

6

Instructional Methods: Identifying Ways to Involve Learners



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KEY WORDS AND CONCEPTS

Presentation
Demonstration
Discussion
Games
Simulations

Cooperative learning
Discovery
Problem solving
Drill and practice
Tutorials

CHAPTER OBJECTIVES

After reading and studying this chapter, you will be able to:

- Define instructional methods and justify their importance in teaching and learning.
- Describe each method discussed in this chapter including examples with your description.

- Demonstrate the correct procedures for using each method discussed in this chapter.
- Discuss techniques for selecting and combining methods for instructional purposes.

INTRODUCTION

Sally Lopez, a fourth-grade teacher at Fair Oaks Consolidated School, is discussing instructional methods with colleagues in the break room. They are discussing techniques with which Sally is not familiar. She remembers studying them when she was an undergraduate, but they are ones she has rarely implemented in her classroom. As her colleagues continue the conversation, she wonders what they see in these methods.

As Sally listens to her colleagues enthusiastically share the various methods that work for them, she begins to think that she may want to experiment with some of these techniques: cooperative learning, problem solving, simulation, discovery, and tutorials. She already uses discussion, games, drill and practice, demonstration, and presentation.

Sally realizes during the discussion that her approaches are very teacher-centered. The other teachers are using terms like “student-centered” and “learner driven.” As you read this chapter, consider Sally’s concerns. Which of the methods do you consider teacher-centered and which are student-centered? Study the descriptions and examples of the various methods. Can you think of other examples that would apply to your teaching? Carefully consider the principles for using each of the methods. This chapter will give you the basic information for applying ten methods, so you can use each more appropriately to enhance the learning experiences of your students.

As is shown in Figure 6–1, the instructional methods represent another piece of the planning puzzle. Chapter 5 began the discussion of how to present the instruction

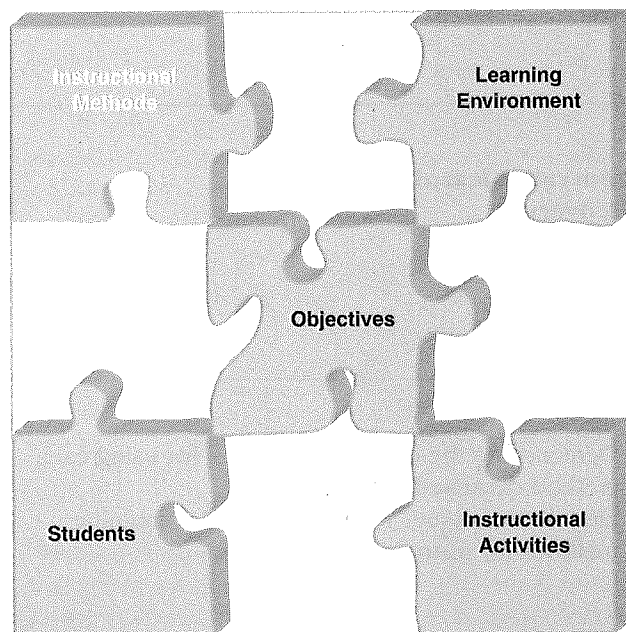


FIGURE 6–1 Instructional methods as the next piece of the planning puzzle.

to the students through various instructional activities. In this chapter we expand that discussion to include the means and procedures that are used for the learner to experience those learning activities.

Figure 6–2 shows the portion of the PIE Checklist related to methods. A full version of the checklist is included in Appendix C.

WHAT ARE INSTRUCTIONAL METHODS AND HOW CAN WE USE THEM?

As described in Chapters 5, instructional activities are done during a lesson to help students learn. They may provide motivation, orientation, information, application, or evaluation. Instructional activities incorporate methods along with media (discussed in the next chapter). Together they assist the learners in getting from where they are before the lesson (previous knowledge, skills, and attitudes) to where you want them to go (mastery of objectives).

Traditionally, instructional methods have been described as “instructional techniques” such as lecture and discussion. Your methods are the procedures and actions used to help students achieve the stated lesson objectives. In Chapter 1, we introduced ten different types of methods (refer to Figure 6–3). We discuss each of them in this chapter, beginning with the more teacher-centered approaches and proceeding to the more student-centered approaches. (See the “Sample Lesson Plan” in Teacher Resource B on page 289.)

You should use a variety of methods in your teaching. However, some methods seem better suited for certain content or certain learners. You will learn which method or combination of methods is most effective only by trying them with actual students. You will undoubtedly find yourself using a variety of methods to keep instruction interesting.

Methods of instruction vary in their interactivity and typical group size. Presentations and demonstrations tend to be less interactive, while drill and practice and tutorials are highly interactive. While most methods lend themselves to small-group instruction, presentations and demonstrations are more effective for larger groups. Tutorials and drill and practice tend to work best with individuals.

The purpose of this chapter is to help you identify the methods most appropriate for your planned instructional activities. Methods can be used to present information and to actively involve the learner. They are an integral part of learning and consequently of your learning plan.

We now look briefly at each method, including examples and guidelines for using it. The methods are discussed in order of their increasing interactivity. Of course, the amount of interactivity can vary greatly for each

Planning Phase

1. Learners – Chapter 4
2. Objectives – Chapter 4
3. Learning Environment – Chapter 4
4. Developing the Initial Draft Outline – Chapter 4
5. Instructional Activities – Chapter 5
6. Instructional Methods – Chapter 6

Select all instructional methods that apply to the instruction and provide a short description of how each selection will be used

Check Methods to incorporate.	Provide Short Description.
<input type="checkbox"/> Presentation	
<input type="checkbox"/> Demonstration	
<input type="checkbox"/> Discussion	
<input type="checkbox"/> Drill and Practice	
<input type="checkbox"/> Tutorial	
<input type="checkbox"/> Instructional Games	
<input type="checkbox"/> Cooperative Learning	
<input type="checkbox"/> Simulations	
<input type="checkbox"/> Discovery	
<input type="checkbox"/> Problem Solving	

Indicate within the planning card set what method, as well as when each of the selected methods will be integrated within the instruction

7. Instructional Media – Chapter 7
8. Instructional Materials – Chapter 8

Implementation Phase

1. Instructional Delivery – Chapters 9, 10, and 11
2. Instructional Management – Chapters 9, 10, and 11

Evaluation Phase

1. Continuous Cycle of Improvement – Chapter 12

FIGURE 6–2 Methods Portion of PIE Checklist.

Cooperative learning	Discussion
Discovery	Drill and practice
Problem solving	Tutorial
Games	Demonstration
Simulation	Presentation

FIGURE 6–3 Instructional Methods.

method, depending upon the actual situation and how it is implemented.

Presentation

In a presentation, a source relates, dramatizes, or otherwise provides information to learners. The source may be a textbook, audio, video, online via e-learning tools, a teacher, a student, and so on. This method makes use of verbal information and/or visual symbols to convey material quickly. Presentations typically provide students



Students share their knowledge through classroom presentations.

