Foreword

Twenty years ago, a colleague and I (Bowers & Reese, 1995) wrote a review of Seymour Papert’s book titled *The Children’s Thinking Machine* (Papert, 1993) in which he offers a vision of how technology could be integrated in classrooms to leverage students’ innate curiosity through inquiry-based learning. We concluded that his constructionist theory had potential to revolutionize schooling, but his approach neglected to describe the crucial role of the teacher and the social context needed to accomplish the goal. I am pleased to say that this handbook contains thoughtful discussions of these crucial missing pieces.

The authors of both books share the assumption that technology has huge potential for supporting math learning by enabling users to interact with abstract mathematical objects encapsulated in programs such as Logo microworlds, and, by extension, dynamic geometry environments, subject-specific games, and online platforms such as MOOCs and animation software. However, Papert took students’ creative play as a starting point and described various mathematical ideas that he saw in their actions. In contrast, the authors of this handbook take today’s math curriculum as a starting point, and describe ways that students’ play with technology enhances their understanding of those particular topics.

One of Papert’s basic assumptions was that students are curious and should be provided tools to support their personal inquiries. The implication is that if a teacher gives a child an expressive tool, the pupil will run with it. While the authors in this book also agree that technology can be used to leverage student curiosity (or maybe the other way around), they argue that a tool, alone, is not sufficient to engage most children in learning the specific topics that today’s curricula require. Instead, the authors provide descriptions of the critical role that teachers play in initiating and sustaining real educational change through strategic lesson planning, inquiry-based questioning, and novel, challenging tasks.

A third assumption that undergirds both books is the view that when technology is added to a classroom, many tacit and explicit variables are affected. Hence, comparative scientific studies looking at test scores resulting from one isolated “intervention” are not appropriate. Instead, both books argue that case studies are more suitable for documenting contexts in which several variables, including student motivation and teacher knowledge, are in continual flux. In fact, the organizing theme of this volume is how the TPACK framework can capture teachers’ stages of flux. As Maggie Niess and her colleagues note in chapter 1, we need to study a variety of classroom-based case studies in order to help us visualize TPACK as a “total package”. That is, the gestalt – not just the intersection-- of technology, content and pedagogical knowledge.
Finally, both books argue for large scale changes in educational practices. For his part, Papert calls for teaching practices that consist of delivering “factlets” to be replaced by pedagogies that encourage students to make connections between the results they see and the intuitive knowledge that they have already constructed. Here, the agreement is unanimous. The authors and editors of the handbook also argue that teachers need to shift from delivering factlets to encouraging the construction of such connections. But the handbook provides insights for teacher educators regarding how this can be done.

If you are a teacher (at any level), a teacher educator, or an administrator looking for real-world examples to address the overall question of how to help teachers learn to teach with technology, this book is for you. It contains a compendium of case studies describing how we can affect sea-changes at the teacher level by focusing on questions such as How can lesson plans be designed to support inquiry based learning and how should teachers plan and implement these lessons?” How can we develop effective professional development for inservice teachers at all levels from elementary through university? How can we develop courses for preservice teachers that incorporate collaboration, communication, along with the added focus on the strategic use of technological tools? And, finally, What is really meant by the assertion from the Standards for Mathematical Practices (National Governors Association Center for Best Practices [NGACBS], 2010) that states “Use tools when appropriate”? In short, in the face of exponential change in technology, teachers need to be encouraged and supported in their efforts to “construct the runway as the plane is taking off.”

Twenty years after reading Papert’s prophetic book, I am encouraged to read this well-documented handbook that integrates cases describing the types of knowledge that teachers need to meet the demands of today’s technologically enhanced classrooms, whether they be onsite, online, or in virtual realities we have not yet even encountered.

Janet Bowers  
San Diego State University, USA

Janet Bowers is a mathematics educator who has been interested in the use of technology in teaching at all levels. She is currently focusing on integrating change with technology into lower division mathematics classes at the university level and also directs the Mathematics Learning Center at San Diego State University.

REFERENCES

