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Technology, Science Teaching, and Literacy

A Century of Growth

Kenneth P. King

Northern Illinois University
DeKalb, Illinois

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To Tina, Marshall, and Harrison
For patience, support, and love

Preface to the Series

The mandate to expand and improve science education is an educational imperative and an enormous challenge. Implementing change, however, is complicated given that science as well as science education is dynamic, continually incorporating new ideas, practices, and procedures. Science and science education take place in varying contexts and must deal with amazingly rapid technological advances. Lacking clear paths for improvement, we can and should learn from the results of all types of science education, traditional as well as experimental. Successful reform of science education requires careful orchestration of a number of factors which take into account technological developments, cognitive development, societal impacts and relationships, organizational issues, impacts of standards and assessment, teacher preparation and enhancement, as well as advances in the scientific disciplines themselves. Understanding and dealing with such a complex mission is the focus of this book series. Each book in this series deals in depth with one or more of potential factors for understanding, creating and sustaining effective science education reform.

In 1992, a multidisciplinary forum was launched for sharing the perspectives and research findings of the widest possible community of people involved in addressing the challenge of science education reform. Those who had something to share regarding impacts on science education were invited to contribute. This forum was the *Journal of Science Education and Technology*. Since the inception of the journal, many articles have highlighted relevant themes and topics and expanded the context of understanding to include historical, current, and future perspectives in an increasingly global context. Recurring topics and themes have emerged as foci requiring expanded treatment and presentation. This book series, “Innovations in Science and Technology,” is the result.

It is a privilege to be able to continue to elucidate and effect improvement and reform in science education by providing this in-depth forum for the work of others. The series brings focus and understanding to efforts worldwide, helping readers to understand, to incorporate, and to utilize what we know, what we are

learning, and what we are inventing technologically to advance the mission of science education reform worldwide.

Karen C. Cohen
Cambridge, Massachusetts

Preface

This book deals with the use of technology in science teaching. The author is not, nor has ever had an intention of being a “techie.” Rather, I spent the first decade of my professional life as a high school physics teacher, making occasional uses of technology to further student understanding and to automate my own teaching practices.

During my graduate work, my interest in the use of technology continued. Catalyzed, to some extent by the increasing availability of graphical interfaces for computers, the realization struck that the computer was more and more becoming a tool that all teachers could use to support their teaching practice—not simply those with a passion for the technology itself. The rapid changes in the hardware and software available, however, frequently caused me to reflect on the usefulness of technology—if it were to change at such a rapid pace, would anyone, save for those who diligently focused on the development of these tools, be able to effectively use technology in science teaching? Was change too rapid to yield a useful tool for teachers?

To address this interest, I examined the nature of science teaching during this century—using the equally fluid notion of “scientific literacy”—which formed the organizing principle for this study. The result is an examination of how technology was used to accomplishing this goal of producing scientifically literate citizens. What was observed is that technology, indeed, consistently came to the service of teachers as they attempted to achieve this goal.

One area that this study did not well address was what might be called the “misuse” of technology in teaching science. The unfortunate notion that the perfect instructional video lasts 48 minutes—to fit perfectly into a 50-minute class period—unsurprisingly was not represented in the literature. Recognizing that this takes place on occasion perhaps underscored the need for a study of this sort—to profile examples of the best uses of technology for science teaching, rather than the occasional misuses. I hope that in some manner my work here has addressed that goal.

Chapter 1 sets the stage for the study, describing the delimitations and scope of the investigation. Chapter 2 traces the evolution of the term scientific literacy from early in the twentieth century to the final decade. Chapter 3 examines the role of the motion picture in science instruction. Chapter 4 investigates the role of the radio in science instruction, and Chapter 5 focuses on the role television has played in science instruction. Chapter 6 covers the instructional uses of the computer, and Chapter 7 reflects on the role of these technologies in science instruction and considers possible directions for the use of technology in science education in the decades to come.

Acknowledgements

A number of individuals deserve recognition for making this book a reality. First and foremost, to members of my dissertation committee, who helped shape the original version of this study from a hazy idea into a workable and worthwhile product. To Professors Thomas Thompson, David Ripley, and James Lockard, I owe a tremendous debt of gratitude.

Dr. Thompson's knowledge of science education is estimable, and his insights provided the essential role of developing a broad perspective that was meaningful to the needs of science education and science educators. Dr. Lockard's extensive knowledge of instructional technology provided the second key component of the study. With his in-depth knowledge of the essential issues of teaching and learning with technology, he ensured a high degree of technical accuracy and his insights into the evolution of technology proved essential. Dr. Ripley, as the historian, ensured that a balanced message was delivered, helping me to present the most accurate view of events that I could deliver. Appreciation must be extended to Dr. Norman Stahl, Curriculum and Instruction Department Chairman, who suggested that a historical study might be of interest. That suggestion was the catalyst that moved the study ahead rapidly.

Additional recognition must be offered to Dr. Karen Cohen, editor of the Journal of Science Education and Technology, as well as this series of books dealing with issues in science education. Her suggestion that the articles I had published in the Journal of Science Education and Technology was the encouragement I needed to make this work a reality.

At Iowa State University, Becky S. Jordan and Jim Wilcox of the Iowa State University Archives offered excellent help and access to the early station records and programs broadcast through WOI-TV.

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