Source: Anthony Magnacca/Merrill Education.

with essential background information. A presentation can also introduce a new topic, provide an overview, and motivate students to learn. It is a one-way communication method controlled by the source, with no immediate response from, or interaction with, the audience.

In a presentation, the content can be presented verbally by the teacher or a student and the “audience” listens and takes notes. Video-, audio-, and computer-based presentations can also be used, either as the main way of presenting new material or as a supplemental approach for covering a specific topic in more detail.

Presentation Examples

1. In Jill Sanchez’s sixth-grade class, a small group of students design and produce a mediated presentation on the origin and meaning of the Bill of Rights to summarize the content studied during a lesson. The presentation is given to the rest of the class.
2. The website from a major food company lists the nutritional information for all its products. Wanda Elliott’s food and nutrition class learns the pros and cons of eating each of the products.
3. Ralph Watson’s social studies class watches a DVD of the television news coverage of the same story from four different cultures (United States, United Kingdom, Spain, and Israel). Students then compare and contrast the nature of coverage, length of coverage, content, and depth of coverage of the same news story from four different perspectives.

Principles for Using Presentations

- Inform students of the purpose of the presentation by providing them with an agenda or outline.
- Highlight the critical points of the presentation by showing a visual that illustrates a key point, by repeating the key points several times, by using voice

inflection to emphasize important points, and by simply declaring a point as one of central importance.

- Make the presentation relevant. Learners need to be able to relate the information from the presentation to their own experiences. You can accomplish this by asking questions such as the following: How does this relate to you? Have you ever had a similar kind of experience? How could you use this information now or in the future?
- Use variety to maintain attention. Add variety by introducing graphics or other forms of media, by asking questions, by incorporating relevant personal experiences, or even by making a simple change in your volume or rate of speech.

Demonstration

Demonstrations show students how to do a task as well as why, when, and where it is done. In this method, students view a real or lifelike example of a skill or procedure. Verbal explanations become more concrete by illustrating ideas, principles, and concepts. In addition, demonstrations can set performance standards for student work. By demonstrating how to properly perform a task, you establish the criteria you expect students to meet. You may use recorded demonstrations played back by means of a video or computer. Two-way interaction or student practice with feedback requires either a live instructor or a computer. The desired outcome may be for the student to imitate a physical performance, such as swinging a golf club or changing the oil in a car, or to adopt the attitudes or values exemplified by a respected person.

In a demonstration an individual performs a procedure in order to highlight an important principle or process. Demonstrations may be done live or recorded on a media format, such as videotape, Web-based video, or DVD.

You may use demonstration to illustrate how something works, to show how to perform a task, or to teach safety procedures. Demonstrations are essential when teaching a psychomotor procedure (such as jumping rope) or an interpersonal skill (such as participating in an interview).

Demonstration Examples

1. Molly Calhoun, a kindergarten teacher, demonstrates on the whiteboard how to form the capital and lowercase “letter of the week.” The students then practice on their worksheets as Ms. Calhoun circulates throughout the classroom.
2. Jason LaJoy, the physical education teacher, demonstrates how to perform a forward flip on the trampoline as students watch. He describes each step and then demonstrates them in sequence. Next, each student is given an opportunity to practice the forward flip with feedback from Mr. LaJoy.



Toolbox: Classroom Response Technologies

Although presentations typically involve one-way communication of information with limited opportunities for interaction, there are ways to involve students, even large groups, in a presentation. A relatively new technology that supports interactivity during group presentations is the use of clickers. **Clickers**, also known as classroom or audience response systems, are devices similar in appearance to TV remotes that allow students to respond to questions during a presentation. In a typical scenario, the teacher embeds questions, often in multiple choice format, to test students' comprehension or poll students' opinions at key points during the presentation. When the question appears, students use their clickers to transmit a response (e.g., A, B, C, or D in answer to a multiple choice question) to a receiving station connected to the teacher's computer. Clickers typically use an infrared or radio frequency signal, and each clicker generates a unique signal so that individual responses can be

linked back to individual students (so that clickers can be used to take attendance in large groups). The receiving station captures all of the students' responses and software on the teacher's computer provides a summary chart or graph showing how many students selected each answer. If a number of students select incorrect answers, the teacher can immediately stop and go over the material again to help clear up any misunderstandings. Opinion questions can also be used to stimulate discussion and help students see how their views compare with others in the class. Similar technologies are being developed that allow students to use cell phones, laptops, and other devices to respond to teacher questions; at Purdue University, new software called *HotSeat* allows students to respond to and even send comments to the teacher through any Web-enabled device. With clickers and related technologies, presentations can become a more interactive instructional method.

3. A computer program demonstrates how to deal with sexual harassment between students. The program dramatizes a variety of ways to deal with sexual harassment. Following the demonstration, students role-play how to deal with unwanted sexual advances.

Principles for Using Demonstrations

- While planning, preparation, and practice are important for all instructional methods, they are especially critical for demonstrations if you are going to be manipulating materials and equipment that you do not use regularly.
- Ensure that all can see and hear.
- Present the demonstration in small, sequential steps.
- Allow the audience to practice. It is often motivational for learners to watch a demonstration and then attempt to complete it themselves.

Discussion

Discussion is a dynamic method that encourages classroom interaction and actively involves students in learning. Discussion involves a group of individuals sharing information about a topic or problem. Students talk together, share information, and work toward a solution or consensus. They are given the opportunity to apply principles and information. This method introduces students to different beliefs and opinions, encouraging them to evaluate the logic of, and evidence for, their own and others' opinions. A major benefit of the discussion method is the amount of interaction that occurs and the learning that results from that interaction. It provides the teacher with immediate feedback on your students' understanding of course material.



Students learn content and communication skills by participating in discussions.

Source: Anthony Magnacca/Merrill Education.

Three important skills are associated with the discussion method: (1) asking questions, (2) managing the flow of responses to your questions, and (3) responding to students' questions. Discussions teach content as well as processes such as group dynamics, interpersonal skills, and oral communication. Discussion among students or between students and teachers can make significant contributions throughout students' learning. It is a useful way of assessing the knowledge and attitudes of a group of students. Discussion can foster collaborative and cooperative learning. In combination with written forms of student assessment, you also may use discussion to evaluate the effectiveness of your instruction.

Discussion Examples

1. A third-grade teacher leads a discussion on the meaning of Thanksgiving Day when preparing his students to attend a Thanksgiving play presented by high school students. A discussion after the play helps to answer students' questions and ensures that everyone understands the performance.
2. After reading different news articles, Jolene Moller's social studies students contemplate a current political issue or hot topic in the news through discussions and debates. Students then write their own viewpoint on the topic based on the discussion.
3. Officer Richardson from the local police department shows a picture of a mangled car resulting from an auto accident involving a drunken driver to gain a student group's attention before discussing the problems of drug and alcohol abuse. She asks the students to discuss the consequences of drunk driving, particularly as it has affected their family and friends.

