C H A P T E R   1 5

EDUCATIONAL MULTIMEDIA CASE STUDY: *SKY HIGH*

Summary

Name of production: *Sky High*
Writers: Maria O'Meara, Ruth Nadel, Ron McAdow, and Beth Chapman
Developer: D. C. Heath and Company
Subject: Space and flight
Audience: Elementary school children
Medium: CD-ROM
Presentation location: Schools
Coals: Inform, teach, entertain
Architecture: Hierarchical branching, worlds, simulation

PROGRAM DESCRIPTION AND BACKGROUND

PROGRAM DESCRIPTION

Sky High is a CD-ROM aimed at an elementary school audience on the subject of manned flight and space exploration. Its main interface is a 360-degree panoramic landscape built along a time line from antiquity to the present. Only a portion of the landscape is visible on the screen at one time. The user accesses the hidden parts of the landscape by moving the mouse to one edge of the screen. This causes more of the landscape to appear as the viewer travels forward or backward in time.

At the bottom of the screen is a time line of dates. Above the dates are screen images and text. These hot spots can be clicked with the mouse to reveal an animation, text, video, and/or graphic on an aspect of flight during that time period. Some
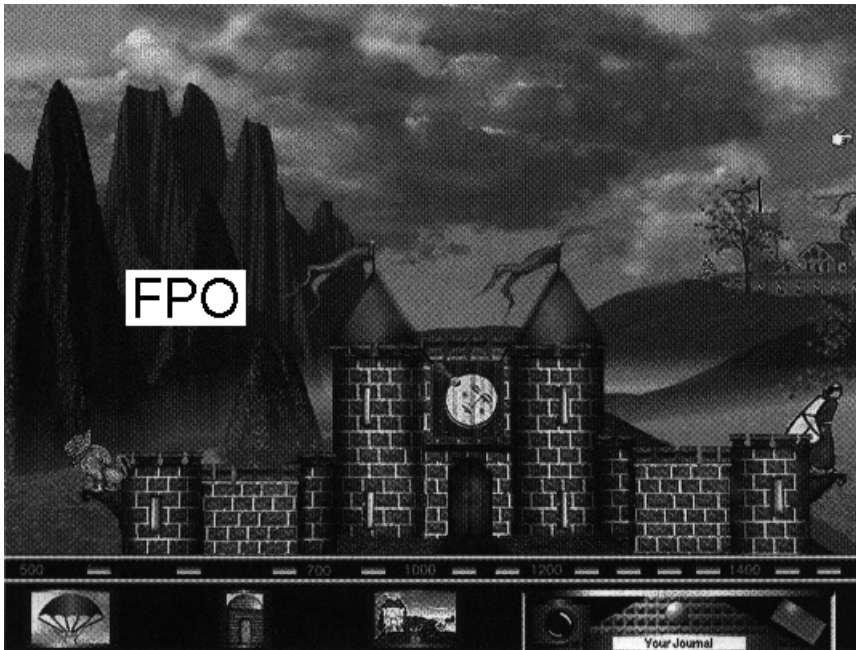
FIGURE 15–1

Medieval and Renaissance panel of main interface with Dragon, Brother Eilmer, and King Arthur's Castle.

hot spots in a panel are grouped into explorable spaces, such as King Arthur's Castle, Leonardo DaVinci's Workshop, the Wright Brothers' House, and the Visitor's Center. Each of these spaces can be entered by clicking.

Inside these spaces are many more hot spots to click on for more information, such as a photo of the Wright Brothers, a trophy, or "books" on various aspects of flight. There are also games and quizzes in several of these spaces. The students can take notes and snap screen shots for their on-screen journal, which pops up by clicking "Your Journal" in the bottom right of the main interface. (See Figure 15–1.)

MULTIMEDIA IN SCHOOLS

CD-ROMs are a major way that multimedia is used in schools. Some titles, such as *Sky High*, are produced primarily for the classroom; other programs, such as *SimCity* and *Carmen Sandiego* are designed for the school and the home. For larger groups, multimedia is often presented with a computer projection system that allows teachers to instruct an entire class in a fashion far superior to "chalk talk."

There are also numerous Web sites geared for children and elementary school teachers, including: EdWeb, Cisco Educational Archives, A&E Classroom, Ask ERIC, and Busy Teacher's K-12 WebSite, which features a collection of resources for teachers presented in alphabetical order. (Links to these sites and others are included under this chapter in the "Chapters" section on the *Writing for Multimedia and the Web* CD-ROM.)

