Using Multimedia to Engage Learners

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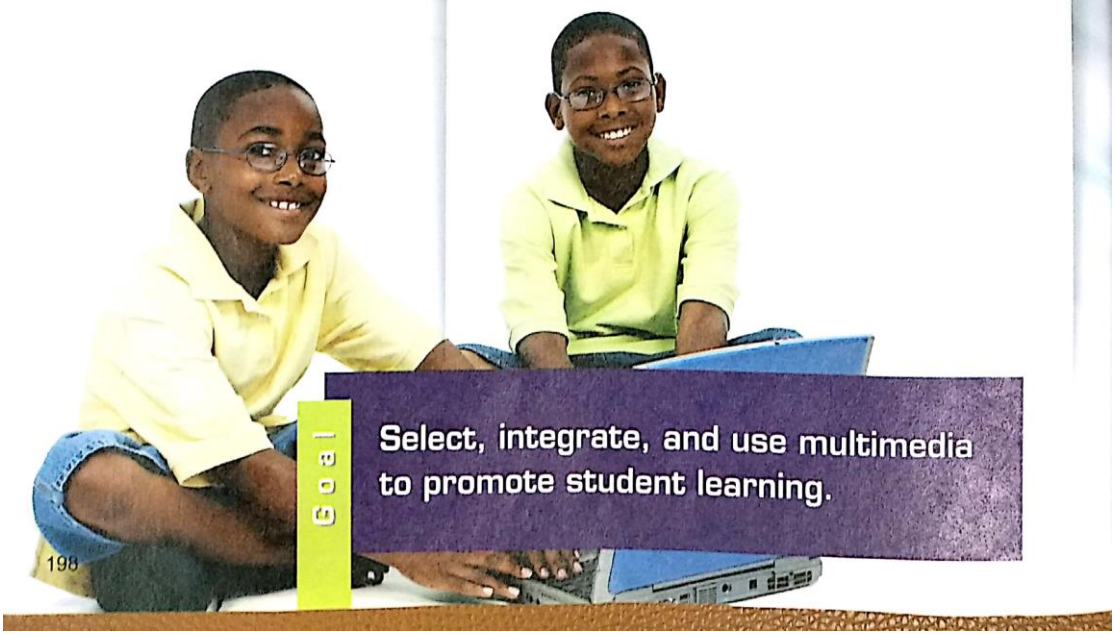
Knowledge Outcomes

This chapter addresses ISTE NETS-T Standard 2.

1. Discuss media literacy, including the aspects of consuming and producing media.
2. Discuss the advantages, limitations, and instructional applications of multimedia in learning.
3. Discuss four types of learning centers and describe one specific example of each.
4. Describe instructional applications that are especially appropriate for manipulatives.
5. Compare the advantages and limitations of various types of display surfaces.
6. Describe instructional applications that are especially appropriate for field trips, displays, and dioramas.



Goal

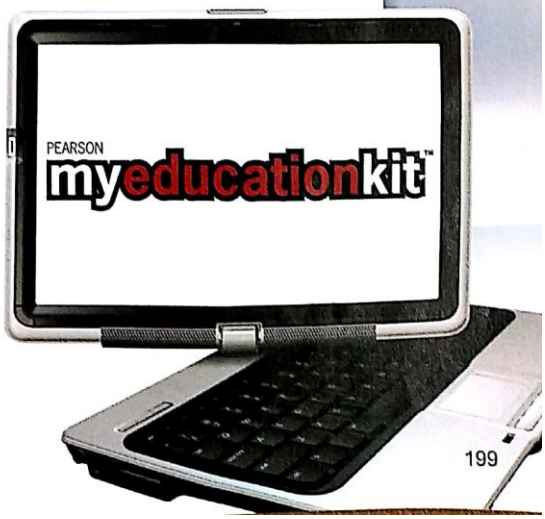
Select, integrate, and use multimedia to promote student learning.

ASSURE Classroom Case Study

The ASSURE Classroom Case Study for this chapter describes how Phil Ekker, a first-grade teacher, selects media experiences for his classroom of approximately 20 students. The school in which Mr. Ekker teaches is located in a suburban neighborhood of middle- to high-income families. His students vary in their reading, writing, and mathematics abilities. This makes it difficult for Phil to use whole-class instructional approaches for these subject areas. To address this concern, Mr. Ekker would like to integrate multimedia and learning centers into his instructional strategies. However, he is not sure how to select the appropriate multimedia materials and learning center strategies to meet the individual learning needs of his students.

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 11 to explore how Mr. Ekker uses multimedia to achieve 21st century learning environments.

Throughout the chapter you will find reflection questions that relate 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

A variety of media can make your lessons more realistic and engaging. This chapter describes how you and Mr. Ekker can use multimedia and learning centers to involve 21st century students. Although many of the media and materials discussed in this chapter are so common that instructors are inclined to underestimate their instructional value, you need to be able to use whiteboards, flip charts, bulletin boards, and other display formats confidently.

Objects and models bring "the real thing" into the classroom. Students can construct displays and dioramas themselves as part of learning activities. Materials don't have to be digital or expensive to be useful. Small can indeed be beautiful, and inexpensive can be effective!

Nonprojected visuals are widely used media.
David Young-Wolff/PhotoEdit

MEDIA LITERACY

Today's students must be good consumers and producers of a wide variety of media, including text, audio, visuals, video, real objects, and/or models. Many of these media are combined to form multimedia. Even textbooks combine text and visuals. Computer programs can include the six types of media listed previously. Understanding how the various types of media produce meaning is called **media literacy**.

CONSUMING MEDIA

To be "media literate," students must be able to consume or interpret media in all formats—text, audio, visuals, and video. To learn to "read" and understand the forms of media students should be taught critical thinking skills in order to properly analyze and question the various messages from media. Is the photograph real or has it been manipulated to distort reality? Is the message on television fact? Students should be taught to question different sources of news and information on television and the Internet.

PRODUCING MEDIA

Students should also be able to generate media in these same formats and in various combinations. Teachers can encourage students to produce media in all four formats as part of class projects and reports. Students must be able to communicate successfully regardless of the type of media used. For example, to develop an accurate video they need to understand how to communicate with their audience and produce visuals that capture the essence of a narrative.

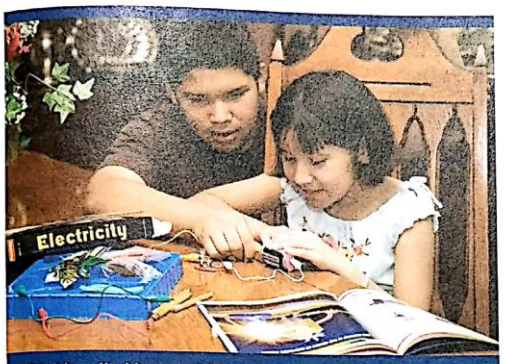
MULTIMEDIA

Multimedia is the sequential or simultaneous use of a variety of media in a presentation or self-study program. Computers are often involved in multimedia presentations that incorporate text, audio, and still or animated images.

An example is Anne Frank House, a House with a Story (Anne Frank House Museum), a tour on CD-ROM of Anne Frank's hiding place in Amsterdam. Here students can visit a digital recreation of the annex where Anne and her family hid from the Nazis when Holland was invaded. Students can **navigate** (use the keyboard and mouse to move around) the rooms, viewing them three-dimensionally as they appeared when she lived there from 1942 to 1944. They can view video and hear audio of people who lived during that period. They can study pages from Anne's diary, which document her plight during that period.

One common method of integrating media is with a **multimedia kit,** a collection of teaching/learning materials involving more than one type of medium and organized around a single topic. Kits often include real objects, models, and mock-ups. They may also include computer programs, audio and video materials, worksheets, charts, graphs, or booklets. Some multimedia kits are designed for the teacher to use in classroom presentations. Others are designed for use by individual students or small groups.

Commercial multimedia kits are available for a variety of educational subjects. They normally include student worksheets and a teacher's manual. Teachers or media specialists



Multimedia kits provide varied sensory experiences. They give the concrete referents needed to build a strong foundation for more abstract mental abilities.
Bob Torrez/PhotoEdit

can also prepare multimedia kits. The main purpose of a kit is to give learners a chance at firsthand learning—to touch, to observe, to experiment, to wonder, and to decide (see When to Use Multimedia).

ADVANTAGES

- *Interactive.* Multimedia engage learners to make choices about moving within the material in meaningful ways, thus fulfilling the requirement of learner participation (the R of the ASSURE model).
- *Individualization.* Multimedia allow students to oversee the rate and sequence of their learning, giving them more control over the outcomes.
- *Special needs.* Multimedia are effective with special learners—at-risk students, student with diverse ethnic backgrounds, students with disabilities, and gifted and talented students. Multimedia accommodate student needs by allowing them to proceed through the instruction at an appropriate pace for each individual learner.
- *Information management.* Multimedia can cover a growing knowledge base associated with the information explosion. Multimedia can manage all types of information—text, graphic, audio, and video—to put more information at the instructor's and student's disposal.
- *Multisensory experiences.* Multimedia provides diverse learning experiences. These can employ a variety of instructional strategies suitable for basic instruction, remediation, or enrichment.

