

---

# Contents

Preface .....	ix
<b>Part 1: Learning about Data and Chance .....</b>	<b>1</b>
<b>1. Graphing with Four-Year-Olds: Exploring the Possibilities through Staff Development .....</b>	<b>5</b>
Sydney L. Schwartz <i>Queens College of the City University of New York     Flushing, New York</i>	
David J. Whitin <i>Wayne State University     Detroit, Michigan</i>	
<b>2. What Does It Mean That “5 Has a Lot”? From the World to Data and Back .....</b>	<b>17</b>
Susan Jo Russell <i>TERC     Cambridge, Massachusetts</i>	
<b>3. Learning to Talk Back to a Statistic .....</b>	<b>31</b>
David J. Whitin <i>Wayne State University     Detroit, Michigan</i>	
<b>4. Engaging Students in Authentic Data Analysis .....</b>	<b>41</b>
Randall E. Groth <i>Salisbury University     Salisbury, Maryland</i>	
<b>5. Students’ Probabilistic Thinking Revealed: The Case of Coin Tosses .....</b>	<b>49</b>
Laurie H. Rubel <i>Brooklyn College of the City University of New York     Brooklyn, New York</i>	

- 6. Assessing the Development of Important Concepts in Statistics and Probability ..... 61**  
 Jane M. Watson  
*University of Tasmania*  
*Hobart, Tasmania, Australia*
- 7. Research on Students' Understanding of Some Big Concepts in Statistics ..... 77**  
 J. Michael Shaughnessy  
*Portland State University*  
*Portland, Oregon*
- Part 2: Reasoning with Data and Chance ..... 99**
- 8. A Statistical Study of Generations ..... 103**  
 Henry Kranendonk  
*Milwaukee Public Schools*  
*Milwaukee, Wisconsin*  
 Roxy Peck  
*California Polytechnic State University*  
*San Luis Obispo, California*
- 9. More than "Meanmedianmode" and a Bar Graph: What's Needed to Have a Statistical Conversation? ..... 117**  
 Susan N. Friel  
*University of North Carolina at Chapel Hill*  
*Chapel Hill, North Carolina*  
 William O'Connor  
*Duke School*  
*Durham, North Carolina*  
 James D. Mamer  
*Rockway Elementary School*  
*Springfield, Ohio*
- 10. When Data and Chance Collide: Drawing Inferences from Empirical Data ..... 139**  
 James E. Tarr  
*University of Missouri—Columbia*  
*Columbia, Missouri*  
 Hollylynn Stohl Lee  
*North Carolina State University*  
*Raleigh, North Carolina*  
 Robin L. Rider  
*East Carolina State University*  
*Greenville, North Carolina*

- 11. Experimental Design: Learning to Manage Variability ..... 151**  
Daniel J. Teague  
*North Carolina School of Science and Mathematics  
Durham, North Carolina*
- 12. “We Were Nicer, but We Weren’t Fairer!” Mathematical  
Modeling Exploring “Fairness” in Data Management ..... 171**  
Susan London McNab  
*Ontario Institute for Studies in Education of the  
University of Toronto  
Toronto, Ontario*  
Joan Moss  
*Ontario Institute for Studies in Education of the  
University of Toronto  
Toronto, Ontario*  
Earl Woodruff  
*Ontario Institute for Studies in Education of the  
University of Toronto  
Toronto, Ontario*  
Rod Nason  
*Queensland University of Technology  
Brisbane, Queensland, Australia*
- 13. Using Real Data and Technology to Develop Statistical Thinking ..... 185**  
Doreen Connor  
*Royal Statistical Society Centre for Statistical Education,  
Nottingham Trent University  
Nottingham, United Kingdom*  
Neville Davies  
*Royal Statistical Society Centre for Statistical Education,  
Nottingham Trent University  
Nottingham, United Kingdom*  
Peter Holmes  
*Royal Statistical Society Centre for Statistical Education,  
Nottingham Trent University  
Nottingham, United Kingdom*
- 14. Using Regression to Connect Algebra to the Real World ..... 195**  
Jim Bohan  
*Lancaster-Lebanon Intermediate Unit #13  
East Petersburg, Pennsylvania*

