Achieving
21st Century Learning Environments

This chapter addresses ISTE NETS-T 1, 2, 3, and 5.

1. Differentiate between teacher-centered and student-centered learning strategies.

2. Compare and contrast the advantages and limitations of ten types of learning strategies.

3. Describe how to select technology and media that facilitate learning experiences.

4. Discuss the types of learning environments and settings you might encounter in PK–12 schools.

5. List the advantages and limitations of integrating free and inexpensive materials into instruction.

Goal

Understand how to select and use appropriate learning strategies, technology, media, and materials to achieve 21st century learning in different PK–12 environments.

The ASSURE Classroom Case Study for this chapter describes the instructional strategies used by teachers Lindsay Kaiser and Jena Marshall, who co-teach a fifth-grade social studies class at a school in a middle-income rural neighborhood. The students read at or above grade level and are experienced users of a variety of technology applications. Each student is equipped with a laptop with high-speed Internet access. The teachers are challenged by the students' lack of interest in U.S. history and try to address this concern by engaging students in a variety of activities about the Lewis and Clark expedition. A key activity includes designing a boat that could have been used by Lewis and Clark. The lesson begins with student pairs completing an interactive Lewis and Clark WebQuest to learn about the expedition and various "boat issues" they faced. To assist with the boat design, students conduct Internet searches to expand on information learned from the WebQuest. Students create an advertisement to sell their boat and write a letter to the president of a boat manufacturing company to seek interest in reproducing the Lewis and Clark boat. The students with the best design will receive an award.

To view the *ASSURE Classroom Case Study* Video for this chapter, go to the MyEducationKit for your text and click on the ASSURE Video under Chapter 4 to explore how Ms. Kaiser and Ms. Marshall use strategies, technology, media, and materials to achieve 21st century learning environments.

Throughout the chapter you will find reflection questions to relate the chapter content to the ASSURE Classroom Case Study. At the end of the chapter you will be challenged to develop your own ASSURE lesson that incorporates use of these strategies, technology, media, and materials, for a topic and grade level of your choice.
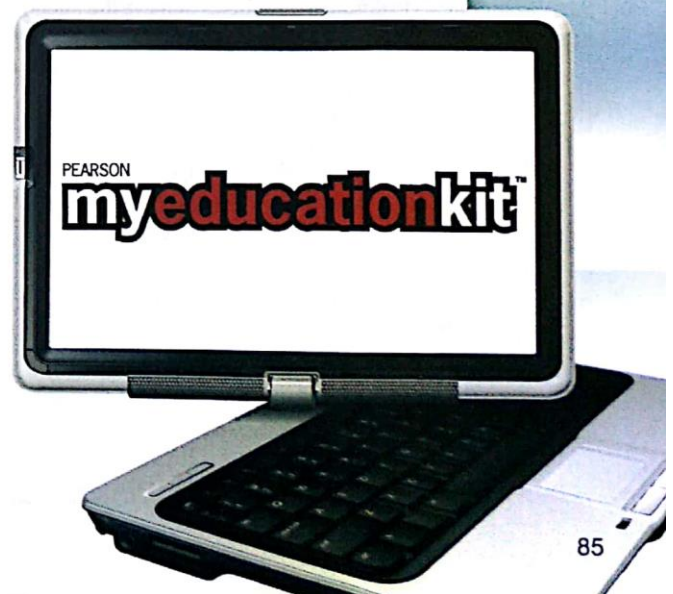
INTRODUCTION

In this chapter we explore a variety of instructional strategies and settings, such as the cooperative learning arrangement used by Ms. Kaiser and Ms. Marshall, that are foundational components of a 21st century learning environment. First we discuss important distinctions between teacher- and student-centered strategies. Next we examine 10 commonly used instructional strategies, discussing the advantages and limitations of each and offering ideas for integrating technology and media. Following that is an introduction to five learning contexts: fact-to-face, distance, blended, independent, and informal. The final section provides ideas for integrating free and inexpensive materials into instruction, their advantages and limitations, and suggestions for obtaining and evaluating them. As you will see, well-planned instructional strategies supported with appropriate technology and media not only promote student learning but also better prepare students for 21st century careers.

Figure 4.1

21st Century Learning Environment Components

21ST CENTURY LEARNING ENVIRONMENTS

The explosion of information available in the 21st century requires teachers to create learning environments that engage this new generation of students in authentic experiences that promote increased knowledge and skills and a better understanding of the world around them. As seen in Figure 4.1, the 21st century learning environment encompasses learning strategies that are teacher-centered or student-centered; integration of technology, media, and materials to support learning; and a variety of learning contexts. We provide guidance to help you carefully plan and manage these learning environment components to ensure that students achieve the intended standards and objectives stated in the ASSURE model.

TEACHER- AND STUDENT-CENTERED STRATEGIES

This section provides information about and examples of instructional strategies proven to be successful with learners of all ages in a variety of settings. We have divided them according to **teacher-centered strategies,** those directed specifically by the teacher, and **student-centered strategies,**

those in which students are largely responsible for their own learning. In both categories, the teacher is key to the design of the instruction. What is different is the focus or orientation of the strategy.

TEACHER-CENTERED STRATEGIES

The ASSURE model, in which every letter of the acronym stands for a step in the process, helps you plan how to approach any learning situation. Once you have Analyzed the learners, Stated the standards and objectives, and Selected the different aspects of the lesson (strategies, technology, media, and materials), the next step is to Utilize strategies, technology, media, and materials. It is during the Utilize step that teacher-centered strategies are implemented. Specifically, the teachers are the "drivers" who direct the learning in very purposeful ways (see When to Use Teacher-Centered Strategies). Examples of teacher-centered strategies include presentations, demonstrations, drill-and-practice, and tutorials. It is important to ensure that teacher-centered strategies engage students in higher-order thinking and enhance learning opportunities with effective use of technology and media. For example, a teacher can demonstrate the behavior of an amoeba with a digital microscope, use an interactive whiteboard to have students collaboratively build sentences, or conduct a whole-class virtual interview with a leading scientist. Students can use "clickers" to answer teacher questions or to compete in a projected online math game that the teacher directs. See Technology for Diverse Learners to

WHEN to USE Teacher-Centered 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 Camtasia or Captivate, the teacher creates a video that includes text 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.
Students need to review and practice information learned as part of earlier instruction.	Drill-and-Practice	Teacher uses interactive whiteboard and students use "clickers" to respond to math problems.
		Drill-and-practice software is made available in a learning center for students to use during the day.
The teacher has determined from tests that several students are having difficulty with the concepts or skills associated with information taught earlier in the week.	Tutorials	Students complete free online tutorials that include practice and immediate feedback to assess learning.
		Teacher selects specific lessons on the school's integrated learning system for students to complete.
		Teacher provides links to podcasts that offer online tutorials on the topics for which students need remediation.

TECHNOLOGY for Diverse Learners

English Language Learners

Robertson (2008) offers teachers seven strategies for using technology with English language learners (ELLs) to prepare them to be 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 their countries of origin, to focus learning on the new technology skills rather than new content.
4. *Extended practice time.* Provide ELLs extra time to practice basic computer skills that may be commonplace for other students, such as using a mouse or basic commands like Save, Print, and Copy/Paste. The extra time is needed because the students have to translate software language as well as learn how to use the technology.
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 ways to complete technology tasks.
6. *Establish meaningful goals.* Focus technology projects on new technology skills and on improving English literacy skills. Plainly outline 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.

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learn about specific instructional strategies to assist English language learners (ELL) students.

STUDENT-CENTERED STRATEGIES

Student-centered strategies occur during the Require learner participation step of the ASSURE model. With student-centered strategies, teachers serve as facilitators who offer guidance as students engage in interactive learning activities and experiences that are directed by the students. Current curriculum and technology standards emphasize the importance of engaging students in authentic, hands-on student-centered activities. The theory base supporting student-centered strategies suggests that learning is enhanced when students are actively engaged in meaningful activities (Marzano, Pickering, & Pollock, 2001). These activities often involve student decision making to create a model, solve a problem, or win a game, individually or in a cooperative group (see When to Use Student-Centered Strategies). Examples of student-centered strategies include discussion, cooperative learning, games, simulation, discovery, and problem solving. Although students appear to "drive" their learning, teachers are responsible for planning and facilitating the arrangements that put students at the center of learning.

WHEN to USE Student-Centered Strategies

Instructional Situation	Strategy	Potential Technology/Media
Students are learning about a specific topic and the teacher has presented them with questions to answer.	Discussion	Teacher posts question to online discussion board. Teacher projects PowerPoint slide showing the discussion questions.
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 (NING, 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.
Students review newly introduced content by playing games focused on topics related to the material.	Games	Students select from several teacher-provided links to online games related to the new topic. Student groups create digital Jeopardy games that they swap and play to see who can earn the highest scores.
The teacher recognizes that the students need to apply their knowledge or skills in a "real-world" situation.	Simulations	Computer software (e.g., Decisions, Decisions) guides the students through a situation to be resolved. The teacher selects a video that presents a situation and guiding questions for the students to apply their knowledge or skills to resolve the video situation. Students use the Internet to participate in an activity with other students in a virtual reality setting.
The teacher wants students to discover key concepts in order to instill 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.
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 forensic lab is created for students to use equipment and resources to "solve a crime" that the teacher has created for them.

