Preface

The constantly changing landscape of STEM Education makes it challenging for experts and practitioners to stay informed of the field’s most up-to-date research. That is why Information Science Reference is pleased to offer this three-volume reference collection that will empower students, researchers, and academicians with a strong understanding of critical issues within STEM Education by providing both broad and detailed perspectives on cutting-edge theories and developments. This reference is designed to act as a single reference source on conceptual, methodological, technical, and managerial issues, as well as provide insight into emerging trends and future opportunities within the discipline.

*STEM Education: Concepts, Methodologies, Tools, and Applications* is organized into six distinct sections that provide comprehensive coverage of important topics. The sections are: (1) Fundamental Concepts and Theories, (2) Tools and Technologies, (3) Frameworks and Methodologies, (4) Cases and Applications, (5) Issues and Challenges, and (6) Emerging Trends. The following paragraphs provide a summary of what to expect from this invaluable reference tool.

Section 1, “Fundamental Concepts and Theories,” serves as a foundation for this extensive reference tool by addressing crucial theories essential to the understanding of STEM Education. Introducing the book is “STEM in Early Childhood Education,” a great foundation laying the groundwork for the basic concepts and theories that will be discussed throughout the rest of the book. Another chapter of note in Section 1 is titled “Creating Open Source Lecture Materials.” Where Section 1 leaves off with fundamental concepts, Section 2 discusses tools and technologies in place for STEM Education.

Section 2, “Tools and Technologies,” presents extensive coverage of the various tools and technologies used in the implementation of STEM Education. Section 2 begins where Section 1 left off, though this section describes more concrete tools at place in the modeling, planning, and applications of STEM Education. The first chapter, “Technology in Mathematics Education,” lays a framework for the types of works that can be found in this section, a perfect resource for practitioners looking for the types of technologies currently in practice in STEM Education. Section 2 is full of excellent chapters like this one, including such titles as “Teaching Mathematics with Tablet PCs,” “Using Educational Computer Games for Science Teaching,” and “Online Simulator Use in the Preparing Chemical Engineers,” to name a few. Where Section 2 described specific tools and technologies at the disposal of practitioners, Section 3 describes frameworks and methodologies within the field.

Section 3, “Frameworks and Methodologies,” presents in-depth coverage of the conceptual design and architecture of STEM Education. Opening the section is “Multiple Perspectives for the Study of Teaching.” This section is vital for developers and practitioners who want to measure and track the progress of STEM Education through the multiple lens of parametric design. Through case studies, this section lays excellent groundwork for later sections that will get into present and future applications for STEM Education, including, of note: “Learning about the Different Dimensions of Sustainability by Applying the Product Test Method in Science Classes” and “Providing Elementary and Middle School Science
Teachers with Content and Pedagogical Professional Development in an Online Environment.” The section concludes with another excellent work, titled “Linking Education to Creating a Knowledge Society.”

Section 4, “Cases and Applications,” describes how the broad range of STEM Education efforts has been utilized and offers insight on and important lessons for their applications and impact. Section 4 includes the widest range of topics because it describes case studies, research, architectures, theory, analysis, and guides for implementation. The first chapter in the section is titled “3D Multi-User Virtual Environments in Science Education” Section 4 concludes with an excellent view of a case study in a new program, “Video Gaming for STEM Education.”

Section 5, “Issues and Challenges,” presents coverage of academic and research perspectives on STEM Education tools and applications. The section begins with “Self-Regulated Learning as a Method to Develop Scientific Thinking.” The section concludes with “Developing an Online Mathematics Methods Course for Preservice Teachers,” a great transitional chapter between Sections 5 and 6 because it examines an important trend going into the future of the field. The last chapter manages to show a theoretical look into future and potential technologies, a topic covered in more detail in Section 6.

Section 6, “Emerging Trends,” highlights areas for future research within the field of STEM Education, opening with “Opening Both Eyes: Gaining an Integrated Perspective of Geology and Biology.” Section 6 contains chapters that look at what might happen in the coming years that can extend the already staggering amount of applications for STEM Education. Other chapters of note include “Environmental Science Education in the 21st Century” and “New Trends in Service Science and Education for Service Innovation.” The final chapter of the book looks at an emerging field within STEM Education, in the excellent contribution, “Why Immersive, Interactive Simulation Belongs in the Pedagogical Toolkit of ‘Next Generation’ Science.”

Although the primary organization of the contents in this multi-volume work is based on its six sections, offering a progression of coverage of the important concepts, methodologies, technologies, applications, social issues, and emerging trends, the reader can also identify specific contents by utilizing the extensive indexing system listed at the end of each volume. Furthermore to ensure that the scholar, researcher, and educator have access to the entire contents of this multi volume set as well as additional coverage that could not be included in the print version of this publication, the publisher will provide unlimited multi-user electronic access to the online aggregated database of this collection for the life of the edition, free of charge when a library purchases a print copy. This aggregated database provides far more contents than what can be included in the print version, in addition to continual updates. This unlimited access, coupled with the continuous updates to the database ensures that the most current research is accessible to knowledge seekers.

As a comprehensive collection of research on the latest findings related to using technology to providing various services, STEM Education: Concepts, Methodologies, Tools, and Applications, provides researchers, administrators, and all audiences with a complete understanding of the development of applications and concepts in STEM Education. Given the vast number of issues concerning usage, failure, success, policies, strategies, and applications of STEM Education in countries around the world, STEM Education: Concepts, Methodologies, Tools, and Applications addresses the demand for a resource that encompasses the most pertinent research in technologies being employed to globally bolster the knowledge and applications of STEM Education.