PRODUCTION BACKGROUND

Sky High was developed by the Educational Technologies Department at D. C. Heath and Company, a major publisher of textbooks for the primary grades through college. Soon after this piece was produced, D. C. Heath was purchased by publisher Houghton Mifflin Company, the current distributor of S*ky High*.

Sky High is part of the Discoveries Series of CD-ROMs that also includes *In the Desert*, *Into the Forest*, and *The Nature Connection*. The Discoveries project was developed as part of Heath Literacy, D. C. Heath's theme-based elementary reading program. The goal of the project was to support the idea that literacy is more than the ability to read. It is the ability to connect ideas that come through a variety of media—sounds and visuals as well as text. In addition, the feeling was that children should be in charge of their learning as much as possible, making choices about what to study in greater depth.

Students can explore the Discoveries CD-ROMs independently or use them to support work on projects involving collaboration and communication with others. Each CD in the series reflects one theme covered in the literacy program. *Sky High* is built around a third-grade theme of space and flight. The plan was that the CDs could be sold and used with Heath literacy, or they could be sold separately to be used alone or with other subject areas. They are also designed to accommodate a wider range of grades than the original target market (Astudillo). The project manager on the series was Deborah Astudillo, and the director of educational technologies was Roland Ochsenbein. The writers were Maria O'Meara, Ruth Nadel, Ron McAdow, and Beth Chapman.

CHALLENGES WRITING AND DEVELOPING *SKY HIGH*

The key challenges in writing and developing *Sky High* were these:

- Organizing and making accessible a large database of loosely related material.
- Reaching a broad elementary school audience.
- Writing to archival material versus creating the content.

ORGANIZING A LARGE DATABASE OF LOOSELY RELATED MATERIAL

Unlike the example in Chapter 14, "Museum Kiosk Case Study: *The Nauticus Shipbuilding Company*," which was tightly focused, *Sky High* covers a wide subject area: manned flight and space exploration. Whereas *Nauticus* is designed to be played in a few minutes, *Sky High* contains hours of material on the subject that can be browsed or searched in the books of the virtual library. This vast amount of information could potentially cause organizational problems for the development team and access problems for the user, who could get lost in such a large database of material.

SCRIPT FORMAT

In a project of this magnitude, the writers and other team members need to use various tools to keep material organized. The script format itself is important. This project used tables in Microsoft Word to separate and label the different types of material.

Sky High's media (text, graphics, video, etc.) are accessed by clicking hot spots, which are grouped on the monitor screen according to a time frame called a panel, such as "Panel IV—Early Aviation." The hot spots in a panel can be further grouped into a location that can be clicked on and entered, such as the Wright Brothers' House.

In the script, the location of the media is first introduced in standard screenplay fashion in single-column format. Then the individual hot spots and their media in that location are explained in a three-column coded format. (The following three-column example does not follow immediately after the description in the script.)

PANEL IV-EARLY AVIATION

IV A. Wright Brothers Close-Up

A Victorian-style house on the panorama opens to a Wright brothers close-up. Note bike leaning on fence outside. This is a nice touch.

    Once inside, Katherine, the Wright brothers' sister, narrates. The walls are covered with wallpaper. There are ferns on plant stands and other Victorian doodads. Photos on the walls and in frames standing on the tables highlight family members, the Wrights as children and adults, and a shot of the bike shop.

VISUAL	NARR/SYNC	MUSIC/SFX
Animation **[BUZZ.QT.ANM]** ANIMATED BUZZARDS Lace curtains in window, clicking on window activates buzzards outside to circle.	**Narration** **[BUZZ.QT.NARR]** KATH NARR Wilbur and Orville studied soaring buzzards and observed how they turned by moving their wings.	**Music** **[BUZZ.QT.SFX]** SFX MUSIC Music, subtle underscoring LIBRARY LINK 01.3 HOW THINGS FLY—GLIDING

The first column lists the clickable hot spot. It is written in caps. In this case, the hot spot that can be clicked is an animation of buzzards outside the window of the house.

The buzzard hot spot gets its own code name: BUZZ.QT.ANM. The first word identifies the buzzard image; QT stands for Quick Time, the digital video format used to present the animation; and ANM means it is an animation as opposed to a STL (still picture) or VID (video). The number at the bottom (1.2) indicates that it has a link to Book 1, topic 2 in the Visitor's Center library. The viewer can click on this library link and get more information about gliding.

