教学媒体与技术

（第七版 影印版）

INSTRUCTIONAL MEDIA AND TECHNOLOGIES FOR LEARNING

(Seventh Edition)

■ Robert Heinich

Michael Molenda

James D. Russell

Sharon E. Smaldino

教学媒体与技术

（第七版 影印版）

INSTRUCTIONAL MEDIA AND TECHNOLOGIES FOR LEARNING

(Seventh Edition)

Robert Heinich
Michael Molenda
James D. Russell
Sharon E. Smaldino

图字：01-2002-3781 号

版权所有　侵权必究

前　言

　　20 世纪末，以计算机和通信技术为代表的信息科学和技术对世界经济、科技、军事、教育和文化等产生了深刻影响。信息科学技术的迅速普及和应用，带动了世界范围信息产业的蓬勃发展，为许多国家带来了丰厚的回报。

　　进入 21 世纪，尤其随着我国加入 WTO，信息产业的国际竞争将更加激烈。我国信息产业虽然在 20 世纪末取得了迅猛发展，但与发达国家相比，甚至与印度、爱尔兰等国家相比，还有很大差距。国家信息化的发展速度和信息产业的国际竞争能力，最终都将取决于信息科学技术人才的质量和数量。引进国外信息科学和技术优秀教材，在有条件的学校推动开展英语授课或双语教学，是教育部为加快培养大批高质量的信息技术人才采取的一项重要举措。

　　为此，教育部要求由高等教育出版社首先开展信息科学和技术教材的引进试点工作。同时提出了两点要求，一是要高水平，二是要低价格。在高等教育出版社和信息科学技术引进教材专家组的努力下，经过比较短的时间，第一批引进的 20 多种教材已经陆续出版。这套教材出版后受到了广泛的好评，其中有不少是世界信息科学技术领域著名专家、教授的经典之作和反映信息科学技术最新进展的优秀作品，代表了目前世界信息科学技术教育的一流水平，而且价格也是最优惠的，与国内同类自编教材相当。

　　这项教材引进工作是在教育部高等教育司和高教社的共同组织下，由国内信息科学技术领域的专家、教授广泛参与，在对大量国外教材进行多次遴选的基础上，参考了国内和国外著名大学相关专业的课程设置进行系统引进的。其中，John Wiley 公司出版的贝尔实验室信息科学研究中心副总裁 Silberschatz 教授的经典著作《操作系统概念》，是我们经过反复谈判，做了很多努力才得以引进的。William Stallings 先生曾编写了在美国深受欢迎的信息科学技术系列教材，其中有多种教材获得过美国教材和学术著作者协会颁发的计算机科学与工程教材奖，这批引进教材中就有他的两本著作。留美中国学者 Jiawei Han 先生的《数据挖掘》是该领域中具有里程碑意义的著作。由达特茅斯学院 Thomas Cormen 和麻省理工学院、哥伦比亚大学的几

位学者共同编著的经典著作《算法导论》，在经历了 11 年的锤炼之后于 2001 年出版了第二版。目前任教于美国 Massachusetts 大学的 James Kurose 教授，曾在美国三所高校先后 10 次获得杰出教师或杰出教学奖，由他主编的《计算机网络》出版后，以其体系新颖、内容先进而倍受欢迎。在努力降低引进教材售价方面，高等教育出版社做了大量和细致的工作。这套引进的教材体现了权威性、系统性、先进性和经济性等特点。

教育部也希望国内和国外的出版商积极参与此项工作，共同促进中国信息技术教育和信息产业的发展。我们在与外商的谈判工作中，不仅要坚定不移地引进国外最优秀的教材，而且还要千方百计地将版权转让费降下来，要让引进教材的价格与国内自编教材相当，让广大教师和学生负担得起。中国的教育市场巨大，外国出版公司和国内出版社要通过扩大发行数量取得效益。

在引进教材的同时，我们还应做好消化吸收，注意学习国外先进的教学思想和教学方法，提高自编教材的水平，使我们的教学和教材在内容体系上，在理论与实践的结合上，在培养学生的动手能力上能有较大的突破和创新。

