Integrating Educational Technology into Teaching: Transforming Learning Across Disciplines

M.D. Roblyer
Nova Southeastern University (retired)

Joan E. Hughes
The University of Texas at Austin

Pearson
330 Hudson Street, NY NY 10013
For Bill and Paige Wiencke, whose love is, as Arthur Clarke said of advanced technology, indistinguishable from magic.

—MDR

For my father Thomas A. Hughes (1933–2017) whose commitment to education and lifelong learning is my inspiration.

—JEH
About the Authors

M. D. Roblyer was a technology-using professor and contributor to the field of educational technology for 35 years. She authored or coauthored hundreds of books, monographs, articles, columns, and papers on educational technology research and practice. Her other books for Pearson Education include Starting Out on the Internet: A Learning Journey for Teachers; Technology Tools for Teachers: A Microsoft Office Tutorial (with Steven C. Mills); Educational Technology in Action: Problem-Based Exercises for Technology Integration; and the most recent text, Introduction to Instructional Design for Traditional, Online, and Blended Environments (2015).

Dr. Roblyer began her exploration of technology’s benefits for teaching in 1971 as a graduate student at Pennsylvania State University, one of the country’s first successful instructional computer training sites, where she helped write tutorial literacy lessons in the Coursewriter II authoring language on an IBM 1500 dedicated instructional mainframe computer. While obtaining a doctorate in instructional systems at Florida State University, she worked on several major courseware development and training projects with Control Data Corporation’s PLATO system. In 1981–1982, she designed one of the early microcomputer software series, Grammar Problems for Practice, for the Milliken Publishing Company.

Dr. Roblyer retired in 2015 after having served as teacher, professor, graduate student mentor, doctoral student dissertation chair and committee member, and leader in shaping educational technology’s changing role since 1969. She lives in Chattanooga, Tennessee, where she is active in local political and community work. She is married to fellow Florida State alumnus Dr. William R. Wiencke and proud mother of daughter Paige Roblyer Wiencke.

Joan E. Hughes has been a technology-using educator and contributor to the educational technology field for more than 25 years and has authored or coauthored more than 100 journal articles, book chapters, proceedings, research conference papers, and practitioner conference papers worldwide.

After earning a bachelor of arts degree in English from Pomona College, she began working in the educational technology field as an elementary and middle school computer teacher in Silicon Valley area of California in the early 1990s. She presented often at the CUE Conference (known then as Computer-Using Educators) and coauthored her first book, The CompuResource Book, a collection of technology-supported lessons. Later, she pursued her doctorate in educational psychology with emphasis on cognition and technology at Michigan State University where she taught courses for preservice teachers in Michigan and inservice teachers internationally in Korea, Japan, Thailand, and England. Her earliest research developed the concept of technological pedagogical content knowledge (TPCK), a theory generated from case studies of English teachers’ learning and use of technologies in schools. This theory has been adapted and adopted widely.

Currently, Dr. Hughes is Associate Professor of Learning Technologies at The University of Texas at Austin where she conducts research and teaches about how teachers and K–12 students use technologies in and outside the classroom for subject-area learning and how school leaders support classroom technology integration. She serves on editorial and review boards for several teaching and technology journals and has contributed to leadership of technology-related special interest groups. She is highly supportive of her students’ educational objectives and has guided 47 doctoral and 45 master of arts and master of education degree students to complete dissertations, theses, or reports.

She is married to Lee Klancher, a writer, photographer, and publisher (Octane Press). They spend time walking their dogs, running, biking, cooking, and eating in Austin and around the world.
About This Book

During a time when nearly everything else is changing rapidly and radically, the mission of this textbook has remained steady and consistent: to reflect the burgeoning, evolving role of technology in education. The book’s 20-year history has always documented new and significant transitions in the role of technology in education, and the eighth edition continues that work. But this edition also reflects a new kind of transition with Joan E. Hughes playing a lead role in the authoring team.

This edition reflects fresh, new perspectives on using technology in teacher learning and leadership, an emphasis on transformative technology integration in the classroom, and content-based technology integration. The text includes four sections that position the reader as a teacher learner and leader of transformative technology integration. The first section provides the historical underpinnings of the field that inform our current practices, the learning theories that shape pedagogy, and a technology integration planning model that leads to technology-supported pedagogy that is responsive to instructional or learning challenges. It provides an extensive review of the mindsets and practices of teacher technology leaders who are problem solvers, use connected learning strategies to continually learn and engage in the profession, build a compelling online professional identity, and employ a personal rationale for using technology in all decision making. The second and third sections introduce the technological resources that support teaching and learning. The second section introduces technologies for general productivity activities and instructional software for learning content. The third section reviews how the web supports teaching and learning. It shares ways to access web-based content and engage in web-based communication, collaboration, design, creation, and making. Ultimately, educators use all these technological resources to build blended or online learning lessons or curricula. The fourth section continues this book’s commitment to technology integration in disciplinary content areas with a chapter specific to the following content areas: special education; English and language arts (ELA); second and foreign languages; science, technology, engineering, and mathematics (STEM); social studies; music and art; and physical and health education. We go well beyond describing the technical features and capabilities of 21st-century technology tools to focus steadfastly on the research-based teaching and learning strategies that these resources can support in content areas.

Across all eight editions of this book, we have strived to develop an enlightened view of technology in education by using the following guidelines on best practices in matching the needs of the educational community with technology’s capabilities.

• **Good pedagogy comes first.** Our experience with educational technologies has shown more clearly than ever that the interaction between teachers and students remains an essential quality of effective education. This textbook proposes that technologies are, above all, channels for helping teachers communicate better with students—ways of making their instructional relationships more meaningful and productive. Technologies can make good teaching even better; it cannot make bad teaching good. Consequently, technology-using teachers can never be forces for improved education unless they are first and foremost informed, knowledgeable shapers of their craft. Before integrating technology into their teaching, educators must know a great deal, for example, about why there are different views on appropriate teaching strategies, how societal factors and learning theories have shaped these views, and how each strategy can address differing needs.
• **Technology is us.** Rather than seeing technology as some foreign invader here to confuse and complicate the simple life of the past, teachers can recognize that technology is very much a response to overcoming obstacles that stand in the way of a better, more productive way of life. Technology encompasses the tools we fashion and the ways we choose to use them to solve problems in our environment. Turmoil will accompany the transitions as teachers adapt to the new environment that teachers have a large role in creating. But technology is, by definition, intended to be part of society’s path to a better life rather than an obstacle in its way.

