

Instructional Technology and Media for Learning, 11th edition, shows how a complete range of technology and media formats can be integrated into classroom instruction using the ASSURE model for lesson planning. Written from the viewpoint of the teacher, the text shows specifically and realistically how technology and media fit into the daily life of the classroom. This book is intended for educators at all levels who place a high value on learning. Its purpose is to help educators incorporate technology and media into their repertoire—to use them as teaching tools and to guide students in using them as learning tools. We draw examples from elementary and secondary education because we know that instructors in these PK–12 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 technology, particularly in those related to computers and mobile technologies and the Internet. The text has been updated to reflect the accelerating trend toward digitizing information and school use of telecommunications resources, such as the Web. The 11th edition also addresses the interaction among the roles of teachers, technology coordinators, and school media specialists, all complementary and interdependent teams within the school.

New to This Edition

- Embedded video in the Pearson eText* enriches your experience with the text by allowing you to see real teachers in real classrooms, and shares their insights.
- Pop-up Selection Rubrics*, which are printable, aid in the process of selecting classroom technology materials.
- Web links at point-of-use help you further explore topics discussed.
- Revised chapters have updated information about designing instruction for 21st century learning, including the Common Core State Standards.
- Current technologies to support learning are identified and include overviews of how to use them with students of all ages.
- End-of-chapter activities guide the user through teacher performance assessment using the ISTE NETS as part of the process.
- Taking a Look at Technology Integration features are updated with examples of how actual classroom teachers use technology to support student learning. The examples place emphasis on integrating the 21st century skills and the Common Core Learning Standards.
- Increased focus is given to enhancing the use of classroom technology to meet the learning needs of all students. With the advent of Response to Intervention (RtI), classroom teachers are expected to meet the learning needs of their students. We have expanded the Technology for All Learners feature to help consider options that will be useful to facilitate learning experiences for all students in the classroom.



The Pearson eText* for this title is an affordable, interactive version of the print text that includes videos, pop-up content, and links to additional information. The play button appears where video is available, while hyperlinked words provide access to pop-ups and other related websites.

Go to www.pearsonhighered.com/etextbooks to learn more about the enhanced Pearson eText for *Instructional Technology and Media for Learning*.

*These enhancements are only available through the Pearson eText, and not other third-party eTexts such as CourseSmart or Kindle.

Our Approach

We share a number of convictions that underlie this edition. First, we believe in an *eclectic* approach to instruction. Advocates cite an abundance of theories and philosophies in support of different approaches to instruction—behaviorist, cognitivist, constructivist, and social-psychological. We view these theoretical positions as differing *perspectives*—different vantage points—from which to examine the complex world of teaching and learning. We value each of them and feel that each is reflected in the guidance 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 a range of technologies and media resources.

Third, we believe that technology can best be integrated into instruction when viewed from a teacher’s perspective. Therefore, throughout the book, we attempt to approach technology and media solutions in terms of a teacher’s day-to-day challenges and to avoid technical jargon as much as possible. Our examples deal with everyday teaching issues in a range of content areas.

The ASSURE Model for Technology Integration

In this edition, the explanation of the ASSURE model has been revised to be more clear, practical, and focused on PK–12 teaching and learning. The text offers several chapter features (Classroom Case Study and Classroom Case Study Reflection) that show how teachers can effectively integrate technology and media into instruction, all in the context of each chapter’s content. Chapters 3 through 9 open with a video feature that offers an example of how one teacher uses technology to augment the learning experiences of the students.

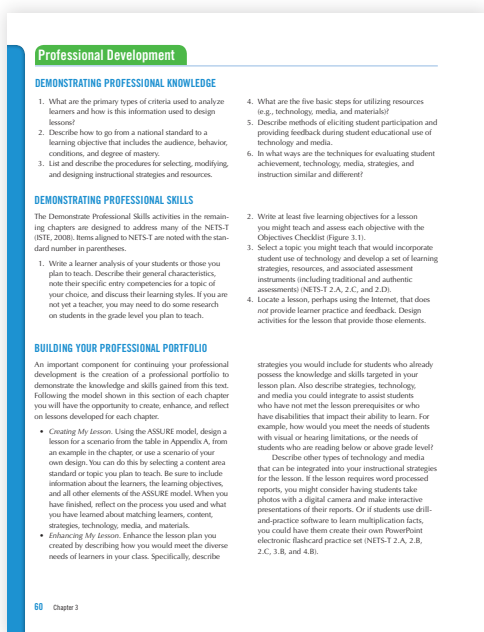
Focus on Professional Development

The “Professional Development” feature helps readers develop their ongoing professional knowledge and skills with regard to effectively using technology and media for learning.

The first section, “Demonstrate Professional Knowledge,” poses questions based on the Knowledge Outcomes at the beginning of each chapter. In the next section, “Demonstrate Professional Skills,” readers integrate their learning through activities that are aligned with the ISTE NETS for Teachers. The final section, “Build Your Professional Portfolio,” includes three parts: Creating My Lesson, Enhancing My Lesson, and Reflecting on My Lesson. These are also linked to the ISTE NETS for Teachers.

- “Creating My Lesson” asks readers to select their own topics and settings for developing lessons that integrate the technology and media discussed in the chapter. Chapter-specific questions help readers make decisions to create their own lesson plan using appropriate instructional strategies, technology, and media.

- “Enhancing My Lesson” asks the reader to describe other strategies, technology, media, and materials that could enhance the lesson. The reader addresses how the lesson could be enhanced to meet the diverse needs of learners, including students who already possess the knowledge and skills targeted in the lesson plan.



- **Reflecting on My Lesson** prompts readers to reflect on their lesson, the process used to develop it, and different types of students who could benefit from it. Readers are also asked to reflect on what they learned about the process of matching audience, content, strategies, technology, media, and materials.

Special Features

The ASSURE Model for Technology Integration. Chapter opening “ASSURE Classroom Case Studies” (in Chapters 3 through 9) each presents a video clip of a specific classroom that will be revisited periodically throughout the chapter in the “ASSURE Case Study Reflections.” These are brief notes and reflection questions that extend the opening case study by addressing the questions that a teacher may face when considering technology integration in the context of specific chapter content. At the end of the chapter, the “ASSURE Lesson Plan” provides a fuller version of the instructional or classroom situation outlined at the beginning of the chapter and offers a possible solution.



ASSURE Classroom Case Study Reflections

Review the ASSURE Classroom Case Study and video at the beginning of the chapter. What kinds of learning experiences can Mr. Chou offer his students? How can he capitalize on the types of learning opportunities to ensure all his students have access to the information?

Network Resources

It is common knowledge that computers can be used to connect resources outside of the classroom. Once you connect computers and share information, you have a **network**. News libraries, organizations, and businesses so that students, families, or share information and instruction instantly in several ways.

TYPES OF NETWORKS

LAN. The simplest of all networks is a **local area network (LAN)** within a limited area, normally a classroom, building, or lab. Each individual computer to use another to permit exchange of files at LAN. A server is a centralized computer called a **file server** and to it. A computer lab is often itself a LAN in the lab are case usually tucked away the-way space. Who needed to a local single computer it media center, who server. Through a school can have software. Men and students to personalized folder useful when multiple it also allows teach such as a PowerPC computer lab.

Within a school a technology you might otherwise inventing skills Coordinators can t ing with teachers a machines and safe center can store it file server, giving access to the internet topic.



ASSURE Lesson Plan

This ASSURE Classroom Case Study is based on a video clip that integrates Web 2.0 resources. Ms. Vicki Davis collaborates with her ninth-grade students to create lessons for seventh graders in a virtual world. This ASSURE Lesson Plan describes the instructional planning used by Vicki Davis, a ninth-grade teacher who wanted her students to develop lesson plans for seventh graders with whom they connected virtually. To address this challenge, Ms. Davis collaborated with her students to create these lessons. Below is Vicki Davis's ASSURE lesson plan for the project.

Vicki Davis
Ninth Grade
Topic: Web 2.0

Analyze Learners

General Characteristics. The students in Vicki Davis's high school class are primarily rural students with a variety of interests in technology. They are fairly equally distributed with regard to gender and range in age from 13 to 15 years old. Student reading ability is at or above grade level, although there are several students with diagnosed learning disabilities in the class. Student behavior problems are minimal.

Entry Competencies. The students are, in general, able to do the following:

- Demonstrate competency in keyboarding, document editing, and general computer skills.
- Prepare written materials, such as narratives, for the lessons they are going to teach to the seventh-grade students, including wiki and blog entries.

their class to help the younger students learn about “digital citizenship” and internet safety. Vicki guides her students through their use of technology, building on their prior experiences and skills. When working in groups, her style of coaching facilitates their learning abilities.

State Standards and Objectives

Curriculum Standards. The following Common Core Standards for Technology and Career Education are addressed in this lesson: (2) Communicate thoughts, ideas, information, and messages in writing and technologically create documents; Students collaborate using blogs, wikis, and preparation of instruction for younger students; (3) Organize ideas and communicate orally in clear, concise, and courteous manner. Students convey their ideas within group discussions and in presentations; and (8) Implement a plan of action making modifications as needed to achieve stated objectives. Students arrange their presentations to ensure that the seventh graders are able to learn the important elements of digital citizenship and internet safety.

Technology Standards. National Educational Technology Standards for Students 1—Creativity and Innovation. Students use Web 2.0 tools to demonstrate creative thinking, construct knowledge, and develop innovative products and processes. 4—Critical Thinking, Problem Solving, and Decision Making: Students use technology to plan and conduct research, manage projects, solve problems, and make decisions, and 5—Digital Citizenship: Students understand human, cultural, and societal issues related to technology and practice legal and ethical behavior.

Learning Objectives. The learning objectives for this lesson are as follows:

1. Develop virtual worlds that engage students in scenarios in which they apply digital citizenship and safety guidelines.
2. Select appropriate technology tools to accomplish team objectives.
3. Participate in internet research and use appropriate attribution for ideas.



ASSURE A Model to Help Assure Learning

Analyze Learners

The first step in planning a lesson is to identify and analyze learner characteristics shown to be associated with learning outcomes. This information will guide your decision making during the design of your lesson. The key areas to consider during learner analysis include (1) general characteristics of learners, (2) specific entry competencies (knowledge, skills, and attitudes about the topic), and (3) learning styles.

State Standards and Objectives

The next step is to state the standards and learning objectives as specifically as possible. Begin with curriculum and technology standards adopted by your district, as these are based on state and national student performance criteria. Well-stated objectives name the learners for whom the objective is intended, the action (behavior) to be demonstrated, the conditions under which the behavior or performance will be observed, and the degree to which the new knowledge or skill must be mastered. For this tool, the condition will include the use of technology and media to support learning and to assess achievement of the standard or learning objectives.

Select Strategies and Resources

Once you have analyzed your learners and stated the standards and objectives, you have established the beginning points (students' present knowledge, skills, and attitudes) and ending points (learning objectives) of instruction. Your task now is to build a bridge between these two points by choosing appropriate instructional strategies and resources to achieve the objectives.

Utilize Resources

This step involves planning your teaching role for utilizing the resources (technology, media, and materials) to help students achieve the learning objectives. To do this, follow the 5-Ps process: Preview the resources; Prepare the resources; Prepare the environment; Prepare the learners; and Provide the learning experience.

Require Learner Participation

To be effective, instruction should require learners' active mental engagement. Provide activities that allow them to practice the new knowledge or skills and to receive feedback on their efforts before being formally assessed. Practice may involve student self-checks, computer-assisted instruction, Internet activities, or group exercises. Feedback can come from the teacher, a computer, other students, or self-evaluation.

Evaluate and Revise

After implementing a lesson, evaluate its impact on student learning. This assessment not only examines the degree to which students achieved the learning objectives, but also examines the entire instructional process and the impact of using technology and media. Whenever there are discrepancies between learning objectives and student outcomes, revise the lesson plan to address the areas of concern.



FIGURE 4.1 21st Century Learning Environment Components

Instructional Strategies

- Teacher-centered
- Student-centered

Learning Context

- Face-to-face
- Distant learning
- Blended instruction
- Independent study
- Informal study

Integration

- Technology
- Media
- Materials

Integrating Technology and Media into Instruction: The ASSURE Model 39

COPYRIGHT CONCERNS

Software

Congress amended the Copyright Act to clear up questions of fair use of copyrighted programs. The changes defined the term *computer program* for copyright purposes and set forth rules on permissible and impermissible use of copyrighted computer software. According to the amended law, you are permitted to do the following with a single copy of a program:

- Make one backup or archival copy of the program.
- Use a "locksmith" program to bypass the copy-prevention code on the original to make the archival copy.
- Install one copy of the program onto a computer hard drive.
- Adapt a computer program from one language to another if the program is not available in the desired language.
- Add features to a copyrighted program to make better use of the program.
- Adapt a copyrighted program to meet local needs.

Without the copyright owner's permission, you are prohibited from doing the following:

- Making multiple copies of a copyrighted program.
- Making additional copies from an archival or backup copy.
- Making copies of copyrighted programs to be sold, leased, loaned, transferred, or given away.
- Setting a locally produced adaptation of a copyrighted program.
- Making multiple copies of an adaptation of a copyrighted program even for use within a school or school district.
- Putting a single copy of a program into a network without permission or a special license.
- Duplicating the printed copyrighted software documentation unless allowed by the copyrighted software company.

For general information and suggested resources (print and web links) on copyright, see Chapter 1.

"microworlds"—environments that permit students to freely experiment, test, and in 1993a, 1993b). These environments reinforce 21st century skills by allowing student to engage and support students in their learning. They have suggested that student the digital environment because it encourages students to use cognitive learning of critical-thinking skills. Students control how and when the computer provides its information they need. Part of your responsibility is to choose from among the m technologies, software programs, and mobile apps available to create such learn and to assist your students in constructing their own mental models.

TYPES OF DIGITAL RESOURCES

Digital technologies provide virtually instantaneous response to student input, his capacity to store and manipulate information, and are unattached to their skill many students simultaneously. Technology's role in instruction is to serve as a rich learning experiences, giving your students the power to influence the depth and their learning. Technology makes it possible to control and integrate a variety of and motion pictures, graphics, and sounds, as well as text-based information. It can also record, analyze, and react to student responses typed on a keyboard, and mouse or touch screens, activated by voice. As your students begin to work with they find the digital resources available to them help make the process easier an Student can use the technology to gather information and to prepare materials; strate their knowledge and understanding of that information.

Besides providing information, digital devices are also tools for creativity and ion. Because these technologies allow sharing and collaboration with others around students often arrive to achieve their "best" artifacts of learning because their work by an audience outside the classroom.