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

PRESENTATION

In a **presentation,** a source tells, dramatizes, or otherwise disseminates information to learners. Information sources include the teacher, textbooks, Internet sites, audio, video, or other students. Presentations can be highly interactive, involving questions and comments among the teachers and learners as a whole class or in small groups. Technology can play a major role during a presentation, such as including a live Internet broadcast from the Orion Space Capsule, a podcast of an author reading her poetry, or a concept map of bird migration that students build on an interactive whiteboard. However, classroom presentations can also involve nontechnological support strategies, such as reading a book or giving a lecture.

ADVANTAGES

- *Present once.* You only have to present the information once for all the students.
- *Note-taking strategies.* Students can use a number of different note-taking strategies to capture the information presented.
- *Information sources.* Technology and media resources can serve as quality sources for the most current information.
- *Student presentations.* Students can present information they have learned to the whole class or a small group.

LIMITATIONS

- *Difficult for some students.* Not all students respond well to a presentation format to learn information; therefore, the lesson will need to include more than one way of presenting content (e.g., reading, listening, or viewing a video).

- *Potentially boring.* Without interaction, a presentation can be very boring. It is important to include ways to keep students interactive through questions and answers, check sheets to complete, or dialog.
- *Note-taking difficulty.* Students may need to learn how to take notes to benefit from a presentation. One solution is to provide a partially completed notes sheet to assist with note-taking skills.
- *Age appropriateness.* Younger students may have difficulty sitting for lengthy presentations, so it is important to adjust presentation time based on student age and attention level.

INTEGRATION

There are a number of technology and media resources that can enhance your presentation of information. For example, you can use an interactive whiteboard to seamlessly move from a video to a spreadsheet chart to notes recorded from student comments. PowerPoint slides are another very
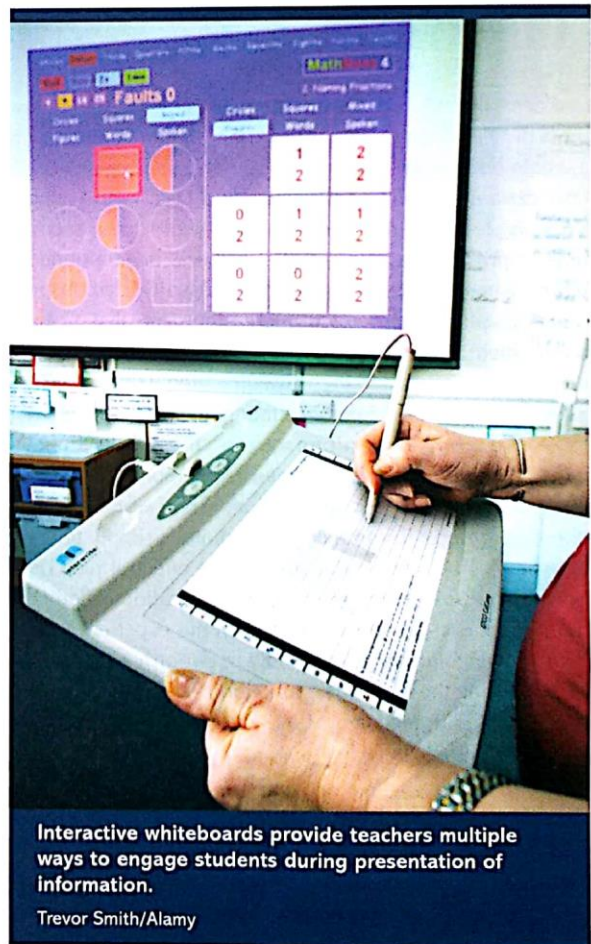
Interactive whiteboards provide teachers multiple ways to engage students during presentation of information.

Trevor Smith/Alamy

common way of presenting information that can include hyperlinks to Internet information or animated diagrams to illustrate a concept, along with summarized content and related images. Just ensure that you and your students follow copyright guidelines when adding information to presentations. Student "clickers" are technology tools that can enhance presentations by immediately displaying student responses to questions. Another way to integrate technology into a presentation is by the use of document cameras, which project printed materials and small three-dimensional objects. Examples include closely examining an old photo of a landmark, displaying a storybook as it is read, or watching the metamorphosis of a caterpillar into a butterfly.

Presentation is a core instructional strategy that has been successfully used for many generations. Today's teachers have the advantage of expanding on tried-and-true strategies by integrating technology and media to further engage students in deep-level thinking and processing to yield even higher levels of meaningful learning.

Demonstration

In a demonstration, learners view an exhibition of a skill or procedure to be learned. Demonstrations can be used with a whole class, a small group, or an individual who needs a little extra explanation on how to do a task. With younger students, teachers demonstrate basic procedures such as how to print letters, use a digital camera, or pronounce a word, whereas secondary teachers usually demonstrate more complicated processes, such as how to solve an algebra problem, read tables of historical data, create interactive websites, or understand the way something works.

The purpose of the demonstration may be for the learner to imitate a physical performance, such as using a digital wind gauge, or to adopt the attitudes exemplified by a role model, such as how to ask questions when working in cooperative groups. In some cases the point is simply to illustrate how something works, such as the effect of heat on a bimetallic strip. Just-in-time peer demonstrations often take the form of one-on-one sessions, with the experienced student showing another student how to perform a procedure, such as using the copy/paste function in a word processing program. This arrangement allows questions to be asked and answered during active learning.

ADVANTAGES

- *Seeing before doing.* Students benefit by seeing something done before having to do it themselves.

- *Task guidance.* A teacher can simultaneously guide a large group of students to complete a task.
- *Economy of supplies.* Only a limited number of supplies are necessary because not everyone will be handling all materials.
- *Safety.* As a safety feature, a demonstration allows the teacher to control the potential danger to students when using caustic materials or dangerous equipment.

LIMITATIONS

- *Not hands-on.* Students do not get direct hands-on experience unless they are following along as the teacher demonstrates steps or skills.
- *Limited view.* Every student may not have an equal view of the demonstration, thus possibly missing some aspect of the experience. A technological solution involves using a document camera to project the demonstration.
- *Nonflexible pacing.* Not all students may be able to follow the demonstration's pace of presentation. Recording the procedure on video will allow students to review the demonstration as needed.

INTEGRATION

Demonstrations can be enhanced by including technological equipment such as digital cameras. Digital video cameras can be used to record a demonstration during or before class. The recording can be viewed with the class to further examine various aspects of the demonstration or used by small groups or individuals to review the process. Students can be assigned as videographers. If more than one camera is available to record the demonstration the tapes can be merged with iMovie or MovieMaker. Creating videos is particularly effective with complex procedures or messy projects using actual objects for the demonstration.

Other types of digital equipment used during demonstrations include devices that record specific phenomena such as wind, temperature, moisture, speed, and pH, as well as magnification devices, such as digital microscopes. These devices are primarily useful in mathematics and science demonstrations in which the results are projected for whole-class or small-group viewing.

Another option involves integrating demonstrations with digital video from online sources such as YouTube. These demonstrations might include the basics of using an abacus application, how to divide integers, or how to test pond water pH. As expected, multiple examples emerge when searching for online videos, so review carefully before using them in class and remember to follow all copyright guidelines.

DRILL-AND-PRACTICE

In **drill-and-practice,** learners complete practice exercises to refresh or increase fluency in content knowledge and skills, most commonly in mathematics and language arts. Use of this strategy assumes that learners have received some instruction on the concept, principle, or procedure they are practicing. To be effective, the drill-and-practice exercises should include feedback to reinforce correct responses and to remediate errors learners might make along the way.

ADVANTAGES

- *Corrective feedback.* Students receive feedback on their responses.
- *Information chunking.* Information is presented in small chunks, allowing students to review the material in small bits.
- *Built-in practice.* Practice is built into the small chunks of information, giving immediate opportunities to try out the new knowledge in some positive way.

LIMITATIONS

- *Repetitive.* Not all students respond well to the repetitive nature of drill-and-practice. It is important to limit the time spent or number of exercises to prevent monotony.
- *Potentially boring.* Some drill-and-practice materials have too many items, which can lead to boredom. A solution is to review the content and only assign material that is relevant.
- *Nonadaptive.* If a student is making repeated errors, continued use of drill-and-practice material does not help the student learn. Keep track of student progress and use a different intervention if learning doesn't improve.

