional development in all of the school districts represented) and ways in which central features of the Math Studio model of professional development and the tools used, promote access and equity for students and provide guidance for teachers. Specifically, they will share what they are learning about how working with specific Mathematically Productive Habits and Routines help students access mathematical ideas and develop beliefs about all students' ability to make sense of important mathematical ideas. There will be opportunities to ask specific questions of all presenters and consider connections to your own contexts for professional development.



## MANDY JANSEN

### *“We are all works in progress”: Incorporating Rough Draft Thinking to Re-humanize Mathematics Learning*

In a mathematics classroom where rough draft thinking is promoted, initial ideas or unfinished ideas are recognized as having value to support everyone’s learning of mathematics. During rough draft thinking, students engage in continual improvement and revision of their ideas, solutions, reasoning, and justifications. We can humanize the process of learning mathematics as we actively work to change the perspective that smart people are those who get it right the first time. This perspective is fundamentally untrue; we can continue to grow our understanding about mathematics even when we know how to obtain a correct answer or a convincing argument. Teachers can promote multiple ways of demonstrating competence by giving students opportunities to revise thinking. Mathematical smartness can include sharing unfinished thinking and pushing for further opportunities to grow thinking through revising. Both students and teachers can learn from sharing rough draft thinking about mathematics and revising the ideas.

In this session, we will explore various routines for revising mathematical thinking, from lesson structures to protocols for peer-to-peer discussion, and discuss a range of goals for revising, going beyond correcting mistakes to include creating more precise or illuminating explanations. We will also explore and experience processes for revising our teaching practice and protocols for engaging in revision of teaching together. Then we will reflect together how promoting revision opportunities provides opportunities to re-humanize learning among students and teachers.

For those who have attended a session on rough draft thinking in the past (at a TDG leadership seminar or elsewhere), new ideas in this session include an introduction to explicit structures and processes for incorporating revision opportunities into mathematics classrooms and stronger connections to equity through reflecting together on re-humanizing the mathematics classroom. The grade level emphasis of this session is 4-10, however, if this is not your main interest, you will be given opportunities to consider the session’s applicability to your particular context.

## MARK DRISCOLL AND JOHANNAH NIKULA

### *Language Strategies for the Mathematics Classroom: Important Features and Common Pitfalls*

An essential part of providing equitable access to mathematical learning opportunities is ensuring that all students, including students who are English Learners (ELs), are active participants in classroom mathematical discourse. All too often the work of supporting EL communication is deemed a separate endeavor from the mathematical work of the lesson. Furthermore, when examples of language strategies are provided, they frequently lack specificity about integration into mathematics lessons. We have undertaken two studies in response to this dilemma, and will draw from that work in this presentation. Specifically, we will explore several strategies that can support access to and participation



in mathematical communication, including the co-constructed word bank, sentence starters, revoicing, clarifying terms, pairs work, and the use of diagrams as both thinking and communication tools. Planning for how best to use language support strategies to engage all students in a mathematically fruitful conversation is nuanced and complex. It is imperative to embed language strategies into the mathematical work of the lesson and to continually monitor for evidence that ELs have access to the mathematical conversation and evidence that they are actively producing mathematical talk and contributing to that conversation.

For each strategy, we will examine the purpose, key features, common pitfalls, and implementation tips related to using the strategy in mathematics lessons. We will explore mathematics tasks and student work examples drawn from our current studies to practice making decisions about how to use these strategies to enrich mathematical discussion with students' language proficiencies in mind. Examples of tasks and student work used during the session will focus on important upper elementary and middle grades content, including percent change and fraction division, both of which prove central to students learning how to think proportionally. Specifically, we will examine how to embed language support in: (1) tasks where proportional relationships are used to answer questions about percent increases and decreases, and (2) tasks where number lines can support understanding of fraction division. Participants will also be encouraged to consider how these same strategies can be used with tasks from their own grade levels and curricula and what would be different depending on the task and content. The session will also support teacher leaders in considering how to bring these strategies to other teachers as a means to deepen all students' access to rich mathematical thinking and learning. The grade level emphasis of this session is 5-7, however, if this is not your main interest, you will be given opportunities to consider the session's applicability to your particular context.

DEBORAH SCHIFTER AND SUSAN JO RUSSELL

### *Using Representations to Explore Structure of the Operations*

Elementary students are frequently asked to show their work with pictures or diagrams. In such cases, representations are usually intended to demonstrate how to find an answer to a calculation problem. In contrast, we, along with our colleagues and collaborating teachers, have been exploring how representations can be used to understand more deeply the structure of the operations and justify conjectures students derive from noticing patterns in the number system.

