ENGAGING the REWIRED BRAIN

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Introduction

Technology is just a tool. In terms of getting the kids working together and motivating them, the teacher is most important.

—Bill Gates
Founder of Microsoft

LET ME START OUT BY SAYING that much of what I report in this book is a blend of thoughtful speculation, personal experience, anecdotal reports, and research about how the human brain is changing due to the impact of technology. However, the information here is based on scientific studies and established knowledge of brain function and how we learn. Certainly, there already are research findings revealing short-term distinct changes in students' attention, memory function, thinking processes, and social behavior. However, no one knows for certain what the long-term impact will be, because we need more time to determine long-term effects. But if the short-term results are any indication of future change, then much of what you read here will very likely shift in a few years from thoughtful speculations to accepted understandings of how the brain is transforming itself because of its interactions with our technological world.

In that sense, this book may be ahead of its time. It may serve to alert parents and educators to forthcoming changes—some beneficial and some undesirable—that we may wish to address now. For instance, will implications of long-term effects

- demand changes in current teaching approaches and strategies?
- require us to limit or expand the use of technology in the classroom?
- drive drastic changes in curriculum content and priorities?
- compel us to look closely at how technology is changing social behavior?
- replace teachers with technology?

These are just a few of the questions that should stir our thinking now about what we are doing at home and in schools and classrooms. Major changes in educational practice are notoriously slow. But technology is moving ahead at breakneck speed, and there is research evidence that it is having some effect on improving student achievement (Tamim, Bernard, Borokhovski, Abrami, & Schmid, 2011). We need to examine the emerging research and decide what action to take to ensure that the rewired brain sees schools as a critical part of learning and not a place to just sit and do something else that is more entertaining. Much of this research is part of a relatively new area of academic inquiry called *educational neuroscience*. This field explores how research findings from neuroscience, education, and psychology can inform our understanding about teaching and learning, and whether they have implications for educational practice. This interdisciplinary approach ensures that recommendations for teaching practices have a foundation in solid scientific research.

ABOUT THIS BOOK

Many school classrooms are very different today compared to just a decade ago. In the following chapters, we examine what research is telling us about how technology may be altering the way students interact with their world and how they perceive the teaching and learning process. In addition, we will look at some teacher-tested and successful strategies that use technology as a tool to entice, motivate, and engage the rewired brain.

Questions This Book Will Answer

This book will help answer questions such as these:

- How do students and teachers feel about how to use technology in the classroom?
- What are some major obstacles to using technology in schools?
- What are some major cautions about using technology?
- What should teachers be able to do with technology?
- How is technology rewiring our children's brains?
- How does technology affect student achievement?
- Is technology shortening students' attention span?

- How is technology affecting students' ability to remember information?
- What changes do we need to make in curriculum to accommodate the rewired brain?
- How can we use technology to improve students' thinking abilities and creativity?
- What role should educational video games play in enhancing teaching and learning?
- How is technology affecting social behavior, and what can we do about it?

Chapter Contents

Chapter 1: Where We Are. Here we look at how students and teachers currently perceive the introduction and use of technology tools in schools, including whether technology improves student achievement. This chapter also describes different types of student engagement and suggests what teachers should be able to do to successfully use technology in today's classrooms.

Chapter 2: Wiring the Young Brain. This chapter explains how the young brain responds to its environment by learning spoken language and developing visual and spatial skills. It explores how technology may be rewiring this brain and the kind of classroom that will engage it and motivate it to learn.

Chapter 3: Engaging Attention. Because most learning requires attention, this chapter focuses on the complexities of attention and what is happening to attention span. It also addresses engaging the brain through novelty and how some instructional models actually discourage attention.

Chapter 4: Engaging Memory. Even rewired brains need to remember information and skills. This chapter explains the components of memory systems and suggests what strategies are more likely to help students remember what they learn.

Chapter 5: Engaging Thinking. Here we explore what effects technology may be having on children's thinking and how to deal with information overload. This chapter also offers ways of improving students' critical thinking and creativity.

Chapter 6: Engaging Social Behavior. Many people recognize that digital devices are changing our youth's social behavior. This chapter examines just how extensive those changes are and what teachers and parents can do about it.

Chapter 7: Where We Are Going. Predictions are always risky, but this chapter suggests ways in which technology will support and encourage effective instructional strategies. It also outlines the components of a professional development program to develop teachers' digital literacy.

Other Helpful Tools

We have included a Glossary of scientific and technical terms used in the book. A Resources section provides a few Internet sites to get teachers familiar with the variety of materials and information that is available. Keep in mind, however, that sites come and go, and they frequently change their names and addresses.

Who Should Use This Book

This book will be useful to classroom teachers because it presents recent research regarding how technology is affecting their students' brains. It focuses on the rewired brain as the organ of thinking and learning, and takes the approach that the more teachers know about how this brain learns, the greater the number of instructional options that become available. Increasing the options that teachers have during the dynamic process of instruction, including the integration of technology, also increases the likelihood that successful learning will occur.

The book will also help professional developers who continually need to update their own knowledge base and include research and research-based strategies and support systems as part of their repertoire. These days, that includes ensuring that teachers are literate in the digital devices available to them. Chapter 7 offers some suggestions to help professional developers implement and maintain the knowledge and strategies that will help teachers know when, how, and why to integrate technology in their lessons.

Principals and teacher leaders will find here a substantial source of topics involving technology and the rewired brain for discussion at faculty meetings, which should include, after all, instructional as well as informational items. In

doing so, they support the attitude that professional growth in digital literacy is an ongoing school responsibility and not an occasional event. More important, being familiar with and modeling technology enhances the principal's credibility as the school's instructional leader and promotes the notion that the school is a learning organization for all its occupants.

College and university instructors will also find merit in the research and applications of technology presented here, as both suggestions to improve their own teaching and as important information to be passed on to prospective teachers.

Information in this book will be useful to parents, who are, after all, the child's first teachers and whose decisions often set the stage for how well their child will succeed in school.

A Note About Effect Sizes

Throughout this book, we will refer to the effect sizes of different interventions. Effect size is a useful tool for measuring the strength of a relationship between two variables. In educational research, the two variables are usually an intervention and student achievement. Researchers ask the question, "How much of an effect does Intervention X have on student achievement?" The larger the positive value of the effect size, the greater the effect of the intervention on student achievement. Effect sizes are a useful descriptive statistic, and they are valuable when comparing the effect of an intervention across different studies, such as in a meta-analysis. Educational researchers generally agree that effect sizes around 0.20 indicate a mild effect, 0.50 a moderate effect, and 0.80 or more a strong effect.

WHAT'S COMING

It is almost impossible to describe how technology is affecting education because as soon as you do, something has already changed. Nonetheless, in the next chapter, that is what we try to do. We explore the views that teachers and students currently have about technology and its impact on teaching and learning. We also discuss some useful criteria for helping teachers decide whether, when, and how to use technology tools effectively in the classroom.