INTEGRATION

Many computer applications offer students opportunities to review information and practice their knowledge or skill while enjoying a game-like experience. Other drill-and-

Figure 4.2
The Magic School Bus

The Magic School Bus provides online drill-and-practice games for topics such as life science, archaeology, and space.

Source: From http://scholastic.com/MagicSchoolBus. Copyright © 2010 by Scholastic Inc. The Magic School Bus is a registered trademark of Scholastic Inc.

practice software titles follow more traditional approaches such as online flashcards and interactive worksheets. Digital versions of drill-and-practice are available as stand-alone software packages, like Math Blaster and Reader Rabbit, and as free interactive online programs, like the Magic School Bus series (see Figure 4.2). There are also many nondigital drill-and-practice resources with years of proven effectiveness that offer a tactile alternative to working on the computer. Most popular are items that students can use individually or in pairs, such as flashcards, word cards, and worksheets in spelling, mathematics, and language instruction.

TUTORIAL

Tutorials involve learners working with an agent—in the form of a person, computer software, or special printed materials—that presents the content, poses questions or problems, requests the learner's responses, analyzes the responses, supplies appropriate feedback, and provides practice until the learner demonstrates a predetermined level of competency. Students often work independently or

one-on-one with someone as they are provided chunks of information designed to build knowledge. Students learn through practice with feedback after each small section. The difference between a tutorial and drill-and-practice is that the tutorial introduces and teaches new material, whereas the drill-and-practice focuses on content previously taught (e.g., lecture) in another type of lesson.

ADVANTAGES

- *Independent work.* Students can work independently on new material and receive feedback about their progress.
- *Self-paced.* Students can work at their own pace, repeating information if they need to review it before moving on to the next section of the material.
- *Individualization.* Computer-based tutorials respond to students' input by directing their study to new topics when content is mastered or to remediation activities when review is needed.

LIMITATIONS

- *Potentially boring.* The repetition can become boring if the tutorial follows a single pattern that lacks variation.
- *Possibly frustrating.* Students can become frustrated if they do not seem to be making progress while working on the tutorial. Care needs to be taken to assign students to tutorials that are aligned with their ability.
- *Potential lack of guidance.* The lack of a teacher's guidance can mean that a student does not move through the material effectively. To avoid this, teachers must carefully select and provide ongoing support when tutorials are used.

INTEGRATION

Tutorial arrangements include instructor-to-learner (e.g., Socratic dialog), learner-to-learner (e.g., peer-tutoring), computer-to-learner (e.g., computer-assisted tutorial software); and print-to-learner (e.g., workbook) pairings. Tutorials are often helpful for students who have difficulty working in large-group situations or who need extra assistance as they learn new material.

As a teacher providing instructor-to-learner tutoring, you can work with an individual or small group of students, guiding them carefully at their pace through the material being presented. Learner-to-learner tutoring needs oversight from the teacher to ensure the peers have clear instructions for the one-to-one sessions. Computer-to-learner tutoring is very popular in PK–12 classrooms due to the immediate,

individualized feedback such programs can provide in a patient and consistent manner. For example, **integrated learning systems (ILS),** such as SuccessMaker, NovaNet, and Plato Learning, offer computer/Internet-based instruction. A student is required to follow a **log-on** procedure, entering a specific name and password, to begin a new tutoring session or continue with a previously started session. Student progression through the tutorial is based on mastery of content. Because ILS systems can be expensive, they are typically purchased at the district rather than the school level.

Your **school media center,** a central location in the school setting, is an excellent source of tutorials. Most centers have a wide variety of tutorial formats, including computer software, audio recordings, and print that you can check out to use with students.

DISCUSSION

As a strategy, **discussion** involves the exchange of ideas and opinions among students or among students and the teacher. Available at any time during instruction in small or large groups, it is a useful way of assessing the knowledge, skills, and attitudes of a group of students before determining instructional objectives, particularly when introducing a new topic or at the beginning of the school year when the teacher is less familiar with the students. Discussion can help teachers establish the kind of rapport within the group that fosters collaborative and cooperative learning.

Discussions can be an effective way to introduce a new topic or to delve more deeply into foundational concepts. Teachers can lead discussions by introducing questions to elicit student responses or assign discussion topics to student groups. Be sure to focus questions on what you wish to have students learn. Also, use higher-level questions involving "What if . . ." and "How would . . ." statements to give students the opportunity to think about the topic or issue (Marzano, Pickering, & Pollock, 2001). When asking higher-level questions, provide ample "wait-time" for students to generate responses.

ADVANTAGES

- *Interesting.* Often more interesting for students than sitting and listening to someone tell them facts.
- *Challenging.* Can challenge students to think about the topic and apply what they already know.
- *Inclusive.* Provides opportunity for all students to speak, rather than only a few answering teacher questions.
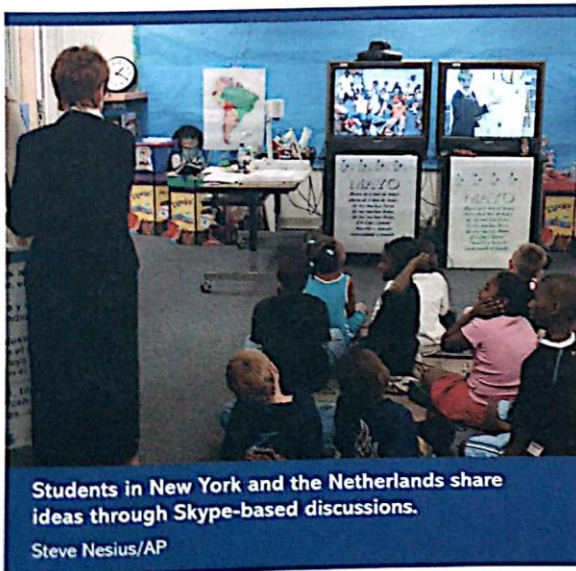
- *Opportunity for new ideas.* Can be a way to bring in new ideas to the information presentation.

LIMITATIONS

- *Potential for limited participation.* Not all students participate, making it important for the teacher to be certain that everyone has a chance to talk.
- *Sometimes unchallenging.* Sometimes students don't learn beyond what they already know and are not challenged to extend their knowledge.
- *Difficulty level.* Some questions asked to elicit a discussion may be too difficult for students to consider based on their level of knowledge.
- *Age appropriateness.* May not be an effective strategy to use with younger students without teacher direction.

INTEGRATION

Technology-supported discussions are becoming more popular in today's classrooms as a method to extend the conversation beyond the classroom. Video-conferencing with software such as Skype allows students from two or more locations to see and hear each other during discussions. Students can also engage in online discussions that may allow others beyond the classroom to join in at certain times. Technology and media can also be used to support an in-class discussion. For example, concept-mapping software can help record key ideas and issues raised during the conversation to guide further input and archive the session.

Many software programs lend themselves to collaboration among students.
Peter Skinner/Photo Researchers

Students in New York and the Netherlands share ideas through Skype-based discussions.
Steve Nesius/AP

COOPERATIVE LEARNING

Cooperative learning is a grouping strategy in which students work together to assist each other's learning. Research has long supported the claim that students learn from each other when they work on projects as a team (Johnson & Johnson, 1999; Slavin, 1989–1990). Two or three students at a computer terminal learn more as they work through the assigned problem together than would the students working individually.

Johnson and Johnson (1999) suggest the following conditions need to be present for successful cooperative learning groups:

- Members who view their role as part of a whole team
- Interactive engagement among the members of the group
- Both individual and group accountability
- Interpersonal and leadership skills
- The ability to reflect on personal learning and group function

You can create formal cooperative groups designed to ensure that specific learning outcomes will be accomplished (Marzano, Pickering, & Pollock, 2001). As a teacher you may wish to assign specific roles to each member of the group, such as secretary, time keeper, task director, and so on.

Cooperative learning experiences can be informal as well. Students may determine their own learning needs and work with others to enhance their learning experiences. Informal groups will need to be monitored to ensure that all students in the group benefit from the interactions.

Many educators have criticized the competitive atmosphere that dominates many classrooms and interferes with students' learning from each other. To instead allow students to gain knowledge from each other, teachers engage them in cooperative learning situations, which have the additional benefit of equipping students with the skills required for success in the 21st century world of work.

ADVANTAGES

- *Learning benefits.* Mixing the ability levels of students within a group leads to learning benefits for all.
- *Formal or informal.* Groups can be informal or formal based on the learning requirements.
- *Learning opportunity.* Long-term groups can be developed, creating multiple learning opportunities.
- *Content areas.* Cooperative learning can be used with all content areas.

LIMITATIONS

- *Size limitation.* Groups need to be kept small (three to five students) to ensure equal participation.
- *Potential overuse.* If the strategy is overused, it can lose its effectiveness. Choose cooperative learning when student learning will be enhanced from discussion and sharing ideas.
- *Group member limitation.* Grouping members of the same ability level does not enhance learning opportunities for all students. Form groups carefully to ensure that multiple levels of ability are represented.