Copyright Concerns. This feature provides an integrated discussion of copyright issues linked to specific chapter content.

SELECTION RUBRIC Web Resources

Complete and save the following interactive evaluation to reference when selecting web resources to integrate into lessons.

Search Terms

Title _____

Source/Location _____

ID/Date _____ Cost _____

Subject Area _____ Grade Level _____

Learning Experiences _____

Brief Description

Standards/Outcomes/Objectives

_____ (category level)

_____ Date _____

Selection Rubrics. These rubrics, which pop up in the Pearson e-Text* version of the book, are related to each of the technology and media formats, making it easy to preview materials systematically and to preserve the information for later reference. Textbook users have permission to print these rubrics for personal use.

MEDIA SAMPLES

Audio

LibriVox

<http://librivox.org>

LibriVox provides a collection of public domain audiobooks available in files ranging from classics, short stories, and poetry. The collection is based on voluntary submissions of audio files, but the entries must be public domain to be entered. Over 12 languages are available, providing native speakers reading familiar texts.

Audio Theatre Production Kit

www.audiotheatre.org

Students can create their own audio theatre productions. The kit contains two versions of a script, one with altered vocabulary to meet the needs of below-grade readers, the second for grade-level and above-grade-level readers. In addition, there is a CD with background music and sound effects. Students, working together, record their production to be shared with others. They

develop technical skills, as well as work collaboratively in the production. It is a motivating way to help students with their reading and vocabulary competencies.

A Kid's-Eye View of the Environment

http://www.michaelismusic.com/64%27%20eye_view.html

Michael Webb based this series of songs on his many visits to schools in southern California to talk to children about the environment. We found them to be more aware and concerned about environmental problems than he expected. Much too the topics that the children were most concerned about (e.g., recycling, water and air pollution, and the greenhouse effect) and put them to music. The songs are engaging, with sing-along choruses. The messages should get primary-age children talking about making this a safer, cleaner world.

Source Link updated by permission of Michael Webb, Debra Michael Webb Music.

- **Provides oral message:** Students who have limited reading ability can learn from audio media. Students can listen and follow along with visual and text material. In addition, they can replay portions of the audio material as often as needed to understand it.
- **Provides current information:** Web-based audio often consists of broadcasts of live speeches, presentations, or performances.
- **Supports second language learning:** Audio resources are excellent for teaching second languages because they not only allow students to hear words pronounced by native speakers, but they also allow them to record their own pronunciations for comparison.
- **Easy to store:** MP3 files can be stored on a computer hard drive, USB drive, or MP3 player.

Limitations of Audio

- **Copyright concerns:** Commercially produced audio can easily be duplicated, which might lead to copyright violations.
- **Doesn't monitor attention:** Some students have difficulty studying independently, so when they listen to recorded audio their attention may wander. They may hear the recorded message but not listen attentively and comprehend. Teachers can readily detect when students are drifting away from teacher-directed learning, but an audio player cannot do this.
- **Difficulty in pacing:** Determining the appropriate pace for presenting information can be difficult if your students have a range of attention spans, abilities, and experiential backgrounds.
- **Fixed content:** The content of audio media presentation segments is fixed, even though it is possible to hear a recorded segment again or select a different section.

Media Samples. This feature provides excellent online audio and video resources for students and exemplifies several examples of media-related content.

INTEGRATION OF AUDIO

is your students, as it can topic to evaluation of student ation of audio resources can

WHEN TO USE

Learning Strategies

Instructional Situation	Strategy	Potential Technology/Media
The whole class needs to learn how to conjugate verbs.	Presentation	A PowerPoint presentation that interactively shows variations of a verb by clicking on key words. Using <i>Camtasia</i> or <i>Camtasia</i> , the teacher creates a video that includes both showing the variations of each verb and video clips of students demonstrating the action noted in the verb.
Because of safety issues, students need to observe the teacher handling chemicals for an experiment.	Demonstration	Teacher models correct use of certain types of chemicals to ensure that safety measures are addressed in the classroom setting. Teacher shows a YouTube video about how to safely handle the chemicals.
The teacher wants to challenge students into thinking about what they know and need to know about a topic.	Problem solving	Students are provided with handheld computers to collect field data that will be compared with data collected from students in a different state. A format is created for students to use equipment and resources to "solve a crime" that the teacher has created for them.
The teacher seeks to increase student learning by having them work cooperatively to research, share, evaluate, and synthesize new content into a group product that demonstrates their learning.	Cooperative learning	Students meet using free online collaboration tools (i.e., Google Docs, social bookmarking, etc.). Computer software (e.g., a database) lets students enter information about what they've learned together. Real objects can be used for the development of a final product.
The teacher wants students to discover key concepts in order to install deeper levels of understanding.	Discovery	Students create digital concept maps to discover relationships among new information. Students download weather data sets into a spreadsheet to discover how weather is predicted.

When to Use This feature gives specific tips on using technology and media with clarity, flair, and dramatic effect. It goes with the U of the ASSURE Model (Utilize Technology, Media, and Materials).

Supporting Learning Contexts with Technology and Media

The five contexts or situations most frequently encountered in PK-12 environments are (1) face-to-face classroom instruction, (2) distance learning, (3) blended instruction, (4) independent study (unattended), and (5) informal study (unattended). Each of these contexts for learning represents a way in which you can engage your students in achieving their learning outcomes. It is up to you to consider the various options to determine which might best serve your students.

FACE-TO-FACE INSTRUCTION

Although other learning contexts are gaining prominence, face-to-face instruction remains the most prevalent type of instructional setting in PK-12 schools. Because the teacher and students are in the same room, the options for learning experiences in the classroom setting are unlimited. Many of the types of technology and media you will be reading about in this textbook are easily used in the face-to-face setting. For example, teachers can use clickers to collect student opinions during presentations, use interactive whiteboards to show videos of historical events, play podcasts of mathematicians explaining how to solve a problem, or conduct live interviews with archeologists in Egypt using Skype.

*Enhancements are only available in the Pearson eText, and not third-party eTexts such as CourseSmart or Kindle.

TECHNOLOGY FOR ALL LEARNERS
English Language Learners

Robertson (2008) offers teachers seven strategies for using technology with English language learners (ELLs) who progress from the 1st to 21st century learners. Although Robertson's strategies are targeted for English learners, they represent best practice that may be useful for all students, from struggling to advanced.

1. **Build vocabulary.** Introduce new technology terms based on individual needs. Use props and demonstrations to depict meanings. Check student understanding before progressing to new vocabulary.
2. **Use handouts.** Use handouts with visuals of the computer screen to assist with language barriers.
3. **Create simple assignments for beginners.** Have students work with familiar content, such as material about major cities in his or her country of origin, to focus learning on the new technology skills rather than new content.
4. **Extend practice time.** Provide ELL extra time to practice basic computer skills that may be commonplace for other

5. **Use pair and group work.** When English learners and native English speakers are paired to learn technology skills, the ELLs not only build English language skills but may also assist their partners to learn different steps to complete technology tasks.
6. **Establish meaningful goals.** Focus technology projects on new technology skills and on improving English literacy skills. Clearly define the technology project criteria, such as number of slides, photos, and hyperlinks in a presentation, as well as providing clear expectations for subject area content.
7. **Teach students to consider the source.** Some English learners may come from cultures with limited access to information, creating a susceptibility to believing online information. Teachers can assist by preparing students to evaluate information for accuracy and relevance to their needs.

and materials to support learning; and a variety of help you carefully plan and manage those learning students achieve the intended standards and object.

As you design 21st century activities for your about and examples of instructional strategies fit them according to **teacher-centered strategies**, the **student-centered strategies**, those in which students ing, in both categories, the teacher is key to the disto focus or orientation of the strategy.

Types of Learning Strategies

There are 10 common types of instructional strategy view of each strategy, discuss the advantages and li integrating technology and media for each strategy.

ASSURE Classroom Case Study Reflection

Review the ASSURE Case Study and video at the beginning of the chapter. What teacher-centered and student-centered activities are included in the lesson? In what ways do the student-centered strategies differ from the student-centered strategies? In what ways do Mr. Kaiser and Ms. Marshall support learning during student-centered activities?

PRESENTATION

In a presentation via discussion, the teacher, stud or other student involve student learners as a w/d and Hummel (learning setting.

TECHNOLOGY RESOURCES

Search Engines for Kids

KidsKids.com

This is a student version of Kids.com that uses age-appropriate content, filtering, and search terms to help kids narrow their searches by asking questions.

Kidzick.org

Librarians created this site to help students conduct searches. Main topic menus and helpful links make it a kid-friendly search engine.

Kids Yahoo.com

The student version of Yahoo! includes sites preselected for young people ages 7 to 12 that present information in a colorful, interactive way. Teachers have been asked to review identified sites, and there is a parent page designed to share information about Internet safety and offer suggestions for ways to help children gain value from using the Internet.

To research this media, pick a selection rubric to evaluate the media and determine which one would work with your lesson plans.

end of this chapter. The URL incorporates the name of the host computer (server), the domain, the directory on the server, and the title of the webpage (actual filename). Navigation within and among webpages relies on hypertext links that, when selected, move users to another location on the same page, another website on the same host computer, or to a different computer on the Web.

To use the Web for online learning, webpages have to be designed and written, and a host computer must be available to house them. Universities and large companies are usually directly connected to the Internet and run the necessary web-hosting server software. A popular resource in online distance learning, the **Course Management Tool (CMT)**, is software designed to make it easier for the teacher to use the resources that are part of the system, such as the discussion board, test options, and grade book. When using a CMT program such as Blackboard or Moodle, the teacher can concentrate on the instruction and not have to be

ners on the Web that it can be de- A selection rubric (see Selection chapter to guide you in identifying support your students' learning. You find while exploring new resources

i in engineering systems to blend world to enhance the information file devices such as smart phones, the GPS capability of a smart phone ent or enhance knowledge about

Technology for All Learners. This feature describes technology and media that can be used to meet the learning needs of diverse learners, ranging from those with learning disabilities to gifted and talented students.

Technology Resources. Because many schools have tight budgets, this feature offers a list of practical and valuable resources that are free or inexpensive. They also inform the reader how to obtain the resources. These are listed at the ends of chapters along with helpful web links.

TAKING A LOOK AT TECHNOLOGY INTEGRATION

Key Pals

Rick Traw, a professor at the University of Northern Iowa, wanted to extend the experience of his elementary education teacher candidates in language arts applications. Because of scheduling difficulties, it was impossible to arrange a visit for his students to work on writing skills with students in a nearby urban elementary school. With the aid of the Internet, however, it was possible for the elementary

students to send their stories to their university "key pals" for review. The children had an exciting new audience for their writing and the elementary teacher candidates had an opportunity to learn about working with emerging writers. Dr. Traw and the classroom teacher provided guidance to the college teacher candidates in techniques for assisting the young children with their writing.

INTEGRATING WEBQUESTS

Although students can access a rich array of information on the Web, their searches often use random or low-level thinking skills. With **WebQuests** you can help your students access the Web effectively for gathering information in student-centered learning activities within the classroom (Dodge, 1999). Developed by Bonnie Dodge at San Diego State University, WebQuests have been a longtime teacher favorite for integrating Internet resources into the school's curriculum to make a **hybrid**, or mixed, learning environment. A WebQuest is an inquiry-oriented simulation activity designed with specific learning outcomes in mind, in which some or all of the information that students interact with comes from resources on the Internet. Students follow a series of steps to gather information meaningful to the task:

1. **Introduction.** A scenario points to key issues or concepts to prepare the students to ask questions.
2. **Task.** Students identify issues or problems and form questions for the WebQuest.
3. **Process.** In groups, students assume roles and begin to identify the procedures they will follow to gather information to answer their questions.
4. **Sources.** Resources that will be investigated in the WebQuest are identified by the teacher and students. This is one area where the teacher helps to provide the links to websites and to ensure students have access to other support materials.
5. **Conclusion.** This is the end of the WebQuest, but it invites students to continue to investigate issues or problems. WebQuests often end with an evaluation of the process students used, along with benchmarks for achievement.

WebQuests can be applied to many types of lessons and information sources:

- Monitoring current events for social studies
- Science activities, such as tracking weather and studying space probes to other planets
- Databases of information for expository writing assignments
- Mathematics puzzles, which require logical thinking

Taking a Look at Technology Integration. These miniature case studies of technology and media applications demonstrate how teachers are using technology in a variety of settings. Like the ASSURE Classroom Case Study, they show technology and media use *in context*.

CHAPTER 1
Exploring 21st Century Learning

Knowledge Outcomes

This chapter addresses ISTE NETS-T 3, 4, and 5:

1. Identify key components of the framework for 21st century learning.
2. Discuss the status of the technology and media in today's PK-12 schools.
3. Describe the roles of technology and media in learning.
4. Explain the roles of the typical 21st century teacher and the typical learner.
5. Discuss the framework for 21st century learning literacies.
6. Identify 21st century learning environments.
7. Explain the role of standards.
8. Describe the key concerns regarding copyright law for educational uses.

Goal

Learn about the uses of technology and media to ensure successful student learning in the 21st century.

ISTE NETS-T Alignment. At the beginning of each chapter, the ISTE NETS-T are aligned with the chapter Knowledge Outcomes. At the end of each chapter, the professional skills activities reflect the ISTE NETS-T. For each end-of-chapter activity, at least one standard has been identified. Students who successfully complete the skills activities will demonstrate that they have accomplished the standards.

Instructor Resources

The following instructor resources support and reinforce the content presented throughout the text. They are available for download under the Educator tab at www.pearsonhighered.com. Simply enter the author, title, or ISBN, and then select this textbook. Click on the Resources tab to view and download the supplements detailed below.

For more information, contact your Pearson Education sales representative.

Instructor's Resource Manual and Test Bank. (0-13-356417-7) This guide provides chapter-by-chapter tools for use in class. Teaching strategies, in-class activities, student projects, key term definitions, and helpful resources will reinforce key concepts or applications and keep students engaged. A bank of test questions for each chapter provides multiple-choice and short answer items. Test items are designed to be flexible and adaptable to meet instructional needs.

TestGen. (0-13-356965-9) This powerful test generator is available exclusively from Pearson Education publishers. You install TestGen on your personal computer (Windows or Macintosh) and create your own tests for classroom use and for 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. Assessments—including equations, graphs, and scientific notation—may be created for both print or testing online.

PowerPoint® Presentations. (0-13-356416-9) Designed as an instructional tool, the presentations can be used to present and elaborate on chapter material. They are available for both students and instructors, and they reinforce key concepts and ideas presented throughout the text. These are available for download from the Instructor Resource Center.