目前，教育部正在全国 35 所高校推动示范性软件学院的建设和实施，这也是加快培养信息科学技术人才的重要举措之一。示范性软件学院要立足于培养具有国际竞争力的实用性软件人才，与国外知名高校或著名企业合作办学，以国内外著名 IT 企业为实践教学基地，聘请国内外知名教授和软件专家授课，还要率先使用引进教材开展教学。

我们希望通过这些举措，能在较短的时间，为我国培养一大批高质量的信息技术人才，提高我国软件人才的国际竞争力，促进我国信息产业的快速发展，加快推动国家信息化进程，进而带动整个国民经济的跨越式发展。

教育部高等教育司
二○○二年三月

PREFACE

Instructional Media and Technologies for Learning, Seventh Edition, presents a complete range of media formats in terms of how they can be integrated into classroom instruction using the ASSURE model of lesson planning. Written from the viewpoint of the teacher, the text shows specifically and realistically how media fit into the daily life of the classroom. This book is intended for educators at all levels who place a high value on successful learning. Its purpose is to help them incorporate media and technologies for learning into their repertoire—to use them as teaching tools and to guide students in using them as learning tools. We draw examples from elementary, secondary, and post-secondary education, as well as corporate training and development, because we know that instructors in these different settings have found previous editions of this book useful in their work.

This new edition is necessitated by the amazing pace of innovation in all aspects of media, particularly in those related to computers and computer networks, and especially the Internet. In the few years since the sixth edition, the digitization of information has accelerated rapidly and so has school use of new telecommunications resources, such as the Web.

Rationales

We share a number of convictions that have motivated us since we first contemplated writing a textbook. First, we believe in an *eclectic* approach to the design of instruction. Advocates cite an abundance of theories and philosophies in support of different approaches to instruction—behaviorist, cognitivist, constructivist, and so on. We view these contending theoretical positions as differing *perspectives*—different vantage points—from which to examine the large and complex world of teaching and learning. We value each of them and feel that each is reflected in the advice we offer.

Second, we have a balanced posture regarding the role of technology in instruction. Because of this perspective we consider each technology in light of its advantages, limitations, and range of applications. No technology can

be described solely as being either "good" or "bad," so we strive to give a balanced treatment to the hard and soft technologies as well as to the simpler and more sophisticated media.

Third, we believe in the possibility of a rapprochement between the humanistic and technological traditions in education. We contend that technology and humanism are two separable dimensions. We demonstrate in Chapter 1 that it's easy to describe instructional arrangements that are high on both dimensions or low on both dimensions, as well as high on one and low on the other. We view them as complementary concepts.

Fourth, we believe that technology can best be integrated into instruction when viewed from the perspective of the teacher rather than that of the technologist. Therefore, throughout the book we attempt to approach media and technology solutions in terms of the day-to-day challenges of teachers and to avoid technical jargon as much as possible. Our examples deal with real, everyday teaching issues, in real content areas, involving real media and materials.

New to This Edition

Not only have we updated the technological information and methodological perspectives, but we have made a number of other changes.

- *New organization.* The text has been reorganized to facilitate understanding of chapter content. The chapter on Technologies of Instruction has been moved to the front of the text based on suggestions by a number of users.
- *Copyright Concerns.* The copyright information from the sixth edition has been updated based on new laws and interpretations. In addition, the copyright information has been moved from an appendix to individual chapters where specific topics are relevant.
- *New photographs and drawings.* Almost 100 new visuals have been added to this edition to update the materials and equipment presented in the text.

- *Updated Classroom Link.* The "Classroom Link Portfolio" CD-ROM that accompanies the text has been significantly updated and expanded. It features templates for lesson plans and materials evaluation, enabling you to develop your professional portfolios. In addition, everything is connected to the ISTE/NETS Standards. This CD-ROM is packaged in the back of your book.
- *Classroom examples.* We provide more examples of specific classroom applications of media and technologies across grade levels and subjects.
- *Media specialists' role.* We have made a special effort to draw the connections between the roles of teachers and school media specialists, portraying them as highly complementary and interdependent.
- *Expanded Companion Website.* The Companion Website (CW), at www.prenhall.com/heinich, has been expanded and is integrated with the text and the CD-ROM to create a complete learning package.
- *Flashbacks.* These brief historical vignettes that lend a sense of perspective to today's technologies have been moved from the text to the Companion Website.