LIMITATIONS

- *Availability and cost of materials.* Materials can be difficult to obtain or priced too high to permit their use.
- *Storage of materials.* Finding storage space for a wide variety of multimedia materials can pose problems.

INTEGRATION

Including multimedia in classrooms is only part of the task. The ultimate value of multimedia in education depends on

WHEN to USE Multimedia

Use when student learning will be enhanced by . . .

Guidelines	Examples
practicing what they have just studied in class	Students who need extra help with a skill or task can work with multimedia materials to practice skills or reinforce their understanding.
enhancing learning opportunities for gifted students	Gifted students can be challenged to expand or enhance their learning by using multimedia or computer software that introduces them to extended problems associated with the classroom activities.
working collaboratively with other students	Students can work together to navigate through instructional materials to help each other understand the information.
reaching a student who is having difficulty in learning	Students can use media materials in a way that is meaningful for them as part of their learning, navigating through the material as appropriate to their style of learning.
challenging students to present information in a new way	Students can create their own multimedia to share their knowledge with others in the class or school.

MEDIA SAMPLE

Multimedia Materials

Rainforest Researchers

www.tomsnyder.com

This combination of CD-ROM, video, and printed materials virtually puts students in the middle of the Indonesian rainforest. They work as teams of scientists and through collaborative problem solving explore the diverse and mysterious web of life in this rich ecosystem. Students work in cooperative teams of four, each taking the role of a chemist, ethnobotanist, taxonomist, or ecologist. Teams watch video and use onscreen displays to guide them in analyzing information, collaborating, and making decisions. (Tom Snyder Productions)

Neighborhood MapMachine

www.tomsnyder.com/products/products.asp?Subject=SocialStudies

Neighborhood MapMachine is a hands-on social studies program in which students can create and navigate community maps. While engaged in generating their maps, students learn concepts related to location, scale, distance, and compass navigation. Students can add pictures, movies, and links to websites on their customized community maps. In addition, students can use their writing and mathematics skills as they share their maps with others. (Tom Snyder Productions)

Diorama Designer

www.tomsnyder.com

It is easy for students to create dioramas on the computer using the Diorama Designer program. They can design original dioramas, print them in color, and assemble them to demonstrate understanding of historical periods for interdisciplinary units in social studies, language arts, or other classes. Students can select from a variety of backgrounds and decorative elements. People and furniture can be printed separately as 3D elements to place inside the diorama. Dioramas can be printed in different sizes, from small enough to fit in a shoebox to a puppet-sized stage. Options include making posters, puppets, and masks. (Tom Snyder Productions)

A variation of this is Rainforest Designer, which lets students design, build, and print 3D rainforest habitats.

Science Court Explorations

www.tomsnyder.com

An exciting science CD-ROM series that combines the power of technology with the effectiveness of hands-on manipulatives is available in an all-in-one, easy-to-use kit. Science Court Explorations, designed for grades 2 to 4, is an extension of Tom Snyder Productions' award-winning Science Court series.

Mary Kate Denny/Getty Images/Stone Allstock

Science Court Explorations comes with a hybrid Mac/Win CD-ROM, a class set of manipulatives (enough for six cooperative learning teams), and a comprehensive teacher's guide with reproducible worksheets and take-home activities.

Science Court Explorations introduces and reinforces the scientific method and fundamental science concepts for young students. A funny and compelling animated story on CD-ROM introduces a scientific question. The CD-ROM then walks students step by step through the scientific process and illustrates how to set up the hands-on experiment. Working in teams, students use the experiment to test hypotheses and answer questions.

Titles include "Pendulums," "Rockets," "Flight," "Heat Absorption," "Magnets," and "Friction." (Tom Snyder Productions)

PBS for Kids

http://pbskids.org

PBS Kids is an interactive website with many types of activities for kids, involving language arts and math experiences developmentally appropriate to the age groups. The themes of the activities relate to popular children's PBS shows such as *Arthur, Sesame Street,* and *Reading Rainbow.* A separate link connects parents and teachers to resources they can use to supplement student learning.

how fully and seamlessly they are integrated into the curriculum. Results need to be measurable against a clear set of objectives—the second step in the ASSURE model. Multimedia should promote problem solving, cultivate creativity, facilitate collaboration, and emphasize the value of lifelong learning.

Multimedia materials are valuable for tasks that must be shown rather than simply described. For example, printed materials and lecture alone cannot present some instruction adequately, such as how to test the pH of soil, erosion patterns, or the dynamics of a presidential debate. If the learner needs to interact with the instruction through the handling of virtual or visual manipulatives, viewing a video of ice formations at slow speed, or controlling a web cam to view different angles of the Golden Gate Bridge, multimedia is an appropriate choice. See When to Use Multimedia for other classroom examples. When you and your students are creating new multimedia materials to fit learning needs, be certain to follow copyright guidelines (see Copyright Concerns: Multimedia Materials).

ASSURE Case Study Reflection

PEARSON myeducationkit™

Review the ASSURE Classroom Case Study and video at the beginning of the chapter. How could Phil Ekker use multimedia with his first-grade students? Would multimedia kits be beneficial to first-graders? Why or why not?

LEARNING CENTERS

A combination of instructional media and materials, the **learning center** is a self-contained environment designed to promote individual or small-group learning focused on a

Copyright Concerns

Multimedia Materials

The advent of new technologies, such as the Internet, the World Wide Web, CDs, and DVDs, have made it necessary to reexamine the copyright laws in view of multimedia capabilities. In 1996, a U.S. House of Representatives Subcommittee on Courts and Intellectual Property adopted a set of fair use guidelines for the production and use of multimedia in educational settings. These guidelines include the following allowances:

- When creating multimedia programs, students and teachers may legally use the following copyrighted materials:

  Text: up to 10% or 1,000 words, whichever is less

  Audio: up to 10%, but not more than 30 seconds, provided the excerpt does not comprise a part of the whole that would constitute a performable unit such as a section, movement, or aria

  Images: not more than 5 images by the same artist or photographer and up to 10%, but not more than 15 images from a single collection

  Video: up to 10% or 3 minutes, whichever is less

  Numerical data: up to 10% or 2,500 fields or cell entries, whichever is less
- Students and teachers may possess three copies. Two may be placed in service, only one of which may be placed on reserve, with a third as a backup in case the original is lost, damaged, or stolen.
- Students and teachers may retain multimedia projects for personal portfolios to be used later for assessment of learning, tenure review, and job interviews. Beyond that period they must acquire permission of the holders of each copyrighted portion.
- Students and teachers are advised to include at the opening of their multimedia project and in any accompanying print material a notice that certain materials are included under the fair use exemption of the U.S. copyright law. It is always best to give credit for the sources of any materials used.
- Students may use their educational multimedia projects and materials only for the duration of the course for which it was prepared.
- Teachers may use their multimedia projects and materials for educational purposes for a period of up to two years after the first instructional use in class. Beyond that period they must acquire permission of the holders of each copyrighted portion.

TAKING A LOOK AT TECHNOLOGY INTEGRATION

Teacher-Made Multimedia Kits

An elementary teacher developed a series of separate multimedia kits on science topics for use with her third-grade class. She incorporated real objects, such as musical instruments, magnets, small motors, rocks, harmless chemicals, and insect specimens in the kits. She also gathered pictures associated with each topic from magazines and old textbooks. A study guide, prepared for each unit, required students to inquire about the topic, make hypotheses, and conduct investigations. References were included for books and computer-based information on the topic. Audiotapes were prepared for use at school and at home for students who had access to audiocassette players.

For a unit on sound, the teacher prepared a multimedia kit that included several musical instruments, cassette recordings of common noises for listeners to identify, anatomical models of the human ear, books about how humans hear, and educational videos explaining how animals like bats, dogs, and dolphins hear and use sound.

The students enjoyed taking the kits home to work on the experiments. The response from parents was very positive. Several parents reported that they, too, learned by working through the activities with their children. Students often preferred to stay in at recess and work on the multimedia kits in the science corner.

Michael Newman/PhotoEdit

specific topic. A learning center may be as simple as some chairs and a table around which students discuss or as sophisticated as organizing several networked computers for collaborative research and problem solving.

An individual teacher may use one learning center within a classroom as a way of breaking the class into small groups to perform hands-on activities (e.g., in a science class with a laboratory-type learning center). Or a whole school may be organized to incorporate learning centers into the daily mix of activities, as in the Project CHILD schools (see Taking a Look at Technology Integration: Project CHILD).

Learning centers should encourage active participation rather than allowing students to simply sit and read text on a computer screen or in a book. Most learning centers provide students practice with feedback through individualized activities. They tend to be designed for use by individuals; however, they can be arranged for pairs or triads.