In this session, we will present a teaching model that frames explorations into the structure of the operations. Seminar participants will have the opportunity to work through the phases of the model, focusing on a particular set of generalizations. We will examine representations made by seminar participants and consider their explanatory power. To what extent do the representations demonstrate why a particular generalization must be true?

Then we will turn to students' representations and consider what each representation offers in terms of explanatory power. What is the potential of having students work together to interpret their classmates' representations? What can be learned by comparing representations?



In order to pursue this work, we have been partnering with urban classrooms in grades 1-5 in schools that have traditionally done poorly on state mathematics assessments but have a commitment to engaging all their students in rigorous and significant mathematics. Among the questions we will address are: Why is this kind of deep exploration of structure important to all students, including those from groups that have traditionally been excluded from mathematical pursuits? Within a single classroom, how do such investigations engage the range of learners, including those who have been successful in calculation as well as those who struggle? This session is appropriate for anyone who teaches, works with teachers on, or is interested in mathematics at grades 1 to 5. The grade level emphasis of this session is 1-5, however, if this is not your main interest, you will be given opportunities to consider the session's applicability to your particular context.



## about Concurrent Sessions V (Friday, 3:15 pm to 5:15 pm)

MIKE SHAUGHNESSY

*Revising the NAEP Mathematics Framework: What Changes Should Occur in America's Report Card on Mathematics?*

It has been over 20 years since the National Assessment Governing Board (NAGB) has authorized an update and revision of the *Mathematics Framework* for the National Assessment of Educational Progress (NAEP). This past November, the revision process was initiated for a new *Mathematics Framework* for NAEP that will be fully implemented by NAGB in 2025. A Vision Panel of thirty people including mathematics teachers, administrators, supervisors, mathematics education researchers, teacher educators and parents was assembled to draft a vision for what NAEP should look like in the future. The Vision Panel was charged with reflecting on and updating what mathematics should be assessed (at Grades 4, 8, and 12), but it was also asked to raise any other issues in the NAEP assessment process that should be considered in the new *Mathematics Framework*. Issues and concerns raised by the Vision Panel included questions about: the conditions under which the assessment occurs; needed accommodations for students; updating a vision for the use of technology in the assessment; improving the ways that the results are reported, and some recommendations for additions to the *Mathematics Framework*. The Vision Panel's recommendations were handed off to a Development Panel for consideration for a revision of the *NAEP Mathematics Framework*. The Development Panel, composed of fifteen members of the original Vision Panel, has been working on rewriting the *NAEP Mathematics Framework* for the past three months.

In this session, participants will be given an opportunity to consider updates and revisions of the *NAEP Mathematics Framework* themselves. The recommendations of the Vision Panel will be shared and participants will be asked to reflect on those recommendations and to formulate and share their own suggestions for updates to include in the *2025 NAEP Mathematics Framework*. At the heart of the session is the question: What would you recommend should be included in the next *NAEP Mathematics Framework*, and why?

The session will begin with a brief history and overview of NAEP, and end by sharing some of the changes that the Development Panel has been crafting over the past three months in its revision of the *Mathematics Framework*. The Development Panel's new draft will be sent to the National Assessment Governing Board (NAGB) for review in March, and later in the Spring (May) the revised *NAEP Mathematics Framework* will be released to the entire nation for public review and comment.



## JOSÉ FRANCO

### *Cultivating Equity-based Mathematics Classroom Practices*

What actions are you and your colleagues taking to establish a safe and coherent system-wide mathematics learning environment for K-12 teachers, students, and families? What successes and challenges have you experienced in your particular role with regard to the pursuit of access and equity for every student?

This presentation will focus on equity-oriented practices that support powerful mathematics learning in grades K-12. Practices to be introduced and examined will include: (1) critically reflecting on our beliefs and expectations of students and their families regarding mathematics as they relate to equity as defined in *Principles to Actions* (NCTM, 2014), (2) rethinking the identities that we often assign students or ourselves as students and teachers of mathematics, (3) encouraging student engagement and voice, and (4) differentiating instruction to meet the needs of each student. Participants will engage in equity oriented practices together and reflect on how their experiences translate to their students and consider implications for professional development.

Participants will have an opportunity to collaborate with others on mathematical tasks, share their stories, discuss issues, and generate ideas to take back to their onsite K-12 Professional Learning Communities to support the learning of students, teachers, and leaders.