• **We control how technology is used in education.** Finally, we must recognize the truth of Peter Drucker’s statement: “The best way to predict the future is to create it.” Both individual teachers and teaching organizations must see themselves as enlightened shapers of the future. Each teacher must help to articulate the vision for what the future of education should look like; each should learn the knowledge, attitudes, and disposition that will help realize that vision.

### What’s New in the Eighth Edition

Best known for its technology integration strategies grounded in strong research, the eighth edition of *Integrating Educational Technology into Teaching: Transforming Learning Across Disciplines* offers a total technology integration framework across all content areas. It also gives teachers practice with technology resources as they learn how to incorporate technology to support curriculum in ways that transform instruction and learning. And as usual, this edition includes additions that reflect changes in the field of educational technology.

• **NEW!** All chapters’ learning outcomes are mapped to the applicable ISTE Standards for Educators (2017). All technology integration example lessons indicate the ISTE Standards for Students (2016) that are addressed within them.

| Chapter Learning Outcomes Address the 2017 ISTE Standards for Educators |
|--------------------------------------------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|
| Chapter 1 – Learner                      | 1 – Leader | 2 – Leader | 3 – Citizen | 4 – Collaborator | 5 – Designer | 6 – Facilitator | 7 – Analyst |
| Chapter 1                               | X          | X          | X          | X              | X            | X              | X            |
| Chapter 2                               | X          | X          | X          | X              | X            |                | X            |
| Chapter 3                               | X          | X          | X          | X              | X            |                | X            |
| Chapter 4                               | X          | X          | X          | X              | X            | X              | X            |
| Chapter 5                               | X          | X          | X          |                | X            |                | X            |
| Chapter 6                               | X          | X          | X          |                | X            |                | X            |
| Chapter 7                               | X          | X          | X          |                | X            |                | X            |
| Chapter 8                               | X          | X          | X          |                | X            |                | X            |
| Chapter 9                               | X          | X          | X          |                | X            |                | X            |
| Chapter 10                              | X          | X          | X          |                | X            |                | X            |
| Chapter 11                              | X          | X          | X          |                | X            |                | X            |
| Chapter 12                              | X          | X          | X          |                | X            |                | X            |
| Chapter 13                              | X          | X          | X          |                | X            |                | X            |
| Chapter 14                              | X          | X          | X          |                | X            |                | X            |
| Chapter 15                              | X          | X          | X          |                | X            |                | X            |

• **NEW!** Chapters 1 through 3 have been updated to provide the research, theory, and pedagogical foundations for teachers to learn, plan, and lead transformative technology integration in their classrooms and schools.

• **NEW!** Chapter 2 introduces the Turn-around Technology Integration Pedagogy and Planning (TTIPP) model and the Replacement, Amplification, and Transformation (RAT) assessment model, which help teachers plan and implement classroom
technology integration. Each chapter opens with a detailed Technology Integration in Action scenario and ends with a Technology Integration Workshop, both of which incorporate the TTIPP model and RAT assessment processes and require learners to apply them.

- **NEW!** Chapter 3 is a new chapter focused on teacher learning and teacher leadership for technology integration, which specifically address the first two ISTE Standards for Educators (2017), Learner and Leader. The chapter highlights the mindsets of leaders, connected learning, online professional identity, and the need for a personal rationale for using technology in teaching.

- **NEW!** Chapters 4 through 7 have been reorganized to sequentially introduce technology and web-based resources for teaching and learning. Chapter 8 focuses on blended and online (virtual) learning pedagogy. Teachers can select and incorporate technology resources introduced in the preceding Chapters 4 through 7 to support their digital blended or online instruction.

- **NEW!** Each discipline-specific chapter (Chapters 9 through 15) culminates by offering strategies for continued teacher learning and leadership in content-specific integration. Each includes a rubric that teachers can use to direct and self-assess their growth in technology integration and suggested Twitter hashtags to follow.

- **UPDATED!** Experts in each of the content areas (in Chapters 9 through 15) have updated each Top Ten Must-Have Technologies and present apps that are widely used in each discipline area; examples help educators see the role these tools are beginning to play in education.

- **UPDATED!** All chapters provide updated research and illustrate how new technology resources and/or strategies are being used in the classroom.

### Key Content Updates by Chapter

- **Chapter 1.** This chapter includes a revised definition of integrating educational technology that aligns with the TTIPP model introduced in Chapter 2 and is used throughout the book. The foundations of educational technology were updated to include learning sciences and the current era of the personalization of education and adaptive learning. The most current ISTE Standards for Educators (2017) and Students (2016) are included as is a description of the TPACK framework of teacher knowledge, including examples of the knowledge in practice from Dr. Hughes’ most recent research.

- **Chapter 2.** This chapter now emphasizes transformative technology integration through revision of the previous TIP model into the TTIPP model, which begins with problems of practice; involves teachers in understanding the technological resources of their learners, families, and schools as assets for planning; and includes the RAT assessment model for determining relative advantage of technology in lessons.

- **Chapter 3.** This all-new chapter positions teachers to be lifelong learners and technology leaders for change. The chapter describes the mindsets of teacher leaders; positions teachers as connected educators who participate in connected learning communities; encourages teachers to build a compelling and consistent online professional identity; and explains how to build a personal rationale for using technology in teaching.

- **Chapter 4.** This chapter (previously Chapters 4 and 5) opens with a new section on technology device and software configurations in classrooms and schools and their capabilities in supporting different pedagogical approaches. A new definition is used to describe technology used for productivity: Hardware and software tools that do not contain predesigned curricular content; instead, teachers and students
bring content to their activities with these resources. Productivity tools are used for writing and publishing; representing ideas or content using multimedia; collecting and analyzing data; planning and organizing; generating instructional materials and forms; and assessing student products.

- **Chapter 5.** This chapter (previously Chapter 3) introduces instructional software with an updated definition: preprogrammed content material that often is instructionally sequenced. The chapter includes a new section on strategies for selecting appropriate instructional software.