Learning centers may be set up in any suitable and available classroom space. They are also commonly found in school media centers. Learning center materials may include any or all of the technology and media mentioned in this text. Teachers or media specialists may purchase center materials and software from commercial producers or can create their own products.

Although students may perform simple learning center activities at their desks or some other open space, it is advisable that learning centers be confined to a clearly identifiable area and that they be at least partially enclosed to reduce distractions. Learning carrels, or booths, which may be purchased from commercial sources or made locally, provide a clearly defined enclosure. You can make carrels by placing simple cardboard dividers on classroom tables.

SKILL CENTERS

Skill centers can provide students with opportunities to do additional practice, typically to reinforce a skill previously taught through other media or strategies. Basic skills that are built up through drill-and-practice lend themselves to the skill center approach. For example, you might design a skill center to give practice in using prefixes for students who are learning word skills. Skill centers could also provide math manipulatives to engage students in constructing concrete examples of math problems completed on a worksheet.

TAKING A LOOK AT TECHNOLOGY INTEGRATION

Project CHILD

Project CHILD (Changing How Instruction for Learning is Delivered) is an innovative instructional system for the elementary school. The CHILD model differs from the traditional single-grade classroom with one teacher covering all subjects. In Project CHILD, teachers form cross-grade cluster teams (primary clusters for grades K–2 and intermediate clusters for grades 3–5). The CHILD cluster teachers each choose a core subject (reading, writing, or mathematics) as their specialty.

Students rotate to each of the three classrooms in their cluster and spend 60 to 90 minutes working at a variety of learning stations focused on the core subject. Each CHILD classroom has six learning stations:

- *Computer* for learning with instructional software
- *Teacher* for small-group tutorials
- *Textbook* for written work
- *Challenge* for learning in a game-like format
- *Exploration* for hands-on activities and projects
- *Imagination* for creative expression

Students stay with the same team of cluster teachers for three years. In addition to having more time to work with students, each teacher receives special training in applying technology and cooperative learning techniques in his or her designated specialty area. The teachers still cover the school's required curriculum and use their basic texts and other school resources. The change with Project CHILD comes through the delivery method that moves beyond lecture and seatwork, now enhanced with technology and hands-on active learning.

Project CHILD

Numerous evaluations have shown the following results for CHILD students:

- Significantly higher performance on standardized tests
- Fewer discipline problems
- Highly satisfied parents

For additional information on this topic, go to the Institute for School Innovation (www.ifsi.org/projectchild).

INTEREST CENTERS

Interest centers can stimulate new interests and encourage creativity. For example, you might set up a get-acquainted center on insect life before actually beginning a unit on specific insects. Or prior to a lesson covering the impact of Native Americans on our culture, you could create a display of photos and artifacts representing various aspects of Native American culture.

REMEDIAL CENTERS

Remedial centers can help students who need additional assistance with a particular concept or skill. A student who has difficulty determining the least common denominator of a group of fractions, for example, could receive the needed help in a remedial learning center. The center could include fun-to-do computer activities, flashcards, and magnetic number boards.

ENRICHMENT CENTERS

Enrichment centers can offer stimulating learning experiences for students who have completed required classroom activities. You might, for example, allow students who have finished their assigned geometry activities to go to a video center that features a DVD showing geometric shapes in bridges.

Computers can provide skill reinforcement and remedial instruction through the use of carefully selected drill-and-practice software. Interest and enrichment centers can be created from CD reference materials and child-safe Internet resources to allow students to explore topics on their own or to expand their exploration of topics covered in the



TECHNOLOGY for Diverse Learners

Learning Centers

Learning centers facilitate learning by diverse students with materials and activities implemented using a variety of technology and media. You can often find existing materials, units, and modules that are appropriate for a learning center. If you are designing your own learning center, components may already be available from web-based and other sources. Be sure to follow copyright guidelines.

You cannot assume that technology will automatically engage students. The technology and media must match each student's learning style and ability. Some students prefer to work in pairs or small groups. Others prefer working by themselves.

Be sure to select appropriate technology for the diverse students in your classroom. Students with special needs can use adaptive technologies to meet their learning needs. For example, a student with motor-skill impairment can type on a large keyboard or students with visual impairments can employ print-to-voice or large-font software. Meeting the needs of your regular and gifted students requires using resources at their level.

Provide students with a variety of self-paced modules from which they can select. Adding elective units—often enriching experiences—allows students to engage in making decisions about their own learning. The "curriculum" varies for each individual student depending on his or her learning abilities. This ensures that students are mastering requirements and at the same time provides opportunities for alternative learning activities.

Assessment of each student's accomplishments can be measured and recorded through a variety of approaches. Technology may be used as a tool to administer tests or self-assessments. In addition, the students may use computer software to develop an artifact demonstrating mastery of the topic in the learning center.

classroom. Learning centers may also use a computer station for learning with instructional software or for student production of work.

ADVANTAGES

- *Self-pacing.* Learning centers encourage students to take responsibility for their own learning and allow them to learn at their own pace, thus minimizing the possibility of failure and maximizing the likelihood of success.
- *Active learning.* Learning centers provide for student participation in the learning experience, for student response, and for immediate feedback to student responses.
- *Teacher role.* Learning centers allow the teacher to play more of a coaching role, moving around the classroom and providing individual help for students when they need it (see Technology for Diverse Learners: Learning Centers).

LIMITATIONS

- *Cost.* A great deal of time must be spent in planning and setting up centers and in collecting and arranging for center materials. The equipment and materials used in the center, too, entail costs. Storage of materials not in use can also pose a problem.
- *Management.* Teachers who use learning centers must be very good at classroom organization and management.
- *Student responsibility.* Any form of independent study will be successful only insofar as students are able and willing to accept some responsibility for their own learning.

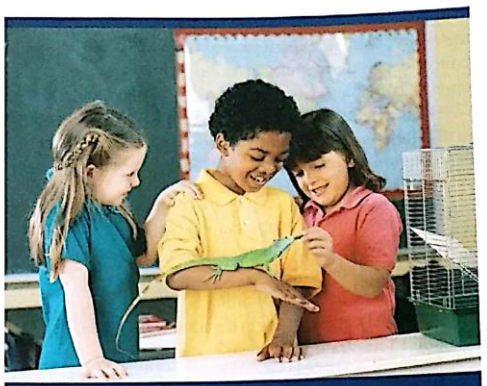
INTEGRATION

You can arrange learning centers for a number of specialized purposes. Computers can be used for information retrieval, construction of knowledge, problem solving, and multimedia learning. When computers are part of a learning center, it is a good idea to provide headphones or earbuds so the audio does not distract other students (see When to Use Learning Centers). Position the computers to prevent glare on the screens and so that students are not facing windows (Morrison & Lowther, 2010).

MANIPULATIVES

Manipulatives are objects that can be viewed and handled in a learning setting. They are often included in learning centers and instructional modules (discussed earlier in this

Learning centers help students develop skills, generate interest, provide remediation, and add enrichment.
Kayte M. Deioma/PhotoEdit



There is no substitute for the real thing when learning some content.
Richard Hutchings/PhotoEdit

chapter). Field trips, displays, and dioramas (discussed later in this chapter) may include manipulatives. They attract student attention and promote learning because students can handle and inspect them. There are three types of manipulatives: real objects, models, and mock-ups.

REAL OBJECTS

Real objects—such as coins, tools, artifacts, plants, and animals—are some of the most accessible, intriguing, and involving materials in educational use. The gerbils that draw a crowd in kindergarten, the terrarium that introduces middle school students to the concept of ecology, and the collection of Colonial-era coins displayed in a high school social studies class are just a few examples of the potential of real objects to elucidate the obscure and to stimulate the imagination.

Real objects are especially appropriate for learners who are encountering a subject about which they have had little direct experience in their daily lives. Educators have understood for many years the dangers of plunging into abstract concepts and principles without building a foundation in concrete experience. To avoid verbalism, or parroting words without meaningful understanding, it is important for learners

WHEN to USE Learning Centers

Use when student learning will be enhanced by . . .

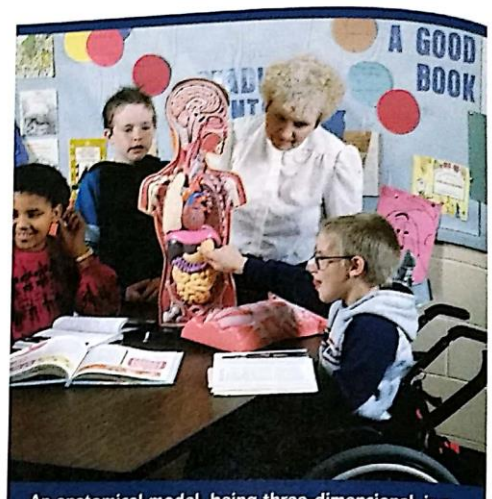
Guidelines	Examples
the teacher serving as coach/facilitator during active student participation in stimulating experiences	Students use a series of tests to identify unknown rocks in a "Geology Skill Center."
self-paced learning experiences	Students move at their own pace through a "History Enrichment Center" display of a photo timeline depicting how their town center has changed over the past 100 years.
practice and feedback after direct instruction	Students go to the "Mathematics Bar-Graph Center" and use computer software to practice creating and interpreting bar graphs.
students working collaboratively in a small group	The "Language Arts Skill Center" is used by students to construct correct sentences from word cards.
an introduction to a new concept or topic	The "American History Interest Center" is used to present civil rights materials (e.g., magazine articles, video of Martin Luther King).

to build an understanding that has meaning and relevance in their lives. This can be accomplished by providing a base of concrete experiences that involves the manipulation of real objects associated with the content to be learned.

