

# Contents

<i>List of Figures</i>	<i>page</i> ix
<i>List of Tables</i>	xiii
<i>List of Contributors</i>	xv
<i>Preface</i>	xix
R. KEITH SAWYER	
<b>1. Introduction: The New Science of Learning</b>	<b>1</b>
R. KEITH SAWYER	

## **Part I. Foundations**

<b>2. Foundations of the Learning Sciences</b>	<b>21</b>
MITCHELL J. NATHAN AND R. KEITH SAWYER	
<b>3. Scaffolding</b>	<b>44</b>
BRIAN J. REISER AND IRIS TABAK	
<b>4. Metacognition</b>	<b>63</b>
PHILIP H. WINNE AND ROGER AZEVEDO	
<b>5. A History of Conceptual Change Research: Threads and Fault Lines</b>	<b>88</b>
ANDREA A. DISESSA	
<b>6. Cognitive Apprenticeship</b>	<b>109</b>
ALLAN COLLINS AND MANU KAPUR	
<b>7. Learning in Activity</b>	<b>128</b>
JAMES G. GREENO AND YRJÖ ENGSTRÖM	

## **Part II. Methodologies**

<b>8. Design-Based Research: A Methodological Toolkit for Engineering Change</b>	<b>151</b>
SASHA BARAB	
<b>9. Microgenetic Methods</b>	<b>171</b>
CLARK A. CHINN AND BRUCE L. SHERIN	

---

10. Analyzing Collaboration	191
NOEL ENYEDY AND REED STEVENS	
11. Frontiers of Digital Video Research in the Learning Sciences: Mapping the Terrain	213
RICKI GOLDMAN, CARMEN ZAHN, AND SHARON J. DERRY	
12. A Learning Sciences Perspective on the Design and Use of Assessment in Education	233
JAMES W. PELLEGRINO	
13. Educational Data Mining and Learning Analytics	253
RYAN BAKER AND GEORGE SIEMENS	
 <b>Part III. Practices that Foster Effective Learning</b>	
14. Project-Based Learning	275
JOSEPH S. KRAJCIK AND NAMSOO SHIN	
15. Problem-Based Learning	298
JINGYAN LU, SUSAN BRIDGES, AND CINDY E. HMELO-SILVER	
16. Complex Systems and the Learning Sciences	319
URI WILENSKY AND MICHAEL J. JACOBSON	
17. Tangible and Full-Body Interfaces in Learning	339
MICHAEL EISENBERG AND NARCIS PARES	
18. Embodiment and Embodied Design	358
DOR ABRAHAMSON AND ROBB LINDGREN	
19. Videogames and Learning	377
CONSTANCE STEINKUEHLER AND KURT SQUIRE	
 <b>Part IV. Learning Together</b>	
20. Knowledge Building and Knowledge Creation: Theory, Pedagogy, and Technology	397
MARLENE SCARDAMALIA AND CARL BEREITER	
21. The Social and Interactive Dimensions of Collaborative Learning	418
NAOMI MIYAKE AND PAUL A. KIRSCHNER	
22. Arguing to Learn	439
JERRY ANDRIESSEN AND MICHAEL BAKER	

- 
- |   |     |
|---|-----|
| 23. Informal Learning in Museums                      | 461 |
| KEVIN CROWLEY, PALMYRE PIERROUX, AND<br>KAREN KNUTSON |     |
| 24. Computer-Supported Collaborative Learning         | 479 |
| GERRY STAHL, TIMOTHY KOSCHMANN, AND<br>DANIEL SUTHERS |     |
| 25. Mobile Learning                                   | 501 |
| MIKE SHARPLES AND ROY PEA                             |     |
| 26. Learning in Virtual Worlds                        | 522 |
| YASMIN B. KAFAI AND CHRIS DEDE                        |     |

## **Part V. Learning Disciplinary Knowledge**

- |   |     |
|---|-----|
| 27. Research in Mathematics Education: What Can It Teach Us about Human Learning? | 545 |
| ANNA SFARD AND PAUL COBB  |     |
| 28. Science Education and the Learning Sciences as Coevolving Species             | 565 |
| NANCY BUTLER SONGER AND YAEL KALI   |     |
| 29. Learning Historical Concepts  | 587 |
| MARIO CARRETERO AND PETER LEE   |     |
| 30. Learning to Be Literate   | 605 |
| PETER SMAGORINSKY AND RICHARD E. MAYER  |     |
| 31. Arts Education and the Learning Sciences                                      | 626 |
| ERICA ROSENFELD HALVERSON AND KIMBERLY<br>M. SHERIDAN                             |     |

## **Part VI. Moving Learning Sciences Research into the Classroom**

- |   |     |
|---|-----|
| 32. Learning Sciences and Policy Design and Implementation: Key Concepts and Tools for Collaborative Engagement | 649 |
| WILLIAM R. PENUEL AND JAMES P. SPILLANE   |     |
| 33. Designing for Learning: Interest, Motivation, and Engagement  | 668 |
| SANNA JÄRVELÄ AND K. ANN RENNINGER  |     |
| 34. Learning as a Cultural Process: Achieving Equity through Diversity  | 686 |
| NA'ILAH SUAD NASIR, ANN S. ROSEBERY, BETH WARREN,<br>AND CAROL D. LEE   |     |

35. <b>A Learning Sciences Perspective on Teacher Learning Research</b>	707
BARRY J. FISHMAN, ELIZABETH A. DAVIS, AND CAROL K. K. CHAN	
36. <b>Conclusion: The Future of Learning: Grounding Educational Innovation in the Learning Sciences</b>	726
R. KEITH SAWYER	
<i>Index</i>	747