## MEGAN FRANKE

### *Taking Up Children's Partial Understandings: Pressing on our Cognitively Guided Instruction Work Together*

This session will explore how attending to the details and partial understandings of children's thinking can enable teachers to engage students in learning together in ways that make use of the variety of resources that each student brings. We will work together on what is involved in creating space in the classroom for students to share their partial ideas and then consider how to support students to extend these ideas. This session will focus primarily on preK-K but will be relevant to early elementary grade levels as well and relevant for anyone across the preK-12 continuum who want to consider ideas of partial understandings.



## ELIZABETH PHILLIPS AND YVONNE SLANGER-GRANT

### *Inscriptions: Developing and Communicating Deep Learning of Mathematics*

As Franke and Kazemi observe, “focusing on students’ mathematical thinking remains a powerful mechanism for bringing pedagogy, mathematics, and student understanding together” (2001, p. 108). Inscriptions are external representations of thinking that students use to develop, record, and communicate their mathematical understandings and vital for creating inquiry-based, student-centered classrooms.

Inscriptions imply a social nature to learning where meanings of the student work are publicly shared and negotiated among students. Essential to the development of inscriptions is an environment that is centered on building from current student understandings, and from there, moving the mathematics forward. This embodies the necessary means to make the mathematics more accessible while building student authority and agency. The focus on inscriptions has the potential to improve the depth, breadth, and productivity of mathematical learning while making problem-based learning more accessible. As students use inscriptions to build, represent, negotiate, justify, and recall their conceptual understandings, students cultivate identities as knowers and doers of mathematics. Meaningful experiences with inscriptions require that students have opportunities to build on their prior experiences in ways such that their thinking gets picked up, elaborated, and used in future work.

Research suggests that inscriptions are an integral part of classroom instruction for both individual cognition and social practice (e.g., Lehrer & Shauble, 2012; Medina & Suthers, 2013; Stylianou, 2010.) Creating inscriptions goes well beyond simply copying what one sees or hears. It involves inventing or adapting conventions of a representational system to “select, magnify, fix, compose, or transport information and to recruit it in the service of disciplinary argument” (Lehrer & Shauble, 2002, p. 168). Inscriptions can push inquiry forward and co-evolve as students develop deep mathematical understandings.

We will report on current research activities involving the *Connected Mathematics Project (CMP)* curriculum. One current NSF design research project involves designing and developing digital collaborative environments that support students to make their thinking visible using digital inscriptional resources. By embedding *CMP* units into the digital environment, we investigate the kinds of student inscriptions that are developed, recorded, and communicated in individual, small group, and whole-class digital spaces and classroom discussions.

We will discuss the opportunities and challenges teachers face with the interplay between the constructions of student inscriptions and the development of mathematical understandings. This discussion will connect to ways in which mathematics educators can design and enact professional learning for teachers of mathematics. The grade level emphasis of this session is 5-9, however, if this is not your main interest, you will be given opportunities to consider the session’s applicability to your particular context.



## MARY ALICE CARLSON AND BETH BURROUGHS

### *Fostering Empathy in Mathematics through Mathematical Modeling*

Purposeful agents of access and equity foster the practice of empathy in the context of their daily work. Often, we frame empathy as something we feel for others – our friends, colleagues, and our students. Empathy helps us consider others' circumstances and may even drive us to action on their behalf. In this session, we will consider empathy as a practice that can and should be cultivated in students' mathematical work. We will explore the critical role empathy plays in how we, and our students, understand and solve authentic problems. That is, problems that make a difference in the lives of our students and their communities.

Mathematical modeling involves taking a real-world situation, translating that situation into the mathematical world where the modeler pursues a solution, and then interpreting the results in light of its original context. As such, mathematical modeling situates mathematical problems solving squarely in the middle of our daily, lived experiences. It forces us to consider the contextual features that give rise to problems and aid in developing their solutions. When students engage in mathematical modeling, they are decision-makers whose perspectives, values, and judgements are important. Students consider how their decisions affect others and wrestle with what it means to arrive at a solution that is not just correct, but also good for individuals and their communities.

Drawing on our experiences working with K-12 preservice and inservice teachers and their students, we will consider practices foster empathy in mathematics. Participants will have the opportunity to 1) Engage in an authentic mathematical modeling problem; 2) Consider the features of mathematical modeling problems that foster empathy; 3) Analyze teaching practices that contribute to a mathematics community where students seek and understand others' perspectives while solving problems; and 4) Reflect on ways empathy can play a more prominent role in the teaching and learning of mathematics. Each session's ultimate goal is to consider mathematics professional learning across the K-12 continuum. The grade level emphasis of this session is K-12. Within the session, you will be given opportunities to consider the session's applicability to your particular context.