Real objects may be used as is, or you may modify them in different ways to enhance instruction, as in the following examples:

- *Cutaways.* Devices such as machines with one side cut away to allow close observation of their inner workings
- *Specimens.* Actual plants, animals, or parts thereof preserved for convenient inspection
- *Exhibits.* Collections of artifacts, often of a scientific or historical nature, brought together with printed information to illustrate a point

Besides their obvious virtues as a means of presenting information, raising questions, and providing hands-on learning experiences, real objects can also play a valuable role in the evaluation phase of instruction. They can be displayed in a central location where learners can identify, classify, or describe them; explain their function or utility; or compare and contrast them. Such testing emphasizes the real-world application of the topic of study, aids transfer of training, and helps transcend the merely verbal level of learning.



An anatomical model, being three-dimensional, is a more concrete referent than a photograph, drawing, or even a videotape.
T. Hubbard/Merrill

MODELS

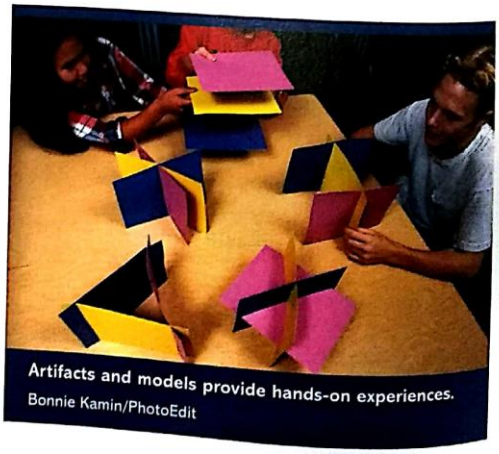
Models are three-dimensional representations of real objects. A model may be larger, smaller, or the same size as the object it represents. It may be complete in detail or simplified for instructional purposes. Indeed, models can provide learning experiences that real objects cannot offer. For example, important details can be accented with color or models can be constructed for easy disassembly to provide interior views not possible with the real thing.

Models of almost anything—from airplanes to zebras—can be purchased for classroom use. Providing collections of models is a standard service of most media centers. School districts and regional media centers and museums often loan artifacts and models, usually as part of multimedia kits (described earlier in this chapter).

A variety of hobby kits are also available for you or your students to assemble. Assembly itself can be instructional. Classroom construction of model kits appeals to children of all ages and can stimulate inquiry and discovery while helping to sharpen both cognitive and psychomotor skills.

MOCK-UPS

Mock-ups are simplified representations of complex devices. By highlighting essential elements and eliminating distracting details, mock-ups clarify the complex. They are sometimes constructed as working models to illustrate the basic operations of a real device, allowing individuals or small groups to manipulate the mock-up at their convenience and work with the subject matter until they comprehend it. For example, a mock-up of a laptop computer might have the internal components spread out on a large board with the components labeled and the circuit diagrams printed on the board. The



Artifacts and models provide hands-on experiences.
Bonnie Kamin/PhotoEdit

A mock-up of an electrical system provides the learner with a working model from which distracting details have been deleted.

Wolfgang M. Weber/Photolibrary/Peter Arnold

most sophisticated type of mock-up, the simulator, is a device that allows learners to experience the important aspects of a real-life activity without the risks.

ADVANTAGES

- *Realism.* Manipulatives provide realism and illustrate concepts that involve three dimensions. They enhance identification of objects by size, shape, or color and provide hands-on experience and laboratory practice.
- *Interest.* Manipulatives arouse interest because they are multisensory. Everyone likes to touch and manipulate real objects—to inspect unusual specimens up close.
- *Cooperation.* Manipulatives can be ideal mechanisms for stimulating small-group project work. Cooperative learning activities can revolve around experiments, problem solving, role-playing, or other types of hands-on practice.

LIMITATIONS

- *Expense.* Manipulatives are often more expensive than other, more conventional materials.
- *Storage.* It can be difficult to find storage space for manipulatives and to remember where they are when you want to use them.
- *Fragility.* Some manipulatives are easily broken or damaged and may then become unusable.

INTEGRATION

Manipulatives are particularly well suited to content for which discovery learning is preferred (see Using Manipulatives in the Classroom). You can pose questions to guide learners' explorations and conclusions. Science topics are well suited to this approach. For example, a unit on magnetism might include several types of magnets, iron filings, and metal objects that may or may not be attracted to magnets. In mathematics, a unit on measurement might involve a folding meter stick and directions for measuring various objects and dimensions around the school or at home. Virtual mathematics manipulatives are provided by teachers to help students gain a deeper understanding of abstract concepts and improve problem-solving skills (Moyer, Salkind, & Bolyard, 2008). When to Use Manipulatives presents guidelines and examples for including manipulatives.

An exciting science CD-ROM series designed for grades 2 to 4 combines the power of technology with the effectiveness of hands-on manipulatives. Science Court Explorations introduces and reinforces the scientific method

USING Manipulatives in the Classroom

- Familiarize yourself with the object or model before using it in classroom instruction.
- Practice your presentation. If your object or model is a working one, be sure you know how it works and what might go wrong.
- Be sure your students do not get the wrong impression of the size, shape, or color of the real object, if the model differs from it in these respects.
- Whenever feasible, encourage students to handle and manipulate the objects and models under study.
- Store objects out of sight when not using them for instruction. Left standing around, they are likely to take students' attention away from other classroom activities.

WHEN to USE Manipulatives

Use when student learning will be enhanced by . . .

Guidelines	Examples
encountering a subject for which they have had little direct experience	Using sand trays for younger students to practice writing letters.
using concrete objects to build a foundation for understanding abstract concepts	Building an algebra problem with base-10 blocks for gifted elementary students.
engaging in real-world applications of knowledge and skills	Using a mock-up of a traffic light to test electrical circuits.
engaging in experiences not possible without the use of models	Examining a 3D model of a plant cell.

and fundamental science concepts for young students. A funny and compelling animated story introduces a scientific question. The software then walks the students step-by-step through the scientific process and illustrates how to set up the hands-on experiment. Working in teams, students use the manipulatives included in the kit to experiment with possible answers. When they feel they have resolved the problem, they enter the information into the computer for confirmation. This seems to be the best of both worlds: efficient use of a computer and authentic learning experiences for students.

ASSURE Case Study Reflection

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Review the ASSURE Classroom Case Study and video at the beginning of the chapter. What types of manipulatives could Phil Ekker's first-grade students use to reinforce basic mathematics and language arts skills? How would manipulatives benefit student learning?

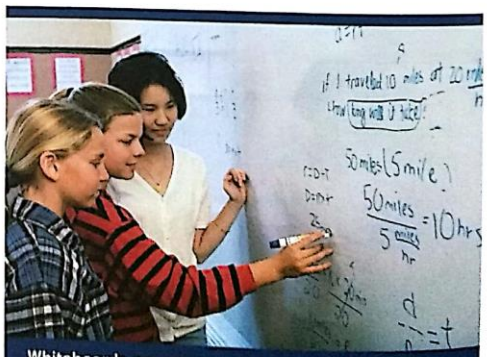
DISPLAY SURFACES

If you are going to provide visuals such as photographs, drawings, charts, graphs, or posters, you need a way to show them. Visuals may be displayed in the classroom in a variety of ways, ranging from simply holding up a single visual in your hand to constructing elaborate exhibits for permanent display. Classroom surfaces commonly used for display of visuals include whiteboards, bulletin boards, cloth boards, magnetic boards, and flip charts (see When to Use Display Surfaces).

WHITEBOARDS

The most common display surface in the classroom is the **whiteboard**. Interactive or **electronic whiteboards** can print copies of the information written on them and can often be connected to whiteboards at different locations for distance learning.

Although the whiteboard is most commonly employed to support verbal communication, you can use it as a drawing



Whiteboards are common in educational institutions.
David Young-Wolff/PhotoEdit

WHEN to USE Display Surfaces

Use when student learning will be enhanced by . . .