INTEGRATION

Students can learn cooperatively not only by discussing text material and viewing media but also by producing media. For example, students can design and produce a podcast, video, or PowerPoint presentation. The teacher should be a working partner with the students in such learning situations.

If your classroom has a single computer, it is possible to establish cooperative groups to allow all students access. A team of students can easily use programs like World Hunger—Food Force (see Figure 4.3). Such software programs can accommodate cooperative grouping because of the **collaborative** or sharing nature of the experience.

You can have groups prepare presentations on topics for the rest of the class. Thus, each group becomes an expert on a portion of the total content. Preparing presentations

Figure 4.3
Food Force
World Hunger Food Force is presented by the United Nations World Food Programme (WFP) to help children learn about the fight against world hunger.
Source: www.supersmartgames.com/Big_Kids/Social_Studies/World_Hunger-Food_Force. Reprinted by permission

requires students to achieve a higher level of mastery than can be derived from studying (see Taking a Look at Technology Integration: Westward Movement).

GAMES

Educational gaming provides a competitive environment in which learners follow prescribed rules as they strive to attain a challenging goal. Involving from one to several learners, games are highly motivating, especially for tedious and repetitive content. Games often require learners to use **problem-solving skills** in figuring out solutions or to demon-

Students take turns playing a computer game.
Valerie Schultz/Merrill

Westward Movement

Connie Courbat, a third-grade teacher, was aware of the various ability levels of her students and wanted them all to have a positive experience studying the westward movement of the 1800s. The lesson objectives were focused on helping students gain a better understanding of the impact of historical events on lifestyle choices. She introduced the topic by forming cooperative groups who used the Oregon Trail software on the one computer in her classroom to experience the adventures of a pioneer traveling the Oregon Trail. She grouped the students to ensure that all ability levels were represented within each group, thus allowing all students to benefit from the experience. Ms. Courbat was careful to establish roles for each member of the group, such as team leader, recorder, and materials manager. She moved among the groups as they worked together, helping them to address questions and ensuring that they were accomplishing the tasks. Each group gave a presentation of their travels westward, explaining their successes and failures in achieving the goal of reaching Oregon.

Corbis RF

strate mastery of specific content demanding a high degree of accuracy and efficiency.

By playing games, students begin to recognize patterns found in particular situations (Moursund, 2006). For example, young children playing a game of concentration will learn to match patterns and increase their memory recall. Older students can learn French, German, Italian, or Spanish with Leonardo's Language Bridge game, in which students are taken on a fun adventure requiring use of the new language to build virtual bridges over a variety of obstacles.

Challenging and fun to play, computer and traditional games add variety to learning experiences and offer opportunities to practice skills. Students like to play games and benefit by extending their learning experiences into challenging environments.

ADVANTAGES

- *Engaging.* Students are quickly engaged in learning through games.
- *Match to outcomes.* They can be adapted to match learning outcomes.
- *Variety of settings.* They can be used in a variety of classroom settings, from whole-class to individual activities.
- *Gain attention.* Most games are colorful, interactive, and competitive, helping to gain student attention for learning specific topics or skills.

LIMITATIONS

- *Competition concerns.* Because of the orientation to winning, games can become too competitive unless caution is used.
- *Levels of difficulty.* Less able students may find the game structure too fast or difficult. Provide alternate games to match student ability.
- *Expense.* Games such as computer games can be expensive to purchase. Often a similar game is available for free on the Web.
- *Misdirection of intention.* The learning outcomes may be lost because of the interest in winning rather than learning. Make sure to clearly state learning objectives before students use games.

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INTEGRATION

The variety of games used for educational purposes includes digital or paper-based crossword puzzles, Suduko, jigsaw puzzles, and logic puzzles—sometimes called brainteasers. Puzzles can be used to practice information such as spelling words or state capitals, to build problem-solving and logic skills with Suduko puzzles, or to strengthen thinking skills with jigsaw puzzles.

One common type of instructional game involves learning about business. In PK–8 classrooms, students practice buying and selling products in a store. At middle school and high school levels, students may prepare a product, which they then market and sell to demonstrate their understanding of the world of business, as in the computer game Hot Dog Stand: The Works. The team with the highest corporate profits is the winner.

The Web offers a multitude of free games for students of all ages across core content areas from highly reputable sources. Example providers include NASA's Space Place (see Figure 4.4), Smithsonian Education, The Environmental Protection Agency's Environmental Kids Club Game Room, and PBS Kids Go! from the Public Broadcasting Service. Teachers should carefully review games prior to use to ensure that the activity supports achievement of the stated standards and objectives. Also note that students should only complete the game activities that are directly associated with the lesson.

SIMULATIONS

Simulation allows learners to confront a scaled-down version of a real-life situation. It permits realistic practice without the expense or risks otherwise involved. With the advent of newer technology, 3D simulations are readily available on the Web or as educational software. Simulation may also involve participant dialog and manipulation of materials and equipment.

Simulations can be used as whole-class or small-group activities, offering experiences that might not otherwise be possible in the real world. For example, students can learn about the various aspects of voting by engaging in a class election process. They can create campaign information, determine voter registration guidelines, set up voting booths, and elect a counting commission to record and report the results.

Beyond role playing, simulations can represent situations that may be too large or too complex to bring into the classroom. For example, in a science lesson about internal combustion, a teacher can use two types of simulation resources. For direct hands-on experience, she can use a small color-coded automobile engine model that students can manipulate to learn about internal combustion. Then the students can watch a 3D simulation of an engine, such as the 4-Stroke Engine Simulator, to see it in action (see Figure 4.5). By using the model engine and viewing the 3D simulation, the students are able to get the inside look they need to help them understand the concepts being presented while being protected from the hazards of operating a real engine.

Online simulations such as The Whole Frog Project (and other suggested websites in MyEducationKit) provide another type of simulated learning experience. The Whole Frog Project engages high school students in a complex study of frogs using technology such as MRI imaging to reveal digital images of internal organs they would not have access to in their classroom, allowing them to gather information about the frog's circulatory, digestive, and muscular systems.
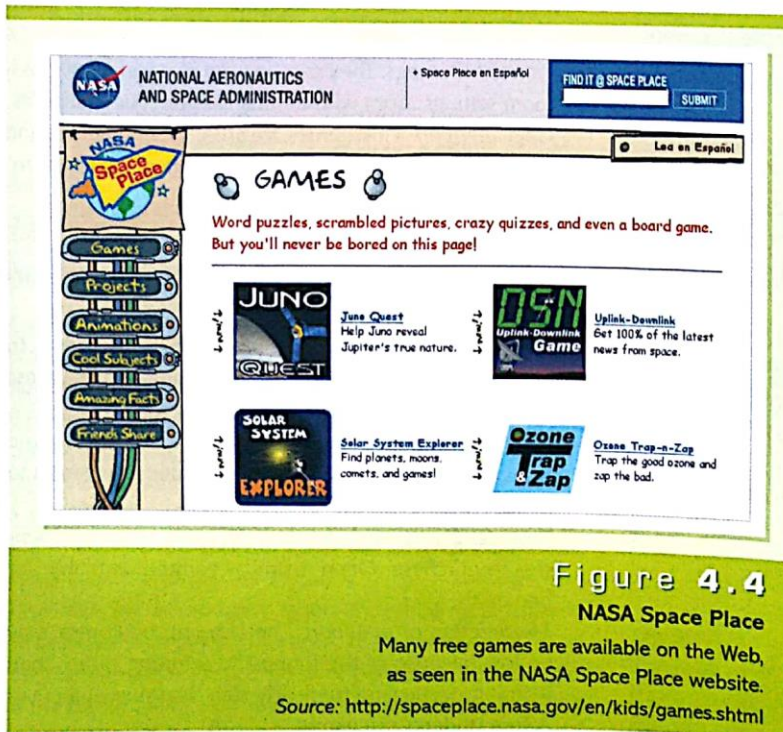

Figure 4.4
NASA Space Place

Many free games are available on the Web, as seen in the NASA Space Place website.

Source: http://spaceplace.nasa.gov/en/kids/games.shtml

Role playing is an effective strategy for engaging students in learning.

Bill Bachmann/Photo Researchers

ADVANTAGES

- *Safety.* Provides a safe way to engage in a learning experience.
- *Recreate history.* May be the only way to engage in the situation (e.g., role-playing ancient Roman history).
- *Hands-on.* Offers opportunities for hands-on experience.
- *Variety of ability levels.* Students of all ability levels can be included in the experience.

LIMITATIONS

- *Questionable representation.* May not be truly representative of the actual event when the simulation is

an artist's rendering rather than video or photos of an event.
- *Complexity.* May become too complex or intense for the classroom setting. Review all simulations before use and only integrate relevant sections.
- *Time factor.* May require too much time to complete. Search for a model that demonstrates the concepts in a shorter time frame.