Text Organization

Introductory Information. The book begins with a visual introduction—a series of vignettes that depict the many applications of media and technology in enhancing learning. The first two chapters parallel the title of the text. Chapter 1 discusses instructional media, and Chapter 2 introduces technologies for learning. Chapter 1 identifies the purposes served by media and technology and provides theoretical grounding in communications and in the psychology of learning and instruction. Chapter 2 describes programmed instruction, programmed tutoring, learning centers, cooperative groups, games, and simulations. Chapter 3 presents the ASSURE model for instructional planning. Readers who are already familiar with lesson planning procedures will find the ASSURE model more congenial than the more technical models associated with full-fledged instructional design. This chapter also presents general procedures for appraising, selecting, and using media.

Core Chapters. Media and instructional materials are described in Chapter 4. Topics include manipulatives, multimedia kits, field trips, printed materials, free and inexpensive materials, and display surfaces. Chapter 5 examines principles and procedures of visual design, an important foundation for use of the visual media discussed in Chapters 6, 8, and 9. The handling of color is a critical element in visual design. To portray the principles of color properly, we have included full-color photos and illustrations in Chapter 5.

Chapters 6 through 10 treat one by one the common formats of media. Chapter 6 deals with visual media.

Chapter 7 features audio media and the listening process. Video is examined in Chapter 8. Chapters 9 and 10 focus on computer-based technologies, including computer-assisted instruction, integrated learning systems, computers as student tools, multimedia, and hypermedia.

Chapter 11 focuses on computer networks including the Internet, the World Wide Web, intranets, wide area networks (WANs), and local area networks (LANs). Distance learning is the focus of Chapter 12, with particular attention paid to broadcast radio and television, audio and video teleconferencing, online technologies, and distance learning issues.

A Vision for the Future. In Chapter 13 we consider the possible impacts of current trends in technology, training, and education. We discuss the emerging influences of computer-based media, telecommunications technologies, schools of the future, and workplaces of the future.

Appendixes. *Appendix A: Use of Standard Visuals* includes topics that have been around since the first edition, but which are still very important and useful to readers. *Appendix B: Equipment and Set-ups* provides nuts-and-bolts advice on setting up and handling media hardware, including setups for audio, visual projection, video, and computers. *Appendix C: Information Sources* provides the key for exploring other sources for instructional media beyond this book, giving names and addresses of specialized and comprehensive sources. Dozens more producers, vendors, and information centers are listed on our Companion Website. The text concludes with a glossary of more than 400 technical terms used in this book and in discussions of instructional media generally, followed by a thorough index.

Special Features

- **Advance organizers.** Each chapter begins with a photo essay giving a visual overview of the content and a brief verbal outline. To provide a more concrete notion of what knowledge and skills are featured in each chapter, we open each chapter with a set of knowledge objectives. Following the statement of objectives is the "Lexicon," a list of technical terms or terms used in a specialized sense in that chapter. All of these features are intended to give you a strong set of advance organizers, scaffolds for the main content of the chapter.
- **Appraisal Checklists.** The checklists are related to each of the media formats and are intended to make it easy to preview materials systematically and to preserve the information for later reference. Users have permission to photocopy these for personal use. The "Classroom Link Portfolio" CD-ROM computer software allows you to enter your appraisals directly into a template for storage and future use.

