

# Contents

---

<b>Foreword</b>	<b>vii</b>
<i>Virginia C. Stimpson</i>	
<b>Acknowledgements</b>	<b>ix</b>
<b>About the Authors</b>	<b>xi</b>
<b>PART I. USEFUL TOOLS</b>	<b>1</b>
<b><i>Secondary Lenses on Learning Observation and Reflection</i></b> <b>Guide for a Mathematics Lesson</b>	<b>2</b>
<b>Levels of the Math-Talk Learning Community:</b> <b>Action Trajectories for Teacher and Student</b>	<b>6</b>
<b>Task Analysis Guide</b>	<b>10</b>
<b>PART II. SESSION INTRODUCTIONS AND READINGS</b>	<b>11</b>
<b>Session 1. What Does It Mean to <i>Know</i> Algebra? (Content)</b>	<b>12</b>
Readings and Focus Questions to Prepare for Session 1 (Two Homework Readings)	<b>14</b>
<b>READING 1.1. SHOULD ALL STUDENTS LEARN A SIGNIFICANT</b> <b>AMOUNT OF ALGEBRA?</b>	<b>16</b>
<i>Zalman Usiskin</i>	
<b>READING 1.2. A COURSE CALLED ALGEBRA I</b>	<b>25</b>
<i>James T. Fey and Elizabeth Difanis Phillips</i>	
<b>Session 2. What Does High-Quality Instruction Look Like? (Instruction)</b>	<b>34</b>
Readings and Focus Questions to Prepare for Session 2 (Two Homework Readings)	<b>35</b>
<b>READING 2.1. MATHEMATICAL UNDERSTANDING: AN INTRODUCTION</b>	<b>37</b>
<i>Karen C. Fuson, Mindy Kalchman, and John D. Bransford</i>	
<b>READING 2.2. ANALYZING MATHEMATICS INSTRUCTIONAL TASKS</b>	<b>68</b>
<i>Mary Kay Stein, Margaret Schwan Smith, Marjorie A. Henningsen,</i> <i>and Edward A. Silver</i>	
In-Session Readings for Session 2	<b>75</b>
<b>READING 2.3. A WORLD OF DIFFERENCE: CLASSROOMS ABROAD PROVIDE</b> <b>LESSONS IN TEACHING MATH AND SCIENCE</b>	<b>76</b>
<i>James Hiebert and James W. Stigler</i>	
<b>READING 2.4. MATHEMATICS FOR THE MOMENT, OR THE MILLENNIUM?</b>	<b>82</b>
<i>Jo Boaler</i>	

