

FIGURE 2.8

Graphic Organizer for Analogies

is to		as	

With his class, Mr. Waters has been discussing the impact the computer has had on modern society. As a way of deepening their thinking about this topic, he presents students with the following analogy graphic organizer:

digital	is to	computer
Relationship: _____		
	is to	

FIGURE 2.9

Graphic Organizer for Analogies in Use

thermometer	is to	temperature
Relationship: _____ measures incremental changes in something		
as	is to	distance

Figure 2.8 shows a graphic organizer that might be used with students to help them understand the nature of analogies. Again, students would use the graphic organizer to fill the elements of an analogy, as Figure 2.9 shows.

The following example describes how a teacher in a technology class used the analogy graphic organizer.

Marzano,
Pichevring,
Pollock
Classroom Instruction
That Works 2005

SUMMARIZING AND NOTE TAKING

In previous years, Mrs. Zimmers taught her middle school unit on mythology by assigning the students a selection of myths to read and asking them to construct their own myths using a story structure in which many of the characters undergo dramatic changes. While the students often enjoyed the storytelling nature of the task, they seemed to miss the deep historical importance of the myths to the people who created them. This year, she had a plan to change things. To gain a deeper understanding about the history of ancient Greece, students were asked to read two essays and view a short film on Greek mythology. Additionally, students were asked to summarize each essay as homework. Finally, Mrs. Zimmers asked students to turn in the notes they took during the film.

Mrs. Zimmers was taken aback with what she received. When she read the first summaries, she realized that many students did not really summarize the information or did not understand the nature and purpose of a summary. They simply reworded information from the text and made no attempt to translate it into a synthesized form. To her dismay, she concluded that her students did not know how to summarize. Mrs. Zimmers set for herself the goal of teaching her students a specific summarizing strategy. Mrs. Zimmers also realized that she would have to teach note-taking strategies and skills. Most of the students took far too few notes, although a couple of students tried to record everything they heard or read.

After realizing a skill weakness in her students, Mrs. Zimmers has chosen to explicitly teach two of the most useful academic skills students can have: summarizing and note taking. We have assigned these skills to the same instructional category because they both

- IDENTIFYING SIMILARITIES AND DIFFERENCES
- SUMMARIZING AND NOTE TAKING
- REINFORCING EFFORT AND PROVIDING RECOGNITION
- HOMEWORK AND PRACTICE
- NONLINGUISTIC REPRESENTATIONS
- COOPERATIVE LEARNING
- SETTING OBJECTIVES AND PROVIDING FEEDBACK
- GENERATING AND TESTING HYPOTHESES
- CLUES, QUESTIONS, AND ADVANCE ORGANIZERS

require students to distill information into a parsimonious, synthesized form.

Research and Theory on Summarizing

Summarizing has a robust and long history of research. Figure 3.1 reports findings from some of the studies that have attempted to synthesize the research on summarizing.

Researchers Valerie Anderson and Suzanne Hidi have provided highly useful reviews of the rather voluminous literature base in summarizing (see Anderson, V., & Hidi, 1988/1989; Hidi & Anderson, 1987). We can extract at least three generalizations from this research:

1. To effectively summarize, students must delete some information, substitute some information, and keep some information. This generalization springs from the work of cognitive psychologists like Walter Kintsch and Teun van Dijk (see Kintsch, 1979; van Dijk, 1980) who have studied the basic cognitive mechanisms involved in summarizing. To illustrate, consider Figure 3.2, which contains a sample passage about the photographic process.

If you were to read this passage with the purpose of summarizing it, your mind would quite naturally engage in three activities: (1) deleting things, (2) substituting things, and (3) keeping things. To obtain a sense of the outcome of these three processes, consider part B of Figure 3.2, which shows how a reader might summarize this passage.

FIGURE 3.1

Research Results for Summarizing Strategies

Synthesis Study	No. of Effect Sizes (ESs)	Ave. ES	Percentile Gain
Pilum, Walberg, Karejanes, & Rasher, 1980 ^a	2	.62	23
	2	.73	27
Cismore, 1985	100	1.04	35
Rosenshine & Meister, 1994	10	.88	31
Hattie, Biggs, & Purdie, 1996	15	.88	31
Rosenshine, Meister, & Chapman, 1996	16	.87	31
Raphael & Kirschner, 1985	3	1.80	47

^aTwo categories of effect sizes are listed for the Pilum et al. study because of the manner in which the effect sizes were reported. Readers should consult that study for more details.

FIGURE 3.2

Exercise in Summarizing

A

The Photographic Process

The word *photography* comes from the Greek word meaning "drawing with light." . . . Light is the most essential ingredient in photography. Nearly all forms of photography are based on the fact that certain chemicals are *photosensitive*—that is, they change in some way when exposed to light. Photosensitive materials abound in nature; plants that close their blooms at night are one example. The films used in photography depend on a limited number of chemical compounds that darken when exposed to light. The compounds most widely used today are silver and chemicals called *halogens* (usually bromine, chlorine, or iodine).