Guidelines	Examples
Whiteboards	
viewing text and/or visuals that support the verbal presentation of information	Elementary students diagram a sentence while describing the function of each part.
capturing brainstorming ideas on an interactive whiteboard and digitally downloading to printed material for use in other activities	Middle school social studies students record and print copies of class ideas for increasing voter turnout rate and then use the ideas in a letter to the mayor.
sharing interactive whiteboard information during videoconferencing between two or more distant sites	High school students from two neighboring schools collaboratively design a recycling center for a local park.
Bulletin Boards	
actively engaging with the bulletin board content through reading and answering questions and/or directly interacting with "moveable" features	Elementary students sequence diagrams in the correct order (e.g., the water cycle) or create complete sentences with word cards and pockets.
creating a bulletin board that depicts designated knowledge and skills	Students display unlabeled digital photos that represent the weekly vocabulary words. Other students match the photos with the words by placing them in pockets under each photo.
Cloth and Magnetic Boards	
viewing illustrations of stories, poems, and other reading materials that can be moved to emphasize key learning points	Students illustrate growth of a flower from a seed; how the shape of an object changes by adding sides; how characters interact during a story.
demonstrating knowledge and skills through verbal descriptions and manipulation of cloth board pictures, shapes, or objects	Students place pictures of food on the correct section of the Food Pyramid. Students create a rainbow by correctly arranging color bars.
Flip Charts	
viewing limited verbal/visual messages in a sequential order	High school students name the main components of a business letter.
visual cues that assist in creating relationships between concepts and information	Students view step 1 of cell division on page 1 of flip chart and step 2 on page 2 of flip chart, etc.
viewing diagrams and lists of brainstormed ideas as thoughts are generated	Students suggest ideas on how to increase recycling at the school.
using group-produced ideas to guide further discussion and decision making	Student groups create a family history interview form from ideas recorded on a flip chart during a class discussion.

surface to help illustrate instructional units. The white surface is also suitable for projection of video, PowerPoint slides, and overhead transparencies. Materials cut from thin plastic, such as objects and letters, will adhere to the surface when rubbed in place. Some of these boards have a steel backing and can be used as magnetic boards. Using a whiteboard effectively requires conscious effort (see Using Whiteboards in the Classroom).

The most common writing materials for whiteboards are dry erase markers, available in a variety of colors and tip widths. Because their solvent base dries quickly, store the markers in a horizontal position with the cap tight to prevent drying out. If a marker dries out, fasten the cap, turn it upside down, and shake vigorously for 20 seconds. Leaving the marker stored overnight with the tip end down may also help.

A whiteboard will provide many years of service if cared for properly. Do not use permanent felt-tip markers that may damage the surface beyond repair. Completely erase the whiteboard with a felt eraser after each use. Do not let the marks remain on the board overnight, as the longer they

USING Whiteboards in the Classroom

- Organize in advance what you plan to write on the board and where you plan to write it. You can draw your planned layout on a sheet of paper and use it as notes during the lesson.
- Put extensive drawing or writing on the board before class. Taking too much time to write or draw creates restlessness and may lead to discipline problems.
- Cover material such as a test or extensive lesson materials with wrapping paper, newspaper, or a pull-down map until you are ready to use it.
- Eye contact with students is important! Face the class when you are talking. Do not talk to the board. Do not turn your back to the class unless it is absolutely necessary.
- Vary your presentation techniques. Do not overuse or rely entirely on the board. Use handouts, PowerPoint, flip charts, and other media during instruction when appropriate.
- Print neatly rather than using script. For a 32-foot-deep classroom, the letters should be $1\frac{1}{2}$ to 2 inches high and the line forming the letters should be $\frac{1}{4}$ inch thick.
- Check the visibility of the board from several positions around the room to be sure there is no glare on the surface. In case of glare, move the board (if portable) or close blinds.
- Use color for emphasis, but don't overuse it. Two or three different colors at a time work best.
- Move around so you do not block what you have written on the board. Do not stand in front of what you have written.
- Use drawing aids such as rulers, stencils, and patterns to save time and improve the quality of your drawings.

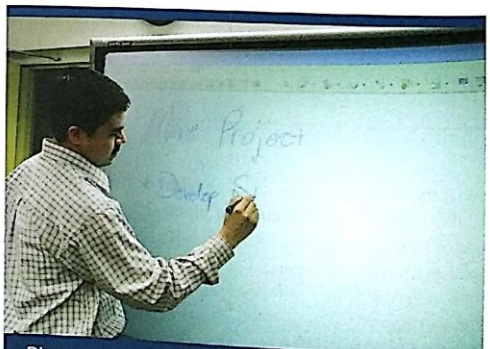
stay, the more difficult they are to erase. You can remove old marks by tracing over them with a black erasable marker and erasing immediately.

For general cleaning, simply wipe the board clean with a soft, damp cloth. If further cleaning is necessary, use a commercial mild spray cleaner. You can also apply a soapy detergent solution and rub briskly with a soft, clean cloth. Always rinse thoroughly with clean water and dry with a soft towel after cleaning.

Interactive whiteboards allow you to "capture" digitally anything written on them and interact with the information. They work in conjunction with a computer to create a file into which screens are fed and from which the screens can be edited, printed, faxed, or emailed. You can make as many copies of each screen as you like. After copying the information, you are free to erase the board and continue without losing valuable time or ideas. Whiteboards are sometimes known by the brand name Smart Boards (www.smarttech.com). Another brand name is Promethean ActivBoard (www.Prometheanworld.com).

Many interactive whiteboards enable the user to access multiple screens or frames that can be scrolled forward and backward. You can prepare content beforehand on any or all of the screens. During your presentation you can reveal the screens one at a time and add new information as desired. You can also move the image forward or backward to a desired frame quickly and easily.

With interactive whiteboards, you can capture your work or save your notes directly into different software applications. This feature is especially valuable for brainstorming sessions and for summarizing group discussions. Copies could be particularly helpful for students who miss class. You can include complex drawings without having students hand copy them. The computer and interactive whiteboard configuration lets you run software programs, surf the Web, review documents, and toggle between items as you would on a desktop computer. Interactive whiteboards allow data and information sharing during a videoconference. You can write, erase, and perform mouse functions with your finger or a pen. Recent



Diagrams and words on an interactive whiteboard can be reproduced on paper with the push of a button.
Najlah Feanny/Corbis

research indicates that interactive whiteboards are frequently used to increase student interactivity and participation and increase the efficiency and professionalism of multimedia delivery (Salton & Arslan, 2009).

BULLETIN BOARDS

With all the modern technology available, classrooms still need **bulletin boards.** Bulletin boards are surfaces of various sizes and shapes made of materials that hold pins, thumbtacks, and other sharp fasteners without damage to the board. One way to attract attention to your bulletin board is to lead off with a catchy headline, one that communicates the main theme, perhaps with a question, a challenge, or a humorous phrase. In practice, bulletin board displays tend to serve three broad purposes: decorative, motivational, or instructional.

The decorative bulletin board is very common in schools. You might have a bulletin board that displays the colors and designs associated with a special holiday or a season. Or you might have one showing books that students might be interested in reading for pleasure.

Displaying student work exemplifies the motivational use of bulletin boards. The public recognition offered by such displays can play an important role in the life of the classroom. It fosters pride in achievement, reinforcing students' efforts to do a good job. It is also relatively easy for you to create a display of student work.

The third broad purpose of bulletin boards is instructional, complementing the educational objectives. Rather than merely presenting static informational messages, you may design displays that actively invite participation. Such displays ask questions and give students some means of manipulating parts of the display to verify their answers, such as flaps, pockets, dials, or movable parts.

Another form of learner participation is taking part in the actual construction of the display. For example, to introduce a unit on animals, an elementary teacher might ask each student to bring in a picture of a favorite animal. The students would then make a bulletin board incorporating all the pictures. Or a geometry teacher might divide the class into five groups and assign each group a different geometric shape. As the class studies each shape, the appropriate group would construct a bulletin board about that shape.

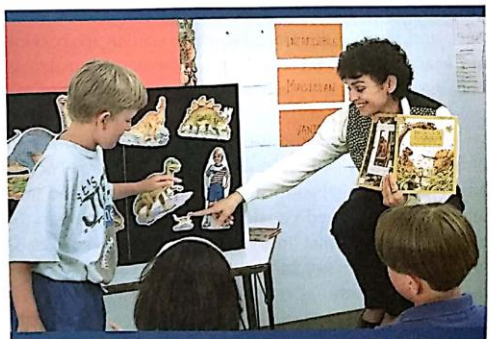
Materials for production of bulletin boards may be available through the school media center. Most schools have workrooms with large tables where you can construct items for your bulletin board and consider various layouts. These workrooms often are equipped with a popular letter-cutting device called the Ellison Prestige die cutter, which allows large letters or other shapes to be cut quickly and neatly from construction paper. The media center may also store the components for bulletin board displays so that teachers can share and easily access materials.

CLOTH AND MAGNETIC BOARDS

Cloth boards are constructed of cloth stretched over a sturdy backing material such as plywood, Masonite, or heavy cardboard. The cloth used for the board may be of various types, including flannel, felt, or hook-and-loop (e.g., Velcro) material.