INTEGRATION

Interpersonal skills and laboratory experiments in the physical sciences are popular subjects for simulations. In some simulations learners manipulate mathematical models to determine the effect of changing certain variables, such as controlling the speed of a skier by changing the degree of incline.

Role playing is another common form of simulation. Software such as Tom Snyder's Decisions, Decisions provides roles for each member of a group, a real-life situation that needs to be resolved, and information to help members as they move along in the process. Decisions, Decisions sample topics include Ancient Empires, The Constitution, Violence in Media, and The Cold War. This software has the additional benefit of requiring only one computer in the classroom for use with a whole class.

DISCOVERY

The **discovery** strategy uses an inductive, or inquiry, approach to learning that fosters a deeper understanding of the content through the learner's involvement with it. A common approach to discovery is the "scientific method," which involves creating a hypothesis or question, trying out a possible solution, and analyzing the information learned to determine whether the approach worked. Various software applications (e.g., spreadsheets, databases, and concept-mapping applications) and digital devices (e.g., science probes and microscopes), assist students in organizing, analyzing, and reporting data and information needed to discover the answer to a question.
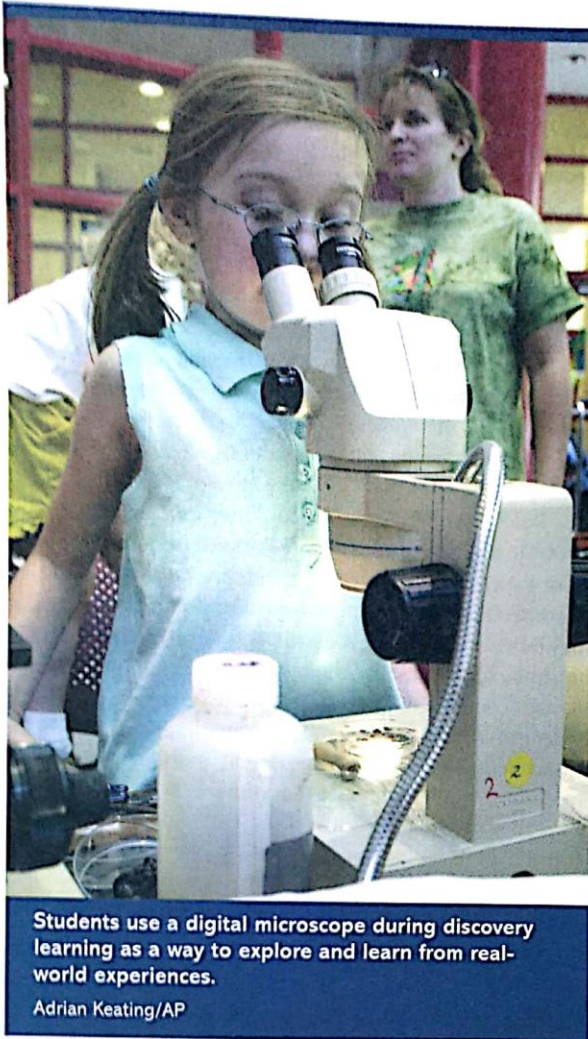
When using the ASSURE model or other lesson plans to design discovery lessons, ensure that the selected strategies include sufficient guidance and support when students are utilizing technology, media, and materials to solve

Figure 4.5

Screenshots from the Forge FX Animated 3D Simulation of an Engine

Source: Developed by ForgeFX for Pearson Prentice Hall. www.forgefx.com

Students use a digital microscope during discovery learning as a way to explore and learn from real-world experiences.

Adrian Keating/AP

LIMITATIONS

- *Time factor.* Time-consuming for design and implementation. An option is to adapt web-based discovery lessons.
- *Preparation is critical.* Requires teachers to think through all the possible issues that students might encounter. This becomes easier with practice.
- *Misunderstanding.* Can lead to misunderstandings about a content area. Make sure to debrief students after a lesson.

INTEGRATION

There are a variety of ways that instructional technology and media can help promote discovery or inquiry. For instance, students can set up a digital camera to take time-lapse photos of a plant during the day to discover that plants follow the sun or they can examine a series of GPS images of the same location on a river to discover how landscapes change over time. Students can use word processing tools to discover the reading level of well-known documents, such as the Bill of Rights and Preamble to the Constitution, or to compare excerpts from classic books to discover whether fiction is easier to read than historical biographies.

Digital video may be used for discovery teaching in the sciences by allowing the teacher to stop, enlarge, or slow down naturally occurring events to allow the development of curiosity and student questions. You will guide them by asking questions or having the students tell you what they have "discovered" or learned.

PROBLEM-BASED LEARNING

Lifelike problems can provide the starting point for learning. In the process of grappling with real-world challenges, students acquire the knowledge and skills needed for success in the 21st century. Through the use of **problem-based learning** students actively seek solutions to structured or ill-structured problems situated in the real world.

Structured problems present students with a clear sense of what might constitute an appropriate response. For example, math word problems are often structured applications of math computation skills students already possess. On the other hand, ill-structured problems can be solved in more than one way. For example, if students are asked to propose solutions to increase student participation in school recycling, multiple responses will be submitted. Because there is more than one correct way to solve the problem, tools such as rubrics will be needed to assess whether students have attained the stated objectives. See the accompanying box on the Ebola Problem

the problem. This will involve a carefully planned **scaffold** approach, building on prior knowledge as students progress through the learning experience. For instance, you will need to consider what supports will be needed if students fail to complete a step along the way as they move through the experience.

ADVANTAGES

- *Engaging.* Very engaging for students at all levels of learning.
- *Repeated steps.* Can use procedures or steps that have been taught previously.
- *Student control of learning.* Allows students the feeling of control over their own learning.

The Ebola Problem

Some high school students walked into class recently and found this memo on their desks: You are a United Nations doctor stationed in Brazzaville, Congo. When you arrived at your office this morning a message marked "Urgent" was on your desk from a tribal chieftain in a village 100 miles west of your clinic.

The message read: "Come quickly! This village has been stricken with something no one has seen before. Twenty villagers have terrible fevers, diarrhea, and have become demented. Four have already died a terrible death. The other sixteen sick people have been placed in a hut where we will keep them until you get here. Please help!"

After forming hypotheses about the possible illness and designing a data-gathering plan, students used their handheld PDAs to create an initial spreadsheet with the known data. Next, the students left their classroom and walked to a darkened room, the village hut, where they found 14 paper cutouts of people on the floor. (Yes, the discrepancy in numbers was the first problem to solve. An additional death had occurred and another person had left the hut to rejoin the general population.) On each cutout was a card that listed that person's symptoms, which were entered into the spreadsheet. With help from online medical diagnosis sites, such as virtualmedicalcentre.com, the students examined the spreadsheet information to determine what the villagers might be facing and how far the outbreak had progressed. The class reached a consensus that the village was facing an outbreak of Ebola and a case of malaria that had been mistakenly grouped with the other sick villagers. The students then developed a word-processed proposal of next steps to treat the afflicted and to prevent the outbreak from spreading.

Source: Stepien, W. J. (1999). Consortium for Problem-Based Learning, Northern Illinois University. Retrieved from http://ed.fnal.gov/trc_new/tutorial.

San Diego Union Tribune/Zuma/Newscom

for an excellent example of problem-based learning in which technology is used to reach a solution.

Jonassen, Howland, Marra and Crismond (2008) suggest that technology becomes an "intellectual partner" with students by engaging and supporting them during problem-based learning. The technology provides the environment and tools students use to access, manipulate, and display information. The processes require students to use cognitive learning strategies and critical-thinking skills.

ADVANTAGES

- *Engaging.* Students are actively engaged in real-world learning experiences.
- *Context for learning.* The relationship between knowledge and skill becomes apparent as students work toward a problem solution.
- *Levels of complexity.* Introducing additional problem issues over time can control the level of problem complexity.

LIMITATIONS

- *Difficult to create.* Creating quality problems for learning can be difficult. It can help to develop problem-based lessons with other teachers and use web resources.
- *Age appropriateness.* Age and experience levels of students may require more control by the teacher.
- *Time-consuming.* Creating and using problem solving lessons can be very time-consuming. Use the ASSURE evaluation step to refine and reuse lessons.

INTEGRATION

Many computer applications are available to support problem-based learning. Software packages like The Factory Deluxe provide specific pattern design problems that start out being relatively easy but gain complexity as students progress. Cognitive mapping software such as Inspiration provides tools to graphically represent information, with links between concepts to depict relationships needed

Figure **4.6**

Example of a WebQuest

This award-wining WebQuest uses The Samurai's Tale as the foundation for a problem-solving lesson.