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

- *Online dialog.* The authors are available to “meet” with your students if you are using an online course delivery tool such as Blackboard or Moodle.
- *Telelectures and Videoconferences.* Contact any of the authors in advance to arrange a guest lecture in your class via telephone or video. Some instructors use this technology as a demonstration of the techniques described in Chapter 7. The authors' phone numbers, fax numbers, and email addresses are listed in the Instructor's Guide.
- *Workshops.* The authors have conducted workshops at the national convention of the Association for Educational Communications and Technology (AECT). This is a forum for exchanging ideas and networking among instructors of courses on technology and media. They are also available to provide a workshop in your area if you wish to arrange one.
- *Consulting.* The authors are available for consulting and conducting workshops at the local, state, and national levels. They are regular presenters and workshop facilitators across the country and around the world.

If you are a student or an instructor using this text and wish to share your comments with us, send them to Sharon Smaldino, Northern Illinois University, Gabel Hall 155, College of Education, DeKalb, IL 60115. She can also be reached at smaldinos@comcast.net.

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Clif Mims

CHAPTER

1

Exploring 21st Century Learning

Knowledge Outcomes

This chapter addresses ISTE NETS-T 3, 4, and 5:

- 1 Identify key components of the framework for 21st century learning.
- 2 Discuss the status of the technology and media in today's PK–12 schools.
- 3 Describe the roles of technology and media in learning.
- 4 Explain the roles of the typical 21st century teacher and the typical learner.
- 5 Discuss the framework for 21st century learning literacies.
- 6 Identify 21st century learning environments.
- 7 Explain the role of standards.
- 8 Describe the key concerns regarding copyright law for educational uses.

Goal

Learn about the uses of technology and media to ensure successful student learning in the 21st century.



This book offers a systematic approach for selecting and using technology and media to facilitate student learning in the 21st century. This approach is based on the ASSURE model, which helps teachers plan effective, integrated lessons by following a six-step process. Exploring both traditional technologies used in PK–12 classrooms today as well as innovative and cutting-edge approaches that may be commonplace in the future, we describe technology and media that teachers can use to promote learning both within and beyond the classroom. We describe how to select, use, and evaluate resources to ensure that learners emerge with the knowledge and skills needed for successful 21st century careers.

We begin by exploring the influence of technology and media within the 21st century learning process on the new roles of teachers to engage students in the classroom. No longer are teachers and textbooks the sources of all information. Instead, the teacher has become the facilitator of knowledge and skills acquisition. With a few keystrokes, students can explore the world using boundless online resources and a wide array of digital media to obtain the information they seek. Students can discuss their findings in real-time conversations with experts and with other students representing a global array of cultures and experiences.

These exciting innovations provide unlimited ways to expand educational opportunities for our students, but they also present new challenges to teachers. As a teacher, how will you go beyond the textbook? How will you select the “right” technology and media when so many choices are available? And more importantly, how will you create learning experiences that effectively use these tools and resources to ensure that your students gain new knowledge and skills?

Framework for 21st Century Learning: Technology and Media in Today’s Schools

As we continue to move forward in the 21st century, it is critical that the foundational components of PK–12 education keep pace with evolving societal needs to prepare students for citizenship and successful careers. As a teacher today, you are challenged to help students achieve mastery of core subjects as well as gain 21st century knowledge and skills. Leaders from business and education, as well as other associations and institutions, are joining together to recommend new approaches and broader learning expectations for PK–12 students (ISTE, 2012; Partnership for 21st Century Learning, 2011). Foundational to 21st century knowledge and skills is the preparation of your students to meaningfully and purposefully use technology and media for creativity and innovation, communication, research, and problem solving. Themes based on global awareness, entrepreneurship, and lifelong learning skills, such as adaptability, leadership, and responsibility, are also recommended for inclusion within core subject area courses. This text will serve as a guide to assist you in integrating 21st century knowledge and skills into your instructional planning and practices.

INSTRUCTIONAL TECHNOLOGY

Currently, when most people hear the word *technology*, they think of products like computers, tablets, and mobile devices. In this text, we will be referring to **instructional technology**, which involves the integration of teacher and student use and knowledge of tools, resources, and techniques to improve student learning.

To promote student learning, you need to create an appropriate learning environment. Throughout the book we will describe the decision-making processes that you can use and the factors you must balance in your decisions. You will need to know the characteristics of your learners. The expected outcomes (objectives) must be specified. You will need to select

the appropriate strategies and materials. The best available technology and media must be used properly to promote optimal learning. You will need to get your learners involved through appropriate practice and feedback. Throughout the process, you will be assessing student learning and evaluating the instructional experience, as well as its components, so you can revise as necessary. We have put all of these steps together in the ASSURE model.

Although some educators view technology as a classroom cure-all, it is important to note that technology resources don't automatically make teachers more capable. You will need to be versed in best practices for integrating technology into the curriculum. The ASSURE model provides a structure and easy-to-follow steps to guide teachers through the process of creating lessons that achieve the goals of effectively using technology. The model is applicable for all types of technology across all subject areas for different learning conditions.

Developed as a planning aid to help ensure that technology and media are used to their maximum advantage, not just as interchangeable substitutes for printed or oral messages, the ASSURE model provides a systematic process for creating learning experiences. Indeed, one of the most important roles of technology and media is to serve as a catalyst for change in the whole instructional environment.

TECHNOLOGY FOR ALL LEARNERS

Introduction



As a result of inclusion, the number of students with disabilities in the general classroom is increasing. Technology plays an important role in the education of students with exceptionalities. Adapted and specially designed technology and media can contribute enormously to effective instruction of all students and can help them achieve at their highest potential regardless of innate abilities.

Children with disabilities in particular need special instructional interventions. Children with mental disabilities have a greater opportunity to learn when presented with highly structured learning situations. Structure compensates for ill-structured prior knowledge that decreases students' abilities to incorporate messages into atypical mental constructs. These students benefit from having much more of the message placed within a familiar context.

Students with hearing or visual impairments require different kinds of learning materials. More emphasis should be placed on audio for students with visual impairments and on visuals for those with hearing problems. Adjusting instruction for all exceptional groups requires heavy reliance on technology and media, as well as the appropriate selection of these materials to fit specific purposes. Many teachers have found that these assistive strategies for students with disabilities have the added benefit of helping all students.

Assistive technologies can be classified as low tech, medium tech, or high tech. Low-tech devices do not use electricity (neither electricity nor batteries). For example, a magnifying glass to enlarge printed material for a visually impaired student would be a low-tech assistive technology. The medium-tech category includes electrical devices. A mini book light to increase illumination would be representative of medium-tech equipment. High-tech assistance

involves the use of a computer. The Knfb Reader is an example of high-tech assistive technology.

Diverse learners also include gifted and talented students who, for example, could use newspapers, periodicals, DVDs, or archived documents to explore topics beyond or in addition to regular classroom assignments. They can also use the Internet to search for current information or to engage in a live chat with the author of a book the class is reading or a state senator who will vote on an environmental issue being studied. They can be asked to analyze the information they locate and to synthesize a presentation for the class, perhaps using PowerPoint, or they can post their findings on a class webpage.

For more information, see the Technology for All Learners features throughout this book.



A braille display is an example of an assistive technology.

Current technology offers several benefits for teachers. One is the ability to digitally store and access large amounts of information, whether as text, audio, visuals, games, or movies, in computer files, on CDs or DVDs, or in a cloud storage space. Another unique advantage of current technology is its adaptability to meet the varying needs of your students. As seen in the accompanying Technology for All Learners feature, you can differentiate instruction and access to learning experiences with a variety of technology tools. A third advantage of technology is that your students are no longer limited to the confines of the classroom. Through the school media center and computer networks such as the Internet, the world becomes each student's classroom.

Status of the Technology Gap. As you plan different technology integration activities, it is important to stay current on technology issues, such as the “digital divide,” that may influence your instructional choices. The digital divide—or technology gap—in PK–12 schools continues to narrow. Students of all economic levels have greater access to high-speed Internet-connected computers at school. The current ratio of about one computer per every three students (Warschauer, 2010) helps bridge the gap for students who may not have home computers.

On the other hand, the technology gap varies when examining Internet usage by adults. Even though in 2011 approximately 80% of American adults used the Internet at home or work, disparities in Internet use still exist based on ethnic groups (Livingston, 2011). For example, 77% of white adults reported using the Internet at home, as compared to 66% of black and 65% of Latino adults. A similar pattern was seen for use of cell phones when focused on voice. Interestingly, the report revealed that nonvoice cell phone use was higher among all groups, with text messaging being the highest nonvoice use of the cell phone among all groups. So, when you are thinking about using the Internet to communicate with your students' families, remember that not all of them will have access to your webpages or emails.

Media Formats. **Media**, the plural of *medium*, are means of communication. Derived from the Latin *medium* (“between”), the term refers to anything that carries information between a source and a receiver. The purpose of media is to facilitate communication and learning.

Media are discussed in more detail in later chapters, but as an overview, let's look at the six basic types of media used in learning (Figure 1.1): text, audio, visuals, video, manipulatives (objects), and people. Text, the most commonly used medium, is composed of alphanumeric characters that may be displayed in any format—book, poster, whiteboard, computer screen, and so on. Audio, another medium commonly used in learning, includes anything you can hear—a person's voice, music, mechanical sounds (running car engine), noise, and so on. It may be live or recorded. Visuals are also regularly used to promote learning and include diagrams on a computer screen, drawings on a whiteboard, photographs, graphics in a book, cartoons, and so on. Video is a visual as well as audio medium that shows motion and can be stored on DVDs, streamed from the Internet, be in the form of computer animation, and so on. Although often not considered media, real objects and models are three-dimensional manipulatives that can be touched and handled by students. The sixth and final category of media is people. In fact, people are critical to learning. Students learn from teachers, other students, and adults.

There are many types of media in each category, which we will refer to as **media formats**—the physical forms in which messages are incorporated and displayed. Media formats include, for example, whiteboards and webpages (text and visuals), PowerPoint or Prezi slides (text and visuals), CDs (voice and music), DVDs (video and audio), and computer multimedia (audio, text, and video). Each has different strengths and limitations in terms of the types of messages that can be recorded and displayed. Choosing a media format can be a complex task, considering the vast array of media and technology available, the variety of learners, and the many objectives to be pursued (Table 1.1). When selecting media formats,

FIGURE 1.1 Six Basic Categories of Media



the instructional situation or setting (e.g., large group, small group, or self-instruction), learner variables (e.g., reader, nonreader, or auditory preference), and the nature of the objective (e.g., cognitive, affective, motor skill, or interpersonal) must be considered, as well as the presentational capabilities of each of the media formats (e.g., still visuals, video, printed words, or spoken words).

INSTRUCTIONAL MATERIALS

Once you determine the media format, such as a DVD, you must decide which of the appropriate DVDs you will use. The specific DVD becomes the instructional material.

TABLE 1.1 Examples of Media Formats and Instructional Materials

Media	Media Formats	Instructional Materials Examples
Text	Printed book, computer software, e-book, webpages	A textbook StoryMaker software
Audio	CD, live presenter, podcast	State of the Union address on webcast
Visual	Drawing on interactive whiteboard Photo in a newspaper	Drawing of the musical scale Photo of local building
Video	DVD, IMAX documentary film, streamed video	<i>Lewis & Clark: Great Journey West</i> video
Manipulative	Real or virtual object	Algebra tiles
People	Teachers, subject-matter expert	The chief officer of NASA

Instructional materials are the specific items used within a lesson that influence student learning. For example, a middle school lesson may focus on adding polynomials with a computer software program that provides virtual manipulatives students use to create “concrete” examples of addition problems in order to reach solutions. The computer software offers feedback and opportunities to continue practicing. The specific math problems and feedback generated by this software are the instructional materials. Another example is this text that you are currently reading, which consists of the written information (text), visuals, and learning exercises found at the end of the chapter.

The design and use of instructional materials are critical, because it is the interaction of the students with those materials that generates and reinforces actual learning. If the materials are weak, improperly structured, or poorly sequenced, only limited learning will occur. On the other hand, powerful, well-designed instructional materials are experienced in such a way that they can be readily encoded, retained, recalled, and used in a variety of ways. Learners will remember these materials if they are created, integrated, and presented in a manner that allows them to have the needed impact.

Students can be actively involved individually, in small groups, or with a teacher.



ROLES OF TECHNOLOGY AND MEDIA IN LEARNING

Jonathan Bergmann and Aaron Sams (2012) coined the phrase “the flipped classroom” to describe a model of instruction that mixes direct instruction with constructivist learning experiences. The idea merges technology-based instructional opportunities with teacher-guided learning. Students are able to gather information through video, online exploration, and audio formats outside the instructional setting that they then use in the classroom to extend their understanding of content with the teacher’s guidance.

Technology and media play an important role in these types of learning experiences, either when you create them for your students to use or when your students explore new learning opportunities. The model provides you with the opportunity to bring technology more naturally into your classrooms and to explore more creative ways to engage your students in learning (Hertz, 2012).

The 21st Century Teacher

When instruction is teacher centered, technology and media are used to support the presentation of instruction. For example, you may use an electronic whiteboard to display variations of a bar graph as your students predict population growth over time. You may also use a pocket chart to show how the meaning of a sentence changes when word cards are rearranged. Projecting a live video feed from a zoo can facilitate a presentation on the feeding habits of birds. Certainly, properly designed instructional materials can enhance and promote learning. This book uses the ASSURE model to assist you in selecting and using instructional strategies, media, technology, and materials. However, the effectiveness of your choices depends on careful planning and selection of the appropriate resources, as seen in the next section.

THE DIGITAL TEACHER

Digital tools expand and enhance your capabilities to fulfill the numerous roles and responsibilities associated with being an educator. These tools better enable the “digital” teacher to plan for and provide interactive instruction while participating in a global community of practice with fellow educators. The following examples show the potential available in a well-equipped digital environment.