- **Chapter 6.** The chapter was reorganized to introduce the web and its use as a resource for archived, immersive, or live content. It includes broadened descriptions of the web, online safety and digital citizenship, and web search strategies. It has new sections on web content (archived, immersive, and live), open educational resources (OER), and an introduction to Creative Commons. The new final section introduces evaluation criteria for determining the ease or difficulty of integrating web content into instruction.

- **Chapter 7.** This chapter (including some content from the previous edition’s Chapter 6) introduces web resources that support communication, collaboration, design, creation, and making. Key new additions include content curation; multimodal creative expressions; digital publishing, storytelling, and book making; and a computer programming section describing computational thinking, coding, visual programming, designing and developing games and apps, building in virtual worlds, building augmented reality, and making.

- **Chapter 8.** This chapter (previously Chapters 7 and 8) provides updated definitions, benefits, challenges, examples, and integration strategies of blended and online (virtual) learning and describes how readers can use the content in preceding Chapters 1 through 7 to build blended or online learning experiences. Key additions include descriptions of teacher competencies for blended/online instruction, characteristics of successful online courses, and national standards for quality online courses.

- **Chapter 9.** This chapter (formerly Chapter 15) was repositioned in the book to emphasize its unique role cutting across teaching and learning activities in all school content areas to meet all learners’ needs. The introduction to special education reflects current laws and the current distribution of students with disabilities. The chapter also reviews additional ways in which mobile devices are used as assistive technologies and includes a section that helps readers learn how to select best technology apps for students with disabilities.

- **Chapter 10.** The key updates in this chapter (formerly Chapter 9) include technological possibilities for literacy practices in relation to broader mobile device access at home and at schools and expanding social media activities. It also emphasizes the need for digital literacy and digital citizenship among teachers and youth.

- **Chapter 11.** The predominant updates in this chapter (formerly Chapter 10) reveal the most recent national characteristics of English learners, responsibilities and strategies for language learning by all content-area teachers, and the latest technological strategies and innovations that support language learning through computer and mobile technologies.

- **Chapter 12.** The first section of this updated chapter (previously Chapter 11) now introduces the science, technology, engineering, and mathematics (STEM) fields, articulates how teachers can integrate STEM, and sets forth an integrated view of these content areas. The chapter now includes new sections on the challenges of and technology integration strategies for engineering to complement the science and math sections.
• **Chapter 13.** This chapter (previously Chapter 12) emphasizes the competing advantages and challenges of web-based content: plentiful access to source materials in every social studies topic area but also widespread inaccurate and misleading information and hateful and malicious falsehoods posing as informed facts. Thus, the importance of digital literacy and digital citizenship thread throughout the chapter. Finally, it includes a new section on the integration of social media.

• **Chapter 14.** Content in this chapter (previously Chapter 13) reflects recent changes in the standards by the National Association for Music Education (NAfME) and the National Visual Arts Standards. Key updates include the influence of Bring Your Own Device (BYOD) on music and art teachers’ options and new technological innovations, such as those supporting live performance and increasing access to online artwork.

• **Chapter 15.** This chapter (previously Chapter 14) has been updated and reorganized around the Whole School, Whole Community, Whole Child (WSCC) model, notably introducing technology integration strategies for physical activity and healthy living: (1) before and after school, (2) during school, (3) with staff involvement, and (4) with family and community engagement.

---

**Revel™ Digital Learning**

REVEL™ is Pearson’s newest way of delivering our respected content. Fully digital and highly engaging, REVEL offers an immersive learning experience designed for the way today’s students read, think, and learn. Enlivening course content with media interactives and assessments, REVEL empowers educators to increase engagement with the course to better connect with students.

REVEL™ offers dynamic content matched to the way today’s students read, think, and learn, including:

- **Integrated Videos and Interactive Media.** Integrated within the narrative, videos empower students to engage with concepts and take an active role in learning. REVEL’s unique presentation of media as an intrinsic part of course content brings the hallmark features of Pearson’s best-selling titles to life.

- **Interactive Check Your Understanding (CYUs).** At the end of every major section, each chapter’s learning outcome is assessed through a formal evaluation with feedback. These evaluations help readers review the concepts and ensure that they master each chapter outcome.

- **Video Examples.** Each chapter includes multiple video demonstrations or commentaries from practitioners in the field that illustrate the concepts introduced in the chapter. Readers can view the technology-supported practices in action or identify key practitioner-based strategies for success.

- **Application Exercises.** Each chapter has several interactive formative assessment exercises that call on readers to apply their developing knowledge and receive expert feedback. For example, readers interpret key strategies from a video-based interview or classroom practice, fill in the blank with missing concepts in text-based scenarios, identify or move concepts within a visual-based representation, view multimedia examples, or match concepts with drag-and-drop text.

- **Shared Writing.** Each chapter includes at least one chance for readers to contemplate a unique scenario-based situation related to the chapter content and share their thinking through a collaborative Shared Writing exercise.

- **Interactive Glossary.** Bolded key terms in the text are linked to glossary definitions, enabling students to read and comprehend with clarity without skipping concepts they do not understand.
Core Principles of this Text

The purpose of this book is to show how teachers can shape the future of technology in education. How teachers respond to this challenge is guided by how the authors see it helping educators accomplish their own informed vision of what teaching and learning should be. Our approach to accomplishing this rests on four premises:

1. Integrating educational technology should be based in learning theory, teaching practice, and curriculum. There is no shortage of innovative ideas in the field of educational technology; new and interesting methods come forth about as often as new and improved gadgets. Those who would build on the knowledge of the past should know why they do what they do as well as how to do it. Thus, various technology-based integration strategies are linked to well-researched theories of learning, and we have illustrated them with examples of successful practices based on these theories.

2. Uses of technology should match specific teaching and learning needs. Some technology resources have the power to improve teaching and learning. Therefore, each resource should be examined for its unique qualities and potential benefits for teachers and students. Teachers should not use a tool simply because it is new and available; each integration strategy should be matched to a recognized need. Teachers should not oppose experimentation but advocate for informed use.

3. Old integration strategies are not necessarily bad; new strategies are not necessarily good. As technologies change and evolve at lightning speed, there is a tendency to throw out older teaching methods with older machines. Sometimes this is a good idea; sometimes it would be a loss. Each of the integration strategies recommended in this book is based on methods with proven usefulness to teachers and students. Some of the strategies are based on directed methods that have been used for some time; other strategies are based on the newer, constructivist learning models. Each is recommended on the basis of its usefulness toward solving learning needs rather than its age.