Principles for Using Discussions

- Provide motivation before beginning a discussion by using a common reading, a picture, an audio recording, or a short video to secure the interest and attention of the students.
- Encourage active participation from each group member. The exchange of ideas among group members is a critical factor in learning from discussions.
- Questions are needed to stimulate discussion and should be prepared beforehand. Either you or your students may prepare the questions.
- Summarize and/or synthesize the different viewpoints of various small groups discussing aspects of a specific topic.

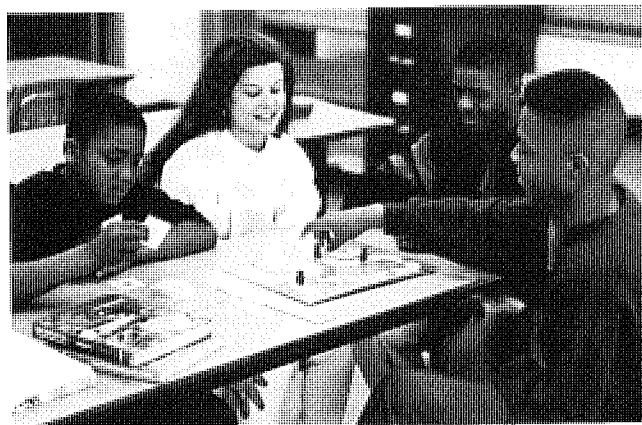
Games

Instructional **games** provide an appealing environment in which learners follow prescribed rules as they strive to attain a challenging goal. It is a highly motivating

approach, especially for repetitive content. Games often require learners to use problem-solving skills or demonstrate mastery of specific content such as math facts or vocabulary words.

Games have two key attributes—rules and competition or challenges. First, a clearly defined set of rules outlines how the game will be played, what actions are and are not allowed, what constitutes winning the game, and what the end result will be for a winning performance. Second, elements of competition or challenge provide players with an opportunity to compete against themselves, against other individuals, or against a standard of some type.

Spelling bees and speed math facts (e.g., students are given a number of problems to solve during a short time period; points are awarded for accuracy and speed) are common instructional games used in elementary classrooms to teach basic skills. You may easily adapt other games, such as Trivial Pursuit and Jeopardy, to contain relevant subject-matter content and at the same time retain the benefits of the game structure. Today, there is growing interest in the use of video and computer games for learning. See the Toolbox: Serious Games on page 166 in Chapter 9.



Instructional games provide a challenging approach to experiencing a variety of activities.

Source: Scott Cunningham/Merrill Education.

**Toolbox: Presentations, Demonstrations, and Discussions**

Presentations, demonstrations, and discussions are instructional methods commonly used within classroom instruction. At this point in your learning career, you have probably experienced these methods literally hundreds of times. From those experiences, compile a list of evaluation criteria that you could use to determine the quality of these methods used within a classroom learning experience. With your list, assess three different

classes that use one or more of these methods. Based on your criteria, what went well, what needed improvement, and what types of suggestions/recommendations could you offer? Did you find that you needed to adapt your evaluation criteria as you were using them to evaluate the quality of the methods? Are there ways in which to improve your set of evaluation criteria?

Game Examples

1. Where in the World is Carmen Sandiego? is a popular computer game that develops students' understanding of geography and world culture (see Figure 6-4). Students assume the roles of detectives who must track down a thief who has stolen a national treasure from somewhere in the world. By gathering clues and conducting research, players are able to track the thief around the world, learning about geography as they go.
2. The religious education students in Reverend McCullan's class of middle school students enjoy playing Jeopardy. Rev. McCullan generates answers each week based on the reading assignment. The student teams actively participate to come up with the correct questions.
3. A group of high school chemistry students is given the assignment to memorize 15 element names and their associated numbers and symbols from the periodic table. The teacher has designed a board game in which four teams of two students each compete to complete the "experiment" by answering questions related to the 15 elements.

Principles for Using Games

- Students must have a clear concept of the instructional goal of the game. Ask yourself, "What do students need to learn, and how will a game help accomplish that?" Make sure to communicate the answer to these questions to your learners.

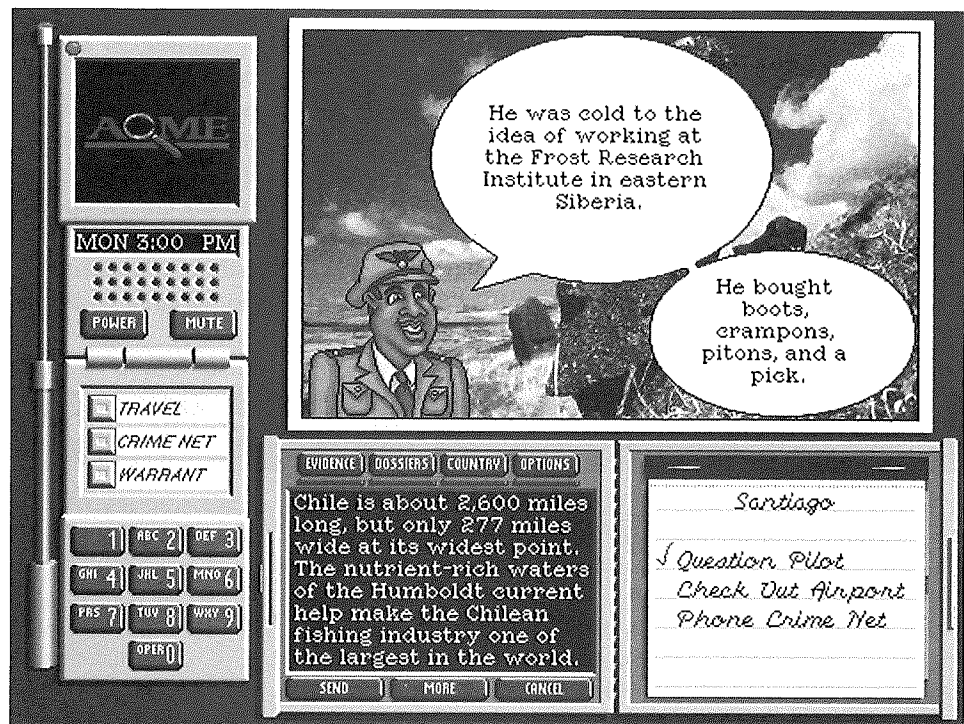
- Students must understand the procedures and rules for how the game, will proceed and how all scoring will occur. With a new game, it always helps to have written rules.
- Make sure the game is structured so active involvement is maintained at the highest possible level for all participants. If groups are too large and long waits occur between "turns," the effectiveness of the game will wane. Allow enough time to play but not so much that students grow tired of the game.
- Include a debriefing or discussion following the game's conclusion. This should focus on the instructional content and value of the game and why it was played. Make sure the students understand that their participation in the game had an instructional purpose, and summarize what they should have learned from it.