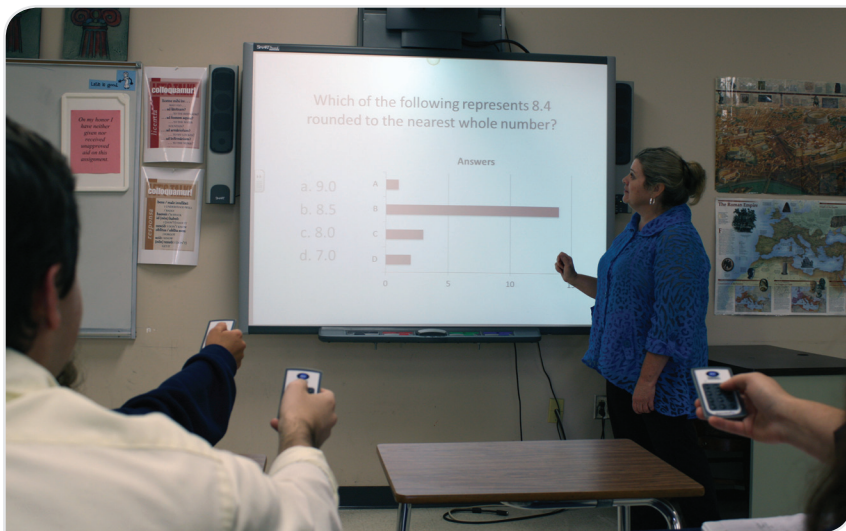
Interactive Instruction. A “digital” teacher’s instruction includes presentations that are media rich and interactive. Live digital videoconferences bring historians, novelists, and content experts into your classroom. Notes and concept maps from brainstorming sessions are captured on electronic whiteboards and instantaneously emailed to your students. Instructional presentations seamlessly integrate streamed digital video and audio from Internet-based files that range from short clips demonstrating specific concepts to full-length documentaries. You instantaneously go to a specific section of a DVD and show a segment in slow or fast motion or as a still image to reinforce targeted outcomes for your students. PowerPoint or Prezi presentations integrate animations, sounds, and hyperlinks with digitized information.

Personal Response Systems (PRS). Digital teachers use handheld digital devices, such as **personal response systems** (PRS), to collect and graphically display student answers to teacher questions. The PRS, commonly called a “clicker,” is a wireless keypad similar to a TV remote that transmits student responses. Because each PRS is assigned to a designated student, the PRS system can be used to take attendance. However, its main benefit is to allow you to know each of your student’s responses in a variety of circumstances. Using PRS during instruction enhances learner–instructor interactivity in whole-class settings, which has been shown to produce better learning outcomes (Flynn & Russell, 2008). Educational uses of the PRS include measuring student understanding of concepts, comparing student attitudes about different ideas, predicting “What if” situations, and facilitating drill and practice of basic skills. The PRS graphs student responses to provide teachers and students immediate feedback. Teachers can use this information to guide the pace and direction of a discussion and to make instructional decisions to meet student learning needs.

Mobile Assessment Tools. Mobile computing resources enable teachers to record student assessment data directly into a mobile device that transfers the data to a computer for report generation. For example, mobile digital devices

Teachers can use technology to help students understand concepts.





Personal response systems provide teachers with immediate feedback from students.

are used to create running records of primary student reading ability or student performance data observed in presentations, lab experiments, or handwriting (Weinstein, 2005).

Elementary teachers are fast becoming large-scale users of mobile assessment tools to monitor and record the reading abilities of their students. Many use mCLASS: Reading by Wireless Generation, software that provides the text of a book the student is reading and a series of tools to let the teacher easily track performance while the student reads the book. The software also offers digital versions of leading reading assessment instruments, such as Dynamic Indicators of Basic Early Literacy Skills (DIBELS).

The mobile devices not only save you time, but the software also provides automatic timing and scoring of your student results. You can continually individualize instruction because of the availability of immediate results. Assessment data are easily downloaded to a secure, password-protected website that offers a variety of reporting options, from whole class to individual student.

Mobile devices allow you to gather information directly from your students. Ms. Unger, a fourth grade teacher, uses Quick Response (QR) Codes to gather information about her students as they enter her classroom every morning. She assigns her students homework that is a summary of what they learned and how they are feeling about school which they then transmit to her each morning. She uses the QR code system the school district installed as a quick way to gather the information. She scans through the student reports and adjusts her teaching to reflect her students' needs. While the data she gathers is informal, Ms. Unger feels that it helps her to ensure quality learning experiences for all her students.

Special education teachers often use a mobile device equipped with GoObserve software as a mobile assessment tool. The program can be customized to record designated activities in a student's Individual Education Plan. During an observation of your student performance or behavior, you use the stylus to record the observed strategies from a list of possible choices. As a teacher, you also can add written comments and notes to that student's record. After the observation, you can transfer the information to your computer to generate reports and graphs of student progress.

Community of Practice. Digital teachers participate in community of practice (CoP) activities, in which groups of educators with common goals from across the nation and around the world share ideas and resources. These Internet-based interactions allow teachers to collaborate and exchange ideas and materials. The Communities of Practice can include educators who are teaching the same subject area and grade level or educators with similar needs, such as technology integration, classroom management, or working with gifted and talented students.

Teachers interested in integrating technology into their instruction can utilize the resources and networks of experts, mentors, and new colleagues supported by a variety of web communities. An example is **TeacherFocus (www.teacherfocus.com)**, a virtual community that offers you the opportunity to work collaboratively with teachers across the country and to learn

about advances in best practice. TeacherFocus offers you topics of interest, event calendars, and focused discussions related to content and grade levels.

As members of the Virtual Math Teams (VMT) project at the Math Forum, math teachers can learn to enhance student use of technology in solving nonroutine, authentic problems requiring pre-algebra, algebra, or geometry knowledge and skills. Through the VMT, middle and high school teachers can work with peers in special Internet chat sessions with shared whiteboard software, which will then be used by their students.

The effective use of technology and media demands that teachers be better organized in advance, first thinking through their objectives, then altering the everyday classroom routine as needed, and finally evaluating to determine the impact of instruction on mental abilities, feelings, values, interpersonal skills, and motor skills. However, the shift to the 21st century and increased access to digital resources will change not only how you function as a teacher, but also student roles, as we discuss next.

NETS FOR TEACHERS

The National Educational Technology Standards for Teachers (NETS-T) provide five basic guidelines for becoming what we call a *digital teacher* (ISTE, 2012b). As seen in Table 1.2, the NETS-T describe classroom practices, lesson development, and professional expectations. Each chapter of this text includes a Professional Development section to help emphasize the importance of the NETS-T and to build your knowledge and skills through Demonstrating Professional Skills and Building My Professional Portfolio activities that are directly associated with NETS-T.

TABLE 1.2 National Educational Technology Standards for Teachers (NETS-T)

Standard	Description
Facilitate and Inspire Student Learning and Creativity	Teachers use their knowledge of subject matter, teaching and learning, and technology to facilitate experiences that advance student learning, creativity, and innovation in both face-to-face and virtual environments.
Design and Develop Digital-Age Learning Experiences and Assessments	Teachers design, develop, and evaluate authentic learning experiences and assessment incorporating contemporary tools and resources to maximize content learning in context and to develop the knowledge, skills, and attitudes identified in the NETS-S.
Model Digital-Age Work and Learning	Teachers exhibit knowledge, skills, and work processes representative of an innovative professional in a global and digital society.
Promote and Model Digital Citizenship and Responsibility	Teachers understand local and global societal issues and responsibilities in an evolving digital culture and exhibit legal and ethical behavior in their professional practices.
Engage in Professional Growth and Leadership	Teachers continuously improve their professional practice, model lifelong learning, and exhibit leadership in their school and professional community by promoting and demonstrating the effective use of digital tools and resources.

Source: Reprinted with permission from *National Educational Technology Standards for Teachers and National Educational Technology Standards for Students*. Copyright (c) 2007, 2008 by ISTE (International Society for Technology in Education.) All rights reserved.

21st Century Learner

When instruction is student centered, the primary users of technology and media are the students themselves. Student-centered activities allow teachers to spend more of their time assessing and directing student learning, consulting with individual students, and teaching one on one and in small groups. How much time you can spend on such activities will depend on the extent of the instructional role assigned to technology and media. Indeed, under certain circumstances, the entire instructional task can be left to technology and media. In fact, media are often “packaged” for this purpose—objectives are listed, guidance in achieving objectives is given, materials are assembled, and self-evaluation guidelines are provided. This is not to say, of course, that instructional technology can or should replace you as the teacher, but rather that technology and media can help you become a creative manager of the learning experience instead of a mere dispenser of information.

THE DIGITAL STUDENT

Digital students learn in classrooms where the technology is a seamless component of learning that expands the educational environment beyond the classroom walls. Devices and digital connections extend the existing capabilities of learners in many directions.

Interactive Tools. The digital student uses mobile wireless devices in a variety of ways in and out of the school setting by taking technology where it is needed. For example, your students on the reading rug find Internet resources on wireless laptop computers or tablets. Students bring personal mobile devices (smart phones); handheld computers; or “netbooks,” smaller and lighter computers, to the library to take notes from archived community newspaper articles. Student pairs use a digital camera to capture examples of symmetry found on the school campus. Elementary students with digital probes record the pH of six soil types used to grow radish plants. A high school student with a reading access

barrier listens to an MP3, or compressed audio file, of Michael Chabon’s “Inventing Sherlock Holmes,” a homework reading assignment for the class (www.assistivemedia.org). These wireless devices extend and embellish the learning experience beyond anything nondigital methods can produce.

Interacting with Others. Never before have your students been so connected with each other as they are in today’s wireless digital environments. Smart phones, tablets, and laptops are used to send video, voice, text, and animated messages; to listen to lessons, music, news, and sports; and to watch the latest music videos and movies. Students communicate with their digital devices through voice commands, written notes, or by using a touchscreen or mini keyboard. Documents with digitally embedded comments and edits are instantaneously exchanged between students and their



Carefully designed technology can make independent learning more effective.

Students can gather information and study material prior to learning experiences in the “flipped” classroom.



teachers, among students, and with experts. Student learning communities extend around the globe through web-based interactive communication tools and social media sites such as **blogs** (publicly accessible personal journals), **wikis** (web information that can be edited by any registered user), and **podcasts** (Internet-distributed multimedia files formatted for direct download to mobile devices). For example, your students can create a blog on global warming in which they regularly exchange commentary and related hyperlinks with students located around the world. Middle school students use wikis to interact with college students who respond to their writing activities, while a high school American literature class uploads podcasts of interviews with authors to the class website.

These tools are becoming increasingly popular, as seen in a 2012 Nielsen report that shows continued increase in the use of technology and in the time spent on social media sites (Nielsen Company, 2012). Wikipedia is similarly popular, with over 3 million entries available in over 200 languages as of March 2013 (<http://en.wikipedia.org>). As with digital teachers, the digital students of today embrace and use technology to explore, inquire, and advance their personal learning, as well as contribute to the knowledge of others.

NETS FOR STUDENTS

The National Educational Technology Standards for Students (NETS-S) provide six critical skills students need to achieve success in school and in future careers (ISTE, 2012a). Notice in Table 1.3 that the NETS-S closely align with 21st century knowledge and skills. Also interesting is the placement of Technology Operations and Concepts as the last standard, a shift from the original arrangement that listed it as the first standard (ISTE, 1998). It is important that as a teacher you are familiar with the NETS-S and build your technology skills to match what is expected of your students. Throughout the text we provide multiple examples of how the NETS-S are integrated into ASSURE lesson plans.

TECHNOLOGY FOR INCLUSION

In today's classrooms, teachers will be working with students who have a variety of learning needs. Many students will have English as their second language. Other students will

TABLE 1.3 National Educational Technology Standards for Students (NETS-S)

Standard	Description
Creativity and Innovation	Students demonstrate creative thinking, construct knowledge, and develop innovative products and processes using technology.
Communication and Collaboration	Students use digital media and environments to communicate and work collaboratively, including at a distance, to support individual learning and contribute to the learning of others.
Research and Information Fluency	Students apply digital tools to gather, evaluate, and use information.
Critical Thinking, Problem Solving, and Decision Making	Students use critical-thinking skills to plan and conduct research, manage projects, solve problems, and make informed decisions using appropriate digital tools and resources.
Digital Citizenship	Students understand human, cultural, and societal issues related to technology and practice legal and ethical behavior.
Technology Operations and Concepts	Students demonstrate a sound understanding of technology concepts, systems, and operations.

Source: Reprinted with permission from *National Educational Technology Standards for Teachers and National Educational Technology Standards for Students*. Copyright (c) 2007, 2008 by ISTE (International Society for Technology in Education.) All rights reserved.

have learning or physical challenges and will need assistance to be able to participate in classroom activities. Technology can provide the kinds of support these students need to be successful in their learning. Teachers will need to make choices and decisions about using technology to optimize learning for all the students in their classrooms. The ASSURE model can help you make technology decisions as you consider the learning needs of all your students.

Framework for 21st Century Learning Literacies

Classroom experiences must provide multiple opportunities for gaining new knowledge and skills that are encompassed in a critical set of literacies for 21st century learning. This text prepares you to embed key learning technologies that your students need to improve learning and achieve successful careers.

STUDENT OUTCOMES

Teachers need an understanding of the ability of a student to comprehend or decode information and to use, transform, and create new information. As you follow the ASSURE model to develop your lesson plans, always include opportunities for students to build general literacy knowledge and skills.

You will also want to consider the standards for learning and recognize how to support your students' learning experiences so that they can be successful. By recognizing your students as individuals with unique learning needs, you will be able to help them achieve the targeted learning outcomes.

SUPPORT SYSTEMS

As a classroom teacher you are not alone in helping your students achieve designated outcomes. There are many resources available to you, such as media specialists, technology coordinators, and area universities with courses and programs, that can help you gain additional knowledge about technology. Many of these support systems are focused on ensuring student engagement and learning. Their intent is to help you to make appropriate choices to meet your students' learning needs and to ensure you are able to use the resources successfully.

21st Century Learning Environments

The trend for today's teachers is a shift from traditional teaching strategies and tools to digital approaches that better meet the needs of 21st century students. However, the transition from traditional to digital classroom environments varies greatly from teacher to teacher and school to school. Prensky (2006) describes teachers in this variable process of technology adoption and adaptation as moving, whether slowly or quickly, through a four-phase process: (1) dabbling, (2) doing old things in old ways, (3) doing old things in new ways, and (4) doing new things in new ways (p. 43) (see Figure 1.2).

The process begins with Phase 1, "dabbling" with technology by randomly adding technology tools to a few learning situations. In Phase 2, technology is used to do old things in old ways, as when teachers display lecture notes in PowerPoint rather than using overhead transparencies. It is not until Phase 3, doing old things in new ways, that technology begins to show its promise, such as when a teacher uses a virtual 3-D model to demonstrate the structure

of a compound rather than drawing it on a chalkboard, or students use word processing and clip art rather than notebook paper and hand-drawn images to create a short story. Finally, Phase 4, doing new things in new ways, fully utilizes the power of technology and media, but it requires providing our students with “future-oriented content [to] develop their skills in programming, knowledge filtering, using their connectivity . . . with cutting edge, powerful, miniaturized, customizable, one-to-one technology” (Prensky, 2006, p. 45).