The second column follows a similar coding procedure, letting us know that this is connected to the BUZZ image and that this is voice-over narration (NARR) as opposed to synchronized sound (SYNC). Synchronized sound usually refers to a sound that appears to be produced by the image on screen, such as a person talking on camera. The next line also lets us know that KATH (Katherine Wright) is the narrator.

The code at the top of the third column labels MUSIC or SFX (sound effects), any sound other than music or speech. This column also clearly defines the link for more information, which in this case is to the "book" in the on-screen "library" titled HOW THINGS FLY. The specific section is GLIDING.

SCREEN FORMAT FOR CARDS AND BOOK PAGES: TECHNICAL LIMITS ON THE WRITER

Each animation in the panorama calls up a card with more information in the form of a video and text, which links to a library "book." The large amount of material in this project necessitated the use of four standard screen formats for these cards:

Format 1: Picture or video on top of the page, with title and text below.

Format 2: Picture or video on top of the page with text below.

Format 3: Text.

Format 4: Text at the top and still picture at bottom.

These standard formats facilitated production because the graphic designers and programmers did not have to design a new screen for every page. The consistency of screen interface also helped the viewer access the material. The viewer could quickly learn that each page had its own rules—for example, no hot spots on all-text screens, and hot spots in certain places on other screens.

Format 1 always had to be first in a sequence because it carries the title panel. The other formats could follow in any order.

These formats created a restriction for the writers, who had to write to one of the specific formats and be sure to flag in the script which format was being used. The writers were limited to the specific number of lines available on each card. This meant writing in journalistic, inverted-pyramid style, with the least important information at the bottom so that it could be trimmed if necessary.

Another limitation on the writer was text that was bitmapped and displayed as an image. This allowed more control over the text's visualization, but as the following example shows, the writers had to write the text in the correct font size and the exact number of lines. This also helped to flag the text as artwork for the production team.

Text	Narration
`[CD.TXT.SPUT]`	`[CD.SPUT.NARR]`
When the Russians sent Sputnik into orbit, it was the first time humans had ever sent anything into outer space. People around the world were surprised. They thought that America would do it first.	When the Russians sent Sputnik into orbit, it was the first time humans had ever sent anything into outer space. People around the world were surprised. They thought that America would do it first.

Information Card Text (F1) **[CD.ART.SPUT]:**

When the Russians sent
Sputnik into orbit, it was the
first time humans had ever
sent anything into outer
space. People around the
world were surprised. They
thought that America would
do it first.

MAKING THE DATABASE ACCESSIBLE TO USERS

Once the writing process was organized, ways had to be found to make this large database of loosely related material accessible to users. This was accomplished through focusing the scope of the project, using concept maps, and moving beyond click-and-read in a number of ways, including simulations, games, and explorable spaces.

Focusing the Scope of the Project

The project was made more accessible to users by focusing the content and limiting the technical complexity of the program. Originally the series was going to hook into the Internet. It was also going to include the capacity for drawing pictures and recording voice. Eventually, all of these approaches were abandoned as too elaborate and expensive. Instead, it was decided to concentrate on presenting content in the most engaging way possible.

The next decision was to narrow the very broad topics of flight and space to flight firsts: the first person to fly a plane, the first person to fly across the Atlantic, the first man on the moon, and so on. The treatment of space focused on a visit to each planet and a history of its discovery and exploration.

Organizing with a Concept Map

Concept maps are a way to organize the material in a database according to a visual image or map. The museum or journey approaches are fairly common. The basic interface of *Sky High*, which tracks the development of flight from antiquity to the present, is a time-journey concept map.

A danger with concept maps is combining incompatible maps. For example, in *Sky High*, one of the original ideas was to be able to pan up from the earthbound time line to see the stars and planets in the sky. This idea had to be abandoned because the panorama journey is time-based, and the stars and planets would have been space-based. The problem would have been ensuring that the right element in the sky was in the right place in relationship to the time line. For example, if a user was in the 1960s time frame and studying the moon landing, he or she should be able to pan up to the sky and see the moon. But when the user is in 1903 and looking at the Georges Méliès film *A Trip to the Moon*, he or she should also be able to pan up to the sky and see the moon. But the moon can't be in two places: above 1903 and 1969.

Because of this conflict as well as technical limitations, the spatial concept map of the sky was dropped from the main panorama interface and instead included as a planetarium in the Visitor's Center, an explorable building on the map that can be clicked on and entered.

