Preface

In recent years, digital and social technologies have been changing the way we teach and learn. Interactive whiteboards vs. blackboards, e-books vs. printed textbooks, handheld devices vs. stationeries, computer-mediated communications vs. face-to-face communications … our classrooms are experiencing an accelerated process of evolution. Today, a classroom is no longer just an isolated physical space in which the “one size fits all” type of teaching and learning takes place – a predetermined number of students all learn the same thing at the same time from the same person in the same way in the same place with four walls for certain hours per day. Instead, the ongoing classroom is a far more personal, social, and flexible learning community where teachers can empower students with 21st century skills and create exciting new learning opportunities for promoting problem solving, critical thinking, and collaboration skills among their students. Students can interact with other students, gain from their experiences, and construct their own knowledge within digital technology. Towards a more comprehensive understanding of transforming K-12 classroom with digital technology, Meier’s (1995) five “habits of mind” are constantly raised: How do we know what we know (evidence)? Whose perspective does this represent (point of view)? How is this related to that (connections)? How might things have been otherwise (supposition)? Why is this important (relevance)? In order to shed light on these questions, we contribute this book, titled *Transforming K-12 Classrooms with Digital Technology*.

*Transforming K-12 Classrooms with Digital Technology* shares both conceptual and practical aspects of using digital and social technologies as tools for transforming K-12 learning environments. The book includes a selection of chapters addressing current research, case studies, design and applications, best practices, pedagogical approaches and strategies, projects, and resources related to digital and social technologies integration in K-12 education. The book is organized into two sections: “Conceptual Aspects” (Chapters 1-8) and “Practical Aspects” (Chapter 9-18). The book is written for a broad audience including K-12 teachers and support staff, school and district administrators, teacher educators, college students in education programs, researchers and professionals working in the area of e-learning in various disciplines (e.g., education, information and communications technology, computer science, library information science, corporate training and workforce development, etc.). The book can also be adopted for support of teacher education, information science, educational technology, and related subjects in undergraduate and/or advanced graduate degrees.

Chapter 1 explores the previous research regarding the integration of digital technologies for schools, teachers, and most importantly the 21st century students that today’s classrooms are intended to serve. However, with most emerging technologies, the research has not kept pace with the ever-increasing advance of digital technologies. Therefore, this chapter highlights some of the promising new technology devices, programs, and educational practices in need of quality evaluative research. By exploring how
today’s students and their learning needs are being changed by current and emerging promising digital technologies, a personal vision for the reader should begin to emerge on how schools might transform their 20th century teachers and classroom into spaces, including virtual spaces, that better serve today’s 21st century students.

Since 2000, there has been an increasing trend in online learning directed toward K-12 schools in the United States. The need for online courses has become evident as schools are searching for ways to meet students’ learning needs. Chapter 2 seeks to demonstrate the growing trend of blended and online learning in the United States, analyze instructional implications of blended and online learning to students, discuss major obstacles to blended and online learning in K-12 schools, and address possible solutions and recommendations for further studies.

Multimodal literacies are an essential construct of the 21st century classroom, and mobile technology will serve to facilitate the collaborative creation of multimodal digital content. The mission of chapter 3 is to highlight the potential of mobile technology as a means for enabling collaborative activities and fostering effective communication. Drawing on recent research on the cognitive benefits of multimodal literacy instruction and its potential for increasing opportunities for student engagement, this chapter provides a rationale for and subsequently sketches a practical approach for fostering collaborative, multimodal literacy practices through mobile technology.

Game-Based Learning (GBL) is proving to be a promising and engaging tool for STEM learning. How GBL affects content and mastery is unknown, however. For GBL to be more than an engaging tool for delivery of basic knowledge, it must be designed to achieve the goals of Project-Based Learning (PBL). Chapter 4 provides guidelines for developing effective GBL for classroom and informal science settings. The guidelines are supported by an analysis of the research behind the use of game-based learning as project-based and problem-based learning.