THE LEARNING CONTINUUM: TRADITIONAL TO DIGITAL

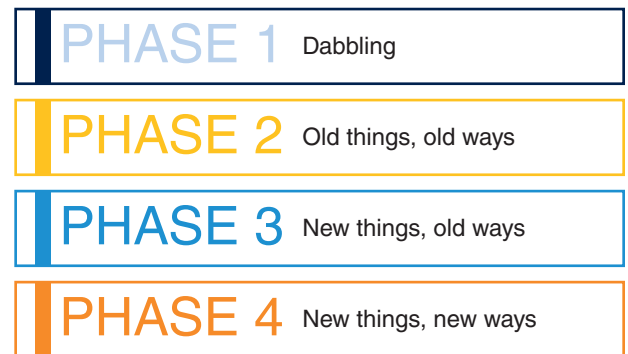
Many of today’s classrooms have achieved Phase 4 by adopting and adapting their environments with digital tools that support and enhance “digital” teacher and student capabilities. For example, technology extends environments beyond the classroom walls by connecting students with other students, outside experts, and parents. Individual classroom websites provide access to homework calendars, assignment details, online resources, and often offer parents access to real-time reports of student progress.

Within these phases, three primary types of instruction are used: face-to-face instruction, distance learning, and blended learning. We have all experienced face-to-face instruction at school, at home, and during extracurricular activities. When done well, it is an excellent method of teaching that is prevalent in PK–12 schools. Distance learning occurs when the teacher and students are not in the same physical location during instruction. In 2011, nearly all of the states offered students options for taking middle or high school online virtual classes (Glass, Welner, & Bathon, 2011). Other schools are offering courses that combine face-to-face instruction with distance learning to create blended instruction, allowing students to see teacher demonstrations and work with other students during hands-on activities, such as labs, drama and musical arts performances, or building 3-D models. Many states are now adding a graduation requirement that all high school graduates must have completed at least one blended or totally online course.

THE CHANGING ROLE OF MEDIA CENTERS

Many school libraries have been merged into what are now called **media centers**, which offer traditional library reading resources but now also include a variety of information technology assets. Most media centers are equipped with multiple Internet-connected computers, often with subscriptions to PK–12 online resources such as libraries of digital books, reference materials, and educational software. The media centers also provide you with a variety of classroom support materials ranging from lab kits to subject-specific software and videos. The role of the media specialist is continually expanding to require increasing expertise in accessing the array of digital resources, as well as understanding basic computer technology to assist your students using the equipment in the center.

FIGURE 1.2 Prensky’s (2006) Technology Adoption and Adaptation Four-Phase Process



A 21st century classroom representing Phase 4: doing new things in new ways.



The Role of Standards

COMMON CORE

The Common Core State Standards (CCSS) were developed over several years with an emphasis on higher-level learning (Calkins, Ehrenworth, & Lehman, 2012; CCSS, 2012). Students are expected to engage in reading and writing as an integral component of their learning within all content areas. The idea is that students can learn to read complex texts and then communicate their understanding of what they have read, whether the text is literature, mathematics, social science, or science. Also valued in the CCSS is the concept that learning is a process; thus, the standards are written so that each grade level's standards reflect what has been learned and what is to follow. Embedded in CCSS is the respect for the teacher's knowledge and skills in working with individual students to facilitate learning. The standards provide teachers with the flexibility to design instruction to meet their students' learning needs and to foster success in all aspects of their learning.

NATIONAL/STATE CURRICULUM STANDARDS

Even though the CCSS have become the focus of much of the implementation of standards throughout the United States, there is still the need to reflect individual learning needs within curricular areas. There are many common core content areas that have standards yet to be developed and some standards that will remain the domain of individual states. The state standards that are used to provide specific guidance for learning, for example, technology, are prominent at national and state levels.

Copyright Concerns: Copyright Law

To protect the financial interests of the creators, producers, and distributors of original works of information and art, nations adopt copyright laws. **Copyright** refers to the legal rights to an original work. These laws set the conditions under which anyone may copy, in whole or part, original works transmittable in any medium. Without copyright laws, writers, artists, and media producers would not receive the compensation they deserve for their creations. The flow of creative work would be reduced to a trickle, and we would all be the losers.

Technology, especially the Internet, has made it much easier to copy from a variety of digital materials—text, visuals, audio, and video. All material on the Internet is copyrighted unless stated otherwise. In 1998, the Conference on Fair Use issued a report (Lehman, 1998) that, despite not being a legal document, provides a consensus view (until tested in a court of law) on use of copyrighted material.

You have a legal and ethical responsibility to serve as a role model for your students; therefore, use all materials in a professional and ethical manner. We also recommend teaching relevant aspects of copyright laws to your students, even very young students. If you are unsure what to do, ask for your school's copyright guidelines. Librarians and media/technology specialists at your school may be able to help you interpret the national guidelines. Ignorance of the law is no excuse!

Please note that the copyright information presented here is *not* legal advice. It is based on what the authors have read in the literature and online. For more information on copyright, refer to the Print Resources at the end of this chapter.

EDUCATORS AND COPYRIGHT LAW

What happens if an educator knowingly and deliberately violates copyright law? The Copyright Act of 1976 contains both criminal and civil sanctions. Possible fines for copyright infringement are from \$750 to \$30,000 per infringement. If it can be proven that the law was broken by willful intent, the fine may be raised to \$150,000. Willful infringement for private or commercial gain carries a possible fine of \$250,000 and up to 5 years in prison. Copyright violation is a serious crime.

FAIR USE

Fair use provides an important copyright exception for teachers and students. Small portions of copyrighted works may be used in teaching, if properly cited and noted that they are copyrighted and by whom. Although there are no absolute guidelines for determining what constitutes fair use in an education setting, the law sets forth four basic criteria for determining what is fair use:

- *Purpose and character of the use, including whether such use is for nonprofit educational purposes rather than of a commercial nature.* Using a copyrighted work for an educational objective is more likely to be considered fair use than using it for commercial gain or entertainment.
- *Nature of the copyrighted work.* If the work is for a general readership, such as a magazine or periodical not specifically designed for education, it would tend to support fair use in the classroom. Works of an entertainment nature, such as movies or music, are less likely to be considered fair use. If the work itself is educational in nature, a judgment of fair use may not be supported because of potential impact on sales.
- *Amount and substantiality of the portion used in relation to the copyrighted work as a whole.* Using a smaller amount of the total work is more likely to be considered fair use than using a larger amount.
- *Effect of the use on the potential market for or value of the copyrighted work.* Use that negatively affects potential sales of the original work weighs against fair use.

Until the courts decide otherwise, teachers and media professionals can use the fair use criteria to decide when to copy materials that would otherwise be protected. For example, if the school media center subscribes to a journal or magazine to which you refer students and you make digital slides of several graphics to help students understand an article, this would be fair use based on the following criteria:

- The nature of the work is general, and its audience (and market) is not predominantly the educational community.
- The character of use is nonprofit.
- The amount copied is minimal.
- There is no intent to replace the original, only to make it more useful to students in conjunction with the copyrighted words.

SEEKING PERMISSION TO USE COPYRIGHTED MATERIALS

Aside from staying within the guidelines that limit but recognize our legal right to free use of copyrighted materials, what else can we do to ensure students have access to these materials? We can, obviously, seek permission from copyright owners and, if requested, pay a fee for their

use. Certain requests will ordinarily be granted without payment of fee—transcripts for the blind, for example, or material to be tried out once in an experimental program. Permission is not needed for use of materials in the public domain—materials on which copyright protection has run out or materials produced by federal government employees in the course of their regular work.

In seeking permission to use copyrighted materials, it is generally best to contact the distributor or publisher of the material rather than its creator. Whether or not the creator is the holder of the copyright, the distributor or publisher generally handles permission requests and sets fees. If the address of the publisher is not given on the material, you can usually find it on the Internet.

When seeking permission:

- Be as specific as possible. For printed materials, give the page numbers and exact amount of print material you wish to copy. If possible, send along a photocopy of the material. Fully describe nonprint material. State how you intend to use the material, where you intend to use it, and the number of copies you wish to make.
- Remember that fees for reproduction of copyrighted materials are sometimes negotiable. If the fee is beyond your budget, do not hesitate to ask whether it can be lowered.
- If for any reason you decide not to use the requested material, make this fact known to the publisher or producer. Without this formal notice, it is likely to be assumed that you have in fact used it as requested and you may be charged a fee you do not in fact owe.
- Keep copies of *all* your correspondence and records of *all* other contacts that you make relevant to seeking permission to use copyrighted instructional materials.

Another solution is to obtain “royalty free” collections of media. Many vendors now sell CDs that contain collections of images and sounds that can be used in presentations or other products without payment of royalties. Be sure to read the fine print. What “royalty free” means varies from one collection to the next. In one case, there may be almost no restrictions on the use of the materials; in another, you may not be allowed to use the materials in any kind of electronic product.

TERM OF PROTECTION

The term, or duration, of copyright was changed by the Sonny Bono Copyright Term Extension Act of 1998. For an individual author, the copyright term continues for 70 years after his or her death. If a work is made for hire (i.e., by an employee or by someone commissioned to do the work), the term is 100 years from the year of creation or 75 years from the date of first publication or distribution, whichever comes first. Works copyrighted prior to January 1, 1978, are protected for 28 years and then may have their copyright renewed. The renewal protects them for a term of 75 years after their original copyright date.

CHANGING THE MATERIAL'S FORMAT

Even though you (or your school) have the capability to convert analog materials to a digital format, it is usually a violation of copyright laws and guidelines. The originators of copyrighted material are granted the sole right to make derivatives of their original work. For example, it is illegal to purchase an analog VHS video and convert it to a digital format. Likewise, you cannot convert copyrighted printed materials into a digital format.

Copyright law protects the format in which ideas are expressed (Becker, 2003). Teachers cannot make audio recordings of library books or textbooks for student use. One exception in the law permits the audio recording of books for use by students who are legally blind.

STUDENTS WITH DISABILITIES

For PK–12 students with disabilities, the National Instructional Materials Accessibility Standard (NIMAS) guides the production and electronic distribution of digital versions of textbooks and other instructional materials so they can be more easily converted to accessible formats, including Braille and text-to-speech.

There are many school resources available for students who have physical or learning challenges. With the addition of **Response to Intervention (RtI)**, a program of assessment and appropriate instructional assistance in schools, challenged students are recognized earlier and their needs are more quickly met. Often these challenged students who are in the regular classroom setting are provided with technology resources that aid their ability to be successful in the classroom. As a teacher, you need to seek the assistance of school specialists to ensure that your students have access to the appropriate technology for their learning needs.

UNIVERSAL DESIGN

Additional guidelines include the concept of universal design for learning (UDL), which was created to expand learning opportunities for all individuals, especially those with disabilities (Center for Applied Special Technology [CAST], 2013). The UDL framework consists of three primary principles:

- *Multiple means of representation*, to give diverse learners options for acquiring information and knowledge
- *Multiple means of action and expression*, to provide learners options for demonstrating what they know
- *Multiple means of engagement*, to tap into learners' interests, offer appropriate challenges, and increase motivation (CAST, 2013)

Summary

In this chapter you read about the foundations that will be important in your study of technology and media as they affect your students' learning. We presented information about the roles of technology and media in learning from both your perspective as the teacher and your students' perspectives. The idea of using technology as a learning tool prior to participating in classroom activities was introduced. Both you and your students were identified within the context of the 21st century setting. Key 21st century literacies needed to achieve effective learning were introduced, as well as the variety of learning settings now available based on access to technological tools. An overview of copyright was presented, which will be further discussed in later chapters as it relates to specific technology and media.

Professional Development

DEMONSTRATING PROFESSIONAL KNOWLEDGE

1. What are the key components of the framework for 21st century learning?
2. How would you describe the status of the technology use in today's PK–12 schools?
3. What are ways technology and media can be used in learning?
4. What are the six basic categories of media and the key features of each?

- In what ways are teacher and student uses of technology and media different?
- Why is it important to consider 21st century learning outcomes?
- How would you describe the three types of instruction (face to face, distance, and blended) as they relate to the classroom continuum?
- What are the key concerns regarding copyright law for educational uses?

DEMONSTRATING PROFESSIONAL SKILLS

- Prepare a 10-minute presentation on your reaction to the framework for 21st century learning (ISTE NETS-T 5.C).
- Analyze an instructional situation (either real or hypothetical) and identify the standards (Common Core, state, national) being reinforced in the lesson (ISTE NETS-T 2.C).
- Prepare a concept map that depicts the benefits and concerns of the three types of instruction (face to face, distance, or blended) presented in this chapter (ISTE NETS-T 5.C).
- Create a one-page guide about copyright that will assist you in following copyright laws for educational uses (ISTE NETS-T 5.C).

BUILDING YOUR PROFESSIONAL PORTFOLIO

- Enhancing My Portfolio.* Select a technology integration lesson from the Web. After citing the source of the lesson, analyze it according to topics discussed in this chapter. Specifically, take note of how or if the lesson addresses the following: (1) use of technology and media, (2) types of media used, (3) types of learning standards identified, (4) type(s) of instruction, (5) teacher use of technology, (6) student use of technology, and (7) areas where copyright laws will need to be followed. Reflect on this lesson analysis, providing strengths, weaknesses, and recommendations for using technology and media to enhance student learning (ISTE NETS-T 5.C).
- Reflecting on My Learning.* Reflect on the 21st century knowledge and skills as compared to the knowledge and skills required for your own PK–12 educational experiences. What are the primary differences? What do you see as the greatest benefits and as your most difficult challenges in ensuring that your students build 21st century knowledge and skills (ISTE NETS-T 2.B)?