B

Macro-structure of the Photographic Process

The word *photography* comes from Greek words and means "drawing with light." Light is the most essential ingredient in photography. Nearly all forms of photography are based on the fact that certain chemicals are photosensitive—that is, they change in some way when exposed to light. Photosensitive materials abound in nature; plants that close their blooms at night are one example. Photography depends on chemical crystals that the films used in photography depend on a limited number of chemical compounds that darken when exposed to light. The compounds most widely used today are silver and chemicals called halogens (usually bromine, chlorine, or iodine).

Source: From "Photography," in *Mimssoft Encarta Encyclopedia*, 99. CD-ROM, Microsoft, 1999.

Note how much of the content has been deleted in Figure 3.2B. The reader simply decided that this information is not central to the overall meaning of the passage. Also note that one term has been substituted for a term in the original text—the term *crystals* has been substituted for the term *compounds*. In a summary, the "substitute" terms can be more general or more specific than those in the text. Finally, note that a few phrases and sentences that seem to convey the key information have been kept. This final, parsimonious synthesis of the information is technically referred to as the "macro-structure" for the information.

2. To effectively delete, substitute, and keep information, students must analyze the information at a fairly deep level. Although the mental operations involved in summarizing—deleting, substituting, keeping—seem quite simple, they demand a fair amount of analysis of the information being summarized. To illustrate using Figure 3.2 again, it requires no small amount of analytic thinking to conclude that the information about the origin of the word *photography* is not critically important, but the information that light is an essential ingredient is. In fact, in their synthesis of research, Borak, Rosenshine and his colleagues

(see Rosenshine & Meister, 1994; Rosenshine, Meister, & Chapman, 1996) concluded that strategies that emphasize the analytic aspect of summarizing, produce the most powerful effects in terms of students' ability to summarize.

3. **Being aware of the explicit structure of information is an aid to summarizing information.** Most writers present information in the context of an explicit structure, and the more a person is aware of this explicit structure, the better she is able to summarize the information. This generalization was brought to the attention of educators by the work of psychologists like Bonnie Meyer (see Meyer, 1975; Meyer & Freedle, 1984). To illustrate, assume you are about to read an article in an education journal on the topic of effective discipline strategies. Even before reading the article, you would know that it will probably take a certain form. You would expect there to be an introductory section explaining why effective disciplinary strategies are important; there would probably be a section discussing what has been done in the past.

Then, there would be a section describing the strategies the author considers most useful. At the end, there probably would be some type of summary statement. An awareness of this structure helps you identify which parts of the article to attend to the most. This knowledge helps you summarize the information. In general, research has demonstrated that making students aware of the specific structure in informa-

tion helps them summarize that information (see Armbruster, Anderson, & Overtag, 1987; Raphael & Kirschner, 1985).

Classroom Practice in Summarizing

The "Rule-Based" Strategy

One summarizing strategy developed by Brown, Campione, and Day (1981) is referred to as a rule-based summary strategy. As the name implies, the strategy is one of following a set of rules or steps that produce a summary. Those rules are as follows:

- ◆ Delete trivial material that is unnecessary to understanding.
- ◆ Delete redundant material.
- ◆ Substitute superordinate terms for lists (e.g., "flowers" for "daisies, tulips, and roses").
- ◆ Select a topic sentence, or invent one if it is missing.

It is fairly easy to see that these rules closely mirror the cognitive process of summarizing as described in Generalization 1—deleting, substituting, keeping. In effect, the rules given students are the very things they have to do to produce a summary. Simply directing students what to do, however, is not the same as showing them how to do it. To make these rules "come alive" for students, a teacher might initially

FIGURE 3.3

Summarizing Strategy: Sample Passage

Why Does Studying Solar Wind Tell Us About the Origin of Our Solar System?

Most scientists believe our solar system was formed 4.6 billion years ago with the gravitational collapse of the solar nebula, a cloud of interstellar gas, dust, and ice created from previous generations of stars. As time went on the grains of ice and dust bumped into and stuck to one another, eventually forming the planets, moons, comets, and asteroids as we know them today.

How this transition from the solar nebula to planets took place has both fascinated and mystified scientists. Why did some planets, like Venus, develop thick, poisonous atmospheres, while others, like Earth, became hospitable to life? Partial answers are available from the study of the chem-

ical composition of the solar system bodies, which scientists find are significantly different from one another. This information helps them model various processes for planet formation, but they are still hampered by one major question: What was the original solar nebula made of?