4. A combination of technological, pedagogical, and content knowledge is necessary. This textbook maintains that teachers not only need to know the content they are teaching and good pedagogical strategies for connecting students with content but also must recognize how to integrate technology into pedagogy to achieve greatest impact on desired outcomes. In other words, teachers need what the field now refers to as Technological Pedagogical Content Knowledge, TPACK or TPACK.

The goal of this edition is for teachers to see more clearly their role in shaping the future of technology in education. This book illustrates that great education means employing technologies to fulfill the vision they make possible—a worldwide social network and a global community that learns and grows together.
Features of this Text

For the eighth edition, the authors maintain a cohesive, comprehensive technology integration framework that builds on strong research and numerous integration strategies. This Technology Integration Framework achieves the following goals:

Introduces Teachers to Technology Integration

- Technology Integration in Action examples located at the beginning of Chapters 2 through 15 are classroom-based scenarios that provide a classroom context for chapter content by focusing on the selection and use of specific technology within a classroom environment. Each walks the reader through the steps of the Turnaround Technology Integration Pedagogy and Planning (TTIPP) Model and lesson RATification using the Replacement, Amplification, and Transformation (RAT) Assessment model. These classroom-based scenarios are tied specifically to the chapter’s learning outcomes.

- Adapting for Special Needs features give teachers alternative software and technology suggestions to consider for use in supporting students with special needs.

- Box 2.1: Adapting for Special Needs: Universal Design for Learning

Universal design for learning (UDL) is a framework that has important implications for technology use in the classroom. UDL proactively addresses academic diversity through strategies that offer students multiple ways to access, engage, and demonstrate their mastery of the learning outcomes. One of the tenets of UDL is that instructional design deliberately created for individuals with disabilities often provides significant benefits to all students. The essence of UDL involves providing three components:

- Multiple means of representation to give learners various ways of acquiring information and knowledge.
- Multiple means of engagement to tap into learners’ interests, to challenge them appropriately, and to motivate them to learn.
- Multiple means of expression to provide learners with alternatives for demonstrating what they know.

Traditionally, when educators fail to recognize that 25–50% of the students in their classroom might not read at grade level, they distribute textbooks that have a readability level above grade level. However, using the principle of multiple means of representation, an educator plans instruction to provide access to digital text that students can manipulate the physical nature of the text (e.g., change the font size, color contrasts), as well as alter the cognitive difficulty by using tools such as text-to-speech (e.g., Natural Reader website) or text-summarization (e.g., Text Compactor website). Learn more about universal design for learning in order to understand its applications for your own classroom by visiting the Center for Applied Special Technology or CAST websites.

—Contributed by Dave Edyburn

- Video Examples are located throughout the chapters to visually and aurally represent technology integration strategies and challenges existing in schools today.

PHASE 1 Analysis of Learning and Teaching Assets and Needs

Step 1: Analyze problems of practice (POPs)

Like many social studies teachers, Mr. Engle sought to create learning experiences where students could make meaningful connections between the past and present. In past years, students had read accounts of the Holocaust and Rwandan genocides, but he was not sure that his students really understood the experiences of people during these events. He wanted to better humanize historical events that might contribute to his students experiencing a richer vision of historical events. He noticed some parallels to current events too, when police and Immigration and Customs Enforcement (ICE) started arresting and detaining people suspected of living in the United States without documentation—event...
Chapter 11

California Language Teachers’ Association’s (CLTA) website, http://www.clta.net/lessons.

Source: 36 Hours in...

In the target language, students use the language they want to learn. They answer questions about the museum of their choice, including its name, telephone number, hours of operation, entrance fees, and some of the major artworks that can be found there. Students can also use Google Maps or Google Earth to identify a sense of the area surrounding the museum. Using word-processing software, they create a poster or brochure for the museum that illustrates an itinerary for a day visiting the museum and the surrounding area (see the New York Times Travel Section 36 Hours in... feature as an example). In the target language, students use the information they have collected, identify nearby sites or restaurants to include in their itinerary, and use images available for reuse (Creative Commons licensed or public domain). Students identify the country’s currency, use an exchange rate website to determine the cost of the visit in U.S. dollars, and include that information in the poster or brochure.

Chapter 3 Summary

1. Teacher Leadership
   - Teacher leaders are classroom teachers who engage in leadership activities outside their classroom that identify educational challenges that they work to solve.
   - Teacher leadership is enabled by five crucial mind sets: creativity, agency, and community.
   - Benefits of being a teacher leader include better relationships among colleagues; confidence and empowerment; growth as a professional; and professionalism within the school, and expansion of leadership activities.
   - Challenges of being a teacher leader include stress, lack of time, too many tasks; conflicting relationships with colleagues, and resistant colleagues.

2. The Connected Educator
   - Connected educators are teachers who engage in learning with others online via networked technologies.

Technology Integration Examples (TIEs) in Chapters 3 through 15 offer numerous technology lesson ideas that can be incorporated into lesson planning across the curriculum. Each lesson suggestion is correlated to the ISTE National Educational Technology Standards for Students (2016) and Common Core State Standards.

Helps Teachers Plan for Effective Technology Integration

Helps Teachers Practice Technology Integration

- **A Teacher Growth Section** located at the end of each discipline-specific chapter (Chapters 9 through 15) offers strategies for continued teacher learning and leadership in content-specific technology integration. It also includes a rubric that teachers can use to self-assess and direct their growth in technology integration and suggests Twitter hashtags to follow.

- **A Technology Integration Workshop** located at the end of every chapter includes hands-on, interactive activities that connect chapter content to real-life practice. Each contains the following:
  - **Apply What You Learned** exercises, which call for students to reread the Technology Integration in Action example that opened the chapter; identify another, different technology resource possibility to solve the problem of practice set within the example; and complete a RAT matrix analysis to determine the new technology resource’s potential for changing instruction, learning, and/or curriculum.
  - **Technology Integration Lesson Planning: Evaluating Lesson Plans** exercises provide students the opportunity and resources to evaluate a set of technology integration lessons.
  - **Technology Integration Lesson Planning: Creating Lesson Plans with the TTIPP model** activity asks students to create a new technology-supported lesson plan that employs a technology resource introduced in the chapter to solve a problem of practice. Students do so by implementing the TTIPP model and are encouraged to share their lessons.
  - **Technology Lesson Plan Evaluation Checklist and the RAT matrix** introduced in Chapter 2 are used throughout the workshop activities.
Support Materials for Instructors

The following resources are available for instructors to download on www.pearson-highered.com/educators. Instructors enter the author or title of this book, select this particular edition of the book, and then click on the “Resources” tab to log in and download textbook supplements.