Suggested Resources

PRINT RESOURCES

- Ashburn, E., & Floden, R. (2006). *Meaningful learning using technology: What educators need to know and do*. New York, NY: Teachers College Press.
- Becker, G. H. (2003). *Copyright: A guide to information and resources* (3rd ed.). Lake Mary, FL: Gary H. Becker.
- Bielfeld, A., & Cheeseman, L. (2006). *Technology and copyright law: A guidebook for the library, research, and teaching professions* (2nd ed.). New York, NY: Neal-Schuman.
- Botterbush, H. R. (1996). *Copyright in the age of new technology*. Bloomington, IN: Phi Delta Kappa Educational Foundation.
- Brooks-Young, S. J. (2009). *Making technology standards work for you* (2nd ed.). Washington, DC: International Society for Technology in Education.
- Brown, J. M. (2002). Enhancing on-line learning for individuals with disabilities. *New Directions for Teaching and Learning*, 91, 61–68.
- Burke, J. J. (2006). *Library technology companion: A basic guide for library staff* (2nd ed.). New York, NY: Neal-Schuman.
- Clyde, W., & Delohery, A. (2005). *Using technology in teaching*. New Haven, CT: Yale University Press.
- Cummins, J., Brown, K., & Sayers, D. (2006). *Literacy, technology, and diversity: Teaching for success in changing times*. Boston, MA: Allyn & Bacon.
- Lamb, A. (2006). *Building treehouses for learning: Technology in today's classroom* (4th ed.). Emporia, KS: Vision to Action.
- Male, M. (2002). *Technology for inclusion: Meeting the special needs of all students* (4th ed.). Boston, MA: Allyn & Bacon.
- Scherer, M. J. (2003). *Connecting to learn: Educational and assistive technology for people with disabilities*. Washington, DC: American Psychological Association.

WEB RESOURCES

Edutopia

www.edutopia.org

Edutopia is sponsored by the George Lucas Foundation and provides teachers current and archived access to special reports, blogs, and videos.

eSchool News

www.eschoolnews.com

eSchool News is a convenient way to keep up to date electronically with what is going on in schools.

Sophia

www.sophia.org

Sophia is a source for tutorials, teacher tools, and professional development. The site holds many resources for teachers and students directed at helping students learn.

AECT.org

www.aect.org

AECT Copyright Committee blog disseminates committee presentations, news, and announcements.

Gary Becker's Copyright Information Site

www.beckercopyright.com

Gary Becker's copyright information site provides you with a quick reference to copyright issues.

Fair Use Guidelines for Educational Multimedia

www.uspto.gov/web/offices/dcom/olia/confu/confurep.pdf

Technology, Education, and Copyright Harmonization (TEACH) Act (2002)

<http://www.ala.org/ala/issuesadvocacy/copyright/teachact>

U. S. Copyright Office

www.copyright.gov The U.S. Copyright Office offers expert and impartial information about copyright law. The website offers a variety of information and services related to the law.

CHAPTER

2

Designing and Assessing 21st Century Learning

Knowledge Outcomes

This chapter addresses ISTE NETS-T standards 2, 4, and 5.

- 1 Describe the similarities and differences in learning theories.
- 2 List the eight principles of effective instruction for 21st century learners.
- 3 Describe the similarities and differences in the principles of effective technology and media utilization.
- 4 Describe the similarities and differences between the types of effective learning assessment.

Goal

Understand how to design and assess 21st century learning.



Learning is the development of new knowledge, skills, or attitudes as an individual interacts with information and the environment. Learning doesn't happen by magic. Rather, teachers must make important decisions to ensure learning, especially when integrating technology and media into a lesson. Foundational learning theories, the principles of effective instruction that integrate technology and media, and effective assessment of learning are all elements of designing and assessing 21st century learning.

Technology and media can be valuable resources to integrate into the assessment of learning. Learners in the 21st century need to be better educated to assume the challenges of continually evolving knowledge and skill requirements for the future (Partnership for 21st Century Skills, n.d.). What students are learning today needs to prepare them for an uncertain tomorrow, and lifelong learning is a cornerstone to guiding students toward understanding how to approach the shifting knowledge and skills of their future. By creating seamless access to the global community and opening new avenues for addressing how and what to learn, technology and media have become essential interfaces for learners as they move forward in their education.

Even as students are entering the classroom with greater understanding of worldwide issues, other learning challenges prevail. Many come into school speaking more than one language, and it is predicted that by 2025, nearly half of all classrooms will have students who do not speak English as their first language (Partnership for 21st Century Skills, n.d.). Students also have greater fluency with technology and media and have greater opportunities for exposure to different points of view and cultures. Even before today's children enter school, many have experience with technology as a learning tool through television programs designed to instruct young children. Many also understand how computers can be used for learning and for communicating. Another medium for communication and interactivity, the cell phone, has become the great equalizer for all students regardless of their social and ethnic backgrounds. How teachers view the role of technology and media in the classroom depends very much on their beliefs about how people learn.



The resources available to students today offer them many opportunities for learning.

Learning Theories

Over the past half-century there have been several dominant theories of learning. Each has implications for instruction in general and for the use of technology and media in particular. We briefly survey each of the major perspectives on learning and discuss their implications. Driscoll (2005) discusses learning theories and their impact on teaching decisions in greater detail.

BEHAVIORIST PERSPECTIVE

In the 1950s, B. F. Skinner, a psychologist at Harvard University and a proponent of **behaviorism**, conducted scientific studies of observable behavior. He was interested in voluntary behavior, such as learning new skills, rather than reflexive behavior, as illustrated by Pavlov's famous salivating dog. He demonstrated that reinforcing, or rewarding desired responses, could

Even at an early age, children learn to use technology to expand their learning opportunities.





Learning is sometimes done best by the individual student working alone.

shape the behavior patterns of an organism. Skinner based his learning theory, known as *reinforcement theory*, on a series of experiments with pigeons. He noted that when the pigeons were given a reward for a desired behavior, they tended to repeat it. When the pigeons did not receive any reinforcer, they tended to stop a particular behavior. Skinner reasoned that the same procedures could be used with humans. The result was the foundation for computer-assisted instruction. Unlike earlier learning research, Skinner's work was logical and precise, leading directly to improved instruction and learning.

Behaviorists refuse to speculate on what goes on internally when learning takes place. They rely solely on observable behaviors. As a result, they are more comfortable explaining relatively simple learning tasks. Because of this posture,

behaviorism has limited applications in teaching higher-level skills. For example, behaviorists are reluctant to make inferences about how learners process information. Although most would argue that, in the 21st century, behavioral concepts are not necessarily applicable to the types of learners you are encountering in your classrooms, you may determine that some basic knowledge or skills require a behaviorist approach to instruction. For example, you might have a student who would benefit from completing a math program that guides him through a series of incremental steps to learning multiplication, with reinforcements integrated throughout, until he has mastered the multiplication table. The student will not be finished with the program until his work is considered to be acceptable and he can demonstrate his ability to complete multiplication facts.

COGNITIVIST PERSPECTIVE

In the latter half of the twentieth century, cognitivists made new contributions to learning theory by creating models of how learners receive, process, and manipulate information. **Cognitivism**, based on the work of Swiss psychologist Jean Piaget (1977), explores the mental processes individuals use in responding to their environment—that is, how people think, solve problems, and make decisions. For example, behaviorists simply state that practice strengthens the response to a stimulus. Cognitivists, on the other hand, create a mental model of short-term and long-term memory. New information is stored in short-term memory, where it is rehearsed until ready to be stored in long-term memory. If the information is not rehearsed, it fades from short-term memory. Learners then combine the information and skills in long-term memory to develop cognitive strategies, or skills for dealing with complex tasks.

Cognitivists have a broader perception of learning than that held by behaviorists. Students are less dependent on the guiding hand of the teacher and rely more on their own cognitive strategies in using available learning resources. Many would suggest that the cognitivist approach to instruction is a good compromise between required **benchmarks**, those standards against which students are tested, and **metacognition**, thinking about one's own learning.

CONSTRUCTIVIST PERSPECTIVE

Constructivism is a movement that extends beyond the ideas of cognitivism, considering the engagement of students in meaningful experiences as the essence of experiential learning. Shifting from passive transfer of information to active problem solving and discovery, constructivists emphasize that learners create their own interpretations of the world of information. They argue that students situate the learning experience within their own experiences and that the goal of instruction is not to teach information but to create conditions in which students can interpret information for their own understanding. The role of constructivist

instruction is to provide students with ways to assemble knowledge rather than to dispense facts. Constructivists believe that learning occurs most effectively when students are engaged in authentic tasks that relate to meaningful contexts (i.e., learning by doing). The ultimate measure of learning is therefore the ability of the student to use knowledge to facilitate thinking in real life. This approach fits with the needs of 21st century learners who must solve problems that not only capitalize on their existing knowledge, but also require them to seek additional information or skills in finding effective solutions.



Teachers can help guide the 21st century learner explore new information.

SOCIAL-PSYCHOLOGICAL PERSPECTIVE

Social psychology is another well-established approach to the study of instruction and learning. Social psychologists look at how the social organization of the classroom affects learning. For example, what is the group structure of the classroom—individual study, small groups, or the class as a whole? What is the authority structure—how much control do students have over their activities? What is the reward structure—is cooperation rather than competition fostered?

Researchers such as Robert Slavin (1990) have taken the position that cooperative learning is both more effective and more socially beneficial than competitive and individualistic learning. Slavin developed a set of cooperative learning techniques embodying the principles of small-group collaboration, learner-controlled instruction, and rewards based on group achievement.

The 21st century learner enters your classroom with many skills developed from technology-based social networking. The ideas fostered in the social psychology perspective address such interdependent collaborative abilities that 21st century learners need to use as part of their learning.

Teachers need to develop an eclectic attitude toward the various schools of learning psychology. You are not obliged to swear allegiance to a particular learning theory. You want to use what works. If you find that a particular learning situation is suited to a behaviorist approach, then you should use behaviorist techniques. Conversely, if the situation seems to call for cognitivist or constructivist strategies, those are what you should use. When guiding the 21st century learners in your classroom, consider which learning theory best applies to the particular type of learning task at hand.

Together, a group of students can collaborate on their learning.

Principles of Effective Instruction for 21st Century Learners

As a classroom teacher, your role is to establish learning experiences that foster the defined learner outcomes. At times those outcomes may be based on specific state or national learning standards; at other times they may be based on negotiated outcomes with individual learners. Whichever direction you take, you need to think about how to engage students in the learning process.

As an educator seeking ways to improve your practice, it is important to consider how to engage learners in their learning.



Because one common feature across all classroom settings is the variety of learning levels and needs among students, it is also critical to determine the best ways to meet the needs of all students by becoming skilled at differentiating instruction to ensure that all learners are adequately and appropriately challenged in their learning. For example, you may offer in-depth reading materials for students who are reading above grade level for extended learning experiences, and worksheets with hints and answer keys for those who are struggling to understand the concepts of the topic.

Research-based classroom practices to engage learners have evolved over time. These principles of effective instruction offer ways to engage your learners regardless of their ability levels:

- *Assess prior knowledge.* Before you can properly provide instruction, you should gather relevant information about each student's knowledge and skill level. You need to know what knowledge your students already have learned. To learn from most materials and activities, students must possess prerequisite knowledge and skills (Newby, Stepich, Lehman, & Russell, 2010).
- *Consider individual differences.* Learners vary in terms of personality, general aptitude, knowledge of a subject, and many other factors. Be aware of the multiple learning needs of your students—for example, whether a language other than English is spoken in a child's home. You need to consider the technology and media experiences your students have had and what resources are essential to help your students learn. Effective instruction allows individuals to progress at different rates, cover different materials, and even participate in different activities (Cooper & Varma, 1997).
- *State objectives.* For you and your students to know where instruction is going and what is to be accomplished, the goals must be specified. Learning objectives must match expected outcomes or standards (Mager, 1997).
- *Develop metacognitive skills.* The skills of selective monitoring, evaluating, and adjusting their approaches enhance students' learning and help to make them lifelong learners. Learners need assistance in understanding how they learn and what resources help in that process (Nelson, 1992).
- *Provide social interaction.* Teachers and peers serving as tutors or group members can provide a number of pedagogical as well as social supports. Learners gain experience and expertise when collaborating with others in and beyond the classroom (Jonassen, Howland, Marra, & Crismond, 2008).
- *Incorporate realistic contexts.* Learners are most likely to remember and to apply authentic knowledge presented in a real-world context. Rote learning leads to "inert knowledge"; that is, learners know something but cannot apply it to real life. Students benefit from understanding how their knowledge and skills fit into the world around them (Bransford, Brown, & Cocking, 2000).
- *Engage students in relevant practice.* The most effective learning experiences are those requiring learners to practice skills that build toward the desired outcome. Learner participation increases the probability of learning. Practice, especially in varying contexts, improves retention rate and the ability to apply the new knowledge, skill, or attitude. Practice promotes deeper, longer lasting learning (Morrison & Lowther, 2010).
- *Offer frequent, timely, and constructive feedback.* Student learning requires accurate information on misconceptions, misunderstandings, and weaknesses. Learners need to know if their thinking is on track. Feedback may come from a teacher, a tutor, electronic messages from a computer, the scoring system of a game, or oneself. In addition to knowing that responses are incorrect, students need to know why they have been unsuccessful and how they can improve their performance. Further, knowing details about their correct responses in terms of how and why they are accurate helps students understand more about what they have learned (Black & William, 1998).

INFORMATION VERSUS INSTRUCTION

As educators, it is important to distinguish between information and instruction. **Information** is knowledge, facts, news, comments, and content. Information can be presented in a memo, in the classroom, in a textbook, or on the Web. Often the presentation, whether it is live, printed, or on the Internet, is general in content and its purpose is to give an overview of ideas or subject matter—to generate interest, to provide background information, or to give procedural details.

Learners should not be expected to be responsible for the retention or use of information they have only seen or heard. The information provided by a job aid (a short guide to help the user), like a phone book, is not meant to be memorized. It is assumed that you will look up the information when needed. With computers, it has become possible to give ever more rapid and detailed information in specific situations, to the point that the computer could be said to be helping or “coaching” the individual. Although with frequent use of a job aid or a computer help system a person might gradually internalize information, remembering more and more of the information provided, the learning is not an intentional part of the system, whose aim is only to provide just-in-time assistance or specific information.

Instruction, on the other hand, refers to any intentional effort to stimulate learning by the deliberate arrangement of experiences to help learners achieve a desirable change in capability. Instruction is meant to lead to learning. Active engagement with the information—questioning it, discussing it, applying it to practice situations—is the critical component of instruction. Meaningful understanding, retention, and application require instructional activities, including practice with feedback. Instruction, therefore, has as its goal a lasting change in the capability of the learner. This is a crucial point in distinguishing instruction from just providing information.

Instruction is also the arrangement of information and the environment to facilitate learning. By *environment* we mean not only where instruction takes place, but also the strategies, technology, and media needed to convey information and guide learning. The learner or the instructor may do this. Gagné (1985) describes instruction as a set of events external to the learner designed to support the internal process of learning.

Preparing the instructional environment is another critical role for teachers. As a teacher responsible for creating learning opportunities for your students, you will need to help them work within learning communities. By using collaborative learning tools such as classroom blogs, wikis, social networking resources, and learning management systems, you can help your 21st century learners move through the various levels of learning appropriate to their goals, the state learning standards, and expected outcomes.