Organizing the Material with Explorable Spaces

The Visitor's Center or planetarium is just one example of an explorable space in this program. An explorable space uses the worlds structure. The interface for this structure is a space that the user can enter and explore, such as a room, a house, or even an entire world. Information related to that space can be accessed by clicking on hot spots, such as photographs on the wall, trophies on a table, or books on a shelf.

Some of the explorable spaces in this project include King Arthur's Castle, which contains medieval flight information; Leonardo DaVinci's Workshop, which contains his drawings and writings; the Wright Brothers' House, which has material about their contribution to flight; and the Visitor's Center, which includes a library, observatory, and trivia games. The Visitor's Center can be entered at any time through its image, which is always located at the edge of the screen between the present and the past, or through its menu bar icon.

Following is a portion of the Wright Brothers' House sequence, a good example of an explorable space. Note the effort to make the media as engaging as possible, such as camera movements and zooms on still pictures, highlighting parts of a plane as the parts are mentioned in the narration, and including entertaining animations, such as the doodle drawing of a kite. Within this "house" the information is also organized into a subcategory with a scrapbook metaphor that can be viewed like a real book.

Wright Brothers' House Sequence

IV A. WRIGHT BROTHERS CLOSE-UP

A Victorian-style house on the panorama opens to a close-up of a room. Note bike leaning on fence outside. This is a nice touch.
   Once inside, Katherine narrates. The walls are covered with wallpaper. There are ferns on plant stands and other Victorian doodads. Photos on the walls and in frames standing on the tables highlight family members, the Wrights as children and adults, and a shot of the bike shop. (Samples from the room sequence follow.)

VISUAL	NARR/SYNC	MUSIC/SFX
Video **[BIKE.QT.VID]** IV A. WALL PHOTO #6 VIDEO-EXT. SHOT OF BIKE SHOP Zoom into front door, slowly dissolve to inside. INT. BIKE SHOP Wilbur working. Still from Wright Collection	Narration **[BIKE.QT.NARR]** KATH NARR Back then bikes were all the rage. Wilbur and Orville started out riding bikes, and then repairing them. . . . Soon they were making bikes and selling them.	SFX **[BIKE.QT.SFX]** Machine noise in shop grows louder as we enter. MUSIC SFX, exterior birds, wind
Still **[GRAD.QT.STL]** IV A. WALL PHOTO #7 KATHERINE graduation still from Wright Collection	Narration **[GRAD.QT.NARR]** KATH NARR There I am, Katherine Wright. In this picture, I was graduating from Oberlin College. I was the only child in the family who went to college. Orville was so wrapped up in his printing business, he never went. Wilbur stayed home to care for Mama, when she was dying of tuberculosis. After Mama died, I came home and took care of the family.	MUSIC? **[GRAD.QT.SFX]**
Animation **[BUZZ.QT.ANM]** ANIMATED BUZZARDS Lace curtains in window, clicking window activates buzzards outside to circle [1.3]	Narration **[BUZZ.QT.NARR]** KATH NARR Wilbur and Orville studied soaring buzzards and observed how they turned by moving their wings.	MUSIC? **[BUZZ.QT.SFX]** SFX MUSIC Music, subtle underscoring LIBRARY LINK 01.3 HOW THINGS FLY-SOARING
Animation **[TOYH.QT.ANM]** IV A. TOY HELICOPTER	Narration **[TOYH.QT. NARR]** KATH NARR That's a toy	SFX **[TOYH.QT.SFX]** Rubber band helicopter sound

VISUAL	NARR/SYNC	MUSIC/SFX
spins when activated	helicopter Orville made after he and Wilbur wore out the toy one Papa had given them.	

Photo Album on Coffee Table

A photo album lies on a coffee table. Clicking opens it. Each page has a voice-over which is activated when clicked. Katherine's voice-over narrates a brief history of her brothers' yearly trips to Kitty Hawk. Viewer may page backwards or forwards. STILLS, Wright Collection.

PAGE 5 & 6 (of photo album).

VISUAL	NARR/SYNC	MUSIC/SFX
Art **[ALBM.QT.ART]** (combine pp. 44 and 126 "See Them Flying") ART Basic diagram of a flying machine, with words "wings," "engine," "rudder" written next to appropriate piece HIGHLIGHT the wings HIGHLIGHT engine HIGHLIGHT rudder	Narration **[ALBM.QT.NARR]** Orville and Wilbur decided that a flying machine would need three things. Wings, to lift it into the air—an engine to move it through the air—and a rudder to steer it.	SFX **[ALBM.QT.SFX]** SFX air, whoosh SFX 12 hp engine SFX turning rudder, creak noise

PAGE 7, (L) SKETCH/KITE.