Source: http://edtech.suhsd.k12.ca.us/inprogress/act/dfickett/japan/samuraistale.htm. Reprinted by permission of Dan Fickett.

to solve problems. Database software such as Access permits students to develop and explore data sets for answers. For example, students could create a database of U.S. presidents to provide information for the following problem statement: "What are the most common traits of U.S. presidents?"
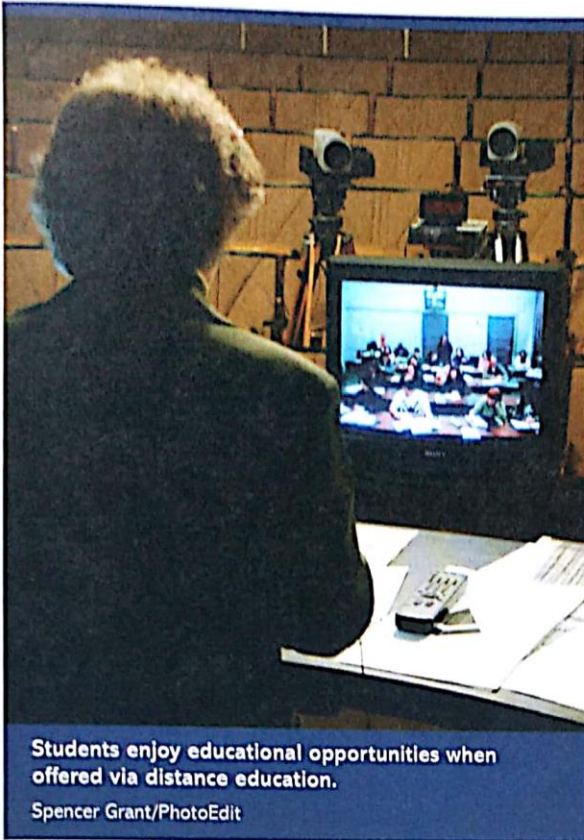
WebQuests are structured problems that include specific steps for students to follow, identified online resources, and instructions for students to prepare a report or presentation on their solution. Numerous teacher-developed WebQuests are available on the Web, as is software for teachers who want to create their own WebQuests. Figure 4.6 presents the opening screen to The Samurai's Tale WebQuest, a problem-based lesson for high school history students.

ASSURE Case Study Reflection

Review the ASSURE Classroom Case Study and video at the beginning of the chapter. What learning strategy could Ms. Kaiser and Ms. Marshall integrate into a social studies lesson that would achieve the goal of increasing student interest in U.S. history while being exciting and fun? How could this strategy assist in achieving this goal?

LEARNING CONTEXT

There are a variety of learning strategies that address different learning contexts. 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 (structured), and (5) informal study (nonstructured).

FACE-TO-FACE CLASSROOM 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, including those just covered, seem unlimited. Many of the types of technology and media are easily used in the face-to-face classroom setting. For example, teachers can use student clickers to collect student opinions during lectures or use interactive whiteboards to show videos of historical events, play podcasts of mathematicians explaining how to solve a problem, or conduct live interviews with archaeologists in Egypt.

DISTANCE LEARNING

Although distance learning has been around for over 100 years, starting with correspondence study using the post office to exchange materials and assignments, recent technology innovations have made it more convenient and dynamic. Students can be in one location while other members of the class and the teacher can be at other locations. If you are invited to teach at a distance, you will need to think about the classroom as if it were divided into many little parts. When you think of it this way, you can begin to consider ways to teach in such a setting. Your students will not be in the classroom with you and may be unable to hear or see you. The instructional choices you make will depend on the technology resources available for getting materials to and from your students efficiently and effectively.

Students enjoy educational opportunities when offered via distance education.
Spencer Grant/PhotoEdit

BLENDED INSTRUCTION

As it sounds, **blended instruction** is a mix of synchronous settings (e.g., face-to-face or real-time video/television) and **asynchronous settings,** in which the teacher and students are not together at the same time. For example, high school students enrolled in a blended instruction Algebra 1 course might meet in a face-to-face classroom on Mondays and Wednesdays every other week. When not meeting in class, students use online courseware to work on assignments at times convenient for them. Students follow a schedule of due dates for uploading completed student products.

INDEPENDENT STUDY— STRUCTURED

Structured independent study is based on the idea that students can learn information and acquire skills without the teacher's direct instruction. However, you will have to prepare the independent study context, using materials you have selected or developed yourself. The Web provides unlimited access to current and archived information that extends content covered in the text. Students will be able

to work at their own pace and come to class ready to apply the knowledge.

Independent study can also occur during class through the use of learning centers. You can use a variety of technology, media, and materials, such as web resources, text, audio, video, and computer software. Or you can develop remedial materials for students who are having difficulty with the topic being taught in class.

INFORMAL STUDY— NONSTRUCTURED

Students today have many opportunities to learn from their experiences outside of the classroom. You can prepare your students to successfully engage in informal study through the application of information and communication technology (ICT) literacy skills during class activities. At the same time you can use techniques to help instil in them a love for learning and demonstrate through your own enthusiasm how to be a lifelong learner.

The nature of the study is what makes it informal. Many students seek information on the Internet and challenge themselves to learn about topics that might not be part of their in-class study. For example, student self-study may involve online discussions on how to "go green," search for information about the history of pandas after visiting the zoo, or examination of sites about earthquakes to discover why they occur. Another example of informal learning occurs when students watch television shows on the History Channel, the National Geographic Channel, or Public Broadcasting System. These experiences increase general knowledge without your directed instruction.
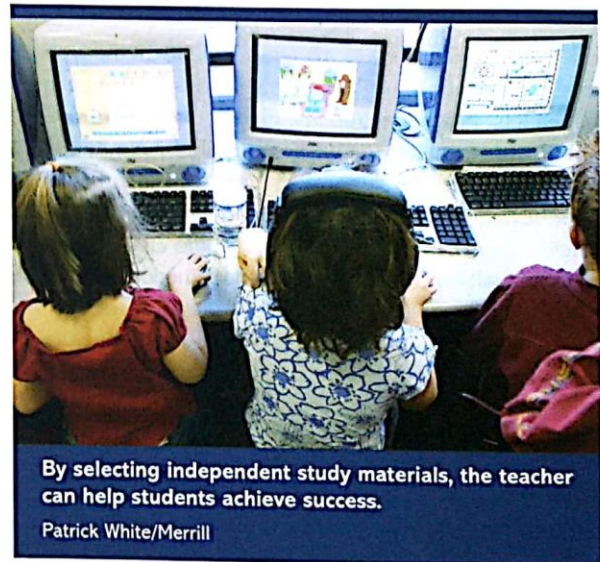
By selecting independent study materials, the teacher can help students achieve success.
Patrick White/Merrill

Achieving 21st Century Learning Environments

Review the ASSURE Classroom Case Study and video at the beginning of the chapter. What learning contexts would best support the learning experiences Ms. Kaiser and Ms. Marshall would like to integrate into their social studies lesson? Why do you consider these learning contexts as the most appropriate choices?

INTEGRATING FREE AND INEXPENSIVE MATERIALS

With the ever-increasing costs of instructional materials, teachers should be aware of the variety of materials they may obtain for classroom use at little or no cost. The types of free and inexpensive materials available online are almost endless. Of key importance to schools with limited technology budgets are **open source** websites that offer free productivity suites (e.g., word processing, spreadsheets, presentation software) similar to Microsoft Office and Apple iWork. Among the most popular are Google Docs and Oracle's OpenOffice.

Additionally, by connecting to websites around the world, teachers and students can acquire digital video, audio, photos, and materials. The Web also offers free collaboration tools to facilitate cooperative learning and connections with classrooms around the globe. Many teachers post lesson ideas, media, and materials for an array of subjects on the Web.

Free and inexpensive materials include all the types of media. Commonly available items include posters, games, pamphlets, brochures, reports, charts, maps, books, CDs, audio, video, multimedia kits, and real objects. The more costly items are usually sent only on a free-loan basis and must be returned to the supplier after use. In some instances, single copies of computer software, audio and video files, or DVDs will be donated to your school media center to be shared among many users.

ADVANTAGES

- *Up to date.* Free and inexpensive materials from online resources can provide current information not found in textbooks or other media.

- *In-depth treatment.* Subject-specific materials typically provide in-depth information on a topic (travel brochures).
- *Variety of uses.* Students can access open source applications outside of school. Audiovisual materials can be used for self-study or for presentation to the class. Posters, charts, and maps can be combined to create topical displays.
- *Student manipulation.* Materials that are expendable have the extra advantage of allowing learners to get actively involved with them. They can also scan printed information and visuals to import into digital products.

LIMITATIONS

- *Bias or advertising.* Many free and inexpensive materials are produced and distributed by particular organizations. These organizations, whether private corporations, nonprofit associations, or government agencies, often have a message to convey. Carefully preview materials to ensure they are appropriate for classroom use.
- *Promotion of special interests.* Some materials do not contain advertising but do promote a special interest in a less obvious way. Soliciting materials on a topic from a variety of sources can help provide different points of view.
- *Limited quantities.* With the increasing expense of producing and shipping printed materials, your supplier may limit the quantities available at one time. You may not be able to obtain a copy for every student in the class.