BLOOM'S DIGITAL TAXONOMY AND 21ST CENTURY 4 CS

Benjamin Bloom developed a learning taxonomy that he described as stages focused on cognitive learning skills ranging from knowledge through evaluation (Bloom and Krathwohl, 1984). His idea was that students progressed in an orderly fashion from simple to complex mental abilities. He suggested that students started at the knowledge stage by recalling specific content (e.g., reciting a poem from memory). Students then progressed to the comprehension stage, in which they would be able to paraphrase or summarize the content (e.g., using your own words, describe what the author meant in her poem). He assumed if students could understand meaning, then they were ready for the next step, application. At the application step, students could use the ideas or information in a meaningful way (e.g., using the author's ideas in her poem, relate those ideas to a similar topic). Finally, Bloom felt that when the student had progressed through these prior steps, it was now time to generate a new idea or example (e.g., using a similar poetry style, write your own poem about a similar topic). He called this highest step evaluation.

Over time, Bloom's Taxonomy has been revised and modified. While best known for his original work in the cognitive domain, Bloom added the psychomotor (manipulative or physical skills) and affective (attitudes or feelings) domains, which followed a similar pattern in a

taxonomy. Bloom further expanded his cognitive taxonomy and divided it into lower-order thinking skills, such as requiring the ability to recall specific facts, and higher-order thinking skills, such as applying the facts to a unique task. His idea was that students needed the lower-order skills in order to be successful at the higher-order skills. In addition, he advocated that all students were to be guided through the steps into higher-order thinking. For example, a teacher would require students to learn multiplication tables, explain relationships between the number facts, use multiplication to solve a specific story problem, and finally to use their multiplication knowledge in a unique and different way, such as in an art project in which they discussed how they repeated certain design elements as a means to demonstrate their understanding of multiplication concepts.

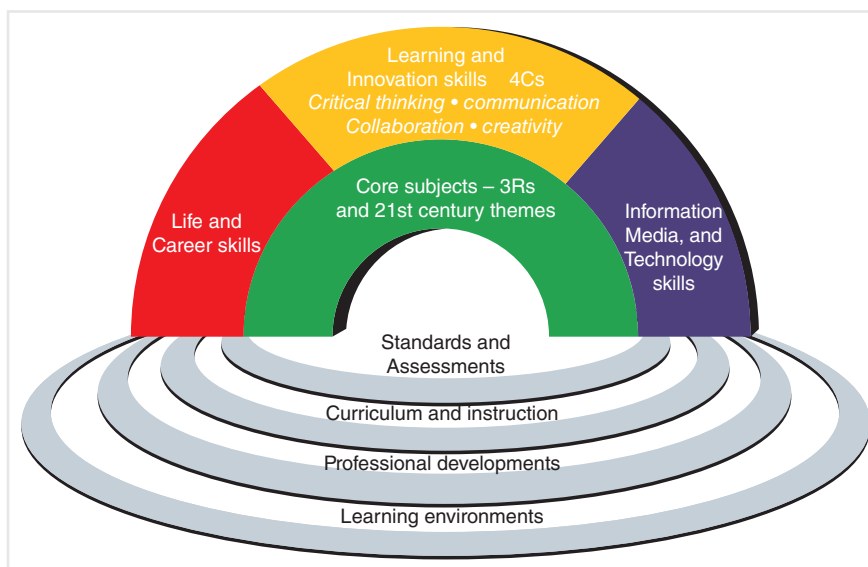
The most recent modification to Bloom's original steps has been termed Bloom's Digital Taxonomy (Churches, 2008). What is significantly different about the new taxonomy is that it is not focused on only cognitive skills, but rather integrates action and resources into the stages. In the Digital Taxonomy, the interplay of use of resources with the cognitive process is an essential element to understanding how students learn. The premise of moving through each stage is not emphasized, but rather the intent is to capitalize on where the student is and what approaches will best help the student to learn the information and use it in meaningful ways. Also critical to the new taxonomy is a focus on collaboration and scaffolding of ideas. In the Digital Taxonomy, the teacher's role as a learning guide is emphasized, as is the idea that technology and media are essential tools to facilitate student learning. Now the teacher does not need to require prior knowledge of multiplication skills in order for students to gain that knowledge as they apply multiplication skills to a problems they generated as part of their explorations of a local problem to be resolved.

Fast forward several years, and the Partnership for 21st Century Skills (www.p21.org) identified skills that every student needs to have to be a successful learner (Figure 2.1). The focus is on those higher-order thinking skills that Bloom and Churches identified as critical to quality learning experiences. The Partnership identified four skills as the means by which children can acquire their academic knowledge: critical thinking, communication, collaboration, and creativity. Each of these skills requires that students have knowledge or can locate the information they need in order to be successful in the implementation of the knowledge as part of their active learning experiences. As a teacher, you would work with groups

of students who share their knowledge and understanding to gain further knowledge as they resolve a creative and unique problem that has significant impact on a local setting.

Closely aligned to the four 21st century skills are cross-cultural understandings through which students have opportunities to view their learning experiences in a global context. For the classroom teacher, these new views of Bloom's Taxonomy and the 21st century skills suggest new approaches of facilitating learning using media and technology outside the regular classroom to facilitate preparation of classroom activities. You can guide your students to work on larger issues across a greater span and learn more from students outside the classroom setting. The GlobalSchoolNet (www.globalschoolnet.org) offers teachers opportunities to collaborate, plan, and

FIGURE 2.1 21st Century Student Outcomes and Support Systems



Source: Reprinted with permission of the Partnership for 21st Century Skills.

TAKING A LOOK AT TECHNOLOGY INTEGRATION

New Tech Network

Started in California, the New Tech Network is a national initiative to develop innovative high schools. It is an outgrowth of the philosophy that empowering students through an alternative instructional approach will help them to become creators, leaders, and tomorrow's productive citizens. New Tech Network advocates learning environments that provide student-centered settings in which

- Problem-based learning engages learners
- Students and teachers have ownership of their learning experiences
- Technology is integrated throughout the entire learning experiences

The goal is to provide students with an integrated curriculum that focuses on critical thinking, collaboration, and problem solving as vehicles to learning. They have the data to demonstrate that their ideas are working, with graduation rates that are significantly higher than the national averages. Also, more of the graduates from

New Tech high schools pursue careers in mathematics, science, and engineering than their regular high school peers.



Technology and media are good sources for gathering information prior to classroom activities.

conduct joint learning projects that engage students from varied locations in working together to solve a common problem. Teachers can also participate in topical discussions with groups focused on key educational issues. Other possibilities include the opportunity to manage or attend online courses, mentor other educators, or try out new ideas in a safe, supportive environment.

The teacher is no longer the source of knowledge, standing and delivering as in earlier school models. Rather, the teacher designs learning situations that focus on engaging learners in active learning experiences while developing their knowledge, understanding, and ability to use knowledge to generate new ideas. As a teacher, you will design lessons, considering the NETS-T (www.iste.org/standards/nets-for-teachers) and NETS-S standards (www.iste.org/standards/nets-for-students) and the resources available to students in order to facilitate moving students toward critical thinking, collaboration, and creativity. Technology and media provide the valuable resources that teachers and students can use to achieve the learning outcomes while engaging in those higher-order thinking arenas. In other words, you can “flip” your classroom by having your students explore the content through media and technology prior to coming to the classroom where you can engage them in applying that knowledge to real-world situations.

MEETING LEARNER NEEDS

Your students are the focus of your instruction; everything you do in the classroom is designed to help your students meet the intended learning outcomes. The more you understand their levels of learning and their interests, the easier it will be for you to address ways to help them learn. When making instructional decisions your goal is to find ways to ensure success. Decide on the strategy or strategies you will use, the technology and media that will offer the best support, and how you will assess students' learning progress.

Teachers guide students in their effective use of technology to support learning.



It is important for teachers to be aware of the multiple types of student intelligences when planning lessons. Howard Gardner (2011), who was dissatisfied with the concept of IQ and its unitary view of intelligence, developed the concept of **multiple intelligences**. Noting that not everyone has the same abilities nor do they learn in the same way, he identified nine aspects of intelligence:

- Verbal/linguistic (language)
- Logical/mathematical (scientific/quantitative)
- Visual/spatial (imagining objects in space/navigating)
- Musical/rhythmic (listening/movement)
- Bodily/kinesthetic (dancing/athletics)
- Interpersonal (understanding other people)
- Intrapersonal (understanding oneself)
- Naturalist (relating to one's surroundings)
- Existentialist (ability to reflect)

Gardner's theory implies that effective teachers need to consider the different learning abilities of their students, recognizing that students vary widely in terms of strengths and weaknesses in each of these areas. The best way to do this is by designing lessons that actively address the range of learning abilities, considering students' perceptual preferences and strengths, information processing habits, motivational factors, and physiological traits that influence their ability to learn. Your 21st century learners come into your classroom with abilities in varying states of development. Your responsibility is to determine how best to address their learning needs while also attending to their individual approaches to acquiring knowledge and skills.

Most lessons can include a variety of technology and media that address the wide range of student abilities. For example, your lessons can include writing activities for students with verbal/linguistic strengths, use of graphics for visual/spatial abilities, or out-of-seat activities for students who prefer bodily/kinesthetic learning. Using Storymaker software allows your students to blend images with text and gives them the opportunity to practice both their verbal/linguistic and their visual/spatial intelligences.

Principles of Effective Technology Utilization

The National Education Technology Plan sets clear expectations for today's teachers to be competent in the use of technology in their teaching (U.S. Department of Education, 2010). This is especially true when working with 21st century learners and addressing the skills outlined for them. Teachers not only need to use technology effectively in their teaching, but they also need to guide students in using those tools to enhance their learning (Bowes, D'Onofrio, & Marker, 2006). The advent of newer technologies requires critical decisions related to the best tools to integrate into teaching. We will be addressing many of these newer technology resources throughout the remaining chapters of this textbook.

The **National Education Technology Standards for Students** (NETS-S), noted in the following list, specifically outline expectations for student use of technology to guide their learning (International Society for Technology in Education [ISTE], 2007).

- Creativity and Innovation
- Communication and Collaboration
- Research and Information Fluency
- Critical Thinking, Problem Solving, and Decision Making

- Digital Citizenship
- Technology Operations and Concepts*

Many of these standards address the essential elements for success in acquiring 21st century knowledge and skills. As a teacher you will be expected to enhance students' abilities to engage in the use of technology to support their learning and address these six areas of competency, also known as **technology literacy** skills. In addition you are expected to enhance learning by engaging students in the 21st century skills of critical thinking, collaboration, communication, and creativity and innovation. What you can note in looking at the two lists of skills to emphasize is that they are very similar and are not something to be considered as "add ons," but rather they can be integrated into the learning experiences you arrange for your students.

You should combine knowledge and skills related to content areas and information literacy skills by using technology in ways that help students learn information and communicate knowledge. For example, in a science lesson on weather, you can present a problem to your students that will require them to search websites for data or information, use communication tools to collaborate with outside experts, generate solutions to the problem collaboratively, and present their ideas to classmates using creative resources. By approaching your instruction in that manner, you have addressed many of the standards by which your students will be measured and will have given them guided practice in developing their knowledge and skills.



Information can be learned from materials beyond the classroom.

Principles of Effective Media Utilization

Learning from multiple sources of media provides us with information and challenges our thinking. As users of these sources we need **media literacy** skills to know how to access them, how to understand and analyze the content, and how to create new media messages (Stansbury, 2009).

Text, television, video, and a host of other media sources covered within this textbook are all valid and vital sources of information. Your role is to guide your students to use these media as sources for their learning in ways that are wise, safe, and productive. For example, students need to learn to find multiple sources to verify facts they may have heard on the news or read in the newspaper. They need to learn to be critical users of these resources to ensure that they are well informed and their conclusions are accurate. As mentioned earlier, the NETS-S and 21st century skills address many of the abilities learners need to be successful consumers of the media resources surrounding them.

Furthermore, your teaching approach should provide students with opportunities to explore how to use these media resources to communicate their knowledge. Later in this textbook you will see examples of how teachers guide their students to use a variety of media to express their knowledge and skills.

Principles of Effective Learning Assessment

The method of assessing achievement depends on the nature of the objective. Some learning objectives call for relatively simple cognitive skills—for example, stating Ohm's Law, distinguishing adjectives from adverbs, or summarizing the principles of the Declaration of Independence. Learning objectives such as these lend themselves to more traditional written tests.

*Source: Reprinted with permission from *National Educational Technology Standards for Teachers and National Educational Technology Standards for Students*. Copyright (c) 2007, 2008 by ISTE (International Society for Technology in Education.) All rights reserved.

Other objectives may call for process-type behaviors (e.g., diagramming a sentence, solving quadratic equations, or classifying animals), the creation of products (e.g., a sculpture, a written composition, a PowerPoint presentation, or a portfolio), or to exhibit attitudes (e.g., choosing to read during free-time activities, placing used paper in the recycle bin, or eating healthy snacks). This type of learning objective requires a more comprehensive, **authentic assessment**, such as a performance-based evaluation of a student's demonstration of learning in a natural context.

AUTHENTIC ASSESSMENT

Rising interest in authentic assessment of students is driven by commitment to a constructivist perspective. Authentic assessments require students to use processes appropriate to the content and skills being learned and to how they are used in the real world. It is the difference between learning science facts and doing what scientists do. How many people take paper-and-pencil tests as part of their occupation?

Authentic assessments can be applied to most performance or products that students develop to demonstrate their knowledge or understanding of the content. The most commonly used rating scales for authentic assessments include performance checklists, attitude scales, product-rating checklists, and rubrics.

When assessing basic process skills, a performance checklist can be an effective, objective way of recording student performances. Figure 2.2 shows a primary-grade checklist for using an audio storybook. Notice the simple yes or no recording system.

Although attitudes are admittedly difficult to assess, measurement tools have been devised, such as attitude scales (see the biology example in Figure 2.3). The five-point scale (strongly agree to strongly disagree) offers the opportunity to capture a range of attitudes. A number

FIGURE 2.2 Performance Checklist: Using an Audio Storybook

Performance Checklist: Using an Audio Storybook

Name _____	Class _____	
Indicate Yes or No with an "X" in the appropriate column.		
Did the Student	Yes	No
1. Locate the assigned audio storybook?	_____	_____
2. Complete the Material Checkout Form for the storybook?	_____	_____
3. Select the appropriate CD player?	_____	_____
4. Select the appropriate headphones?	_____	_____
5. Correctly insert the storybook CD?	_____	_____
6. Correctly connect the headphones?	_____	_____
7. Play the CD and follow along as the storybook was read?	_____	_____
8. Remove the CD and headphones when the story was finished?	_____	_____
9. Return the audio storybook, CD player, and headphones to the proper location?	_____	_____
10. Complete the Materials Return Form?	_____	_____
Teacher Name _____	Date _____	

FIGURE 2.3 Attitude Scale: Biology

Attitude Scale: Biology

Each of the statements below expresses a feeling toward biology. Please rate each statement on the extent to which you agree. For each, you may select (A) strongly agree, (B) agree, (C) undecided, (D) disagree, or (E) strongly disagree.