Instructor’s Resource Manual and Test Bank (978-0-13-474640-1)

The Instructor’s Resource Manual and Test Bank includes a wealth of interesting ideas and activities designed to help instructors teach the course. Each chapter contains learning outcomes, key terms, key concepts, and group activities as well as a comprehensive test bank containing multiple-choice and essay questions.

PowerPoint Slides (978-0-13-474626-5)

Designed for teachers using the text, the PowerPoint™ Presentation consists of a series of slides that can be shown as is or used to make handouts. The presentation highlights key concepts and major topics for each chapter.

TestGen (978-0-13-474639-5)

TestGen is a powerful test generator available exclusively from Pearson Education publishers. You install TestGen on your personal computer (Windows or Macintosh) and create your own tests for classroom testing and other specialized delivery options, such as over a local area network or on the web. A test bank, which is also called a Test Item File (TIF), typically contains a large set of test items organized by chapter and ready for your use in creating a test based on the associated textbook material.

The tests can be downloaded in the following formats:

- TestGen Testbank file — PC
- TestGen Testbank file — MAC
- TestGen Testbank—Blackboard 9 TIF
- TestGen Testbank—Blackboard CE/Vista (WebCT) TIF
- TestGen Testbank—Canvas
- Angel Test Bank (zip)
- D2L Test Bank (zip)
- Moodle Test Bank
- Sakai Test Bank (zip)

Acknowledgments

Both the goal and challenge of this book have been to provide the reader with the most up-to-date foundations, theory, research, and practices in educational technology across the disciplines. We believe this goal has been achieved. As in any project, realizing this goal would not have been possible without the assistance of numerous individuals who helped sharpen the focus of this edition. These individuals include the reviewers for this edition: Li-Ling Chen, California State University at East Bay; Mary Jo Dondlinger, Texas A&M University-Commerce; Lynne M. Pachnowski, University of Akron; Karen M. McFerrin, Ed.D., Northwestern State University; and Kevin Oliver, North Carolina State University.

The vibrancy of this new edition is partly due to the contributors for the current edition, who all engage in researching and using the latest technology-supported teaching and learning approaches in their discipline areas. The contributors include the following:
The degree of support from the Pearson Education staff is impossible to measure. The logistical challenges of this edition would not have been manageable without the professional oversight and personal direction of our Senior Content Editor, Max Chuck. Max, you’re always the best! We would also like to thank the Pearson editorial, production, and media team, which includes Yagnesh Jani, Production Manager; Drew Bennett, Portfolio Manager; Allison Longley, Senior Digital Producer; Krista Slavicek, REVEL Developmental Editor; and Maria Feliberty, Editorial Assistant—all of whom made this version of the book useful, attractive, and meaningful. Thank you for your indispensable contributions to this text.

From MDR: I would like to recognize the enduring love and support of my family, Bill and Paige Wiencke, and the tenacious loyalty of friends in various parts of our global village. Also, I would like to continue to remember and acknowledge the incalculable contributions of those who are with us now only in memory: parents Servatius L. and P. Catherine Roblyer, Raymond and Marjorie Wiencke, and mentor and friend FJ King. Finally, my gratitude goes out to Joan E. Hughes, who took on a project of this magnitude in the midst of a demanding professional and family schedule and who added so much to the usefulness of this edition. I could not have asked for a more capable and dependable writing partner.
From JEH: I would like to thank M. D. Roblyer for her commitment in creating and updating this book over the years—it’s a remarkable legacy—and for her invitation to join her as coauthor. Being able to collaborate on this book is a highlight of my career, which has always focused on technology integration in the K–12 classroom. Further, I would like to recognize the guidance and love of my husband, Lee Klancher, during the year-long revision process. With many books of his own to his credit, he helped me start by sharing a Google Sheet “book map” that provided a template for charting my plan for revision. He also provided me countless breakfasts and dinners while I wrote, edited, and updated this book. Very special thanks go out my assistants, Dr. Michelle Read and doctoral students Cynda Fickert and Jason Harron, who assisted with library research. Most important, I extend heartfelt and generous respect for schools and teachers who choose to participate in research studies. Such participation is the only way the education field begins to understand which innovations work and which do not. Behind every research study mentioned in this book is at least one or more classrooms of students and teachers who opened up their classrooms!

From both authors: We would like to acknowledge all the educators whose perseverance and commitment to their students remains a constant we can count on as we face the educational innovations and challenges present with technological change.

— M. D. Roblyer and Joan E. Hughes
Brief Contents

PART 1  Technology Integration and Leadership in Education

1  Educational Technology in Context: The Big Picture  1
2  Theory into Practice: Foundations for Transformative Technology Integration  34
3  Learning and Leading for Transformative Technology Integration  75

PART 2  Technology Resources for the Modern Classroom

4  Technology Device and Software Resources for Classroom Productivity  97
5  Instructional Software for Student Learning  152

PART 3  Web-based Resources for Blended and Online Learning

6  Web-Based Content Resources  196
7  Web-Based Communication, Collaboration, Design, Creation, and Making  237
8  Blended and Online Learning  269

PART 4  Integrating Technology Across the Disciplines

9  Teaching and Learning with Technology in Special Education  305
10  Teaching and Learning with Technology in English and Language Arts  330
11  Teaching and Learning with Technology for Second and Foreign Languages  359
12  Teaching and Learning with Technology in Science, Engineering, and Mathematics  386
13  Teaching and Learning with Technology in Social Studies  428
14  Teaching and Learning with Technology in Music and Art  449
15  Teaching and Learning with Technology in Physical and Health Education  477
Contents