Simulation

Using simulation, learners confront realistic approximations of real-life situations. Simulation allows realistic practice without the expense or risk involved in real situations, such as driving and flight simulators. The simulation may involve participant role-play, handling of materials and equipment, or interaction with a computer. This method promotes skills that emphasize accuracy and speed. Simulations also allow students to practice cooperation and team work, and can help foster leadership skills. Simulations can promote decision making and build positive values and attitudes by putting

FIGURE 6-4 A screen from *Where in the World is Carmen Sandiego?*, a popular educational computer game.

Source: *Where in the World is Carmen Sandiego?*, © 1999. The Learning Company, Inc.



students in unfamiliar roles (see “Toolbox: Role-Playing” page 92 in Chapter 5).

Laboratory experiments in the physical sciences are popular subjects for simulations because simulations avoid the risks and costs of real experiments. Sim City is a popular computer simulation. The program allows students to simulate the management of a city, including such elements as budget, construction of infrastructure, traffic, pollution, and crime. Students can build their own city from scratch or manage one of several well-known cities around the world.

Simulation Examples

1. The sixth-graders in Judy Krajcik’s class learn about surviving in the inner city by playing a computer simulation about life downtown in a large city. She introduces the simulation to the entire class, then divides the students into groups of four and assigns each group to one classroom computer. She moves among the groups to answer questions, to monitor the progress of each group, and to discuss students’ feelings about the conditions in the inner city.
2. Students in John Morales’s middle school social studies class learn about the operations of government by participating in a role-playing simulation about creating and passing new legislation. John circulates around the room and lets the simulation progress at the students’ pace. He takes extensive notes for a debriefing at the conclusion of the “legislative session.”
3. High school students in Family Studies pretend that they are taking care of a baby. They are assigned a computerized doll that requires feeding, changing, and other baby functions. These simulated experiences give them insight into how they might respond in similar real-life situations.

Principles for Using Simulations

- Explain the purpose and procedures for the simulation. Make students aware of over simplifications implicit in the simulation. Explain the goal to be achieved and, where appropriate, the role of each student.
- Simulations can be confusing, and students may need guidance or direction in order to benefit from them. Questions, activities, and scenarios can fill this guidance role.
- Allow participants to play out their roles with minimum input from you.
- Conduct follow-up discussions or debriefing with students to maximize the benefit from the simulation. Provide feedback following the simulation.

Cooperative Learning

Many educators have criticized the competitive atmosphere that dominates some classrooms. They believe that pitting student against student in achieving teacher-assigned grades creates an adversarial relationship between students and teachers and is contrary to later on-the-job teamwork. Some teachers feel competition in the classroom can interfere with learning.

Cooperative learning involves small groups of students working together to learn collaborative and social skills while working toward a common academic goal or task. This method is specifically designed to encourage students to work together, drawing on their individual experiences, skills, and levels of motivation to help each other achieve the desired result. The central idea is that cooperation and interaction allow students to learn from several sources, not just the teacher, while also providing each student opportunities to share their own abilities and knowledge.

Each student in the group is accountable to the group for a different and specific aspect of the content. Individual students cannot complete the task on their own, but must rely on others in the group. In this method, students apply communication and critical-thinking skills to solve problems or to engage in meaningful work together. A growing body of research supports the claim that students learn from each other when they work on projects as a team.

Cooperative groups have several uses including learning course content, promoting positive interactions and interdependence among groups of students, and teaching important social and communication skills. Another important reason for using such an approach is

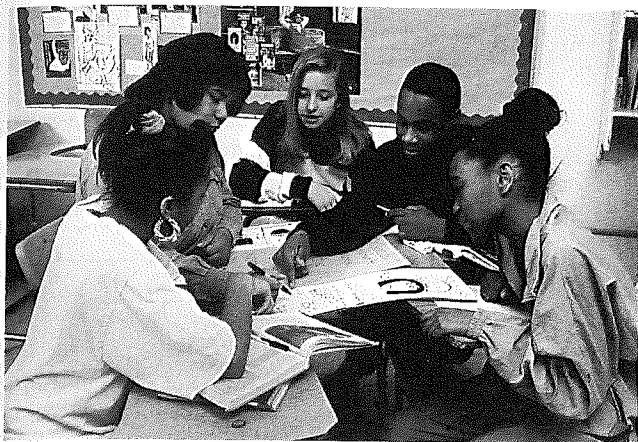


Toolbox: Simulations

Simulations of all varieties can be found on the Internet to download and explore. One example is a popular simulation known as Roller Coaster Tycoon (for a free trial, go to <http://www.searchamateur.com/Tycoon-Games/Tycoon-Game-Download.htm>). Additional simulations can be found by completing a search (e.g., using Google) with the search term simulation game demo. Locate a simulation such as Roller

Coaster Tycoon and preview the software. From your experience with the software:

- a. Identify and describe the simulation aspects of the program;
- b. Identify and describe the game aspects of the program; and
- c. Describe how this program could be used within an educational setting.



Students learn interpersonal skills through cooperative learning.

Source: Tom Watson/Merrill Education.

to teach individual accountability. When a group's success depends on the input of each individual in it, individuals learn to be accountable for their actions.

Cooperative Learning Examples

1. Recently the members of the fifth-grade Ecology Club and their advisor went on a field trip to view a creek near their school. Upon close observation of the creek, the students noticed patches of oil floating on the slow-moving water. After further investigation, the club advisor decided it would be a good project for the club to research what was occurring and to determine what could be done about it. He divided the students into four-person teams. Each team member was given a specific task. One student was to determine who should be contacted at the public health department. Another was to find out what the oily substance was and determine how it could have been introduced to the creek. Still another was in charge of identifying potential ways of publicizing what was occurring and determining the potential impact on the animals and community. The fourth was to review what the club could do to raise public awareness.
2. In the science lab, groups of middle school students work together as "detectives" to determine the nature of an unknown substance. In each group, one student is assigned to search the Internet, another goes to the public library for background research, others focus on designing and running experiments on the substance, while others work to locate someone who may be familiar with the substance. Together they pool their information to come to a combined, cooperative solution.
3. In a high school art appreciation class, groups of students were assembled to learn about the

different forms of creative art. Each group was composed of three students: one who was accomplished at a musical instrument, another who had the ability to paint, and a third who had the ability to sculpt. The group's task was to learn about the different art forms and their relationships.

Principles for Using Cooperative Learning

- Build an atmosphere that encourages participation and cooperation. Help students realize the advantages of working together as a team. This can be facilitated by requiring that all members of the group have roles to fill that are necessary for the group's success.
- Teach group processes to the students. Effective group cooperative efforts do not happen by chance.
- Learn to facilitate, not dominate. It is important for you to take on the role of monitor, facilitator, and guide instead of director.

PEARSON
myeducationkit™ Go to the Assignments and Activities section of Chapter 6 in MyEducationKit and complete the activity entitled "Cooperative Learning with Handhelds." As you view the video and answer the accompanying questions, consider the benefits of cooperative learning and think about how you might use such an activity in your own classroom.

Discovery

The **discovery** method enables and encourages students to find "answers" for themselves. A principle of discovery learning is that students learn best by doing, rather than by just hearing and reading about a concept. With this method, your role is to arrange the learning environment so that "discovery" can occur.