Pieces of flannel stick together when gentle pressure is applied. You can draw with felt-tip markers on visuals cut from flannel or back still pictures and graphics with pieces of flannel to put on a flannel board. Coarse sandpaper also

Bulletin boards have many important functions in the classroom.
Matthew Steigbigel/Taxi/Getty Images



Cloth boards are often used to involve students in storytelling.
Robin L. Sachs/PhotoEdit

Magnetic boards allow quick manipulation of letters and other materials.

Scott Cunningham/Merrill

works to attach visuals to a cloth board. Pipe cleaners, available in a variety of colors, and fuzzy yarns stick to the flannel and can be attached to form lines and letters. If adhesion is less than desired, slant the board slightly back at the top to prevent materials from slipping.

Reading teachers often use the cloth board to illustrate stories, poems, and other reading materials. For example, they may depict characters and scenes in a story and move them around as the story unfolds. Use this approach to encourage your students' creativity by allowing them to manipulate cloth board materials. Shy children may profit from this kind of activity. It encourages them to speak through the visual representations of story characters as they move the illustrations on the board.

Magnetic boards serve much the same purpose as cloth boards. Visuals are backed with magnets and then placed on the metal surface of the board. Magnetic boards, magnets, and flexible strips of magnetic materials for backing are available commercially. Plastic lettering with magnetic backing can be purchased from teacher supply stores and used for captioning visuals.

Any metal surface in the classroom to which you can attach a magnet can serve as a magnetic board. For example, some whiteboards are backed with steel and thus attract magnet-backed visuals. Use whiteboard markers for captioning or to depict lines of association between visuals. You can also use steel cabinets and metal walls and doors as magnetic boards.

The major advantage of magnetic boards is that maneuvering visuals is easier and quicker than with cloth boards. For example, physical education instructors often use them to demonstrate rapid changes in player positions. Magnetic boards also have greater adhesive quality. Visuals displayed on a magnetic board are not likely to slip or fall. They move only when you move them.

FLIP CHARTS

A **flip chart** is a pad of large paper fastened together at the top and typically mounted to an easel. The individual sheets hold a limited verbal or visual message and usually are arranged for sequential presentation to a small group. You may write key words extemporaneously while talking or you can prepare them in advance to be revealed one at a time.

Easel-sized Post-it chart pads are available from 3M. These 25-by-30-inch self-sticking easel sheets come in plain white or with a blue outline grid. The easel pads have a built-in handle, a sturdy backing, and a cover flap to protect the sheets from damage or flapping while in transit. The universal slots on the backing attach to most easel stands. Each sheet peels off for quick posting on a nearby wall, or it can be flipped over the top of the pad.

You can use poster software such as PosterPrinter to produce flip chart pages. Commercially produced materials are also available in this format. Prepared visual sequences are especially useful for instruction involving sequential steps in a process. The diagrams or words can serve as cues, reminding you of the next point in your presentation.

The most common use of flip charts, though, is for the extemporaneous drawing of key illustrations and key words to supplement a presentation. The flip chart is an extremely versatile, convenient, and inexpensive media format. It is portable, requires no electrical power, has no moving parts to wear out, can be used in a range of lighting conditions, and requires only a marking pen. But don't let the flip chart's simplicity fool you. Using it professionally takes some practice (see Using Flip Charts in the Classroom).

The PosterPrinter can convert a notebook-size original into a poster or banner that is many times larger.

Image provided by HP: www.hp.com/go/designjet

USING Flip Charts in the Classroom

- Position the flip chart at an angle so everyone can see it. Place it in the left front corner (as you face the audience) if you are right-handed and in the right front corner if you are left-handed.
- Be sure the easel is properly assembled and the pages are securely fastened so the flip chart will not fall apart during your presentation.
- Prepare lettering and visuals in advance or outline their shape using a light blue pencil; then trace them during your presentation.
- For group-generated responses, draw lettering guidelines with a blue pencil.
- Keep lettering and visuals simple but large enough for everyone to see.
- Use more than one color, but not more than four.
- Use broad-tip marking pens that provide contrast but will not bleed through to the next sheet.
- Print rather than use cursive writing.
- Keep words short or use well-understood abbreviations.
- Include simple drawings, symbols, and charts.
- Talk to the audience, not to the flip chart.
- Avoid blocking the audience's view of the flip chart.
- Be sure your materials are in proper sequence.
- Have a blank sheet exposed when not referring to the flip chart.
- Reveal pages only when you are ready to discuss them, not before.
- Put summary points on the last sheet rather than paging back as you make your summary.

ADVANTAGES

- *Visual stimulation.* Display surfaces can provide colorful and dynamic displays for instruction and interaction requiring learner participation.
- *Variety of instructional strategies.* Display surfaces can be incorporated into all levels of instruction—basic, remediation, or enrichment.

LIMITATIONS

- *Lack of attention to proper use.* Display surfaces are so common that teachers often neglect to give them the attention and respect they require.
- *Need for careful thought and planning.* An effective display, whether done by a teacher or students, should focus on one main topic or objective.

INTEGRATION

Display surfaces allow you to present prepared visuals or visuals you create as you are discussing the topic. Common in most classrooms, whiteboards can display written, drawn, or projected visuals. Bulletin boards can enhance the atmosphere of the classroom and motivate students to learn. Cloth boards and magnetic boards allow easy manipulation of instructional materials. Flip charts provide convenient writing surfaces for small groups of students. They can also be used to show prepared materials. Don't neglect the multiple uses and value of display surfaces in the classroom. See When to Use Display Surfaces for possible uses of various display surfaces.

ASSURE Case Study Reflection

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Review the ASSURE Classroom Case Study and video at the beginning of the chapter. What considerations does Phil Ekker need to address when selecting display surfaces for use with his first-grade students? How do these considerations vary when using different types of displays, such as whiteboards, bulletin boards, cloth or magnetic boards, or flip charts?

EXHIBITS

Exhibits are collections of various objects and visuals designed to form an integrated whole for instructional purposes. Any visuals, real objects, models, or mock-ups can be included in an exhibit. Any of the display surfaces discussed in this chapter can contribute to an exhibit. Exhibits

A complex exhibit can bring together real objects, still pictures, and other visuals with verbal information to engage learners at many levels.

Russell D. Curtis/Photo Researchers

can generally be used for the same instructional purposes and in the same ways as their individual components.

Exhibits provide a display format incorporating a variety of materials such as real objects and models along with visuals (see When to Use Exhibits). Often area museums or historical societies will lend items. How you display the materials will depend on a number of factors, including type of audience, the nature of your objects and visuals, the instructional setting, and, of course, the availability of the various display surfaces.

Exhibit locations are readily available in most classrooms. You can set up simple exhibits on a table, shelf, or desk. More complex exhibits may require considerable floor space and special structures (a booth or bookcase, for example). The school media center is a convenient location for student-produced exhibits, displays, and dioramas.

There are three types of exhibits—field trips, displays, and dioramas. Field trips provide an exhibit of real objects in their natural environment. A display is a collection of materials, whereas a diorama shows a three-dimensional scene.

FIELD TRIPS

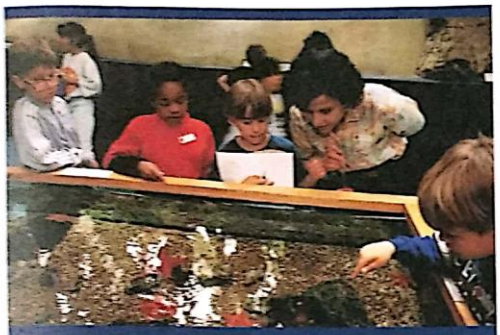
The **field trip,** an excursion outside the classroom to study real processes, people, and objects, often grows out of student need for firsthand experiences. It makes it possible for students to encounter phenomena that cannot be brought into the classroom for observation and study.

Examples of field trips include a visit of a few minutes into the schoolyard to observe a tree, a trek across the street to see construction work, or a longer trip of several days to tour historical locations. Popular field trip sites include zoos, museums, public buildings, and parks. The school media specialist can increase the chances for a successful field trip experience by maintaining a local resource file listing possible sites to visit. Usually the file includes the names, addresses, and phone numbers of people to contact. A good resource file will also include notes regarding the value of previous trips. Some district media centers and

WHEN to USE Exhibits

Use when student learning will be enhanced by . . .

Guidelines	Examples
Field Trips	
firsthand experiences (seeing and hearing) with phenomena that cannot be brought into the classroom for observation or study	A class visits a city council meeting to learn about governmental processes, or goes to the schoolyard to collect leaf samples.
virtual experiences of phenomena that cannot be visited during a field trip due to distance or safety issues	Students explore a space station by viewing live video broadcasts on the Internet.
Displays	
viewing and studying, or creating, a collection of labeled objects, visuals, printed materials, and perhaps audio recordings that have an instructional intent	Students create a "Countries of Our Classroom" corner by displaying artifacts that represent the cultural heritage of each student and a map depicting the country of each student's ancestors.
Dioramas	
viewing or creating three-dimensional representations of past, present, or future events or settings	Student groups build a four-part diorama to show how a tree changes with the four seasons.