A	B	C	D	E
Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree

____ 1. Biology is very interesting to me.

____ 2. I don't like biology, and it scares me to have to take it.

____ 3. I am always under a terrible strain in biology class.

____ 4. Biology is fascinating and fun.

____ 5. Learning biology makes me feel secure.

____ 6. Biology makes me feel uncomfortable, restless, irritable, and impatient.

____ 7. In general, I have a good feeling toward biology.

____ 8. When I hear the word *biology* I have a feeling of dislike.

____ 9. I approach biology with a feeling of hesitation.

____ 10. I really like biology.

____ 11. I have always enjoyed studying biology in school.

____ 12. It makes me nervous to even think about doing a biology experiment.

____ 13. I feel at ease in biology and like it very much.

____ 14. I feel a definite positive response to biology; it's enjoyable.

of other suggestions for attitude measurement can be found in Robert Mager's *How to Turn Learners On . . . without Turning Them Off* (see this chapter's Suggested Resources).

For product skills, a product-rating checklist can guide your evaluation of critical subskills and make qualitative judgments more objective, as in the rating form in Figure 2.4 for a student-created digital concept map. This checklist provides more detailed information regarding student performance because each product component is rated from poor to excellent rather than on a yes/no scale.

Used to provide a more comprehensive assessment of student performance, a rubric is a set of assessment criteria for appraising or judging student products or performances. A rubric typically consists of a rating scale for performance criteria based on level-of-performance descriptors. The performance criteria are the key area of focus for the performance or the product (e.g., problem presentation, supporting graphics, appropriate labels). Rating scales to measure achievement of performance criteria normally range from three to six levels designated by names and/or numbers. A three-point scale might be shown as (1) needs work, (2) okay, (3) good. An example of a four-point scale might show the following levels: (1) beginning, (2) developing, (3) accomplished, and (4) exemplary. The descriptors for the levels of performance describe the student performance or product at each level. By comparing an actual student product or performance to the descriptors, a teacher can give a numerical score. An example rubric for a multimedia product is presented in Figure 2.5. See "Technology Resources: Rubrics" for rubric resources.

FIGURE 2.4 Product Evaluation Checklist: Digital Concept Map

Product Evaluation Checklist: Digital Concept Map

Name _____ Date _____

Rate the digital concept map on the basis of content and layout by checking the appropriate box.

Content	Poor	Fair	Good	Very Good	Excellent
• Key ideas are represented	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
• Supporting ideas are logical	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
• Information is accurate	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
• Paraphrasing is appropriate	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Comments about the content:					
Layout					
• Main idea shapes are appropriate	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
• Supporting idea shapes are appropriate	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
• Connecting lines are meaningful	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
• Graphics support concepts	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
• Use of colors is appropriate	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
• Font is clear and easy to read	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Comments about the layout:					
Overall Evaluation: _____ Poor _____ Fair _____ Good _____ Very Good _____ Excellent	Overall Comments:				

Portfolio Assessment. If your assessment plan involves determining the overall individual performance of each student, traditional or electronic portfolio assessments can help achieve your goal. Portfolios are used to assess tangible products that exemplify student accomplishments in terms of analysis, synthesis, and evaluation. A key component of portfolios is their requirement for students to self-reflect on their own learning as demonstrated in the portfolio products. For example, students are asked to select a piece of work that demonstrates achievement of a learning objective and then to explain why they chose the piece and how it shows the target knowledge and skills. The reflections can be extended to develop metacognitive skills by asking the students to describe what they would do differently to improve their learning.

To use portfolios, begin by deciding between traditional or electronic formats. Then identify the types of artifacts that will demonstrate student achievement of the standards and objectives and select or develop an appropriate rating scale (previously described). The rubrics should be given to students before they begin working on the products. The types of artifacts that a portfolio might contain include the following:

- Written documents such as poems, stories, or research papers
- Audio recordings of debates, panel discussions, or oral presentations
- Video recordings of skits, lab experiments, or 3-D models
- Computer multimedia projects such as animated timelines, podcasts, or WebQuests

Traditional versus Electronic Portfolios. Traditional portfolios are physical collections of student work, whereas electronic portfolios contain digital work. Traditional portfolios consist of paper documents, photos, video and audio recordings, or perhaps 3-D models. The portfolios

FIGURE 2.5 Multimedia Product Rubric

Multimedia Product Rubric				
Student's Name _____			Date _____	
Category	4	3	2	1
Content	Covers topics in-depth with details and examples. Subject knowledge is excellent.	Includes essential knowledge about the topic. Subject knowledge appears to be good.	Includes essential information about the topic but there are 1–2 factual errors.	Content is minimal OR there are several factual errors.
Sources	Source information collected for all graphics, facts, and quotes. All documented in desired format.	Source information collected for all graphics, facts, and quotes. Most documented in desired format.	Source information collected for all graphics, facts, and quotes, but not documented in desired format.	Very little or no source information was collected.
Organization	Content is well organized, uses headings or bulleted lists to group related material.	Uses headings or bulleted lists to organize, but the overall organization of topics appears flawed.	Content is logically organized for the most part.	There was no clear or logical organizational structure, just lots of facts.
Requirements	All requirements are met and exceeded.	All requirements are met.	One requirement was not completely met.	More than one requirement was not completely met.
Originality	Product shows a large amount of original thought. Ideas are creative and inventive.	Product shows some original thought. Work shows new ideas and insights.	Uses other people's ideas (giving them credit), but there is little evidence of original thinking.	Uses other people's ideas, but does not give them credit.

Rubrics



Rubistar

<http://rubistar.4teachers.org>

Rubistar is a free online tool designed to assist teachers in creating a variety of rubrics. The website has numerous examples of rubrics that can be accessed through keyword searches. If you are new to rubrics, the site offers a rubric tutorial. When you are ready to try it out, Rubistar provides an easy-to-use template to create and print rubrics. If you complete the registration, you can save and edit rubrics online.

Assessment Focus

www.assessmentfocus.com/rubrics-rubric-makers.php

Assessment Focus offers a number of links to sites that will help you generate rubrics. The site includes links for ready-made

rubrics, as well as sites that will allow you to build your own rubrics.

Teach-nology

www.teach-nology.com/web_tools

The Teach-nology site offers a variety of rubric resources for teachers. Both samples and templates are available to use. The rubrics are developed for grades K–12 to include social studies, math, science, and reading and language arts.

are often kept in large three-ring binders and storage boxes, which are moved from teacher to teacher as the student progresses through school. As can be imagined, over time the portfolios can become quite large and hard to manage and store.

Electronic portfolios (called **e-portfolios**), on the other hand, store all the student work as digital files. For example, any computer-generated products, such as spreadsheets, word-processed reports, or WebQuests, can be directly added to the portfolio. Student work created on paper, such as drawings, handwritten poems, or illustrated stories, can be converted to digital format with a scanner. For capturing actual student performances, digital audio and video are also important components of an electronic portfolio, including readings, skits or presentations, student-created 3-D models, or lab experiments conducted by students. The digital format also allows students to add their self-reflections as text or audio narration.

An e-portfolio provides the opportunity for a student to use artifacts in multiple ways. For example if a student writes a paper on how the Mississippi River influenced the economy of the bordering communities that he feels is a good example of his language arts skills, he would place it in the e-portfolio for that purpose. If later, that student realizes that the paper would also serve to demonstrate his insights into social studies knowledge, he can connect that same artifact to another aspect of his e-portfolio. The ability to move or connect the artifacts within the e-portfolio offers students more options in how they capitalize on the ways to demonstrate their success in learning outcomes.

Electronic portfolios can be created with specialized portfolio software, at online sites, or with combinations of basic software such as PowerPoint. Drawbacks for electronic portfolios include availability of equipment and time, as well as questions of access to the tools. Moreover, creating e-portfolios is initially time-consuming because teachers and students need to learn how to scan, save, and format documents in a useful and appealing manner. However, once the process is mastered, e-portfolios take less time to maintain and obviously require less storage space than traditional portfolios. Security is a concern when deciding who will have access to the files among parents, principals, counselors, teachers, and other students. For some practical tips on using Google Docs as an open source software solution for e-portfolios, visit Dr. Helen Barrett's ePortfolios website, <http://electronicportfolios.org>.

TRADITIONAL ASSESSMENT

There are times when, as a teacher, you need to verify that students have specific knowledge or skills. Often, more traditional measures are used to demonstrate levels of knowledge. Such things as multiple-choice, fill-in-the-blank, true/false, or short-answer tests are ways to identify students who have mastered particular facts and to determine which students may need additional instruction (Waugh & Gronlund, 2012). Traditional tests tend to be used to measure lower-order learning, which is sometimes essential to ensuring students are meeting state and local learning standards.

Teachers can design traditional tests using learning objectives as their guide. Many instructional materials, such as textbook series, include tests as part of their teacher resource package. Teachers can use these types of tests as quick measures to determine which students need additional instructional assistance or to check on student progress on a particular topic or skill. Traditional tests can serve as a way to identify where students are in their knowledge about a topic prior to designing instruction; thus, you will not repeat content that students have already mastered.

In addition, each state is required to annually report the progress of students' learning. State-wide **standardized tests**, which are administered in a consistent manner and use the same scoring procedures, are a type of traditional assessment measure. In this instance, the tests are scheduled for a specific date across the state and the procedures are carefully orchestrated so that student learning is measured in the same way. Currently, state standardized tests are used to identify student learning that is meeting or exceeding state standards and to determine where there is a need for improvement.

Summary

In this chapter we discussed the major theories of learning and how teachers need to consider them when working with a variety of students. Teachers need to design instruction to meet the needs of 21st century learners. As a teacher, you will want to be prepared to engage your students with technology and media to motivate them and help them to gain the types of knowledge and skills they need to be successful learners. In addition, we addressed several ways to assess student learning.

Professional Development

DEMONSTRATING PROFESSIONAL KNOWLEDGE

1. Describe the similarities and differences in the learning theories discussed in this chapter.
2. What are the eight principles of effective instruction for the 21st century learner?
3. Describe the similarities and differences in the principles of effective technology and media utilization.
4. Describe similarities and differences in the different types of effective assessments presented in this chapter.

DEMONSTRATING PROFESSIONAL SKILLS

1. Prepare a 10-minute presentation on your reaction to a topic of interest in this chapter (ISTE NETS-T 5.C).
2. Analyze an instructional situation (either real or hypothetical) and identify the psychological perspective on learning and the technology and media used (ISTE NETS-T 5.C).

3. Prepare a position paper on the roles of technology and media in learning (ISTE NETS-T 5.C).

4. Describe different instances in which you would use the types of assessment described in this chapter (ISTE NETS-T 2.D).

BUILDING YOUR PROFESSIONAL PORTFOLIO

- *Enhancing My Portfolio.* Select a lesson from a source on the Web. Indicate how specific portions of the lesson illustrate, if present, the psychological perspectives addressed in this chapter (behaviorist, cognitivist, constructivist, and social psychology). Identify the assessment that is used to measure student learning. Discuss the value of the assessment being used. Cite the source of the lesson. Reflect on this analysis, providing strengths, weaknesses, and

recommendations for teaching this lesson to a specific group of students (ISTE NETS-T 2.C).

- *Reflecting on My Learning.* Reflect on the different assessment processes described in the chapter. Discuss how these assessment strategies measure student learning and where they best fit into an instructional situation. Comment on the types of teacher feedback that might contribute to student understanding of the assessment results (ISTE NETS-T 5.C).

Suggested Resources

PRINT RESOURCES

Anderson, R., Grant, M., & Speck, B. (2008). *Technology to teach literacy: A resource for K–8 teachers* (2nd ed.). Boston, MA: Allyn & Bacon.

Callison, D. (2003). *Key words, concepts and methods for information age instruction: A guide to teaching information inquiry*. Englewood, CO: Libraries Unlimited.

Del, A., Newton, D., & Petroff, J. (2007). *Assistive technology in the classroom: Enhancing the school experiences of students with disabilities*. Upper Saddle River, NJ: Prentice Hall.

Erben, T., Ban, R., & Castanda, M. (2008). *Teaching English language learners through technology*. New York, NY: Routledge.

Jonassen, D. H., Howland, J., Moore, J., & Marra, R. M. (2002). *Learning to solve problems with technology: A constructivist perspective* (2nd ed.). Upper Saddle River, NJ: Merrill/Prentice Hall.

Mager, R. (1997). *How to turn learners on . . . without turning them off*. Atlanta, GA: CEP Press.

O'Bannon, B., & Puckett, K. (2010). *Preparing to use technology: A practical guide to curriculum integration* (2nd ed.). Boston, MA: Allyn & Bacon.

Roblyer, M., & Doering, A. (2010). *Integrating educational technology into teaching* (5th ed.). Boston, MA: Allyn & Bacon.

WEB RESOURCES

International Society for Technology in Education

www.iste.org

ISTE is an association focused on improving education through the use of technology in learning, teaching, and administration. ISTE members include teachers, administrators, computer coordinators, information resource managers, and educational technology specialists.

eSchool News

www.eschoolnews.com

This site offers a convenient way to keep up to date electronically with what is going on with technology in schools.

Partnership for 21st Century Skills

www.p21.org

The Partnership for 21st Century Skills advocates for infusing 21st century skills into education. Working with leaders in business, education, and policy, the organization's goal is to work with schools to infuse 21st century skills into education

and provides tools and resources to help facilitate and drive change.

Learning Styles Inventory

<http://www.learning-styles-online.com/inventory/questions.php?cookieset=y>

The Learning styles inventory has 70 questions that assess dominant and secondary learning styles concerning the following areas: aural, verbal, physical, logical, social, and solitary.

Learning Styles Inventory for Students with Learning Disabilities

www.ldpride.net/learning_style.html

This website offers an inventory to identify the preferred learning styles of students with learning disabilities. The inventory results provide educators and parents with a better understanding of students' learning preferences. This information will assist in adapting learning environments to better meet the needs of individual learners.