## about Concurrent Sessions VII (Saturday 8:00 am to 10:00 am)

SUSAN JO RUSSELL AND DEBORAH SCHIFTER

### Who Can Think Mathematically? Insisting on Significant Math Thinking in Urban Classrooms

Who can think mathematically? Especially for students seen as “not yet ready” for engaging with significant mathematical ideas, an overly simplified view of a progression from “concrete” to “abstract” can restrict access to cognitively demanding tasks. Do you have to know algorithms for adding and subtracting before you can think about additive structures? Do you have to know your multiplication facts before you can think multiplicatively? In our work over the last decade, we have been learning how work on generalization and mathematical argument in the elementary classroom opens up opportunities for students with a range of strengths and needs to engage in rigorous and meaningful mathematics.

Generalization and mathematical argument are at the heart of the discipline. Students in the elementary grades can engage in these fundamental practices in the context of core grade-level content. In several NSF-funded projects, we developed an approach to integrating mathematical argument into the classroom (Russell, Schifter, & Bastable, 2011; Russell, Schifter, et al., 2017). Our teaching model comprises several phases of student work: noticing regularities and patterns about the operations; articulating conjectures about those regularities; using representations in order to understand the mathematical structure underlying the conjectures; and constructing representation-based arguments.

In our current work, we have been exploring how to engage the range of learners in significant mathematics, while, at the same time, ensuring that each learner starts with what they know and is challenged to move forward. In particular, how can a pre-written sequence of lessons on mathematical argument support all students to grow in both mathematical content and practices? In order to pursue these questions, we are partnering with urban classrooms in grades 1-5 in schools that have traditionally done poorly on state mathematics assessments but have a commitment to engaging all of their students in rigorous and significant mathematics.

In this session, we will be looking at videos from these classrooms in order to consider how the expectation that all students grapple with important mathematics supports students from groups that have been historically left out of mathematics learning. We will focus on three key aspects of this work: 1) articulating mathematical ideas and explanations; 2) representation-based argument; and 3) productive lingering on important math ideas. The grade level emphasis of this session is 1-5, however, if this is not your main interest, you will be given opportunities to consider the session’s applicability to your particular context.



## JOSÉ FRANCO

### *Cultivating Equity-based Mathematics Classroom Practices*

What actions are you and your colleagues taking to establish a safe and coherent system-wide mathematics learning environment for K-12 teachers, students, and families? What successes and challenges have you experienced in your particular role with regard to the pursuit of access and equity for every student?

This presentation will focus on equity-oriented practices that support powerful mathematics learning in grades K-12. Practices to be introduced and examined will include: (1) critically reflecting on our beliefs and expectations of students and their families regarding mathematics as they relate to equity as defined in *Principles to Actions* (NCTM, 2014), (2) rethinking the identities that we often assign students or ourselves as students and teachers of mathematics, (3) encouraging student engagement and voice, and (4) differentiating instruction to meet the needs of each student. Participants will engage in equity oriented practices together and reflect on how their experiences translate to their students and consider implications for professional development.

Participants will have an opportunity to collaborate with others on mathematical tasks, share their stories, discuss issues, and generate ideas to take back to their onsite K-12 Professional Learning Communities to support the learning of students, teachers, and leaders.

## PEG SMITH

### *The 5 Practices in Practice: What it Takes to Select, Sequence and Connect Student Responses*

Discussions that focus on tasks that promote reasoning and problem solving are the primary mechanism for promoting conceptual understanding of mathematics. Such discussions provide students with opportunities to share ideas and clarify understandings, develop convincing arguments, learn to see things from other perspectives, and develop positive identities as mathematical doers. Discussions, however, can be challenging for teachers who are trying to build on and honor students thinking while at the same time ensure that the mathematical ideas that are at the heart of a lesson are clear and public.

Smith and Stein (2011, 2018) proposed the 5 Practices model to help teachers manage this complexity. The five practices – anticipating, monitoring, selecting, sequencing, and connecting – focus on planning in advance of a lesson, thus limiting the number of in-the-moment decisions that need to be made during the lesson.

