

## TABLE OF CONTENTS

Acknowledgments	vii
Foreword <i>Lee S. Shulman</i>	ix
SECTION I: INTRODUCTION	
1. Pedagogical Content Knowledge: An Introduction and Orientation <i>Julie Gess-Newsome</i>	3
SECTION II: THE LITERATURE	
2. The Complex Nature and Sources of Teachers' Pedagogical Knowledge <i>Greta Morine-Dersheimer &amp; Todd Kent</i>	21
3. Secondary Teachers' Knowledge and Beliefs about Subject Matter and their Impact on Instruction <i>Julie Gess-Newsome</i>	51
4. Nature, Sources and Development of Pedagogical Content Knowledge for Science Teaching <i>Shirley Magnusson, Joseph Krajcik &amp; Hilda Borko</i>	95
5. Domains of Teacher Knowledge <i>William S. Carlsen</i>	133

**SECTION III: EMERGING LINES OF RESEARCH IN SCIENCE  
TEACHER EDUCATION**

6. Assessment and Measurement of Pedagogical Content Knowledge 147  
*Juliet A. Baxter & Norman G. Lederman*
7. Changing our Teaching: The Role of Pedagogical Content Knowledge in Elementary Science 163  
*Deborah C. Smith*
8. Reconceptualizing Secondary Science Teacher Education 199  
*Norman G. Lederman & Julie Gess-Newsome*
9. Pedagogical Content Knowledge and Co-Participation in Science Classrooms 215  
*Kenneth Tobin & Campbell J. McRobbie*

**SECTION IV: IMPACTS OF PCK ON THE DEVELOPMENT OF  
SCIENCE TEACHER EDUCATION PROGRAMS**

10. Constructing a Framework for Elementary Science Teaching Using Pedagogical Content Knowledge 237  
*Carla Zembal, Mary Starr & Joseph Krajcik*
11. Incorporating Subject Matter Specific Teaching Strategies into Secondary Science Teacher Preparation 257  
*Margaret L. Niess & Janet M. Scholz*
12. The TRIAD Approach: A Consensus for Science Teaching and Learning 277  
*Cheryl L. Mason*
- Notes on Contributors 293
- First Author Index 299
- Subject Index 305

## SUBJECT INDEX

- academic tasks 28-30, 43, 238-242, 283-288
- assessment 7, 99, 108  
dimensions 108-109  
methods of 109-110, 149-158  
teacher knowledge of 250-252
- card sort 153-154, 203
- case-based teacher education 38-41, 45
- classroom discourse 8, 30-35, 43, 216-221, 230-233
- classroom observation 158-160, 286
- classroom organization and management 22-27, 43, 98, 202, 204, 244
- classroom practice 24-25, 155-160, 208
- collaboration 279-281
- community of learners 30, 43, 100, 101, 123, 181, 216, 218, 229-231
- concept maps 151-153, 156, 157, 158, 240, 243, 282, 284-285, 287
- conceptual change 100, 101, 102, 106, 107, 110, 111, 154, 155, 157, 158
- conceptual knowledge 55-56, 59-64, 155, 277
- constructivism 217-220
- content representation 8-9
- content specific methods courses 86-87, 179-182, 211, 238, 243, 274-275
- context, knowledge of 98, 118-119, 245-246
- convergent/inferential techniques 149-151
- co-participation 215-233
- curricular knowledge 21, 99, 103-104, 136-137, 175, 247-248, 259
- electrochemistry 215, 221-225
- expert-novice differences 26-27, 107, 114, 122, 190-191
- gender 34-35, 43
- induction period 87-88
- instructional strategies 27-30, 32-34, 43-44, 99, 109-117, 156, 157, 173-175, 183, 200  
activities 101, 111, 113-115  
representations 111-113  
subject-specific 110-111  
topic-specific 110, 111-115
- interviews 154-156, 157-159
- interview about instance 154, 157
- journals 283-284, 287, 288
- knowledge bases of teaching 95-96, 103, 116, 117-118, 242-243
- lesson/unit planning 154, 202, 239-242
- Master of Arts in Teaching 208, 209, 210, 258, 262
- metaphors 36-37, 46
- models of teacher cognition 3, 10-14
- nature of science 57, 70-75, 82-84, 169, 183-185, 209, 250
- orientations to teaching 57-58, 75-78, 87-88, 97-103, 172, 185, 211, 246-247
- pedagogical content knowledge 6, 7, 8, 10-16, 22, 23, 52, 98-99, 116-117, 215, 217, 232, 257, 279  
assessment 149, 151, 152-160  
definition 3-4, 96, 135, 147-148, 149, 151, 158, 243  
history 3-4, 133-142, 147
- pedagogical knowledge 5, 21-24, 98, 116-120, 244, 257, 261, 278, 281  
assessment 149-151, 153, 156-160  
definition 21-24, 136, 148, 149, 244, 278  
personal 23, 36-42  
context-specific 23, 41-42
- pedagogy structures 207-210

- pictorial representation 151-153, 157  
 post-structural perspectives 6, 133-142  
 power relations 135, 137-139, 232  
 prior beliefs 36-37, 122  
 process-product research 24-26, 51-53, 158  
 program evaluation 8-9  
 questioning 31-32, 172, 180  
 school context 27, 58, 78-82, 245-246  
 science educational reform 53, 121, 134, 140-142, 238, 250  
 science teacher preparation 38-39, 44-46, 124-125, 126-127, 199, 277-281, 290-291  
     elementary 8, 179-188, 238-244, 251-254  
     international 210, 213  
     preservice 116, 123-127  
     secondary 9, 82-86, 107, 113, 114-115, 199-213, 257, 279-280  
 sociology of schools 87  
 structural perspective 133-142  
 students  
     achievement 24-27, 31  
     interaction 33-35, 215-218  
     knowledge 106, 107  
     learning 104, 108, 218-221, 228-230, 282  
     misconceptions 102, 105-108, 181, 224, 232  
     participation 34, 226-233  
     preconceptions 122, 167-168, 172, 180  
     understandings 97, 104, 106-107, 113, 218-221, 249-250  
 subject matter knowledge 5-6, 7, 51-89, 98, 110, 113-115, 117-119, 123-124, 136, 140-141, 202, 203, 202, 212, 243-244  
     assessment 151, 153, 157, 159  
     content 283-285  
     definition 52, 54-58, 148, 243-244  
     history 51-53  
     subject matter structure 56-57, 123-124, 151-155, 157, 159, 203-212, 280, 284  
     substantive knowledge 98, 121, 136, 155, 165, 166, 176-183  
     syntactical knowledge 98, 136, 165, 169-171, 176-179, 183-187  
 teachers/faculty  
     college/university 82-84  
     secondary 54, 59-89  
 self-critique 200  
 teacher beliefs 111, 122-123, 157, 158-159, 215, 225  
 teacher decision making 158, 202  
 teacher knowledge 26  
     domains of 95-98, 103, 111, 116-118, 133-142  
 teaching concerns 200, 201, 202  
 teaching experience 26, 38-42  
     apprentice 241, 245  
     inservice 172-179  
     micro teaching 44, 200-201, 203, 204, 275  
     peer teaching 44, 201, 203, 204  
     preservice 45, 179-188, 202, 238-242, 251, 275, 276  
 textbooks 79-81, 141-142  
 university science content courses 8-9, 82-83, 211, 238  
 viability 219, 229