SOURCES FOR FREE AND INEXPENSIVE MATERIALS

There are local, state, national, and international sources for free and inexpensive materials, and many of these are now available online. Table 4.1 lists many popular sources of free educational materials.

OBTAINING FREE AND INEXPENSIVE MATERIALS

As seen in the list of sources, most classroom materials are available in a format that can easily be downloaded from the provider's website. For those resources that are not available online, you can submit your request via email, phone, fax, or mail. Some agencies may require the request to be submitted

Table 4.1 Sources of Free and Inexpensive Materials

Source	Types/Topics of Materials
Business organizations and chambers of commerce	Guest speakers and materials on entrepreneurship, investing, budgeting, and so on
Community organizations	Brochures on special interest topics (American Red Cross, the League of Women Voters, etc.)
Federal publications	Posters, charts, brochures, and books (see Figure 4.7) from the U.S. Government Printing Office (www.gpoaccess.gov) and the National Technical Information Services (www.ntis.gov)
Foreign governments	Posters, maps, travel booklets, and videos on a free-loan basis
Government agencies	Classroom materials on topics related to each service—Cooperative Extension Services (e.g., agriculture, animals, biotechnology, environment, technology); Department of Public Health (speakers, reports, brochures on health issues, public readiness for emergencies), and National Park Service (speakers, field trip planning, videos to loan, etc.)
Medical societies	Health resources such as booklets or guest speaker podcasts and information from the National Medical Association, including Tox Town audio, video, brochures, handouts, slide shows, and clip art (see Figure 4.8)
Museums	PDF copies of booklets on culture, art, how to visit a museum, lesson plans—Smithsonian, Natural History Museum, National Gallery of Art (Teaching Packets with image CDs, DVDs, videos, online interactive materials, etc.)
News broadcasters	Interview videos/audio podcasts, articles
Police and fire departments	Safety presentations and materials
Public broadcasting	Handouts, online activities, videos/audio on history, social studies, health, environment, and so on
Public libraries	Videos, prints, software, books, speakers
Utility companies	Classroom materials to teach energy conservation, going green, and safety
Weather stations	Guest speakers and materials on severe weather, the difference between climate and weather, and so on

on school letterhead and signed by your principal, such as scheduling a police officer for a guest presentation. Any student requests should include your endorsement. When ordering hard copies of materials, please ask for a preview copy before requesting multiple copies, and when possible, share the resources with other teachers. When obtaining online resources from sites with feedback options, respond with descriptions of how the materials were used along with student reactions. Be courteous, but be honest! Many suppliers attempt to improve free and inexpensive materials on the basis of user comments. When online feedback isn't possible, send a thank you note.

EVALUATING FREE AND INEXPENSIVE MATERIALS

As with any other types of material, evaluate the educational value of free and inexpensive materials critically. Some are very slick (technically well presented) but not educationally sound. Use the appropriate Selection Rubric for the type of media (web resources, videotape, etc.) you are evaluating. All the Selection Rubrics in this book have the rating criterion "Bias Free." Use it judiciously when reviewing free and inexpensive materials. To select among Selection Rubrics, view the list in MyEducationKit.

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Figure 4.7

Government Printing Office

Numerous resources are available from the Government Printing Office

Source: www.gpoaccess.gov

Figure 4.8

Tox Town

The National Library of Medicine's Tox Town provides an interactive experience to learn about toxic chemicals and environmental health risks as well as a suite of teacher resources (audio, video, brochures, handouts, slide shows, clip art, etc).

Source: http://toxtown.nlm .nih.gov/index.php

INTERACTIVE MULTI-TOUCH DESKS

Classrooms of the future will no longer have desks and separate laptops. Interactive multi-touch desks resemble the navigational interface used in the TV series "Star Trek." The screen serves as an individual workspace, an interactive whiteboard, and a collaboration tool for several students. Students use fingers or pens to interact with the desk and can define their own space with an icon or avatar. The desks are connected through a fully interactive classroom system, which is monitored with a teacher's console that can also be used to view student work on every screen or display example work.

Interactive Multi-Touch Desks, developed by SynergyNet, provide an intuitive interface accessed with fingers or pens.
Courtesy of Durham University

SUMMARY

In this chapter we explored the differences between teacher-centered and student-centered instruction and discussed in detail ten commonly used instructional strategies. We included advantages and disadvantages of each and provided multiple examples for integrating the strategies into your classroom. We also emphasized how to include specific technology, media, and materials to enhance student learning. We examined five contexts for learning commonly found in PK–12 education: face-to-face classroom instruction, distance learning, blended instruction, independent study (structured), and informal study (nonstructured). The chapter ended with a discussion of the types and sources of free and expensive materials.

PEARSON
myeducationkit

To check your comprehension of the content covered in Chapter 4, go to the **MyEducationKit** for your book, and complete the Study Plan for Chapter 4. Here you will be able to take a chapter quiz, receive feedback on your answers, and then access resources that will enhance your understanding of the chapter content.

ASSURE Lesson Plan

PEARSON
myeducationkit

The following ASSURE Lesson Plan provides a detailed description and analysis of the lesson in the ASSURE Classroom Case Study and video at the beginning of the chapter. To review the video again, go to the MyEducationKit for your text and click on the ASSURE Video under Chapter 4. The video explores how Ms. Lindsay Kaiser and Ms. Jena Marshall implement a Lewis and Clark lesson in which fifth-grade students complete a WebQuest and design a "Lewis and Clark" boat.

Analyze Learners

General Characteristics. Ms. Kaiser and Ms. Marshall's fifth-grade students are of mixed ethnicities and from middle-income homes. They are fairly equally distributed with regard to gender

Achieving 21st Century Learning Environments

and are all either 10 or 11 years old. All students are reading at or above grade level. Student behavior problems are minimal.

Entry Competencies. The fifth-grade students are, in general, able to do the following tasks required to complete the lesson activities:

- Conduct an Internet search
- Create and save word processing documents
- Create and save documents with publishing software (e.g., MS Publisher)
- Use graph paper to draw images to scale

Learning Styles. The fifth-grade students learn best when engaged in hands-on activities that are interesting and challenging. The students' level of interest and motivation increases when working as a team to win a competition. The students vary in the style with which they prefer to demonstrate their learning. For example, when creating the boat advertisement, some students prefer to write the content, whereas others choose to select and arrange photos and images to express their ideas.

State Standards and Objectives

Curriculum Standards. National Center for History in the Schools, United States Grades 5–12 Standards, Era 4 Expansion and Reform (1801–1861): Standard 1: United States territorial expansion between 1801 and 1861, and how it affected relations with external powers and Native Americans; Standard 1A: The student understands the international background and consequences of the Louisiana Purchase.

Technology Standards. National Educational Technology Standards for Students 3.B—Research and Information Fluency: Locate, organize, analyze, evaluate, synthesize, and ethically use information from a variety of sources and media. Reprinted with permission from *National Educational Technology Standards for Students* © 2007, ISTE (International Society for Technology in Education, www.iste.org). All rights reserved. National Center for History in the Schools, http://nchs.ucla.edu

Learning Objectives

1. Given Internet resources and drawing materials, pairs of grade 5 students will design a boat appropriate for the challenges faced by Lewis and Clark during their expedition (e.g., able to withstand rough currents while portable enough for carrying across rugged terrain).
2. Using the student-created boat design, pairs of grade 5 students will create an advertisement for their Lewis and Clark boat that clearly defines the reasons why it fulfills the requirements of suitability for the Lewis and Clark expedition.
3. Using the student-created boat design, pairs of grade 5 students will write a persuasive letter to the president of a boat manufacturing company about why their Lewis and Clark boat should be produced by the company.

Select Strategies, Technology, Media, and Materials

Select Strategies. Ms. Kaiser and Ms. Marshall select four student-centered strategies: discussion, problem solving, discovery, and cooperative learning. Examples include working in cooperative pairs to complete a WebQuest, conducting Internet searches for information on boats used by Lewis and Clark, designing the boat, creating an advertisement to sell the boat, and writing a letter to the president of a boat manufacturing company.

Select Technology and Media. This lesson involves student use of Internet-connected computers, the Lewis and Clark WebQuest, an Internet browser to locate information about boats, publishing software to create the advertisement, library resources, and word processing tools to write the letters. Students might also need access to a scanner to copy paper-based photos for their advertisements.