<b>Session 3. How Can Assessment Support Learning and Instruction? (Formative Assessment)</b>	<b>85</b>
Readings and Focus Questions to Prepare for Session 3 (Two Homework Readings)	86
<b>READING 3.1. ASSESSMENT CRISIS: THE ABSENCE OF ASSESSMENT FOR LEARNING</b> <i>Richard J. Stiggins</i>	<b>88</b>
<b>READING 3.2. WORKING INSIDE THE BLACK BOX: ASSESSMENT FOR LEARNING IN THE CLASSROOM</b> <i>Paul Black, Christine Harrison, Clare Lee, Bethan Marshall, and Dylan Wiliam</i>	<b>99</b>
<b>Session 4. How Can We Hold High Expectations and Provide Strong Support for All Students? (Equitable Practices)</b>	<b>117</b>
Readings and Focus Questions to Prepare for Session 4 (Readings 4.1 and 4.2 for All Participants and Readings 4.3, 4.4, and 4.5 to Be Divided Among Building Team Members)	119
<b>READING 4.1. MAKING MATHEMATICS WORK FOR ALL CHILDREN: ISSUES OF STANDARDS, TESTING, AND EQUITY</b> <i>Alan H. Schoenfeld</i>	<b>121</b>
<b>READING 4.2. THE CASE OF THE RAFTER SCHOOL DISTRICT</b>	<b>143</b>
<b>READING 4.3. IT DOESN'T ADD UP: AFRICAN AMERICAN STUDENTS' MATHEMATICS ACHIEVEMENT</b> <i>Gloria Ladson-Billings</i>	<b>149</b>
<b>READING 4.4. LEARNING FROM TEACHING: EXPLORING THE RELATIONSHIP BETWEEN REFORM CURRICULUM AND EQUITY</b> <i>Jo Boaler</i>	<b>161</b>
<b>READING 4.5. A SITUATED AND SOCIOCULTURAL PERSPECTIVE ON BILINGUAL MATHEMATICS LEARNERS</b> <i>Judit Moschkovich</i>	<b>180</b>
<b>Session 5. How Can Professional Development Enable Teachers to Improve Student Achievement? (Practice-Based Professional Development)</b>	<b>199</b>
Readings and Focus Questions to Prepare for Session 5 (Three Homework Readings)	200
<b>READING 5.1. PRACTICE-BASED PROFESSIONAL DEVELOPMENT FOR TEACHERS OF MATHEMATICS</b> <i>Margaret Schwan Smith</i>	<b>203</b>
<b>READING 5.2. DESIGNING PROFESSIONAL DEVELOPMENT FOR TEACHERS OF SCIENCE AND MATHEMATICS</b> <i>Susan Loucks-Horsley, Nancy Love, Katherine E. Stiles, Susan Mundry, and Peter W. Hewson</i>	<b>210</b>
<b>READING 5.3. IMPLEMENTING STANDARDS-BASED MATHEMATICS INSTRUCTION: A CASEBOOK FOR PROFESSIONAL DEVELOPMENT</b> <i>Mary Kay Stein, Margaret Schwan Smith, Marjorie A. Henningsen, and Edward A. Silver</i>	<b>244</b>
In-Session Readings for Session 5	252
<b>READING 5.4. THE CASES OF CATHERINE EVANS AND DAVID YOUNG</b> <i>Margaret Schwan Smith, Edward A. Silver, and Mary Kay Stein</i>	<b>253</b>

<b>READING 5.5. DESCRIBING LEVELS AND COMPONENTS OF A MATH-TALK LEARNING COMMUNITY</b>	<b>270</b>
<i>Kimberly Hufferd-Ackles, Karen C. Fuson, and Miriam Gamoran Sherin</i>	
<b>READING 5.6. REDEFINING SUCCESS IN MATHEMATICS TEACHING AND LEARNING</b>	<b>302</b>
<i>Margaret Schwan Smith</i>	
<b>Session 6. How Can School Leaders Advance Their Mathematics Program Toward Success for All? (Mathematics Improvement Process)</b>	<b>310</b>
Reading and Focus Questions to Prepare for Session 6 (One Homework Reading)	311
<b>READING 6.1. BRIDGING THE GAP BETWEEN STANDARDS AND ACHIEVEMENT: THE IMPERATIVE FOR PROFESSIONAL DEVELOPMENT IN EDUCATION</b>	<b>313</b>
<i>Richard E. Elmore</i>	
<b>PART III. TEAM DATA ASSIGNMENTS (DATA AS A TOOL FOR ASSESSING THE MATHEMATICS PROGRAM)</b>	<b>345</b>
<b>Team DATA to Collect Between Session 1 (Content) and Session 2 (Instruction)</b>	<b>346</b>
Part A: Overview of DATA Assignments Between Sessions 1 and 2	347
Part B: Templates for Data Collection	348
Part C: Whole Team Reflection	357
<b>Team DATA to Collect Between Session 2 (Instruction) and Session 3 (Formative Assessment)</b>	<b>358</b>
Part A: Overview of DATA Assignments Between Sessions 2 and 3	359
Part B: Templates for Data Collection	360
Part C: Whole Team Reflection	365
<b>Team DATA to Collect Between Session 3 (Formative Assessment) and Session 4 (Equitable Practices)</b>	<b>366</b>
Part A: Overview of DATA Assignments Between Sessions 3 and 4	367
Part B: Templates for Data Collection	368
Part C: Whole Team Reflection	387
<b>Team DATA to Collect Between Session 4 (Equitable Practices) and Session 5 (Practice-Based Professional Development)</b>	<b>388</b>
Part A: Overview of DATA Assignments Between Sessions 4 and 5	389
Part B: Templates for Data Collection	390
Part C: Whole Team Reflection	399
<b>Team DATA to Collect Between Session 5 (Practice-Based Professional Development) and Session 6 (Mathematics Improvement Process)</b>	<b>401</b>
Part A: Overview of DATA Assignments Between Sessions 5 and 6	402
Part B: Templates for Data Collection	403
Part C: Whole Team Reflection	404
<b>Areas to Pursue: Composite List</b>	<b>406</b>
<b>A Few Final Thoughts</b>	<b>409</b>