Implementing a discovery method places students in a situation where they can learn through personal experience. Such experiences generally require learners to develop and use observation and comparison skills. Moreover, like detectives, students must learn to follow leads and clues and record findings in order to explain what they experience.

Discovery uses an inductive, or inquiry, approach to learning; it presents problems students must solve through trial and error. The aim is to develop a deeper understanding of the content through active involvement with it. For discovery learning in the physical sciences, students might view a video in which the narrator states a set of relationships and then go to the lab to discover the principles that explain those relationships. For example, after hearing the narrator say, "Air has weight," the students may then experimentally weigh a balloon before and after filling it with air, thus discovering that the statement is true.

Discovery Examples

1. Judy Lewis gives her first-graders a variety of watercolors and encourages them to mix any two colors together and see what color is produced. Judy uses the activity to teach color names. She has printed the color names on large cards along with a sample of the color. She also used cards with plus signs and equal signs to form equations such as "Blue + Yellow = Green." The activity allows students to "discover" the results of various combinations of colors. In addition, they learn to read the names of colors and are introduced to the basics of addition.
2. To help her middle school science students discover the relation between time and distance, Linda Harrison has them "experiment" with remote-control cars measuring the time it takes to go specific distances. Linda has the laboratory lesson carefully planned, but does not tell students what the result "should be." The students work in pairs and each lab pair manipulates the data with the aid of a computer, which constructs graphs of their data. Each pair shares their results with the entire class. Often, individual pairs' data do not show the function. However, when the class pools the data, the relationship among the variables becomes evident to everyone.
3. High school economics students "play" the stock market with \$100,000 in pretend money. Students work in teams to gain the most from their "investments." Their success or failure is determined by the rise and fall of the real stock market during the time they are "investing." Students discover how outside forces, such as the Federal Reserve, impact the value of stocks.

Principles for Using Discovery

- Be prepared for all types of "discoveries." Combining unique students with unique learning environments often leads to unique results. Be prepared for all types of standard and not-so-standard findings when students are allowed to make their own observations and draw their own conclusions.
- Encourage students to share their discoveries. Through the experience of discovery, students often gain both great insights into their subject and great enthusiasm for what they have learned. These important insights and feelings should be shared with other individuals.
- Make sure students understand that "one right answer" may not exist. They may need instruction and examples on how to observe, compare, and evaluate phenomena.
- Constantly encourage and reward students for being inquisitive, for asking questions, and for trying new approaches.



Go to the Assignments and Activities section of Chapter 6 in MyEducationKit and complete the activity entitled "Promoting Innovative Thinking, Creativity, Collaboration and Inventiveness through WebQuests." As you view the video and answer the accompanying questions, consider how this activity has been structured to foster innovative thinking and cooperative learning.

Problem Solving

The real world is filled with problems that need resolution. Some problems may be very well defined (e.g., determining if purchasing a new outfit is within one's current monetary means; finding the shortest route to travel to a near by art museum). Other problems may be less well defined (e.g., determining how to increase neighborhood safety and finding the "best" postsecondary education). To fully participate in this world, students need to be able to analyze problems, form tentative hypotheses, collect and interpret data, and develop some type of logical approach to solving the problem.

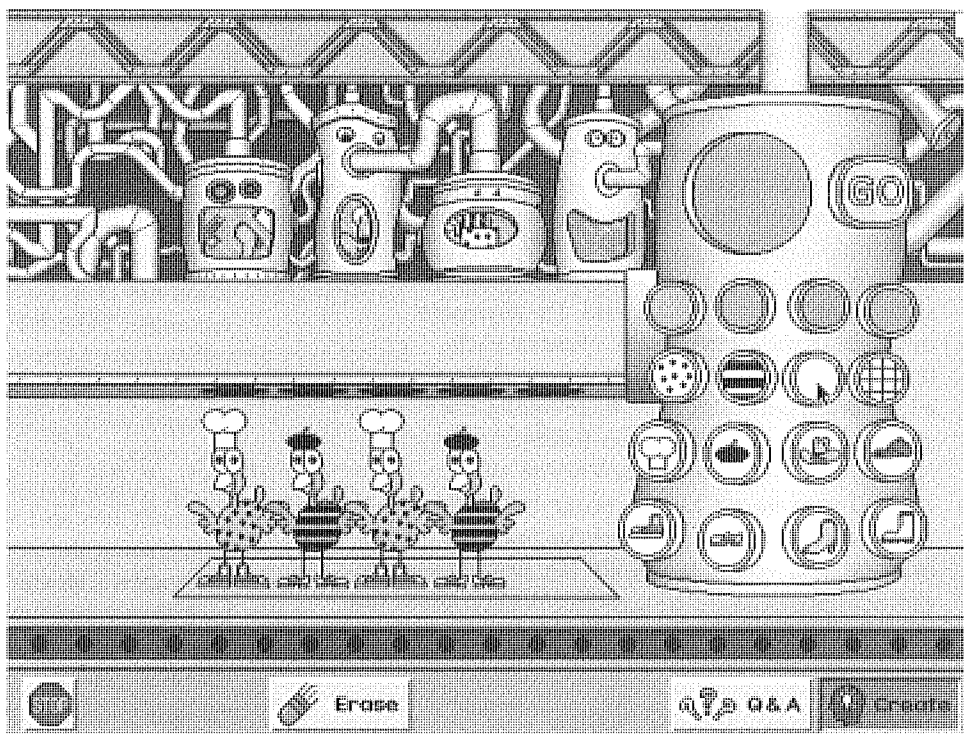
In the problem-solving method, learners use previously learned content and skills to resolve a challenging problem. **Problem solving** is often based on the scientific method of inquiry. The usual steps are (1) define the problem and all major components, (2) formulate hypotheses, (3) collect and analyze data, (4) formulate conclusions and/or solutions, and (5) verify conclusions and/or solutions. Learners must define the problem clearly (perhaps state a hypothesis), examine data (possibly with the aid of a computer), and generate a solution. Through this process, learners are expected to arrive at a higher level of understanding of the content under study.

One way to distinguish problem solving from discovery is that in problem solving students are using previously learned content and skills to solve problems while in discovery students are learning the content and skills.

Problem-Solving Examples

1. A computer program called Thinkin' Things makes use of various problem-solving strategies, such as working backwards, analyzing a process, determining a sequence, and thinking creatively (see Figure 6-5). The software provides the user with a factory that produces creative-looking feathered friends. The preschool-aged child selects from a set of options in order to create the next appropriate bird in the sequence.
2. Sister Anne is a sixth-grade science teacher at St. John's Catholic School. During a recent unit in science, she wanted her students to directly experience the impact of human population on the environment. She posed the following problem: "Does acid rain have an impact on the environment?"

FIGURE 6-5 *Thinkin' Things* allows the student to create a feathered friend based on a specific pattern and sequence.



Source: *Thinkin' Things*, Edmark Corporation. Reprinted with permission.