Digital games are increasingly being used as educational tools. They are intrinsically motivating for many students and offer a natural learning environment. However, not all games are equally effective in the classroom and there is thus a need for frameworks to guide teachers so that learning goals are aligned with a game’s goals and to determine whether or not the game design supports effective learning. Chapter 5 offers an analysis framework that can be used by classroom teachers to understand the different ways that games can support learning and to critique specific games to determine whether or not they meet the learning requirements. The chapter includes a checklist for teachers as well as a feedback form for students who play test games for use in the classroom.

Chapter 6 describes the use of a family of Electronic Performance Support Systems (EPSS) to support teachers and students with mild disabilities, especially those with special learning and behavioral needs. This approach uses technology to support students in educational environments. In this chapter, the authors provide a brief overview of the family of tools and describe the need, rationale, and technical development process of the latest tools in the family, PictureTools™ and PictureTools-Mobile™. These tools are designed to support positive behaviors of young children, incorporate both images and video, and in the case of PT-Mobile, have the capacity to run on iPod and iPad. In addition, this chapter presents the results from two federally funded projects related to development, usability, and feasibility testing of these tools. Future research directions are also discussed.

Chapter 7 discusses Apple’s iBooks Author, a brand-new Mac application intended for textbook writers and publishers to create e-textbooks. It provides insight on why IBA holds a prominent place in the field of education and will change our classroom landscape, that is, how we teach and learn. The main purpose of this chapter is to explore IBA’s potential, possible controversial issues, pedagogical
meanings, and implementation challenges of using it as a classroom textbook. The chapter includes lessons learned from the leading countries in implementing e-textbooks in the classroom, such as South Korea and Malaysia.

Chapter 8 reviews previously published articles and summarizes trends in STEM research in early childhood education over the last twelve years (2000-2012) by employing a content analytic procedure. The specific purposes of the study were to determine the general characteristics of the STEM research in early childhood education, to identify the research designs being applied in articles, and to reveal the common research topics/issues on STEM education in the field of early childhood education. A total of 41 articles were extracted from a wide range of publications. Thematic analysis revealed two main themes and nine subthemes on research topics/issues, including policy, management, equity issues, STEM schools, theories, models, professional development, teacher support, program development and evaluation, learner and teacher attributes, and pre-service teacher education.

The need for technology-enriched learning environments is driven by advancements in 21st century technology and an increase in STEM-related careers. Although women and racial/ethnic minorities make up a significant portion of the American workforce, they remain underrepresented in STEM-related careers. Integrating Computing Across the Curriculum (ICAC) is a five-year research intervention project whose aim is to reduce STEM career-related inequality by providing teachers with the resources they need to integrate computing across the curriculum. The ICAC integration model involves administrators, teachers, students, and their parents. Chapter 9 provides support for the ICAC model as a means of promoting student interest in STEM and as a means of developing technology-enriched curricula designed to improve 21st century teaching and learning.

Chapter 10 showcases a new framework (Technology and Play Framework) for teachers to consider when planning the use of digital technologies in the early years of formal schooling. It also presents the findings from a pilot study conducted with an F-1 (Foundation year and year 1) class in an Australian primary school that demonstrated how this framework could direct the effective use of a specific digital technology in terms of student learning outcomes with particular focus on literacy and numeracy. While play is recognized as an essential component of good practice in early childhood settings, it needs to be reconsidered and aligned to incorporate emerging digital technologies and complementary pedagogical practices in order to support authentic learning.

Integrating the arts into the Early Childhood Education (ECE) is considered one of the effective pedagogies for children to learn different disciplines. However, most students in early childhood teacher education programs do not have experience in art, nor do they generally create art themselves. Chapter 11 describes a hands-on approach for guiding ECE majors who have little or no arts experience to understand, appreciate, and engage in the arts through technology and the interdisciplinary possibilities of Puppetry Arts. It describes the philosophy, process, resources, and outcomes of the course and offers recommendations for integrating the arts into early childhood education coursework through technology.