PART 1 Technology Integration and Leadership in Education

1 Educational Technology in Context: The Big Picture
   LEARNING OUTCOMES 1
   INTRODUCTION 2
   THE “BIG PICTURE” ON TECHNOLOGY IN EDUCATION 3
         Perspectives That Define Educational Technology 3
         How This Textbook Defines Integrating Educational Technology 5
         An Overview of Technology Resources 6
         Hardware Setup for Classrooms 7
         Software Applications in Schools 7
         Technology Support and Expertise 8
   EDUCATIONAL TECHNOLOGY: HOW THE PAST SHAPES THE PRESENT AND FUTURE 9
         Era 1: The Mainframe Computer Era 10
         Era 2: The Microcomputer Era 10
         Era 3: The Internet Era 11
         Era 4: The Mobile Technologies, Social Media, and Open Access Era 12
         Era 5: The Personalized, Adaptive Learning Era 12
         What We Have Learned from the Past 13
   TODAY’S EDUCATIONAL TECHNOLOGY STANDARDS AND TEACHING COMPETENCIES 15
         The Common Core State Standards (CCSS) and Content Standards 15
         ISTE Standards for Students and Educators 15
         The ICT Competency Framework for Teachers 16
         The Technological Pedagogical Content Knowledge Framework 17
   TODAY’S ESSENTIAL CONDITIONS THAT SHAPE TECHNOLOGY INTEGRATION 18
         Educational Conditions 18
         Political Conditions 20
         Technical Conditions 22
         Social Conditions 23
         Equitable and Cultural Conditions 25
         Legal and Ethical Conditions 26
   EMERGING TRENDS IN TECHNOLOGICAL RESOURCES 28
         Trends in Hardware and Software Innovation 28
         Educational Trends Leveraging Technology Innovations 30
   CHAPTER 1 SUMMARY 32
   TECHNOLOGY INTEGRATION WORKSHOP 33

2 Theory into Practice: Foundations for Transformative Technology Integration
   LEARNING OUTCOMES 34
   INTRODUCTION 35
   OVERVIEW OF SUCCESSFUL TECHNOLOGY INTEGRATION PLANNING AND PRACTICE 36
         Learning Theory Foundations 36
         Turn-around Technology Integration Pedagogy and Planning (TTIPP) Model 37
   LEARNING THEORY FOUNDATIONS OF DIRECTED INTEGRATION MODELS 38
         Behaviorist Theories 38
         Information-Processing Theories 39
         Cognitive-Behaviorist Theory 41
         Systems Approaches: Instructional Design Models 42
         Objectivist Theory Foundations for Directed Methods 43
   LEARNING THEORY FOUNDATIONS OF CONSTRUCTIVIST INTEGRATION MODELS 44
         Social Activism Theory 44
         Social Cognitive Theory 45
         Scaffolding Theories 46
         Child Development Theory 47
         Discovery Learning 48
         Multiple Intelligences Theory 49
         Social Constructivist Theory Foundations for Technology Integration Methods 50
   TECHNOLOGY INTEGRATION STRATEGIES BASED ON DIRECTED AND CONSTRUCTIVIST THEORIES 51
         Instruction and Assessment in Directed and Constructivist Theories 52
         Technology Integration Strategies Based on Directed Models 52
         Technology Integration Strategies Based on Constructivist Models 54
         Technology Integration Strategies Useful for Either Model 57
   TURN-AROUND TECHNOLOGY INTEGRATION PEDAGOGY AND PLANNING (TTIPP) MODEL 59
         Phase 1: Analysis of Learning and Teaching Assets and Needs 60
         Phase 2: Design of the Integration Framework 62
         Phase 3: Post-Instruction Analysis and Revisions 69
   CHAPTER 2 SUMMARY 73
   TECHNOLOGY INTEGRATION WORKSHOP 74
PART 2  Technology Resources for the Modern Classroom

4  Technology Device and Software Resources for Classroom Productivity 97

LEARNING OUTCOMES 97
INTRODUCTION 100
INTRODUCTION TO TECHNOLOGY PRODUCTIVITY RESOURCES 101
Configurations of Digital Devices 101
Alignment of Device Configurations with Pedagogical Approaches 105
Productivity Software 107
WRITING AND PUBLISHING SOFTWARE FOR TEACHING AND LEARNING 109
Integration Strategies for Writing and Publishing Software 110
Instructional Strategies for Writing and Publishing Software 115
Benefits of Writing and Publishing Software 117
Challenges of Using Writing and Publishing Software 118
REPRESENTATION SOFTWARE FOR TEACHING AND LEARNING 119
Integration Strategies for Representation Software 121
Benefits of Using Representation Software 128
Challenges of Using Representation Software 129
DATA AND ANALYSIS SOFTWARE FOR TEACHING AND LEARNING 130
Integration Strategies for Data and Analysis Software 131

Benefits of Using Data and Analysis Software 136
Challenges of Using Data and Analysis Software 136
PLANNING AND ORGANIZING SOFTWARE FOR TEACHING 137
Lesson Planning Software 137
Scheduling, Calendar, and Time Management Software 138
Outlining and Concept Mapping Software 138
INSTRUCTIONAL MATERIAL GENERATORS 139
Web Design Software 139
Interactive Whiteboard Activity Software 140
Worksheets and Puzzle Generators 142
Individualized Education Program (IEP) Generators 142
Graphic Document Maker 142
PDF and Form Maker 143
ASSESSMENT SOFTWARE 143
Student Response Systems 144
Rubric and Test Generators 145
Computer-Based Testing Systems 146
Digital Portfolios 147
Gradebooks and Student Information Systems 148
CHAPTER 4 SUMMARY 149
TECHNOLOGY INTEGRATION WORKSHOP 150

5  Instructional Software for Student Learning 152

LEARNING OUTCOMES 152
INTRODUCTION 156
INTRODUCTION TO INSTRUCTIONAL SOFTWARE 156
Definition of Instructional Software 156
Teaching Functions in Instructional Software 157
Selecting Appropriate Instructional Software 157
CHARACTERISTICS OF DRILL AND PRACTICE FUNCTIONS 160
Selecting Appropriate Drill and Practice Software 160
Benefits of Drill and Practice 161
Challenges Related to Drill and Practice 163
Integration Strategies Using Drill and Practice 164
CHARACTERISTICS OF TUTORIAL SOFTWARE 165
Selecting Appropriate Tutorial Software 166
Benefits of Tutorials 167
Challenges Related to Tutorials 168
Integration Strategies Using Tutorials 168
CHARACTERISTICS OF SIMULATIONS 169
Simulations That Teach about Something 170
Simulations That Teach How to Do Something 170
Selecting Appropriate Simulation Software 171
Benefits of Simulations 171
Challenges Related to Simulations 174
Integration Strategies Using Simulations 174
CHARACTERISTICS OF GAMES AND GAMIFICATION 176
Selecting Appropriate Instructional Games 178
Benefits of Instructional Games 179
PART 3 Web-based Resources for Blended and Online Learning