She quickly felt the need to clarify and redefine the question at her students' level, so she revised her question to, "In what ways does acid rain affect the growth patterns of common outdoor plants?" She asked her students to design an experiment that would provide an answer to that question.

3. Students in a business class are given information about a situation at a small manufacturing firm and asked to design a solution for a problem of low production. After gathering more data, they determine whether the solution should involve training or, perhaps, changing the environment or attitudes of the workers.

Principles for Using Problem Solving

- Clarify the problem when necessary. Especially with less mature students, one of the most difficult parts of problem solving is getting a true, accurate picture of the problem itself. In the initial stages of problem solving, your role often involves helping students in identifying and outlining the specific problem. Be careful, however, to not overdo the clarification. If you explain the problem too thoroughly, the students won't have to work for the answer.
- Use additional resources and materials when necessary. It is important that students have access to additional resources, as well as instruction on how to use those resources most effectively.
- Keep groups small. Because of the uniqueness of the potential solution paths to the problems and the time required to complete the various steps, it is

often essential to have a smaller number of students.

- Help students understand the need for generalization. Students must recognize that problem solutions are generally unique and that no single answer works for all problems. This connotes an emphasis on learning general problem-solving strategies and procedures and adapting them as each new situation dictates.

Drill and Practice

Drill and practice is frequently beneficial when students need to memorize and recall information. During drill and practice, students are led through a series of practice exercises designed to increase proficiency in a newly learned skill or to refresh an existing one. To be effective, drill and practice exercises should include feedback to correct errors students might make along the way.

Drill and practice is a common classroom method for helping individual learners master basic skills or knowledge through repetitive work. Drill and practice is not designed to introduce new content. It is assumed that the skill or knowledge has already been introduced and, thus, its purpose is to give learners the opportunity to master the material at their own pace.

Drill and Practice Examples

1. To learn math facts to a level of automatic recall, students employ flash cards. On one side of the card is a simple arithmetic problem; on the other,

- the answer. Students attempt to answer the problem and then flip the card and compare their answer to the correct solution. This format can be used to learn states and their capitals, the names of animals and their young (e.g., goose and gosling, kangaroo and joey), foreign words and their translation, and other paired information sets.
2. Students in Wilber Groves's seventh-grade geography class work on their map-recognition skills using printed worksheets. He circulates throughout the classroom to monitor each student's work as they practice their skills in recognizing countries from their outline map. He also makes sure to give them feedback as to the correctness of their answers.
 3. Mary Owens uses a tutorial program on the computer to help her high school French students practice their vocabulary skills. Ms. Owens uses the quizzing ability of a voice recognition program that gives her students immediate feedback on their vocabulary pronunciation.

Principles for Using Drill and Practice

- Introduce content prior to the drill and practice session.
- Use many short drill and practice sessions instead of a few longer ones. Use both individual and group activities.
- Use competition (against self or others) to make drill more interesting.
- Make sure students are practicing the correct information or procedures. Only correct practice makes perfect!
- Provide opportunities for students to apply what they master through drill and practice.

Tutorial

Tutorials convey content from a tutor to a learner and may include instructor and student, student and student, computer and student, and print and student. The computer can play the role of tutor because of its ability to quickly deliver a variety of responses to different student inputs. Tutorials can be used for learning all types of content. Unlike drill and practice, which simply goes over previously presented information again and again, you can use tutorials to introduce new material to the student.

A tutor—in the form of a person, computer, or special print materials—presents content, poses a question or problem, requests student response, analyzes the response, supplies appropriate feedback, and provides practice until learners demonstrate a predetermined level of competency. Tutoring is most often done one to one and is frequently used to teach basic skills such as reading and arithmetic, although you may use it to teach higher-level skills as well.

Tutorial Examples

1. John Johnson uses a tutorial, in the form of an illustrated storybook on local history, as a makeup activity for his fourth-grade students who were absent when the topic was covered in class. He monitors their progress to check their understanding and learning.
2. A middle school math teacher uses a tutorial to teach her class how to calculate the area of a rectangle. First, she helps them recall relevant information from previous lessons (e.g., the concepts of rectangle, length, height, and multiplication). Then, she introduces and explains the concept of area as the product of the length of the rectangle multiplied by its height. She then demonstrates and shows a number of examples of determining the area of different sizes of rectangles. The students then attempt novel problems using the same format. The teacher gives them feedback on their performance, and they continue practicing until all students can successfully calculate a rectangle's area.
3. Jill Day, an industrial arts teacher, uses a video-based tutorial on shop safety as a prelude to having her students work with power equipment. The video shows each step of shop safety procedures and poses questions for students to answer.

Principles for Using Tutorials

- Present an overview of the material. Prompt students through content or skills, then release them to demonstrate content or skills on their own. Provide opportunities for students to apply what they have learned.
- Present content or skills one step at a time.
- Ask questions of the student, and encourage the student to ask questions.
- Plan for varying rates of completion. Monitor students' progress regularly to ensure that they are on task and learning.

Kevin Spencer's Lesson Plan

1. Refer to Teacher Resource B. This teacher resource describes the instructional plan Mr. Spencer has developed for his sixth-grade social studies class. Read over the plan and identify several of the instructional methods that have been incorporated within the plan.
2. With a partner, discuss the strengths and weaknesses of several of the selected methods. Convince your partner of an alternative method that should work effectively within Kevin Spencer's lesson plan. Justify your selection with information from Figures 6-6 and 6-7.

Instructional Method	Advantages	Limitations
Presentation	<p>Can be used with groups of all sizes</p> <p>Gives all students the opportunity to see and hear the same information</p> <p>Provides students with an organized perspective of lesson content (i.e., information is structured and relationships among concepts are illustrated)</p> <p>Can be used to efficiently present a large amount of content</p>	<p>Requires little student activity</p> <p>Makes assessment of students' mental involvement difficult</p> <p>Doesn't provide feedback to students; by definition, presentation is a one-way approach</p>
Demonstration	<p>Utilizes several senses; students can see, hear, and possibly experience an actual event</p> <p>Has dramatic appeal if the presenter uses good showmanship techniques, such as demonstrating an unexpected result or a discrepant event</p>	<p>May be difficult for all students to see the demonstration</p> <p>Is time consuming if demonstrations are done live</p> <p>Demonstrations may not go as planned</p>
Discussion	<p>Allows students to actively practice problem-solving, critical-thinking, and higher-level thinking skills</p> <p>Is interesting and stimulating for teachers and students alike</p> <p>Can change attitudes and knowledge level</p> <p>Makes effective use of students' backgrounds and experiences</p>	<p>Students must have a common experience (reading a book, viewing a video, participating in an activity) in order to meaningfully participate and contribute</p> <p>Teacher must prepare and possess discussion-leading skills for the method to be effective</p>
Games	<p>Actively involves students and encourages social interaction through communication among players</p> <p>Provides the opportunity for practice of skills with immediate feedback</p> <p>Can be incorporated into many instructional situations to increase student motivation</p> <p>Helps students learn to deal with unpredictable circumstances</p>	<p>May involve students with competition more than content</p> <p>Can be impossible to play if pieces are lost or damaged</p> <p>Can be time-consuming to set up if games have many components</p>
Simulation	<p>Provides practice and experimentation with skills</p> <p>Provides immediate feedback on actions and decisions</p> <p>Simplifies real-world complexities and focuses on important attributes or characteristics</p> <p>Is appealing, motivates intense effort, and increases learning</p>	<p>Can cause deep emotional involvement (e.g., students in veterinary school get very attached to "sick" animals they diagnose and attempt to "save," even though the animals exist only within the simulation)</p> <p>Both setup and debriefing can be time-consuming</p>
Cooperative Learning	<p>Promotes positive interdependence, individual accountability, collaborative and social skills, and group processing</p> <p>Encourages trust building, communication, and leadership skills</p> <p>Facilitates student learning in academic as well as social areas</p> <p>Involves students in active learning</p>	<p>Requires a compatible group of students (this may be difficult to form)</p> <p>Takes more time to cover the same amount of content than other methods</p> <p>Is less appealing to individuals who prefer to work alone</p>
Discovery	<p>Encourages higher-level thinking; students are required to analyze and synthesize information rather than memorize low-level facts</p> <p>Provides intrinsic motivation (where merely participating in the task itself is rewarding) to discover the "answer"</p> <p>Usually results in increased retention of knowledge; students have processed the information and not simply memorized it</p> <p>Develops the skills and attitudes essential for self-directed learning</p>	<p>Allows for the discovery of "incorrect" or unintended information</p> <p>Can be time-consuming</p>