- **ASSURE Blueprints.** These model lesson plans appear at the end of Chapters 3 through 12. They demonstrate how the ASSURE model can be used to integrate media into instructional plans, thus serving as a concrete link with daily professional practice. As a convenience, they are also available on the "Classroom Link Portfolio" CD-ROM.
- **AV Showmanship.** These features give specific tips on using media with flair and dramatic effect.
- **Close-Ups.** These serve as miniature case studies of media applications in a variety of settings. Like the Blueprints, they show media and technology use *in context*.
- **How To . . .** Various media production and operation procedures are spelled out with illustrated step-by-step procedures. Troubleshooting suggestions are included as part of these how-to discussions.
- **Media Files.** Actual materials in various media formats are highlighted as concrete examples of the types of commercially available materials. The materials referred to are meant to be *typical* of a given format, not necessarily as exemplary. No endorsement is implied.
- **Classroom Link Portfolio Activities.** New to this edition, these activities tie together the book, the "Classroom Link Portfolio" CD-ROM, the Companion Website, and the ISTE and NETS-T standards. These activities and projects can be found at the end of each chapter and are indicated with both a CW and a CD-ROM icon.
- **Integration Assessments.** Each chapter concludes with a set of activities, which address the sorts of real-life skills typically cultivated in courses using this book as the textbook. Activities that can be completed on the Companion Website are indicated with a CW icon.

For Students

"Classroom Link Portfolio" CD-ROM.

The companion CD-ROM, "Classroom Link Portfolio," will assist you in creating, maintaining, and printing lesson plans and evaluations of materials based on the ASSURE model. The resulting database can be the basis for a teaching portfolio that can grow throughout your career. The portfolio components are connected to ISTE and NETS-S standards. The CD is fully integrated into the text and the Companion Website with performance-based and reflection-based activities and projects. These activities and projects, found at the end of each chapter, are indicated with both a CW and a CD-ROM icon. The guide for using the "Classroom Link Portfolio" CD-ROM is located on the Companion Website; the instructions for using this software have been completely revised and simplified.

Companion Website (CW). The Companion Website, located at http://www. prenhall.com/heinich, includes study materials such as knowledge objectives for each chapter, chapter overviews and summaries, interactive practice quizzes with answers, portfolio activities, integration assessments, links to related web sites, flashbacks, a message board to encourage discussion, a chat feature, and a detailed guide for using the "Classroom Link Portfolio" CD-ROM.

The CW provides students with resources and immediate feedback on exercises and other activities linked to the text. In addition, these activities, projects, and resources enhance and extend chapter content to real-world issues and concepts. Each chapter on the CW contains the following modules (or sections) unless specified otherwise:

- Knowledge Objectives
- True/False—self-quizzes with automatic grading that provides immediate feedback for students
- Multiple Choice—self-quizzes with automatic grading that provides immediate feedback for students
- Web Links—links to WWW sites that relate to and enhance chapter content
- Portfolio Activities—performance-based and reflection-based activities and projects that are connected to the ISTE/NETS standards
- Integration Assessments—projects and activities that enhance students' understanding of chapter content as it relates to technology
- Message Board—serves as a virtual bulletin board to post—or respond to—questions or comments to and from a national audience
- Chat—allows anyone who is using the text anywhere in the country to communicate in a real-time environment—ideal for discussion and study groups, class projects, and so on
- Other Resources: In addition, users have access to PowerPoint Transparencies, Flashbacks, and links to dozens of Information Sources

For Instructors

Instructor's Guide. Ask your Merrill/Prentice Hall representative or contact the publisher directly for a copy of this comprehensive teaching guide, available to adopters without cost. The *Instructor's Guide* includes teaching tips for each chapter, suggestions for different ways to organize an Instructional Media course, and overhead transparency masters on perforated pages.

Computer Test Item Bank. Adopting instructors can obtain a set of computer disks, available in either Windows or Macintosh format, containing a test item bank with instructions on how to create their own tests. Contact your Merrill/Prentice Hall representative.

Companion Website.   The Companion Website is located at http://www.prenhall.com/heinich. It includes links to related web sites, a message board to encourage discussion, study materials and other features for students, and a library of PowerPoint slides that can be downloaded for class use. Of particular interest is **Syllabus Manager**™—an online syllabus creation and management instrument that has the following capabilities:

- **Syllabus Manager** provides you, the instructor, with a step-by-step process to create and revise syllabi, with direct links into the Companion Website and other online content without having to learn HTML.
- Your completed syllabus is hosted on our servers, allowing convenient updates from any computer on the Internet. Changes you make to your syllabus are immediately available to your students at their next logon.
- Students may log on to your syllabus at any time. All they need to know is the web address for the Companion Website and the password you've assigned to your syllabus.
- Clicking on a date, the student is shown the list of activities for that day's assignment. The activities for each assignment are linked directly to text content, saving time for students.
- Adding assignments consists of clicking on the desired due date, then filling in the details of the assignment.
- Links to other activities can be created easily. If the activity is online, a URL can be entered in the space provided, and it will be linked automatically in the final syllabus.