Field trips provide students with opportunities for firsthand observation and participation, as in this trip to an aquarium.

Bob Daemmrich Photography

public libraries maintain a local resource file as part of their electronic catalog.

Virtual field trips are an extension of actual field trips. Often the expense or the time to travel to an interesting location is not possible. But, using computers, students may experience the sights and sounds of a faraway location from their home or school. In addition to virtual field trips based on computer technology, videoconferencing can also be used. Teachers with videoconferencing equipment can take their students to any location that has videoconference capabilities, such as manufacturing facilities. Some of these trips are offered at predetermined dates and times and are available on a first-come, first-served basis. The only charge is for network time—no transportation or other fees.

For example, the Cincinnati Zoo (www.cincyzoo.org) offers virtual field trips in which students get to interact live with zookeepers. Their program "Nobody Likes Me," for example, introduces students to frogs, toads, bats, bugs, and snakes.

For any field trip to be justified, it should grow out of and be directly related to the regular course of study. You should devise lead-in as well as follow-up (including evaluation) activities to first prepare students for the field trip and then to help them reflect on the experience and integrate it into their understanding.

The follow-up is a vital aspect of a field trip. If the purpose for making the trip is to get additional factual information, the evaluation will be more formal. If the objectives involve attitudes and appreciation, follow-up activities might include discussion, role playing, or creative art projects. Whatever form it takes, follow-up activity should measure the success of the trip. Students and teachers should address content as well as possible ways to improve future trips.

DISPLAYS

A **display** is an array of objects, visuals, and printed materials (e.g., labels and descriptions). Most displays include descriptive information about the objects or visuals shown. Instructional displays are not only used in the classroom but also in museums and many other settings.

Student assembly of a display can be a motivating learning experience, fostering retention of subject matter and sharpening visual skills. For a lesson on transportation, one sixth-grade teacher had each student bring in a replica of a vehicle. Some students made their own vehicles from construction paper. Others brought in toys from home or contributed vehicles assembled from hobby kits (e.g., boats, cars, trucks, trains, space ships). The teacher set up tables and other classroom furniture along a wall to provide a "shelf" on which to arrange the three-dimensional objects. On the wall above the display surface, the teacher placed a long sheet of paper with a timeline illustrating forms of transportation from the past (humans and beasts), through the present (trains, cars, planes), and into the future (space vehicles). The display was a great success!

DIORAMAS

A **diorama** is a static display consisting of a three-dimensional foreground and a flat background to create a realistic scene. Dioramas are usually designed to reproduce scenes and events from the past or present or to depict future scenarios.

Students may design their own dioramas as a follow-up activity to instruction. Scenes from history are often portrayed with model figures and photographs or drawings from the time period as background images. Animals can be shown in their natural habitats for a biology class. Scenes including towns and landscapes from various parts of the world make stimulating dioramas for geography instruction. Prehistoric landscapes and geologic formations are also popular topics.

ADVANTAGES

- *Actual materials.* Students go to the materials during field trips. Displays and dioramas bring materials into the school.
- *Multisensory experience.* Displays can provide sight, sound, touch, and sometimes taste.
- *Access to materials not available in the classroom.* Field trips and displays off campus allow students to experience sights, sounds, and materials that cannot be brought into the classroom.

LIMITATIONS

- *Expense of field trips.* Taking students on field trips can be expensive and time-consuming.
- *Storage of materials.* Displays and dioramas in the school often cause storage problems between uses.
- *Space required.* Space to exhibit displays and dioramas is often limited in classroom and media centers.

INTEGRATION

Integrating exhibits into your instruction adds variety and real-world experiences that increase student engagement and opportunities for learning. If you are studying Paris, France, it would be nearly impossible for the whole class to go there. However, with a few simple clicks of a mouse, the whole class can see and hear the city through a virtual field trip. Although it is not exactly the same as being there, it certainly makes it possible to learn about a location with some authenticity to the experience.

Displays are commonly used to provide hands-on experiences for students. For elementary students studying musical instruments, a teacher collected scale-model plastic instruments that his students could handle and classify by describing the function of each instrument. During a field trip, middle school students visited a historical museum that included a scale-model diorama of their community in the early 1930s. The students took pictures of the diorama and compared them to recent pictures of the same areas when they returned to their classroom.

Middle school students could create a display of arts and crafts they construct from recycled materials. A high school English class might display political cartoons depicting opinions on a current issue. As a way to extend understanding of a Shakespeare play, student groups could build a diorama depicting a key scene from each act of the play. Groups then could compare the dioramas to see which scenes were selected and how they were depicted.

ASSURE Case Study Reflection

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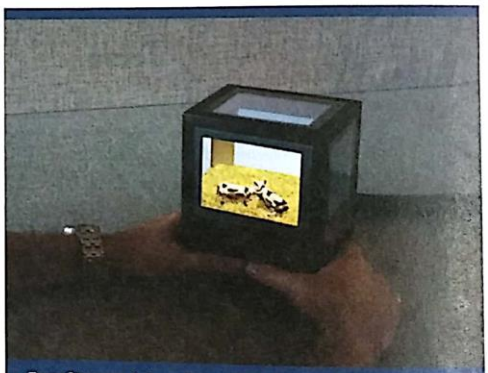
Review the ASSURE Classroom Case Study and video at the beginning of the chapter. What types of exhibits would be effective to use with first graders? What types might Mr. Ekker develop to reinforce math skills? What type could his first-graders construct to build their reading skills?

INNOVATION on the HORIZON

3D INTERACTIVE CUBE DISPLAY

Tabletop Display Gets Rid of the Glasses

A cube-shaped device offers all the thrills of 3D without those annoying glasses. The device, called "pCubee," has five LCD screens—one on each side and another on the top of the cube. The viewer can pick it up and see virtual objects from four sides and the top. The viewer can shake the cube, tilt it, and even interact with objects in the cube using a virtual stylus. Just think of the advantages of using the 3D cube in the classroom to show different objects without having to store the many objects between uses.



From Stavness, I., Lam, B., and Fels, S. 2010. pCubee: A perspective-corrected handheld cubic display. In Proceedings of the 28th International Conference on Human Factors in Computing Systems (Atlanta, Georgia, USA, April 10–15, 2010). CHI '10. ACM, New York

SUMMARY

Multimedia materials come in a variety of formats, from real objects to printed materials that can be displayed in a variety

of ways. They can be effective tools for engaging students and facilitating learning if used properly. This chapter explored the use of these materials in learning centers, instructional modules, and integrated learning systems. We have discussed their advantages and limitations as well as when and how to use them effectively. Various types of manipulatives and display surfaces were described. The chapter concluded with a discussion of exhibits, including field trips, displays, and dioramas.

PEARSON myeducationkit

To check your comprehension of the content covered in Chapter 11, go to the **MyEducationKit** for your book and complete the Study Plan for Chapter 11. 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

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The ASSURE Classroom Case Study is based on an interdisciplinary lesson created by Phil Ekker using multimedia materials and experiences to meet the individual needs of his first-grade students. His insights for achieving successful use of instructional materials and displays integrated into learning centers are provided. Go to Chapter 11 of MyEducationKit to view the Chapter 11 "Multimedia" Video.

Analyze Learners

General Characteristics. The students in Phil Ekker's first-grade class are from middle- to high-income homes. There is little variation with regard to ethnicity, gender, and age of the children. Student reading ability ranges from below to above grade level. Student behavior problems are minimal when they are engaged in hands-on activities.

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

- Operate a player to listen to audio books.
- Use educational software on a desktop computer
- Complete assignments requiring basic first-grade-level writing skills
- Independently move among and complete learning center activities

Learning Styles. Phil's students learn best when engaged in a variety of activities that last from 15 to 20 minutes each. Their level of interest and motivation increases when they use technology or hands-on materials. Differences are seen in student learning styles with regard to working with other students, some preferring cooperative learning groups and others prefering to work alone. There are also differences in student need for reinforcement from the teacher or fellow students.

State Standards and Objectives

Curriculum Standards. National Council of Teachers of Mathematics 1—Numbers and Operations 1.6: Understand numbers, ways of representing numbers, relationships among

numbers, and number systems; understand and represent commonly used fractions, such as $^1/_4$, $^1/_3$, and $^1/_2$. National Council of Teachers of English 3: Students apply a wide range of strategies to comprehend, interpret, evaluate, and appreciate texts; and 5: Students employ a wide range of strategies as they write and use different writing process elements appropriately to communicate with different audiences for a variety of purposes.

Technology Standards. National Educational Technology Standards for Students 1: Students apply existing knowledge to generate new ideas, products, or processes.

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

1. Given mathematics drill-and-practice software for fractions, students will successfully progress through the five levels.
2. Given audio books and a player, students will successfully follow along as the book is read.
3. Given alphabet practice sheets, students will correctly write the designated letter and draw a picture that represents the same letter.
4. Given a book and a reading buddy, students will read the book to their buddy and provide corrective feedback as they listen to their buddy reading.

