

Contents

| | | |
|------------------|---|------------|
| | Foreword | iii |
| | Task Force | v |
| | Acknowledgments | ix |
| | From the National Perspective | xiii |
| | Preface: Changing the Teaching and Learning of Mathematics | xv |
| | Introduction: Planning Curriculum in Mathematics | xxi |
| CHAPTER 1 | We Are All Learners of Mathematics. | 1 |
| | Where Is Mathematics Today? | 3 |
| | How Did Mathematics Education Get Where It Is Today? | 4 |
| | Mathematics in Wisconsin | 10 |
| Chapter 2 | Teaching and Learning Mathematics with Understanding. | 19 |
| | Why Understanding? | 21 |
| | What Is Understanding? | 22 |
| | How Understanding Is Developed | 22 |
| | Is Understanding the Same for Everyone? | 25 |
| | Critical Dimensions of Classrooms That Promote Understanding | 25 |
| | Structuring and Applying Knowledge | 27 |
| | Reflection and Articulation | 28 |
| | Classroom Norms | 30 |
| | Conclusion | 32 |
| CHAPTER 3 | Curriculum, Instruction, and Assessment | 35 |
| | Curriculum | 37 |
| | What Is a Curriculum? | 37 |
| | How Is Mathematical Knowledge Built? | 38 |
| | What Are the Implications for Curricula? | 40 |
| | What Are Conceptual and Procedural Knowledge? | 41 |
| | What Is the Relationship Between Conceptual and Procedural Knowledge? | 43 |
| | What Has the TIMSS Study Found in Curricular Comparisons? | 43 |
| | What Efforts Have Been Made to Address the Curriculum Question? | 44 |
| | Instruction. | 45 |
| | What Is Good Mathematics Teaching? | 45 |
| | How Is Teacher Expertise Achieved? | 47 |
| | Professionalization or Professionalism? | 48 |
| | What Steps Have Been Taken to Professionalize Teaching? | 49 |
| | Assessment | 51 |
| CHAPTER 4 | Designing Professional Development to Promote Understanding | 63 |
| | Why Is There a Need for Professional Development? | 65 |
| | What Should This Professional Development Look Like? | 67 |
| | What Assessment Techniques Can Be Used to Measure the Effects of Professional Development Experiences? | 74 |
| | What Is the Ultimate Goal of Professional Development? | 77 |

| | | |
|------------------|---|------------|
| | Is There Anything Regarding Professional Development That Can Be Learned from the Experiences of Other Countries? | 78 |
| | What Does the Research Show about Professional Development? | 80 |
| CHAPTER 5 | Putting the Standards into Action | 85 |
| | Mathematics Content PK–12 | 87 |
| | Early Beginnings in Mathematics | 113 |
| | Learning Mathematical Processes in the Elementary Grades | 120 |
| | The Young Adolescent Learner of Mathematics | 167 |
| | The Secondary Learner of Mathematics | 199 |
| CHAPTER 6 | Using Research to Guide Mathematics Program Development. | 273 |
| | Learning Research | 275 |
| | Nature of Classroom Tasks | 277 |
| | Role of the Teacher and the Social Culture of the Classroom | 279 |
| | Mathematical Tools as Learning Supports | 281 |
| CHAPTER 7 | Foundations for Consideration in Mathematics Program Development. | 285 |
| | Openness | 287 |
| | Time | 290 |
| | Equity | 295 |
| | Technology | 301 |
| | Service Learning | 305 |
| CHAPTER 8 | How Does a District Look at Mathematics Program Development? | 319 |
| | How Does a School District Go About Examining Its Mathematics Program? | 322 |
| | Ongoing Program Support | 334 |
| CHAPTER 9 | Commitment and Adaptability. | 339 |
| | Adaptability | 347 |
| | Commitment | 347 |
| | Appendix | 351 |
| | Appendix A: National Science Foundation-Funded Curricula and Impact Studies | 351 |
| | Appendix B: Proposed Mathematics Program Approval Guidelines for PI 34 Standard 1 | 359 |
| | Appendix C: Suggested School District Mathematics Standards Levels to be Compatible with State of Wisconsin Model Academic Standards | 367 |
| | Appendix D: Assessment Sample Forms | 393 |
| | Appendix E: Readings | 461 |
| | Appendix F: Exemplary Professional Development Programs | 477 |
| | Appendix G: National Council of Teachers of Mathematics Position Papers | 495 |