6 Web-Based Content Resources 196
LEARNING OUTCOMES 196
INTRODUCTION 199
INTRODUCTION TO THE WEB 200
Using Uniform Resource Locators (URLs) 201
Methods for Navigating the Web 201
Downloading Software, Plug-Ins, and Apps 202
Basic Web Troubleshooting 204
ONLINE SAFETY AND DIGITAL CITIZENSHIP 205
Online Safety and Security Issues 205
Online Ethical and Legal Issues 208
Rules and Guidelines for Online Behavior: Digital Citizenship and Netiquette 209
SEARCHING THE WEB FOR INFORMATION 212
Types of Search Engines 212
Search Tools and Strategies 212
Research and Reference Tools 215
Information Literacy Skill Development 216
ONLINE EDUCATIONAL CONTENT 218
Archived Online Content 218
Interactive or Immersive Web Content 219
Live Web Content 224
OPEN EDUCATIONAL RESOURCES 226
Locating OER 227
Benefits of OER 230
Challenges of Using OER 230
EVALUATION AND INTEGRATION OF WEB CONTENT FOR INSTRUCTION 231
Evaluation Framework for Web Content 231
Integration Strategies for Web Content 233
CHAPTER 8 SUMMARY 234
TECHNOLOGY INTEGRATION WORKSHOP 235

7 Web-Based Communication, Collaboration, Design, Creation, and Making 237
LEARNING OUTCOMES 237
INTRODUCTION 240
ONLINE COMMUNICATIONS 240
Email and Listservs 240
Instant Messaging and Text Messaging 241
Videoconferencing for Synchronous Communication 241
Online Communication Integration Strategies 242
ONLINE COLLABORATION 243
Blogs 243
Microblogs 245
Content Curation 246
Wikis 247
Video- and Photo-Sharing Communities 248
Social Networking Sites 248
WEB DESIGN AND DEVELOPMENT 250
Web Authoring Tools 250
Resources for Final Site Production 251
Design Perspectives 252
Web Development Steps and Evaluation Criteria 252
ONLINE DESIGN, CREATION, AND MAKING 255
Multimodal Representations 255
Digital Publishing, Storytelling, and Book Making 256
Web-Based Digital Portfolios 258
Audio and Video Development 258
Computer Programming 262
CHAPTER 7 SUMMARY 267
TECHNOLOGY INTEGRATION WORKSHOP 268

8 Blended and Online Learning 269
LEARNING OUTCOMES 269
INTRODUCTION 272
BLENDED LEARNING 272
Blended Learning Models 273
Benefits of Blended Learning 275
Challenges of Blended Learning 276
Integration Strategies for Blended Learning 277
ONLINE LEARNING 280
Online Courses and Schools 280
Benefits of Online Learning 284
Challenges of Online Learning 285
Integration Strategies for Online Learning 286
TEACHING ONLINE COURSES 292
Technology Infrastructure and Support Resources for Online Teaching 292
Management of Online Small Group Activities 296
Designing and Developing an Online Course in an LMS 297
CHAPTER 8 SUMMARY 302
TECHNOLOGY INTEGRATION WORKSHOP 303
PART 4 Integrating Technology Across the Disciplines

9 Teaching and Learning with Technology in Special Education 305

LEARNING OUTCOMES 305
INTRODUCTION 308
INTRODUCTION TO SPECIAL EDUCATION 308
ISSUES AND CHALLENGES IN SPECIAL EDUCATION 309
Special Education and Inclusion Requirements 309
Policy Drivers of Technology Use in Special Education 311
Educational Reform and Accountability in Special Education 313
Challenges in Special Education Technology 313
TECHNOLOGY INTEGRATION STRATEGIES TO MEET SPECIAL NEEDS 314
Foundations of Integration Strategies for Special Education 314
Technology Strategies for Students with Cognitive Disabilities 317
Technology Strategies for Students with Physical Disabilities 321
Technology Strategies for Students with Sensory Disabilities 322
Technology Strategies for Students with Speech and Language Impairments 324
Technology Strategies for Students with Gifts and Talents 324
Teacher Growth in Technology Integration Strategies for Students with Special Needs 326
CHAPTER 9 SUMMARY 328
TECHNOLOGY INTEGRATION WORKSHOP 328

11 Teaching and Learning with Technology for Second and Foreign Languages 359

LEARNING OUTCOMES 359
INTRODUCTION 362
ISSUES AND CHALLENGES IN SECOND LANGUAGE LEARNING 362
EL Issue 1: Demands on Content Area Teachers 363
EL Issue 2: Academic and Language Needs and Assets of ELs 364
EL Issue 3: The Need to Differentiate Instruction 365
EL Issue 4: The Challenge of Integrating Students’ Native Languages 366
EL Issue 5: Technology Standards for Language Learning 367
ISSUES AND CHALLENGES IN FOREIGN LANGUAGE LEARNING 368
FL Issue 1: The Need for Authentic Materials and Perspectives 369
FL Issue 2: The Need for Creating Audience and Purpose 369
TECHNOLOGY INTEGRATION STRATEGIES FOR EL AND FL INSTRUCTION 370
Support for Authentic Oral and Written Language Practice and Assessment 371
Virtual Collaborations and Conferencing Tandem 375
Virtual Field Trips for Modified Language Immersion Experience 377
Support for Practice in Language Subskills 378
Presentation Tools 379
Support for Production of Written and Oral Texts 380
Teacher Growth in Technology Integration Strategies for Second and Foreign Language Teachers 382
CHAPTER 11 SUMMARY 384
TECHNOLOGY INTEGRATION WORKSHOP 384