Digital technologies that serve to develop new ways of engaging with each other and promote learning are challenging how collaborations are formed and enacted in the educational setting. Chapter 12 discusses a project set in Melbourne, Australia, that involved learning about what young people think about visiting a gallery as part of an education program. The investigation centered around seeing if it was possible to integrate digital cameras in a specifically designed gallery program that required students to generate digital still photographs to share their experiences. It highlights the integration of digital devices as a hand-held mobile technology that supports the crossing of boundaries between school and
gallery learning environments and that supports young people to be trusted, honored, and allowed to explore their own voice and choice.

The purpose of chapter 13 is to design and implement an online interactive learning program to improve migrant children’s Internet skills. An online program is designed with five interactive learning modules including an array of practice activities to support students’ development of retrieving, assessing, storing, producing, presenting and exchanging information. Pre- and post-tests and interviews examined the effectiveness of the program. Data analysis found that migrant children’s Internet self-efficacy and Internet exploratory behavior were significantly improved by attending the program. Based on observed program limitations, suggestions for improvement are proposed in the last part of the chapter.

Research into “21st-century skills” has emphasized collaborative skills as a requirement for success in our future society. Chapter 14 investigates the development of educational programs designed to foster collaborative skills among students and analyzes students’ self-efficacy for training. The analysis shows that students’ self-efficacy is higher in “collaborative skills” than in other areas. On the other hand, logical-thinking skills and relationship-building skills maintain low scores. These findings suggest that students follow a learning process in which they have to recognize collaborative behavior as an early step, and this behavior is re-recognized by the reaction of other students as the next step. Therefore, it is suggested that educators incorporate opportunities to recognize successful experiences through relationships with other students into the learning process.

Chapter 15 compares preservice teachers’ knowledge, skills, and their pedagogical use of digital technologies in the areas of Web 2.0, multimedia production, and online collaboration. The results show mixed findings and significant correlations between their pedagogical uses in the three research areas. In-depth interviews were conducted to examine these subjects’ knowledge, digital production, and online collaboration both in and out of the classroom in order to identify the digital tools and resources they applied during their student teaching, as well as to understand how they perceived their teacher preparation coursework’s impact on their digital competence and proficiency. Recommendations for educating 21st-century teachers and modeling digital-age teaching practices are provided in this chapter.

In China, the availability of high quality teacher resources varies from region to region and differs even among different schools in the same region. Two approaches were taken to solve this resource problem (i.e., traditional educational support and traditional instructional research). The former approach was attempted to relieve the shortages of high quality teacher resources in resources-poor schools by sending excellent teachers to assist in instruction and school management. The latter approach was intended to improve teachers’ teaching skills within resources-poor schools by conducting instructional research on the spot. However, both have little effect. Chapter 16 explores two innovated approaches, network-based educational research approach and network-based instructional research approach, to develop high quality teacher resources by using network technology.

Chapter 17 examines middle school and high school teachers’ uses of interactive boards in the classroom, as well as the goals behind this use and the difficulties encountered throughout it. The research findings show that science and mathematics teachers made different uses of the interactive board with various goals. It also indicates that while using the interactive board in the classrooms, the teachers encountered some difficulties, such as technical difficulties, owning the appropriate skills for using effectively the interactive board’s different options, preparing appropriate activities, fulfilling students’ expectations, and keeping class order.
By examining the current status of education informationalized development in three different economic areas in China, chapter 18 collects, complies, compares, and evaluates the application and development of regional education informatization, including information technology hardware, informational network, information capabilities, and education informatization development funds in primary and secondary schools. Recommendations for the development of regional education informatization in China are provided in this chapter.

We hope readers will benefit from the work of authors who range from cutting-edge researchers to experienced practitioners regarding teaching and learning in the digital era.

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REFERENCES