FIGURE 6-6 Advantages and Limitations of Instructional Methods.

Problem Solving	<p>Increases comprehension and retention; students are required to work with everyday problems and to apply theory to practice</p> <p>Involves higher-level learning; students cannot solve problems by simple memorization and regurgitation</p> <p>Provides students with the opportunity to learn from their mistakes</p> <p>Develops responsibility as students learn to think independently</p>	<p>Limits the amount of content covered; can be time-consuming</p> <p>Selecting, modifying, and/or designing effective instructional problems can be time-consuming</p> <p>Requires teachers to have good management skills to coach students without giving them the "answer"</p>
Drill and Practice	<p>Provides repetitive practice in basic skills to enhance learning, build competency, and attain mastery</p> <p>Promotes psychomotor and low-level cognitive skills</p> <p>Helps build speed and accuracy</p>	<p>Students can perceive it as boring</p> <p>Does not teach when and how to apply the facts learned</p>
Tutorial	<p>Provides optimum individualized instruction; all students get the individual attention they need</p> <p>Provides the highest degree of student participation</p> <p>Expands the number of "teachers" in the classroom by using students or computers as tutors</p> <p>Frequently benefits student tutors as much as, or more than, the tutees</p> <p>Introduces new concepts in a sequenced, interactive way</p>	<p>May be impractical in some cases because appropriate tutor or tutorial material may not be available for individual students</p> <p>May encourage student dependency on human tutor; students may become reluctant to work on their own</p>

FIGURE 6-6 (Continued)

- With the selection of your alternative method, what alterations (if any) would have to be made for the selected instructional activities?



WHICH METHOD(S) TO USE?

It is important to note that you may use multiple or mixed methods within a single lesson. In many instructional situations one method will not do the job. For example, you can combine a tutorial with drill and practice to strengthen the newly learned skills. The combination of methods may be more powerful and result in more learning than either method used alone. The key is to focus on what will work best to help your students learn your content. Try various methods with actual students to help determine which method or combination of methods is most effective and consider using a variety of methods to keep the instruction interesting. The advantages and limitations of the methods we have just discussed are listed in Figure 6-6. These advantages and limitations provide a foundation for choosing methods for a particular lesson.

We have compiled the advantages of the various instructional methods into a checklist, shown in Figure 6-7. This table will help you select your method(s) for a particular lesson. The checklist will help you remember the factors to consider when selecting instructional methods. Without such a list, it is easy to make choices based

only on what you like best or are most comfortable with. The list will remind you that there are other important considerations. It is not meant to replace your professional judgment, but to supplement or support it. We recommend that you use the checklist to narrow your choices and then rely on your experience and judgment to make a final decision. This will, of course, become easier as you gain teaching experience.

Kevin Spencer's Lesson Plan

As begun in Chapter 4, we are tracing the development of Kevin Spencer's sixth-grade social studies lesson plan that deals with the Civil War. As part of the Planning Phase, Kevin decides upon the methods he might use (see Figure 6-8).

SUMMARY

This chapter discussed different types of methods for learning. We presented the ten most widely used instructional methods, gave examples, and listed advantages and limitations of each method. You will need to select the appropriate method(s) for your students. Keep in mind that methods can be used in combination. There is no one best method for any instructional situation. For each lesson you will have to consider your objectives, your students, and your comfort level with each method.

Which Methods Should I Choose?

The Methods Selection Checklist will help you select the method or methods that will best fit your lesson. Each method has advantages, listed in the first column of the table. There are ten additional columns, one for each instructional method. To use the checklist, place a "✓" in all the white spaces that best describe your instructional needs or situation. For example, if you think learning will be enhanced by allowing students to learn on their own, go to item 4 and place a "✓" in the four columns that contain a white space. Continue this process for each of the items in the first column. When you have gone through the entire checklist, determine which column has the most "✓s."

If most of the "✓s" are in:	Select	If most of the "✓s" are in:	Select
P	Presentation	CL	Cooperative Learning
DM	Demonstration	DY	Discovery
DN	Discussion	PS	Problem Solving
G	Games	DP	Drill and Practice
S	Simulation	T	Tutorial

It is possible that you will have more than one column with the same number of "✓s." In that case, you will need to choose which method is best or consider using multiple methods for your lesson.

**Student learning will be enhanced
by instructional methods that**

	P	DM	DN	G	S	CL	DY	PS	DP	T
1. Are predominantly student centered										
2. Are predominantly teacher centered										
3. Provide a high level of interactivity										
4. Allow for students to learn on their own										
5. Allow several students (2-5) to be involved simultaneously										
6. Are appropriate for a small group (6-15)										
7. Are group oriented (16 plus)										
8. Provide information and content										
9. Provide practice with feedback										
10. Provide a discovery environment										
11. Present situations requiring strategy										
12. Can be completed in a short time (less than 20 minutes)										
13. Provide more content in a shorter time (are efficient)										
14. Enhance skills in the high-level intellectual skills domain										
15. Enhance skills in the low-level intellectual skills domain										
16. Enhance skills in the psychomotor skills domain										
17. Enhance skills in the attitude domain										
18. Are appropriate for a noncompetitive environment										
19. Promote decision making										
20. Provide a realistic context for learning										
21. Are highly motivating										
22. Enhance retention of information										
23. Use the inductive or inquiry approach to learning										

FIGURE 6-7 Method selection checklist.