VISUAL	NARR/SYNC	MUSIC/SFX
Art **[ALBM.QT.ART]** SKETCH Drawing of kite, biplane with 5 ft. wingspan, show in proportion to a brother, doodle style, make sure to put cap & bow tie on him. Maybe have doodle with two brothers flying it, kids watching?	Narration **[ALBM.QT.NARR]** To test their theories, my brothers built a huge kite. Every child in the neighborhood showed up to watch them fly it! Delighted at their ability to control the kite, Wilbur and Orville set to work immediately on a glider big enough to carry a person.	SFX **[ALBM.QT.SFX]** SFX Wind, laughter, children's voices

Organizing the Material with a Book Metaphor

The last part of the above example uses a photo album as a way to organize the material. Books are a handy metaphor to organize information. *Sky High* uses this metaphor again in the library of the Visitor's Center with books on a variety of topics. To read a "book," the user clicks on the book, and it comes off the shelf; more clicking turns the pages. Following is a page from the library's working table of contents to show how the material is organized and labeled. To sample the contents of one of the books, read the space shuttle example at the end of this chapter.

SKY HIGH LABELED LIBRARY TABLE OF CONTENTS

[BK.HOW]	How Things Fly
[FLAP]	Flapping (QT)
[GLID]	Gliding (QT)
[HOVR]	Hovering (QT)
[JPRO]	Jet Propulsion (ANIMATION)
[BK.MOON]	The Moon
[ORBT]	Orbit-ANIMATION
[PHAZ]	Phases-ANIMATION (Day, Month)
[ECLP]	Eclipses-ANIMATION
[BK.WHY]	The Book of Why about the Sky
[RAIN]	What Makes Clouds? (ANIMATION)
[TBNN]	Why Is There Thunder and Lightning? (ANIMATION)
[RBOW]	Why Are There Rainbows? (ANIMATION)
[BK.FFLY]	Famous Fliers
[WBRO]	The Wright Brothers (QT)
[LIND]	Charles Lindbergh (QT)
[EAR]	Amelia Earhart (QT)
[BESS]	Famous Person (QT)
[BK. GAZE]	Stargazers
[ANGZ]	Ancient Stargazers (STOCK/QT)
[COP]	Copernicus (STOCK/QT)
[GAP]	Celia Gaposhkin (STOCK/QT)
[NOVA]	Stephen Hawking (STOCK/QT)

Simulation as a Way to Present Material

Most of the above approaches simply organize the material into categories that can be explored in an interesting way through a concept map or a book. There are other ways to present material, however, that are more interactive. Perhaps the most engaging is the simulation approach, which was demonstrated in depth in *The Nauticus Shipbuilding Company* case study in Chapter 14. A simulation structure, however, does not have to be used for an entire piece. As in the next example, it can also be used as part of a larger piece that follows another structure.

"Ye Olde Gravity Lab" is a simulation that can be played by clicking on a castle and entering King Arthur's Court. Ye Olde Gravity Lab is meant to teach principles of gravity by showing what would happen if you catapulted various sizes of balls at

a bull's-eye while on different planets or the Earth's moon. Following is the scripted content of the Court followed by a description of the "Ye Olde Gravity Lab" simulation.

PANEL II: MEDIEVAL AND RENAISSANCE TIMES

CLOSE-UP: KING ARTHUR'S COURT-600 A.D.

Click on the castle and go inside!

VISUAL	NARR/SYNC	MUSIC/SFX
Animation **[PHAZ.QT.ANM]** Castle—On the wall, an ancient looking calendar with moving phases of the moon	Narration **[PHAZ.QT.NARR]**	SFX **[PHAZ.QT.SFX]** [BK 2.2]
VISUAL	**NARR/SYNC**	**MUSIC/SFX**
Video **[ECLP.QT.VID]** CASTLE VIDEO— Méliès FOOTAGE, from "The Astronomer's Dream" will probably need to be speeded up a little (ARCHIVE FILMS)	Narration **[ECLP.QT.NARR]**	Music **[ECLP.QT.MUS]** Music [BK 02.3]
Animation **[CATP.QT.ANM]** Castle—Ye Olde Gravity Lab—enter lab and play animated game catapulting different balls. Take catapult to the moon, Mars, and Jupiter to see differences.	Narration **[CATP.QT.NARR]**	Music **[CATP.QT.MUS]**

Ye Olde Gravity Laboratory

When you click on the castle in the panorama, you see a close-up of a wall inside the castle. There are three hot spots on this wall, leading to a moon, to an eclipse, and to Ye Olde Gravity Lab. If you click on the catapult, you enter the laboratory.
   The laboratory fills the screen except for the Discoveries control bar on the bottom. The initial laboratory screen contains the following elements:

• Catapult—base with hinge, arm with basket for ball, and compression spring to power the "throw." The base and hinge can be part of the background art, but the

arm + basket + spring is separate artwork. In order to do the animation with the arm + basket we need five different positions between the starting position and the ending position. There is a release mechanism, such as a string that you "pull" to fire the catapult.