Select Strategies, Technology, Media, and Materials

Select Strategies. Phil Ekker selects teacher- and student-centered strategies for the learning centers lesson. The teacher-centered strategies involve conducting small reading groups or buddy reading with students. Mr. Ekker also provides feedback and guidance to students as they work in the various learning centers. The student-centered strategies consist of the following learning center activities: books on tape, fractions software, handwriting, story writing, group reading, and buddy reading.

Select Technology and Media. Mr. Ekker selects two types of technology for this lesson: computers and audiotape players. The media include the fractions software, books on tape packets, storybooks, and the letter "H" handwriting/drawing sheet. Phil uses the following guidelines to assess the appropriateness of his technology and media selections:

- *Alignment with standards, outcomes, and objectives*. The fractions software, books on tape packets, storybooks, and the letter "H" handwriting/drawing sheet were selected because they are directly aligned to the learning objectives.
- *Accurate and current information*. The lesson materials have accurate information. The currency of the materials is not of concern for this lesson as it focuses on basic skills.
- *Age-appropriate language*. Mr. Ekker selects materials appropriate for the varying reading, writing, and mathematics ability levels of his students.
- *Interest level and engagement*. The storybooks, books on tapes, and fractions software were selected because they were written to appeal to young children and keep them engaged.
- *Technical quality*. The audiotapes for books on tape are of high quality as is the fractions software.
- *Ease of use*. Both the books on tape and the fractions software were developed to be used by young children. Mr. Ekker shows the students how to use the audiotape player and software at the beginning of the year. Afterward the children are able to use them with little or no assistance.

- *Bias free.* Prior to including materials in a learning center, Mr. Ekker reviews all storybooks and software to ensure they are bias free.
- *User guide and directions.* Mr. Ekker reviews the software user guide prior to including it in the learning center.

Select Materials. Phil Ekker uses the preceding guidelines for selecting all learning center materials.

Utilize Technology, Media, and Materials

Preview the Technology, Media, and Materials. As mentioned, Phil Ekker previews all technology, media, and materials before including them in the learning centers. He reads the storybooks, listens to the books on tapes, and completes the fractions software to ensure they are aligned with his standards and learning objectives.

Prepare the Technology, Media, and Materials. Phil ensures that the fraction software is loaded and functioning on the two desktop computers. He tests the tape players to ensure they are working. He then prepares copies of the letter "H" handwriting sheet and organizes learning center cards so students will know which activities to complete.

Prepare the Environment. The learning center lesson requires desks to be arranged for handwriting, story writing, and listening to books on tapes; floor space to be available for buddy reading; and the computer area to be readily accessible.

Prepare the Learners. Students in Mr. Ekker's class have experience working in learning centers and know how to check the learning center cards to see which activities they are to complete and in which order they are to be completed.

Provide the Learning Experience. The learning experience occurs in each learning center and is provided as the students rotate through their designated activities.

Require Learner Participation

Student Practice Activities. Each learning center requires students to practice reading, writing, or math skills. In the Buddy Reading center students practice reading to each other; in the writing center students practice their handwriting by completing an "H" page. Students also practice by writing a story about a topic of their choice. When students go to the small reading groups, they work with Mr. Ekker on their reading skills and comprehension. And, the computer center provides students practice with fractions.

Feedback. Feedback for learning center work is provided immediately in the computer center as the fractions software lets students know the correctness of their response with each action. It also provides instructional feedback to help them improve their performance. In the small reading groups, students receive immediate feedback on their reading skills from Mr. Ekker. While buddy reading, students receive feedback from each other; however, the accuracy of the feedback cannot be ensured. Students receive feedback for the remaining activities when Mr. Ekker returns their corrected learning center work.

Evaluate and Revise

Assessment of Learner Achievement. Phil assesses learner achievement in two ways. First is a casual assessment completed while students are working. The second is assessment of student work that is submitted at the conclusion of the learning center activities.

Evaluation of Strategies, Technology, and Media. Phil evaluates the lesson strategies through continuous observation of students working in the centers and from feedback he receives from students while in the centers. He also examines student products to determine if the strategies are effective. Evaluation of the technology and media involve noting technical problems that occur during the lesson. He also gauges student interest and ability to complete the fractions software.

Revision. After reviewing the evaluation results collected from student achievement measures and evaluation of the lesson strategies, technology, and media, Phil concludes that the learning centers worked well. However, he feels students need an additional creative writing activity. Therefore, Mr. Ekker revises the lesson by adding an activity in which students write captions for cartoons with the wording removed.

CONTINUING MY PROFESSIONAL DEVELOPMENT

Demonstrating Professional Knowledge

1. Discuss media literacy, including the aspects of consuming and producing media.
2. Discuss the advantages, limitations, and instructional applications of multimedia in learning.
3. Discuss four types of learning centers and describe one specific example of each.
4. Describe instructional applications that are especially appropriate for manipulatives.
5. Compare the advantages and limitations of various types of display surfaces.
6. Describe instructional applications that are especially appropriate for field trips, displays, and dioramas.

Demonstrating Professional Skills

1. Generate two ideas for using learning centers in your own teaching. (ISTE NETS-T 2.A & 3.B)
2. Develop an instructional module for a topic and audience of your choice. (ISTE NETS-T 2.A & 3.B)
3. Obtain an example of a manipulative(s) that you could use for instruction. Submit the manipulative(s) and a description of how you would use it, including an objective. (ISTE NETS-T 2.C & 3.B)
4. Plan a lesson that would include a field trip (real or virtual). Locate at least one site on the World Wide Web that could be a place to visit as a virtual field trip in your lesson. (ISTE NETS-T 2.A).

Building My Professional Portfolio

- *Creating My Lesson.* Using the ASSURE model, design a lesson for a scenario from the table in the Lesson Scenario Chart appendix or create a scenario of your own design. Use the information from this chapter related to learning centers, manipulatives, display surfaces, and exhibits. Be sure to include information about the audience, the objectives, and all other elements of the ASSURE model. Be certain to match your intended outcomes to state or national learning standards for your content area. (ISTE NETS-T 2.A & 2.B)

- *Enhancing My Lesson.* Using the lesson you've just designed above, consider your audience again. You might wish to consider that some of your students have special needs, such as physical or learning disabilities. You might also consider those students who are identified as gifted. How will you change your lesson design to ensure that these students are recognized and supported to allow them to succeed in your lesson? (ISTE NETS-T 2.B & 2.D)
- *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. What have you learned about matching audience, content, instructional strategy, and materials? What can you have done to develop your students' higher-order thinking or creativity skills? In what ways did the materials you selected for your lesson enhance the learning opportunities for your students? (ISTE NETS 5.C)

SUGGESTED RESOURCES

Print

Alvarado, A. E., & Herr, P. R. (2003). *Inquiry-based learning using everyday objects: Hands-on instructional strategies that promote active learning in grades 3–8.* Thousand Oaks, CA: Sage.

Bender, W. N. (2005). *Differentiating instruction for students with learning disabilities: A multimedia kit for professional development.* Thousand Oaks, CA: Corwin Press.

Butzin, S. (2005). *Joyful classrooms in an age of accountability: The Project CHILD recipe for success.* Bloomington, IN: Phi Delta Kappa International.

Cambre, M., & Hawkes, M. (2004). *Toys, tools, & teachers: The challenges of technology.* Lanham, MD: Scarecrow Press.

Counts, E. L. (2003). *Multimedia design and production for students and teachers.* Boston: Allyn & Bacon.

Cummings, J. P., Sayers, D., & Brown, K. (2006). *Literacy, technology, and diversity: Teaching for success in changing times.* Boston: Allyn & Bacon.

Ivers, K. S., & Barron, A. E. (2006). *Multimedia projects in education: Designing, producing, and assessing* (3rd ed.). Westport, CT: Libraries Unlimited.

Karnes, F. A., & Bean, S. M. (2001). *Methods and materials for teaching the gifted.* Waco, TX: Prufrock.

Ruffin, M. F. (2009). *Designing and creating virtual field trips: A systematic approach with Microsoft PowerPoint 2007* (2nd ed.). Boston: Pearson Learning Solutions.

Stainfield, J., Fisher, P., Ford, B., & Solem, M. (2000). International virtual field trips: A new direction? *Journal of Geography in Higher Education, 24*(2), 255–262.

Web Links

To easily access these web links from your browser, go to the MyEducationKit for your text, then go to Chapter 11 and click on the web links.

Project CHILD

www.ifsi.org/projectchild

The Institute for School Innovation is the organization that developed Project CHILD. Refer to their website for more information about the research and developments related to the project.

Smart Boards

www.smarttech.com

Smart Technology is one of the companies that produces interactive whiteboards. They refer to their product as "Smart Boards."

Cincinnati Zoo

www.cincyzoo.org

The Cincinnati Zoo & Botanical Garden is dedicated to creating experiences that foster a sense of wonder, share knowledge, and advocate active involvement with wildlife and wild places. The Cincinnati Zoo & Botanical Garden is proud to offer programs for children and adults, school groups, and families.