Authors' Services.   The authors are eager to assist you in putting together an outstanding Instructional Media course. We offer the following services to instructors who have adopted this book:

- *Telelecture.* Call any of us in advance to arrange a guest lecture in your class via telephone. The only cost to you is for the toll charges. Some instructors use this telelecture as a demonstration of the techniques described in Chapter 12. Our phone numbers, fax numbers, and e-mail addresses are listed in the *Instructor's Guide.*
- *Newsletter.* We keep in touch with our adopters through an occasional newsletter. The newsletter keeps you informed about new developments, teaching tips and new teaching materials, and updates on our workshops and other services. You can receive it free of charge by sending your name to Sharon Smaldino.
- *Workshops.* We have conducted workshops annually since 1982 at the national convention of the Association for Educational Communications and Technology (AECT). This is a forum for exchange of ideas and networking among instructors of courses on Instructional Media.

If you are an instructor using this text, send your name and address to Sharon Smaldino, Schindler Education Center 618, University of Northern Iowa, Cedar Falls, IA 50614-0606. We would like to add your name to our newsletter mailing list, and we welcome any comments you have about the text.

ACKNOWLEDGMENTS

This book also contains the products of the work of many others who have contributed to past editions; we continue to be indebted to all of them.

The editorial and production staffs of Merrill/ Prentice Hall, particularly Debbie Stollenwerk, Heather Fraser, and Mary Harlan, deserve special commendation. A new member of the production team, Nancy Ritz, our photo coordinator, greatly enhanced the look of this edition. We also want to thank our copy editor, Robert L. Marcum, for his valuable editing contributions and for his assistance with the content related to computers. Molly Lane of Purdue University provided valuable assistance in updating the Suggested Readings.

The authors have never had such intense and helpful support from any previous publication team.

We are grateful to our colleagues from our own universities—Indiana, Purdue, and Northern Iowa—for their many and valued forms of support over the years.

Finally, we thank our families for all they do to make this project possible.

Robert Heinich
Michael Molenda
James D. Russell
Sharon E. Smaldino

ABOUT THE AUTHORS
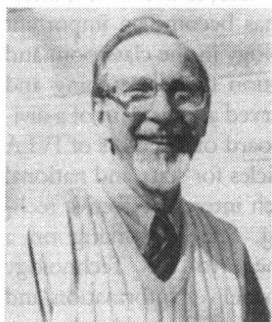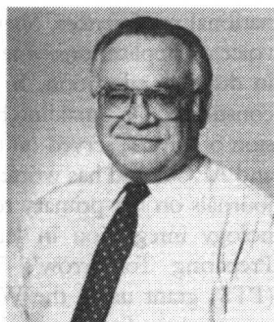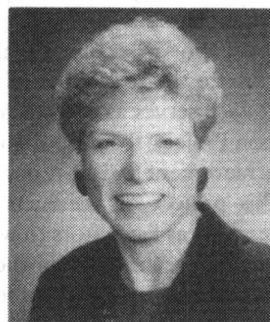
Robert Heinich | Michael Molenda | James D. Russell | Sharon E. Smaldino

Robert Heinich.   Dr. Heinich is Professor Emeritus in the department of Instructional Systems Technology (IST), Indiana University. He is now retired from active teaching, having served on the faculty since 1969 following completion of his doctorate at University of Southern California and a stint as multimedia editor for Doubleday Publishing. Prior to that he built a nationally prominent media program at the Colorado Springs school district. Bob has been an active leader in the field of educational technology for four decades, serving as president of the Association for Educational Communications and Technology (AECT) in 1971–1972 and as president of AECT's foundation from 1972 to 1982. He was editor of AECT's scholarly journal from 1969 to 1983. Indicative of his professional contributions, Dr. Heinich has received the Presidential Citation of the International Society for Performance and Instruction and the Distinguished Service Award of AECT. At Indiana University he served as chairman of the IST department from 1979 to 1984. His many articles and monographs provide some of the major theoretical underpinnings of the field. The University of Northern Colorado honored Bob with their Trail Blazer Award as an outstanding alumnus. He is currently president of the Old Colorado City Historical Society in Colorado Springs, where he now lives.