- Target supported by post or tripod.
- Balls (with labels): Ping-Pong, golf, baseball, and bowling. Each ball is a separate piece of artwork, and each has a labeled resting place that is part of the background art.
- A control panel with radio buttons for four places: Jupiter, Earth, Mercury, Earth's Moon, and an Exit Lab button. These buttons can be painted into the background art BUT there must be an alternate version of each gravity button that is highlighted (radio button on).
- Prompter's booth. The guy who changes the place backgrounds is in this booth. Although you don't see him do it, he also grabs thrown balls as they roll in front of him.
- An Exit Lab button.
- A curtain or other wall covering that appears to be behind the control panel. On the curtain is an instructions box:

> Ye Olde Gravity Lab Welcomes You
> Click to Choose a Place

When you click a place button, a voice says:
"So, you want Jupiter."
"Okay, here's Earth."
"All right, you get Mercury."
"Here's the moon."
A hand reaches from the prompter's booth to the top of the screen and pulls down a backdrop representing the place requested.

- Jupiter sign: "Jupiter. Twice the gravity of Earth."
- Earth sign: "Earth."
- Mercury sign: "Mercury. One-third the gravity of Earth."
- Moon sign: "Moon. One-sixth the gravity of Earth."

SFX: "WHAPWHAPWHAPT" as backdrop unrolls.

The instructions box says: "Drag a ball to the end of the catapult." When the catapult is loaded, the instructions box says: "To fire the catapult, pull the string."

There are seventeen different throwing possibilities, one for each combination of ball and gravity, plus one for an unloaded catapult. If the ball flies over the target, you hear a SFX "WHOOSH." If it hits the target but misses the bull's-eye!, you hear SFX "THUMP," then as it bounces on the floor you hear

SFX "BOUNCE." If it hits the bull you hear a loud
bell. If the bowling ball goes directly to the floor
you hear SFX "CRASH." If the catapult is fired without
being loaded, you hear SFX "THWANGGGGG."

   After a throw, there is a two-second delay; then
the program resets. The place does not change, but the
balls return to their starting points and the catapult
is drawn back into ready position (SFX "SPRING
COMPRESS"). The directions box says "Load the catapult
or change the place."

   At any time you can click a different place. A hand
from the prompter's booth pushes up the old background
(SFX "WHIROOP"), then pulls down the new one while you
hear its narration. The instructions box returns to
"Drag a ball to the end of the catapult." You can
change the gravity or exit at any time. Clicking the
Exit Lab button takes you back to the close-up through
which you entered. As you exit, the guy sticks his
head out of the prompter's booth and looks at you.

   If you click on the prompter's booth, the "guy"
peers around at you and says "Huh."

Quizzes as a Way to Present Material

Another way to present material is through quizzes, as in the next example. Notice
that there is feedback for every answer and amusing sound effects aimed at the young
audience.

QUESTION 14 [CD.QZ.CSNA 1-BG.PAN]