---

# 2 Session

## *What Does High-Quality Instruction Look Like?*

### *(Instruction)*

Instruction plays a critical role in students' learning of mathematics. In order to deliver high-quality instruction in mathematics, teachers need to have a deep knowledge and understanding of the subject matter at two levels: (1) one that enables them to do mathematics themselves and (2) one that enables them to teach it. In addition, effective teachers of mathematics need both general pedagogical knowledge and specific pedagogy for the teaching of mathematics (including both a deep understanding of how students learn mathematics and the capacity to elicit and build on students' mathematical thinking). They also need to know the mathematics curriculum (within the grade level[s] they teach as well as across the K–12 grades).

This session focuses on what high-quality instruction in mathematics looks like. It also provides an opportunity to discuss research findings about how people learn mathematics, as the basis for recommendations about promising instructional practices. In addition, participants explore the connection between the “cognitive demand” of tasks and opportunities to learn mathematical ideas.

This session offers the opportunity to do the following:

- Examine what is known about how people learn mathematics
- Develop an understanding of instructional strategies that promote student learning in mathematics
- Examine the types of knowledge teachers need to effectively lead mathematics instruction: (a) strong mathematics content for themselves, (b) the content needed to teach it to others, (c) pedagogy of mathematics, (d) students and how they learn, and (e) and curriculum, at and across grade levels
- Consider how various types of mathematical tasks directly affect what mathematics students have the opportunity to learn.

## READING 3.2

### *Working Inside the Black Box* *Assessment for Learning in the Classroom*

Paul Black

Christine Harrison

Clare Lee

Bethan Marshall

Dylan Wiliam

*In their widely read article “Inside the Black Box,” Mr. Black and Mr. Wiliam demonstrated that improving formative assessment raises student achievement. Now they and their colleagues report on a follow-up project that has helped teachers change their practice and students change their behavior so that everyone shares responsibility for the students’ learning.*

In 1998 “Inside the Black Box,” the predecessor of this article, appeared in this journal.<sup>1</sup> Since then we have learned a great deal about the practical steps needed to meet the purpose expressed in the article’s subtitle: “raising standards through classroom assessment.”

In the first part of “Inside the Black Box,” we set out to answer three questions. The first was, Is there evidence that improving formative assessment raises standards? The answer was an unequivocal yes, a conclusion based on a review of evidence published in over 250 articles by researchers from several countries.<sup>2</sup> Few initiatives in education have had such a strong body of evidence to support a claim to raise standards.

This positive answer led naturally to the second question: Is there evidence that there is room for improvement? Here again, the available evidence gave a clear and positive answer, presenting a detailed picture that identified three main problems: (1) the assessment methods that teachers use are not effective in promoting good learning, (2) grading practices tend to emphasize competition rather than personal improvement, and (3) assessment feedback often has a negative impact, particularly on low-achieving students, who are led to believe that they lack “ability” and so are not able to learn.

However, for the third question—Is there evidence about how to improve formative assessment?—the answer was less clear. While the evidence provided many ideas for improvement, it lacked the detail that would enable teachers to implement those ideas in

---

Source: © Black, 2004. Reproduced by permission of GL Assessment Ltd.