Michael Molenda.   Dr. Molenda is Associate Professor in Instructional Systems Technology (IST) at Indiana University. He received his Ph.D. from Syracuse University and taught at University of North Carolina at Greensboro before joining Indiana University in 1972. He designs and teaches courses in Media Applications, Instructional Development, Evaluation and Change, and Instructional Technology Foundations. Mike served as chairman of the IST department from 1988 to 1991. He has lectured and consulted extensively on educational technology in Spain, the Netherlands, Indonesia, Korea, Swaziland, and several countries in Latin America and the Middle East. Among his professional distinctions are selection as a Fulbright Lecturer in Peru in 1976, membership on the Board of Directors of AECT, 1988–1991, and presidency of AECT's International Council, 1978–1979. Dr. Molenda's breadth of knowledge of the field of educational technology is indicated by his authorship of articles on educational technology in elementary and secondary education and instructional technology for recent editions of international encyclopedias of education. Since 1997 he has co-authored an annual survey of issues and trends in educational technology for *Educational Media and Technology Yearbook*.

James D. Russell.   Dr. Russell is Professor of Educational Technology at Purdue University. During spring semesters he is visiting professor of Instructional Systems at Florida State University. A former high school mathematics and physics teacher, Jim teaches courses on Media Utilization, Instructional Design, Instructional Delivery Systems, and Principles of Adult Education. He was honored as his department's Outstanding Teacher in 1993 and with the School of Education's Best Teacher Award for 1996. Jim works part-time for Purdue's Center for Instructional Excellence, where he conducts workshops on teaching techniques and consults with faculty and graduate assistants on instructional improvement. His specialty areas, in which he has achieved national prominence through his writings and presentations, are presentation skills and using media and technology in classrooms. Because of his commitment to remaining close to the real world of teachers in the classroom, Dr. Russell serves as co-director of the Technology Integration Project, the purpose of which is to improve students' achievement and attitudes in math and science. As part of this project he conducts daylong workshops to train teachers as facilitators to work with other teachers to implement technology in their classrooms. Through these workshops and this textbook, Jim continues to make a significant impact on classroom teaching practice.

Sharon E. Smaldino.   Dr. Smaldino is a Professor of Educational Technology at the University of Northern Iowa. Sharon received her Ph.D. in 1987 from Southern Illinois University, Carbondale. Prior to that she received an M.A. in Elementary Education and served for more than a dozen years as teacher, speech therapist, and special educator in school districts from Florida to Minnesota. At Northern Iowa she teaches an introductory educational media course for undergraduates and graduate majors and is coordinator of the Educational Technology program. Dr. Smaldino also teaches graduate courses in Instructional Development, Instructional Computing Design, Desktop Publishing, and Selection and Integration. She is the recipient of the UNI 2000 Outstanding Graduate Teaching Award. Presenting at state, national, and international conferences, Sharon has become an important voice on applications of technology in the classroom and in distance education. In addition to her teaching and consulting, Dr. Smaldino has served as president of a division of AECT, served on the board of directors of IVLA and AECT, and has written articles for state and national journals on her primary research interest, effective technology integration in learning. She is working on a Preparing Tomorrow's Teachers to use Technology (PT3) grant using the Web to deliver information and case studies of teachers using technology in schools.

BRIEF CONTENTS

CONTENTS

6

Visuals   140

7

Audio   170

8

Video   190

9

Computers   212

10

Multimedia   240

11

Internet and Intranets   260

12

Distance Learning 284

13

Looking Ahead 306

A

Use of Standard Visuals 325

B

Equipment and Setups 339

C

Information Sources 355

Glossary 359

Credits 366

Index 367

SPECIAL FEATURES