12 Teaching and Learning with Technology in Science, Engineering, and Mathematics 386

LEARNING OUTCOMES 386
INTRODUCTION 389
INTRODUCTION TO STEM AND STEM INTEGRATION 390
What Is STEM Integration Instruction? 390
ISSUES AND CHALLENGES IN SCIENCE INSTRUCTION 393
Accountability for Standards in Science 393
An Increasing Need for Scientific and Engineering Literacy 395
Difficulties in Teaching K–8 Science 395
<table>
<thead>
<tr>
<th>Chapter</th>
<th>Title</th>
<th>Pages</th>
</tr>
</thead>
<tbody>
<tr>
<td>13</td>
<td>Teaching and Learning with Technology in Social Studies</td>
<td>428</td>
</tr>
<tr>
<td></td>
<td>Learning Outcomes</td>
<td>428</td>
</tr>
<tr>
<td></td>
<td>Introduction</td>
<td>432</td>
</tr>
<tr>
<td></td>
<td>Issues and Challenges in Social Studies Instruction</td>
<td>432</td>
</tr>
<tr>
<td></td>
<td>Meeting Standards across Social Studies Areas</td>
<td>432</td>
</tr>
<tr>
<td></td>
<td>Critical Consumption of Online Content</td>
<td>435</td>
</tr>
<tr>
<td>14</td>
<td>Teaching and Learning with Technology in Music and Art</td>
<td>449</td>
</tr>
<tr>
<td></td>
<td>Learning Outcomes</td>
<td>449</td>
</tr>
<tr>
<td></td>
<td>Introduction</td>
<td>452</td>
</tr>
<tr>
<td></td>
<td>Issues and Challenges in Music Instruction</td>
<td>453</td>
</tr>
<tr>
<td></td>
<td>A Changing Definition for Music Literacy</td>
<td>453</td>
</tr>
<tr>
<td></td>
<td>Preparing Teachers to Meet Music Standards</td>
<td>453</td>
</tr>
<tr>
<td></td>
<td>Downloading Music Illegally</td>
<td>454</td>
</tr>
<tr>
<td></td>
<td>The Intersection of Popular Music, Technology, and Music Instruction</td>
<td>455</td>
</tr>
<tr>
<td></td>
<td>The Music Director as Small Business Administrator</td>
<td>455</td>
</tr>
<tr>
<td></td>
<td>Technology Integration Strategies for Music Instruction</td>
<td>455</td>
</tr>
<tr>
<td></td>
<td>Support for Music Composition and Production</td>
<td>456</td>
</tr>
<tr>
<td></td>
<td>Support for Music Performance</td>
<td>459</td>
</tr>
<tr>
<td></td>
<td>Support for Self-Paced Learning and Practice</td>
<td>461</td>
</tr>
<tr>
<td></td>
<td>Support for Teaching Music History</td>
<td>462</td>
</tr>
<tr>
<td></td>
<td>Support for Interdisciplinary Strategies</td>
<td>463</td>
</tr>
<tr>
<td></td>
<td>Teacher Growth in Technology Integration Strategies for Music</td>
<td>464</td>
</tr>
<tr>
<td></td>
<td>Issues and Challenges in Art Instruction</td>
<td>465</td>
</tr>
<tr>
<td></td>
<td>Funding for Art Instruction</td>
<td>466</td>
</tr>
<tr>
<td></td>
<td>Ethical Issues Associated with the Use of Images and Other Materials</td>
<td>466</td>
</tr>
<tr>
<td></td>
<td>Accessing Images Used in Art Instruction</td>
<td>466</td>
</tr>
<tr>
<td></td>
<td>The Challenge of Meeting Standards in Arts Instruction</td>
<td>466</td>
</tr>
<tr>
<td></td>
<td>Technology Integration Strategies for Art Instruction</td>
<td>467</td>
</tr>
<tr>
<td></td>
<td>Accessing Art Examples for Classroom Use</td>
<td>468</td>
</tr>
<tr>
<td></td>
<td>Using Teaching Examples and Materials</td>
<td>468</td>
</tr>
<tr>
<td></td>
<td>Producing and Manipulating Digital Images</td>
<td>468</td>
</tr>
<tr>
<td></td>
<td>Supporting Graphic Design and 3-D Modeling</td>
<td>470</td>
</tr>
<tr>
<td></td>
<td>Supporting Student Publication</td>
<td>471</td>
</tr>
</tbody>
</table>

---

**Contents**

The Need to Consider All Historical Resources as Perspective Laden | 436
Setting Instructional Purposes for Technology | 437

**TECHNOLOGY INTEGRATION STRATEGIES FOR SOCIAL STUDIES**

- Videconferencing for Global Citizenship Education | 437
- Using Simulations and Problem-Solving Environments | 438
- Virtual Field Trips | 439
- Adventure Learning (AL) | 439
- Information Visualization Strategies | 440
- Geospatial Analysis Strategies | 441
- Accessing Primary Sources | 443
- Social Media Integration | 444
- Digital Research and Analysis Strategies | 444
- Digital Storytelling | 445
- Teacher Growth in Technology Integration Strategies for Social Studies | 446

**CHAPTER 13 SUMMARY**

**TECHNOLOGY INTEGRATION WORKSHOP**

---

**14 Teaching and Learning with Technology in Music and Art**

**LEARNING OUTCOMES**

**INTRODUCTION**

**ISSUES AND CHALLENGES IN MUSIC INSTRUCTION**

- A Changing Definition for Music Literacy
- Preparing Teachers to Meet Music Standards
- Downloading Music Illegally
- The Intersection of Popular Music, Technology, and Music Instruction
- The Music Director as Small Business Administrator

**TECHNOLOGY INTEGRATION STRATEGIES FOR MUSIC INSTRUCTION**

- Support for Music Composition and Production
- Support for Music Performance
- Support for Self-Paced Learning and Practice
- Support for Teaching Music History
- Support for Interdisciplinary Strategies
- Teacher Growth in Technology Integration Strategies for Music

**ISSUES AND CHALLENGES IN ART INSTRUCTION**

- Funding for Art Instruction
- Ethical Issues Associated with the Use of Images and Other Materials
- Accessing Images Used in Art Instruction
- The Challenge of Meeting Standards in Arts Instruction

**TECHNOLOGY INTEGRATION STRATEGIES FOR ART INSTRUCTION**

- Accessing Art Examples for Classroom Use
- Using Teaching Examples and Materials
- Producing and Manipulating Digital Images
- Supporting Graphic Design and 3-D Modeling
- Supporting Student Publication