Preface

Why undertake a book about inquiry methods in science, technology, engineering, and mathematics (STEM)? Primarily, there is a lot of information about inquiry, and a lot of information about STEM, but not a lot of meaningfully written, thoughtful application about both topics. This book represents the work of many authors toward meaningful discourse of inquiry used in STEM teaching. Secondly, we began this book journey with the idea that teachers and teacher education candidates needed a solid foundation from which to create inquiry based STEM curriculum. It presents to teachers and teacher education candidates incredibly insightful information about using inquiry in the real classroom, case studies from which research suggests appropriate uses, and tangible direction for creating their own inquiry based STEM activities.

The book is presented in four sections. The sections take the reader logically through the meaning of inquiry in STEM teaching, how to use technology in modern classrooms, STEM projects that successfully integrate inquiry methodology, and inquiry problem solving within STEM classrooms. We hope that you enjoy reading the book and use the activities and models in your classrooms.

As a methodology, teachers are often flummoxed when it comes to teaching using inquiry. The range of teacher understanding sometimes with students answering questions on worksheets to students conducting their own research projects. Rylander's chapter, "*Using Levels of Inquiry in the Classroom*," carefully explains the inquiry method and how teachers can use it in the classroom with students of all ages. Childers and Lowry expand understanding of inquiry by integrating it into writing, in their chapter, "*STEMing the Tide: Writing to Learn in Science*." Shroeder and Adesope's chapter on concept mapping does an excellent job of helping student learn scientific language and concepts. Meletiou–Maverothis and Paparistodemou examine how teachers can help parents understand not only scientific language that their children are learning, but develop an understanding of STEM: Science, Technology, Engineering, and mathematics. A meta-analysis of distance eLearning, by Kumtepe, Bozkaya, and Aydın, analyzes the ways in which inquiry has been used, or not used, in distance learning classes over the last decade. Assessment is always part

of any good instruction and Clarke-Midura, Code, Zap, and Dede finish this section with their chapter on Virtual performance assessment, in their chapter "*Assessing Science Inquiry: A Case Study of the Virtual Performance Assessment Project*."

So how do we use technology with inquiry? Part of any instruction is helping students become comfortable and adept at using technology. Lennex, Nettleton, and Murphy examine how preschool students learn to navigate a computer, providing implications for curriculum planning and assessment with technologies. Barnes' chapter on mobile technology provides insight into using a variety of mobile technologies in the classroom as tools to inquiry. Amir and Subramaniam's chapter, "*Fostering Inquiry in Science Among Kinaesthetic Learners Through Design and Technology*," addresses issues involving kinesthetic learners and technology, while Adesope examines a variety of multimedia use in a statistics course.

Integrating technology into inquiry based learning is just one aspect of STEM. The rest of the book is divided into two sections: Project learning and problem-based learning. Shon, Jeong, and Hammons starts project learning with a preschool undertaking that not only integrates aspects of STEM into inquiry, but highlights the cultural heritage of the students. Eguchi and Uribe use robotics as the basis for learning in "*Educational Robotics Meets Inquiry-Based Learning: Integrating Inquiry-Based Learning into Robotics*." Angelone inspires student to explore and learn through movie making in "*Making and Thinking Movies in the Science Classroom*." Cleary's students explore the ocean core in "*Getting to the Core: Undergraduate Research on Ocean Cores and Collaborative Scientific Project Management*." Bhattacharyya encourages student to use digital stories as they study rocks, minerals, and plate tectonics in "*Using Digital Stories in a College Level Course on Rocks and Minerals: Lessons Learned*."

In the final book section, problem solving is the instructional strategy used in inquiry learning. Using problem solving methods with teacher candidates in e-learning, Matsuda provides insights in the chapter, "*Cultivating Student-Teachers' Problem-Solving Abilities by Promoting Utilization of Various Ways of Thinking through E-Learning and E-Portfolio System*." Holmes, Thurmond, Annetta, and Sears suggest in "*Serious Educational Games (SEGs) and Student Learning and Engagement with Scientific Concepts*," that student educational gaming can be a powerful learning tool. Carvalho, Palhares, Osorio, Gomes, and Mamede examine how student use of math LOGO software in elementary school creates better understanding. Urban, Marker, and Falvo examine the problem of climate change in "*An Interdisciplinary Exploration of the Climate Change Issue and Implications for Teaching STEM Through Inquiry*." Cohen and Zimmerman use WISE software to help students examine the Greenhouse effect in "*Teaching the Greenhouse Effect with Inquiry-Based Computer Simulations: A WISE Case Study*." Finally, Fragoudakis and Karampatsis created and field tested software to help students resolve problems with conceptual geometry.