- *Align to standards, outcomes, objectives.* The WebQuest, Internet and library resources, and production software (publishing and word processing) provide the necessary tools for students to meet the learning objectives.
- *Accurate and current information.* Students will access multiple resources of Lewis and Clark information, which will allow the students to crosscheck content accuracy. Current information may be used for new ideas on building handmade boats with tools available at the time.
- *Age-appropriate language.* The WebQuest is written at an appropriate level for fifth-grade students. The teacher may need to assist with interpretation of some web-based resources.
- *Interest level and engagement.* The combined use of the WebQuest, the boat design, and advertisement competition will keep student interest and engagement at a high level.
- *Technical quality.* The WebQuest and production software used by the students are of high technical quality.
- *Ease of use.* The WebQuest is designed for fifth-grade students. Students can easily use word processing software; however, the publishing application may require initial training and support.
- *Bias free.* The WebQuest and production software are bias free.
- *User guide and directions.* The online help features of the WebQuest and production software are fairly easy for fifth-grade students to use. However, students most frequently will ask each other, Ms. Kaiser, or Ms. Marshall for assistance with technical difficulties.

Select Materials. Ms. Kaiser and Ms. Marshall selected the WebQuest on Lewis and Clark because it provides information needed for students to achieve the learning objectives. They met with the media specialist to create a special collection of relevant resources and preselected example websites that provide grade-appropriate Lewis and Clark information.

U tilize Technology, Media, and Materials

Preview the Technology, Media, and Materials. Ms. Kaiser and Ms. Marshall preview the WebQuest and an online bookmarking site to list relevant Internet resources.

Prepare the Technology, Media, and Materials. Ms. Kaiser and Ms. Marshall prepare the lesson instructions and rubrics for the boat design, letter, and advertisement. They add the WebQuest link and Internet resources links to Lewis and Clark information on the class webpage.

Prepare the Environment. Ms. Kaiser and Ms. Marshall check the classroom laptops to ensure the Internet connections are functional and that the publisher software is loaded on all machines. They retrieve the library cart with Lewis and Clark material and set out all instruction sheets and rubrics for the lesson.

Prepare the Learners. Ms. Kaiser and Ms. Marshall provide a brief overview of U.S. history studied up to the 1800s to provide a context for learning about the Lewis and Clark expedition. They also ask students to share personal boating experiences and projects in which they designed or built a model.

Provide the Learning Experience. Ms. Kaiser and Ms. Marshall begin the class by presenting a brief introduction to Lewis and Clark and the historical background of the time. They then present the boat competition challenge and explain how the lesson activities are structured.

R equire Learner Participation

Student Practice Activities. The students in Ms. Kaiser and Ms. Marshall's class use computers, the Internet, and word processing and publishing software to complete their work assignments. Each student individually completes the Lewis and Clark WebQuest. Students then join their partners and conduct research using the Internet and resources from the library cart. The goal is to locate additional information about the Lewis and Clark boats and boat construction. This research allows

students to crosscheck information learned in the WebQuest. The students use the information to design their boat, create the advertisement, and write their letter. All the activities provide opportunities for the students to engage in practice and relearning of Lewis and Clark information.

Feedback. Ms. Kaiser and Ms. Marshall provide ongoing feedback to students as they conduct Internet and library information searches, draft beginning boat designs, and write the first drafts of their letters to the boat manufacturer. Student use the rubrics (see next section) for these three products to check progress and focus of the work.

E valuate and Revise

Assessment of Learner Achievement. Ms. Kaiser and Ms. Marshall use the rubrics to assess each team's final boat design, advertisement, and letter. The rubrics assess demonstration of content knowledge, as seen in the students' advertisements and letters and in their technology skills. Ms. Kaiser and Ms. Marshall assess these skills by evaluating the final student advertisements and letters according to the assignment criteria.

Evaluation of Strategies, Technology, and Media. Ms. Kaiser and Ms. Marshall evaluate the strategies, technology, and media. Evaluation of the lesson strategies involves reviewing the students' final products to determine the degree to which students have met the learning objectives. They also engage in continuous communication with the students to learn what is working and identify areas of needed improvement. Ms. Kaiser and Ms. Marshall regularly communicate with the school's technology support staff regarding technology upkeep and problems.

Revision. Ms. Kaiser and Ms. Marshall review the information collected from evaluation of the lesson strategies, technology, and media. The evaluation shows that the Lewis and Clark WebQuest was an excellent source of information to guide the remaining boat design activities. However, students struggled with writing the persuasive letter. Ms. Kaiser and Ms. Marshall revised the lesson to include a review and practice for writing persuasive letters.

C ONTINUING MY PROFESSIONAL DEVELOPMENT

Demonstrating Professional Knowledge

1. Differentiate between teacher-centered and student-centered learning strategies.
2. Compare and contrast the advantages and limitations of ten types of learning strategies.
3. Describe how to select technology and media that facilitates learning experiences.
4. Discuss the types of learning environments and settings you might encounter in PK–12 schools.
5. List the advantages and limitations of integrating free and inexpensive materials into instruction.

Demonstrating Professional Skills

1. Develop a table that lists the ten types of instructional strategies in the first column. In the second column write a brief description of how you could use each strategy in an ASSURE lesson. (ISTE NETS-T 2.A & 2.B)
2. Using the table developed for Item 1, add a third column to the table that describes how technology can be used to support each of the ten learning experiences. (ISTE NETS-T 2.A & 2.B)
3. Design an ASSURE lesson for one of the learning contexts and settings. (ISTE NETS-T 2.A & 2.B)
4. Using the district or state curriculum guide from the grade level and subject area that you teach or plan to teach, create an annotated list of free and inexpensive resources you could integrate into your teaching and describe how you could use the resources. (ISTE NETS-T 5.C)

Achieving 21st Century Learning Environments

- *Creating My Lesson.* Using the ASSURE model, design a lesson for one of the case studies presented in the Case Study Chart in the Lesson Scenario Chart appendix or use a scenario of your own design. Incorporate into your lesson one or more of the instructional strategies and technology and media ideas described in this chapter. Choose a learning context appropriate for your lesson. Carefully describe the audience, the objectives, and all other elements of the ASSURE model. Be certain to match your intended outcomes to state or national curriculum and technology standards for your content area.
- *Enhancing My Lesson.* Using the lesson you created in the previous activity, consider how to meet the needs of students with varying abilities. What adaptations are needed to keep advanced learners actively engaged while helping students who struggle with reading? What changes are needed to ensure that students transfer knowledge and skills to other learning situations? You might look for free and inexpensive resources to enhance the lesson. How can you integrate additional use of technology and media into the lesson?
- *Reflecting on My Lesson.* Reflect on the process you have used in the design of your lesson and your efforts at enhancing that lesson to meet student needs within your class. How did information from this chapter about instructional strategies, learning contexts, and free and inexpensive materials influence your lesson designing decisions? In what ways did the technology and media you selected for your lesson enhance the learning opportunities for your students?

SUGGESTED RESOURCES

Print

Conklin, W. (2007). *Instructional strategies for diverse learners.* Huntington Beach, CA: Teacher Created Materials.

Elementary teachers guide to free curriculum materials (67th ed.). (2010). Randolph, WI: Educators Progress Service.

Herr, N. (2008). *The sourcebook for teaching science, grades 6–12: Strategies, activities, and instructional resources.* San Francisco: Jossey-Bass/Wiley.

Hoffner, H. (2007). *The elementary teacher's digital toolbox.* Upper Saddle River, NJ: Merrill/Prentice Hall.

Lengel, J. G., & Lengel, K. M. (2006). *Integrating technology: A practical guide.* Boston: Allyn & Bacon.

Middle school teachers guide to free curriculum materials (12th ed.). (2010). Randolph, WI: Educators Progress Service.

Nash, R. (2009). *The active classroom: Practical strategies for involving students in the learning process.* Thousand Oaks, CA: Corwin.

SchifferDanoff, V. (2008). *Easy ways to reach & teach English language learners: Strategies, lessons, and tips for success with ELLs in the mainstream classroom.* New York: Scholastic.

Secondary teachers guide to free curriculum materials (119th ed.). (2010). Randolph, WI: Educators Progress Service.

Web Links

To easily access these web links from your browser, go to the MyEducationKit for your text, then go to Chapter 4 and click on the web links.

The Federal Reserve Board

www.federalreserve.gov/kids

This website is designed to inform students aged 11 to 14 about the role of the Federal Reserve Board, why it was created, and its primary responsibilities. The site includes a built-in assessment.

Leon M. Lederman Science Education Teacher Resource Center

http://ed.fnal.gov/home/educators.shtml

The U.S. Department of Energy collaborated with Fermi National Accelerator Laboratory to develop a teacher resource center. Teachers can explore a variety of mathematics and science materials developed to enhance PK–12 education.

Resources to Help ELL Students

www.mcsk12.net/SCHOOLS/peabody.es/ell.htm

This page, created by Judie Haynes, provides suggested strategies for using online activities and games to assist ELL students to increase their understanding of English and improve their language skills each time they visit a site.

The Whole Frog Project

http://froggy.lbl.gov

The U.S. Department of Commerce collaborated with a variety of publicly supported science labs across the United States to prepare instructional materials for teachers and students in science areas such as astronomy, biology, earth science, and environmental control.