- 15. Using Data to Enhance the Understanding of Functions:  
Data Analysis in the Precalculus Curriculum ..... 209**
- Peter Flanagan-Hyde  
*Phoenix Country Day School  
Paradise Valley, Arizona*
- John Lieb  
*Roxbury Latin School  
West Roxbury, Massachusetts*
- 16. Changing the Face of Statistical Data Analysis in the Middle  
Grades: Learning by Doing ..... 229**
- Kay McClain  
*Vanderbilt University  
Nashville, Tennessee*
- Julie Leckman  
*Madison Number One Middle School  
Phoenix, Arizona*
- Paula Schmitt  
*Madison Meadows Middle School  
Phoenix, Arizona*
- Troy Regis  
*University of Missouri—Columbia  
Columbia, Missouri*
- 17. Understanding Data through New Software Representations ..... 241**
- Andee Rubin  
*TERC  
Cambridge, Massachusetts*
- James K. Hammerman  
*TERC  
Cambridge, Massachusetts*
- 18. Using Graphing Calculator Simulations in Teaching Statistics ..... 257**
- Michael H. Koehler  
*Blue Valley North High School  
Overland Park, Kansas*
- 19. What Is Statistical Thinking, and How Is It Developed? ..... 273**
- Sharon J. Lane-Getaz  
*University of Minnesota  
Minneapolis, Minnesota*

<b>20. Using Graphing Calculators to Redress Beliefs in the “Law of Small Numbers”</b> .....	<b>291</b>
Alfinio Flores	
<i>Arizona State University</i>	
<i>Tempe, Arizona</i>	
<b>Part 3: Reflecting on Issues Related to Data and Chance</b> .....	<b>305</b>
<b>21. Statistics and Mathematics: On Making a Happy Marriage</b> .....	<b>309</b>
Richard L. Scheaffer	
<i>University of Florida, Emeritus</i>	
<i>Gainesville, Florida</i>	
<b>22. Some Important Comparisons between Statistics and Mathematics, and Why Teachers Should Care</b> .....	<b>323</b>
Allan Rossman	
<i>California Polytechnic State University</i>	
<i>San Luis Obispo, California</i>	
Beth Chance	
<i>California Polytechnic State University</i>	
<i>San Luis Obispo, California</i>	
Elsa Medina	
<i>California Polytechnic State University</i>	
<i>San Luis Obispo, California</i>	
<b>23. The Statistical Education of Grades Pre-K–2 Teachers: A Shared Responsibility</b> .....	<b>335</b>
Christine A. Franklin	
<i>University of Georgia</i>	
<i>Athens, Georgia</i>	
Denise S. Mewborn	
<i>University of Georgia</i>	
<i>Athens, Georgia</i>	
<b>24. The GAISE Project: Developing Statistics Education Guidelines for Grades Pre-K–12 and College Courses</b> .....	<b>345</b>
Christine A. Franklin	
<i>University of Georgia</i>	
<i>Athens, Georgia</i>	
Joan B. Garfield	
<i>University of Minnesota</i>	
<i>Minneapolis, Minnesota</i>	

- 25. Why Variances Add—and Why It Matters** ..... 377  
 David Bock  
*Cornell University*  
*Ithaca, New York*  
 Paul F. Velleman  
*Cornell University*  
*Ithaca, New York*
- 26. Bootstrapping Students' Understanding of Statistical Concepts** ..... 391  
 Tim Hesterberg  
*Insightful Corporation*  
*Seattle, Washington*
- 27. Interpreting Probabilities and Teaching the Subjective Viewpoint** ..... 417  
 Jim Albert  
*Bowling Green State University*  
*Bowling Green, Ohio*
- 28. Assessments, Change, and Exploratory Data Analysis** ..... 435  
 John A. Dossey  
*Illinois State University, Emeritus*  
*Normal, Illinois*
- 29. Fish 'n' Chips: A Pedagogical Path for Using an In-Class  
 Sampling Experiment** ..... 449  
 Heather A. Thompson  
*Iowa State University*  
*Ames, Iowa*  
 Gail Johnston  
*Iowa State University*  
*Ames, Iowa*  
 Tamara Pfantz  
*Iowa State University*  
*Ames, Iowa*
- 30. Research in the Statistics Classroom: Learning from  
 Teaching Experiments** ..... 467  
 Dani Ben-Zvi  
*University of Haifa*  
*Mount Carmel, Haifa, Israel*  
 Joan B. Garfield  
*University of Minnesota*  
*Minneapolis, Minnesota*  
 Andrew Zieffler  
*University of Minnesota*  
*Minneapolis, Minnesota*