| VISUAL	NARR/SYNC	MUSIC/SFX
Question 14 **[CD.QZ.CSNA.1]** Charles Lindbergh named his plane The Spirit of . . . St. Louis. Ammonia. New York.	Narration **[CSNA.1.Q.NARR]** Charles Lindbergh named his plane The Spirit of . . . St. Louis. Ammonia. New York.	
Answer **[CSNA.1.A]** St. Louis		SFX **[CSNA.1.Q.SFX]** Right answer SFX
Distracter 1 **[CSNA.1.D1]** ammonia.	Narration **[CSNA.1.D1.NARR]**	SFX **[CSNA.1.D2.SFX]** Whew! No!
Distracter 2 **[CSNA.1.D2]** New York.	Narration **[CSNA.1.D1.NARR]**	SFX **[CSNA.1.D2.SFX]** loud honking car
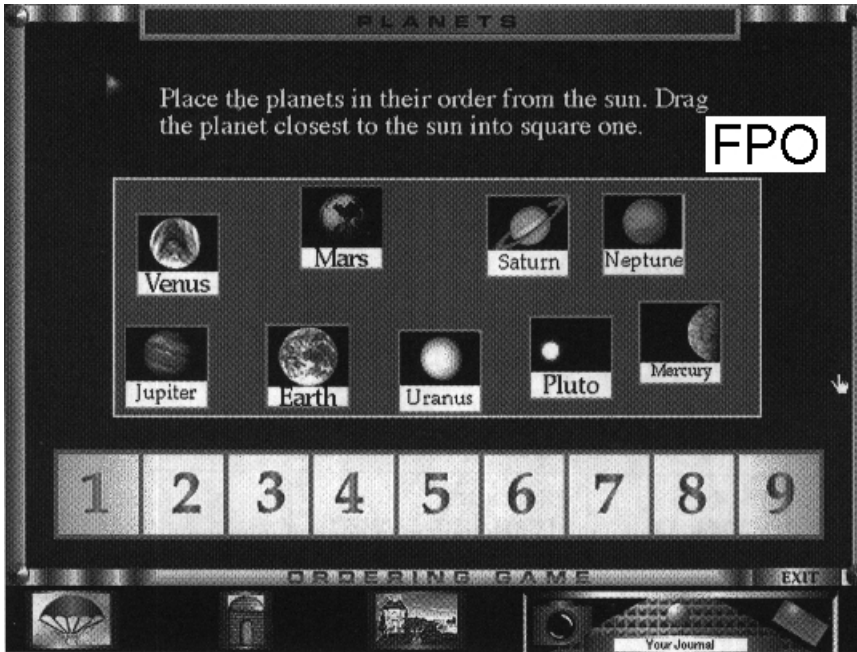
FIGURE 15–2

Ordering game.

Matching Games as a Way to Present Material

Matching games, which use images that viewers can move with the mouse, are another way to get the user to interact with the material. *Sky High* used two basic types of matching games:

- Put things in the right sequence—for example, place planets in order, starting from the closest to the sun (see Figure 15–2).
- Place in the proper group—for example, choose all elements that fly straight up, such as a hummingbird, helicopter, and hot air balloon, or drag planets that have moons into the boxes.

REACHING A BROAD PRIMARY SCHOOL AUDIENCE

In addition to the key challenge of *Sky High*, which was organizing and making accessible a large database of material, the writers also had to maximize the program's use by making the material appealing to a broad primary school audience.

This was done by:

- Using the many media in this program to make the basic information comprehensible to a wide age group.
- Including entertaining elements.
- Expanding the basic subject material to make the program multidisciplinary.

Using the Many Media to Make the Information Comprehensible to a Wide Age Group

Although the *Sky High* CD was aimed primarily at third-graders, multimedia can appeal to a wide audience, because the same information can be communicated in multiple ways and can be replayed by the user. This feature helps both younger children and students with disabilities. For example, on this CD, students have the option of having text read out loud. They can take notes and snap screen shots for their on-screen journal for later review and questions for the teacher. In general, the images also provide a context to understand information. Because of this multimodal communication, the finished CD-ROM has a wide appeal, ranging from grades 1 through 8.

Presenting information in an entertaining way or simply choosing entertaining material is also important with a school-age audience. This can be done in a number of ways:

- Feedback: There's a trivia game in the Visitor's Center in which the user's correct answers are rewarded with different animations of a flying stunt, such as a barnstormer on the wings of a biplane.

- Text and audio quotes: It's important to keep an eye out for quotations that might especially appeal to children. This vivid description of life at Kitty Hawk by Orville Wright has gotten chuckles in the classroom:

VISUAL (Super Quote Still)	NARR/SYNC	MUSIC/SFX
TEXT [CSNA.QT.VID] There was no escape [from the mosquitoes.] The sand and grass and trees and hills and everything was fairly covered with them. They chewed us clear through our underwear and socks. Lumps began swelling up all over my body like hen's eggs. Your brother, Orville	NARR TEXT ORVILLE There was no escape [from the mosquitoes.] The sand and grass and trees and hills and everything was fairly covered with them. They chewed us clear through our underwear and socks. Lumps began swelling up all over my body like hen's eggs. Your brother, Orville	SFX Buzzing mosquitoes

- Audio. The buzz of mosquitoes sound effect in the above script sample is an example of how audio can be used to enliven information.