This session will focus on the practices of selecting, sequencing and connecting. These practices involve determining what strategies—and what mathematics—will be the focus of the whole class



discussion (selecting); purposefully ordering the solutions so that the mathematics is accessible to all students (sequencing); and making connections between different solution strategies and to the key mathematical ideas at the heart of the lesson (connecting). This session will provide an unpacking of what is involved in these practices and the identification of specific challenges teachers have faced related to these practices and how to address them, drawing on the work of Smith and Sherin (in press).

During this session, participants will have the opportunity to: 1) consider the importance of selecting, sequencing and connecting student responses; 2) discuss key challenges associated with selecting, sequencing and connecting and how to overcome them; 3) consider the ways in which selecting, sequencing and connecting can promote equity; and 4) reflect on how to support teachers' ability to effectively select, sequence and connect student responses. Throughout the session, participants will engage in analyzing artifacts (e.g., video, samples of student work) drawn from urban middle school classrooms to illustrate aspects of selecting, sequencing and connecting. The challenges that will be discussed include: selecting only solutions that are most relevant to learning goals, determining how to sequence errors, misconceptions, and/or incomplete solutions, and ensuring key mathematical ideas are made public and remain the focus. The grade level emphasis of this session is 6-8, however, if this is not your main interest, you will be given opportunities to consider the session's applicability to your particular context.

## IMANI MASTERS GOFFNEY

*From Oakland to Wakanda: Transforming Mathematics Classrooms to Become Equitable and Empowering Spaces for Black and Brown Students*

In this presentation, we will use the context of the Marvel Movie *Black Panther* and our pedagogical imaginations to consider how we might transform mathematics classrooms to become equitable and empowering spaces for Black and Brown students. In particular, we will consider the character of Shuri to consider a few important questions: 1) What types of learning experiences must Shuri have had in mathematics classrooms? 2) How are Wakandan classrooms organized so that students become forward-thinking and willing to take mathematical risks? These questions allow us to re-imagine what types of mathematical learning experiences we should create for students, especially for Black, Latinx, and Indigenous students who are most disadvantaged by our current system and practices, that might produce more students like Shuri.

We will examine Shuri's actions in the movie that demonstrate the ways in which she is innovative, brave, persistent, and uses math and science to solve current problems, predict and plan to solve future problems, focuses on the use of resources to improve her community; values criticism and feedback to improve and open to new ideas. Leveraging existing mathematics education research on teaching, we will examine both the types of experiences that the students must have in mathematics classrooms and what the teacher needs to do to develop these qualities in an effort to rehumanize mathematics classrooms and help students develop positive mathematics identities. Using our pedagogical imaginations, we will also discuss what we do in teacher education and professional development to prepare more "Wakandan like" teachers who can help inspire more students to become like Shuri. The



grade level emphasis of this session is K-8, however, if this is not your main interest, you will be given opportunities to consider the session's applicability to your particular context.

## EVA THANHEISER AND AMANDA SUGIMOTO

### *Access to Learning Opportunities as a Teaching Routine*

In this session, we will examine what it takes for mathematics teachers to give “access to learning opportunities (ALO)” to understand mathematical ideas and concepts for all students as a regular routine in K-8 math classrooms. Teaching for access to learning opportunities includes exposing mathematical content in different modalities, discussing the meaning of words and ideas, and keeping record of essential concepts, representations, and discussions. There is empirical evidence that suggests that these teaching routines have a positive and significant impact on providing equitable learning opportunities in the classroom, in particular, in linguistically diverse classrooms. Illustrations and discussion around these routines will be analyzed in the context of elementary and middle school math lessons, including geometry and fractions. The illustrations are from diverse classroom settings, including international and the southern US border.

We will identify essential components of such a teaching routine and discuss how each of those components can be enacted in the classroom. We will analyze video clips of K-8 math classrooms with a focus on evidence of the essential components of the ALO teaching routine. We will examine episodes of classroom teaching where access to opportunities to learn are limited as well as ones where access to learning opportunities may be evident. We will discuss the extent to which features of the opportunities are present and what counts as evidence. Through this work together, we will generate a common understanding of “access to learning opportunities” and consider how to use it as a tool in planning math lessons as well as something that is observable during math teaching. Session participants will be given opportunities to create an action plan to incorporate one or two specific “access to learning opportunities” routines in their own teaching context and consider what kind of professional learning support is necessary for teachers to develop and support students in developing these routines. Facilitators will present current research related to the topic and empirical evidence of promising effects of this routine on student achievement. The grade level emphasis of this session is K-8, however, if this is not your main interest, you will be given opportunities to consider the session's applicability to your particular context.