Toolbox: Selecting Appropriate Instructional Methods

For practice, look over each of the following three scenarios. Decide what would be the best method for each situation. Then answer the following questions: What were the reasons you used to make your selections? Did you identify any potential problems with your selections? If so, what were those problems? What other methods could you also have selected? Under what conditions would you switch to those alternatives?

- **Scenario A:** The sixth-grade concert band instructor, Mr. Snyder, has decided that his students need to better discriminate between sharps, flats, and natural notes on the musical scale. He has 56 students currently in his band, and the instruction will take place in the band room, which is large enough to seat approximately 125 individuals.
- **Scenario B:** The instructor of an advanced survival training course needs to teach the six participants how to recognize edible versus inedible desert plants found in the southwestern United States. Even though the course involves training for desert survival, it is being taught at a small college in Ohio.
- **Scenario C:** Mrs. Spence and her class of 25 tenth-grade students have been studying a unit on developing

critical-thinking skills. One section of the content focuses on methods used to solve ill-defined problems and Mrs. Spence has decided that she wants to give the students practice using the different techniques they are studying.

To help you understand how factors such as the students, objectives, and learning environment might affect your choice of method in these scenarios, consider how your selections would change if the following aspects were different:

- **Scenario A:** Instead of being a band director, Mr. Snyder is a private flute teacher with 12 students of different ages who all come at different times during the day for individualized instruction. His goal is still to have the students increase their ability to discriminate between flats, sharps, and natural notes.
- **Scenario B:** The survival course takes place at the University of Nevada, Las Vegas, within minutes from large sections of desert.
- **Scenario C:** The focus of Mrs. Spence's class changes from being able to apply the problem-solving techniques to simply understanding them.

Refer to Teacher Resource B (see page 241) and review the sample lesson plan. Note the methods used for each of the sections. Would you consider using any different methods for any of the sections? Why or why not?



TECHNOLOGY COORDINATOR'S CORNER

At the beginning of this chapter, we introduced you to Sally Lopez, a fourth-grade teacher at Fair Oaks Consolidated School. She listened to her colleagues in the break room discussing various methods. Being more familiar with some of the methods than others, Sally decided to talk with her friend, the school's tech coordinator, Nikki Sharp. Nikki reminded Sally of a couple of things. First, learning is complex, and thus a number of different methods may be needed in order to attain maximum effectiveness. There would always be times when one method or another would be less appropriate. Second, the learners and the objective of the learning should dictate what types of methods are needed in order to accomplish the learning. It is important to understand

different types of methods so that an optimal selection can be made. Finally, there will be times when technology is not needed as the primary means to attain learning; however, it may still play other important supporting roles to learning. For example, a debate may not involve any technology; however, technology can be used to facilitate gathering needed prerequisite information, to prepare the debaters to deliver their remarks effectively, and so on. Nikki said, "Often technology has its greatest impact on learning as a support to other effective instructional methods."

Nikki encouraged Sally to consider a wide variety of methods before deciding which one or ones to use. Consider your learners and the content. Use a variety of methods, not just the ones with which you are most familiar. Extend your range of expertise by trying them all during various lessons.

PEARSON

myeducationkit

To check your comprehension of the content covered in this chapter, go to the MyEducationKit for this book and complete the Study Plan for Chapter 6. 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 chapter content.

Planning Phase

1. Learners – Chapter 4
2. Objectives – Chapter 4
3. Learning Environment – Chapter 4
4. Developing the Initial Draft Outline – Chapter 4
5. Instructional Activities – Chapter 5
6. Instructional Methods – Chapter 6

- Select all instructional methods that apply to the instruction and provide a short description of how each selection will be used

Check Methods to in-corporate.	Provide Short Description.
X Presentation	Show sample story-telling presentation; Overview of important events; Student presentations
<input type="checkbox"/> Demonstration	
X Discussion	Introduction; Orientation; Student presentations; Summary
<input type="checkbox"/> Drill and Practice	
<input type="checkbox"/> Tutorial	
<input type="checkbox"/> Instructional Games	
X Preparation of student presentations Cooperative Learning	
<input type="checkbox"/> Simulations	
X Discovery	Use WebQuest search for information
<input type="checkbox"/> Problem Solving	

- X Indicate within the planning card set what method, as well as when each of the selected methods will be integrated within the instruction

7. Instructional Media – Chapter 7
8. Instructional Materials – Chapter 8

FIGURE 6–8 Methods Portion of PIE Checklist for Kevin Spencer's Lesson Plan.

SUGGESTED RESOURCES

Print Resources

Anderson, P. (2006). *Psychology in learning and instruction*. Upper Saddle River, NJ: Merrill/Prentice Hall.

Benjamin, A. (2005). *Differentiated instruction using technology: A guide for middle and high school teachers*. Larchmont, NY: Eye on Education, Inc.

Borich, G. (2007). *Effective teaching methods: Research-based practice* (6th ed.). Upper Saddle River, NJ: Pearson/Merrill/Prentice Hall.

Dieterle, E., & Clarke, J. (in press). Multi-user virtual environments for teaching and learning. In M. Pagani (Ed.), *Encyclopedia of multimedia technology and networking* (2nd ed.). Hershey, PA: Idea Group.

Forcier, R., & Descy, D. (2007). *The computer as an educational tool: Productivity and problem solving* (5th ed.). Prentice Hall.

Jacobsen, D. A., Eggen, P., & Kauchak, D. (2006). *Methods for Teaching: Promoting Student Learning* (7th ed.). Upper Saddle River, NJ: Merrill/Prentice Hall.

Joliffe, W. (2007). *Cooperative learning in the classroom: Putting it into practice*. London: Paul Chapman Publishing.

Kozma, R. B., Belle, L. W., & Williams, G. W. (1978). *Methods of Teaching. Schooling, Teaching and Learning American Education*. (pp. 210-211). St. Louis, Missouri: C.V. Mosby Co.

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

Orlich, D., Harder, R., Callahan, R., Trevisan, M., & Brown, A. (2009). *Teaching strategies: A guide to effective instruction*. Boston, MA: Wadsworth.

Thorsen, C. (2008). *Techtactics: Technology for teachers*. (3rd ed.). Boston: Allyn & Bacon.

Westwood, P. (2008). *What teachers need to know about teaching methods*. Victoria, Australia: ACER.

Electronic Resources

<http://www.educause.edu/ELI/LearningTechnologies/GamesSimulationsandVirtualWorl/11263>

(Educause Learning Initiative: Games, Simulations, and Virtual Worlds)

<http://simschoolresources.ed.greenriver.org/portal/simschoolresources/simulations>

(SimSchool Resources: Simulations & Games in Education)

<http://www.adprima.com/teachmeth.htm>

(Instructional Methods: Advantages and Disadvantages)

<http://www.teach-nology.com/teachers/methods/models/>

(Technology: Methods and Theory Resources)

<http://olc.spsd.sk.ca/de/pd/instr/index.html>

(Saskatoon Public Schools: Instructional Strategies Online)

<http://www.sasked.gov.sk.ca/docs/policy/approach/instrapp03.html>