- Pop culture material. Using material from pop culture can also be effective. For example, a *Flash Gordon* video illustrates some early ideas about vertical flight, and a clip from the TV series *Lost in Space* portrays visions of space travel.

Expanding the Basic Subject Material to Make the Program Multidisciplinary

The audience for this program was broadened by expanding the subject matter beyond pure science issues concerning flight. An example is the inclusion of the story of Bessie Coleman, the first black person to earn a pilot's license. Because of racism, no one in the United States would teach her how to fly. There was, however, less prejudice in France, so she learned French, got her pilot's license, and later returned to the United States and started her own air shows.

Important popular culture material was also included, such as *A Trip to the Moon*, by Georges Méliès. This is a significant work in film history and the first movie about a trip to the moon. It was made the same year the Wright brothers made their flight. General historical context is also available to the *Sky High* user. Clicking on the date on the bottom of the time line reveals a description of other events happening at that time.

WRITING TO ARCHIVAL MATERIAL VERSUS CREATING THE CONTENT

Writing a broad database project, such as this one, means using primarily archival material to present information. Writers can approach this challenge by acquainting themselves with existing archival material and then developing their concepts based on this information, or they can form a general concept of what they want to say, then find (or have a researcher find) the photo, video, quotation, or other element that will best present their idea.

In either case, writers are always adjusting their original conceptions to the archival material that is available. It is important for writers not to become too rigid about their original ideas because sometimes they must abandon them when available media supports a totally different approach.

Below are the first and second drafts of the Space Shuttle section from the "book" in *Sky High*'s Visitor's Center titled "Space Firsts." The original concept in the first draft was to present a serious piece about repairing the Hubble telescope. Unfortunately, the footage received from NASA was about the shuttle crew eating breakfast! The sequence had to be completely rewritten to accommodate the new footage. See what you think of the results.

SPACE SHUTTLE: FIRST DRAFT

VISUAL	NARR/SYNC	MUSIC/SFX
VIDEO **[CSNA.QT.VID]** NASA, shots of space shuttle #1 TAKE OFF	**NARR VIDEO** **[CSNA.QT.NARR]** The crew of this space shuttle went up to repair the Hubble, a powerful space telescope.	SFX take off
#2 Hubble being repaired	The crew worked hard to fix the Hubble.	

VISUAL	NARR/SYNC	MUSIC/SFX
#3 Hubble being repaired	Many people watched them on TV.	Mix in wild sound of astronauts & ground control
#4 Crew leaving Hubble	Now the Hubble can bring us pictures and information about the stars so we can learn more about how our universe was formed. The shuttle comes back ready to go on another mission.	
#5 Shuttle landing		SFX shuttle landing

SPACE SHUTTLE: SECOND DRAFT

VISUAL	NARR/SYNC	MUSIC/SFX
VIDEO **[SHOT.QT.VID]** #1 SPACE SHUTTLE TAKE OFF	**NARR VIDEO** **[SHUT.QT.NARR]** A day in the life of a space shuttle crew member is a lot like yours.	**MUSIC** Skater's Waltz
#2 Floating astronaut putting on pants. #3 Banana spins into mouth #4 POV floating through tunnel	You get up in the morning . . . get dressed . . . have a little breakfast . . . and find your way to school or work.	
#5 3 astronauts stacked up doing push-ups, then flying toward camera #6 ECU hand holding candy, then letting go. #7 Wide shot, woman eating M & Ms that are floating in air	Now you're ready to get down to business. Time for some exercise! Feeling a little hungry? Then it's time for a snack . . .	
VIDEO **[SHUT.QT.VID]** #8 EXT. Astronauts working outside	**NARR** Now for some outdoor activities . . . Of course, everyone has	**MUSIC** Skater's Waltz *Continues*

VISUAL	NARR/SYNC	MUSIC/SFX
shuttle, floating in space. #9 INT. Astronauts in bunk area, writing, notebooks floating all over. #10 ECU red globs breaking apart.	homework to do . . . and some experiments to finish.	
#11 Long shot of earth in distance. #12 Astronauts asleep in bunk, arms floating around. #13 EXT. Shuttle going through space.	Then it's time to kick back and just watch the world go by. It's been a long day. Time to get some rest. Goodnight.	

CONCLUSION: RESPONSE TO THE PROJECT

The project is popular in the classroom. In some cases, it is hard to tear students away to give a classmate a chance to play—testament to the skillful way this development team took a large body of loosely related information and fashioned it into an informative and engaging multimedia program.

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