Our sun may contain the answer. It contains over 99 percent of all the material in the solar system and, while its interior has been modified by nuclear reactions, its outer layers are believed to be composed of the same material as the original solar nebula. By collecting and studying solar wind, the material flung from the sun, scientists may find more answers to this mysterious puzzle.

demonstrate them in some detail. The following example shows how a teacher might do this

Mr. Newton is trying to walk students through the rule-based summarizing strategy in the context of a science unit. He begins by presenting them with a passage on the origin of the solar system (see Figure 3.3).

He first asks students to read the passage silently. After they read the passage, Mr. Newton explains that he is going to use it to demonstrate the "rule-based strategy" for summarizing which he introduced them to the previous day. He talks them through the process as follows:

"I'm going to think aloud as I apply the rules of this strategy. See if my thinking makes sense to you."

"The rules say to delete trivial material, to delete redundant material, and to substitute superordinate terms for lists. The first

paragraph is almost all background, but it doesn't seem trivial. There are, however, a couple of lists. Let's see, for 'interstellar gas dust, and ice' I'll substitute 'interstellar material.' For 'planets, moons, comets, and asteroids' I'll substitute 'heavenly bodies.' Also I see something redundant. The 'solar nebula' and the 'cloud of interstellar material created from previous generations of stars' are the same thing, so I'll delete one of them. And come to think of it, the expression 'bumped into' is a little trivial and a little redundant. I think I can take it out. Too. Here's my first paragraph now."

Most scientists believe our solar system was formed 4.6 billion years ago with the gravitational collapse of the solar nebula. As time went on grains from the solar nebula stuck to one another, eventually forming the heavenly bodies we know today.

"Now I'll apply the rules to the second paragraph. Hmm, I don't see any lists for which I could substitute a superordinate

term, but *fascinated and mystified* is a little redundant. I'll just say *intrigued* which sort of combines them. Also, the examples about Venus and the Earth, while interesting, aren't necessary to my understanding of the paragraph. I think I'll take them out.

"The rest of the paragraph explains what scientists already know and what they need to know. It's not really trivial, but for a summary I'm going to try and say it more simply. I'll take the part that says *partial answers are available from the study of the chemical composition of the solar system bodies, which scientists find are significantly different from one another. This information helps them model various processes for planet formation, but they are still hampered by one major question: What was the original solar nebula made of?* and just say *Scientists have some of the answers but they really need to know what the original solar system was made of. How's this?*"

How this transition from the solar nebula to planets took place has intrigued scientists. They have some of the answers but they really need to know what the original solar nebula was made of.

"The third paragraph is full of interesting information. How can I apply the rules here? Is anything redundant, trivial, or unnecessary to my understanding?"

"The first sentence says *our sun may contain the answer.* Wow, that's important so I'll keep it. The second sentence explains why the sun may contain the answer. Only part of that sentence—*its outer layers are believed to be composed of the same material as the original solar nebula*—is necessary to my understanding so I can take out the rest. In the last sentence, *solar wind* and *the material flung from the sun* are the same thing so I'll keep only one. Now I've got."

Our sun may contain the answer. Its outer layers are believed to be

composed of the same material as the original solar nebula. By collecting and studying the material flung from the sun, scientists may find more answers to this mysterious puzzle.

"Finally, I can put it all together. Do the three new paragraphs make sense? Hmm, I think my use of the term *solar nebula* is a little redundant. I'll take it out where I can without losing clarity. What do you think of my final summary?"

Most scientists believe our solar system was formed 4.6 billion years ago with the gravitational collapse of the solar nebula. As time went on grains from the solar nebula stuck to one another, eventually forming the heavenly bodies we know today.

How this transition took place has intrigued scientists. They have some of the answers but they really need to know what the original solar nebula was made of.

Our sun may contain the answer. Its outer layers are believed to be composed of the same material as the original solar nebula. By collecting and studying the material flung from the sun, scientists may find more answers to this mysterious puzzle.

After this detailed description of his own thinking, Mr. Newton has students try out the rule-based summarizing strategy on their own using a different passage from the textbook.

Summary Frames

Summary frames are direct applications of Generalization 3. A summary frame is a series of questions that the teacher provides to students. These questions are designed to

highlight the critical elements for specific types of information. We present six types of summary frames in this chapter:

1. The Narrative Frame
2. The Topic-Restriction-Illustration Frame
3. The Definition Frame

4. The Argumentation Frame
5. The Problem/Solution Frame
6. The Conversation Frame

Each frame captures the basic structure of a different type of text. To illustrate, consider Figures 3.4–3.9. Also note the questions that go with each frame.

FIGURE 3.4

The Narrative Frame

The narrative or story frame is commonly found in fiction and contains the following elements:

1. **Characters:** the characteristics of the main characters in the story.
2. **Setting:** the time, place, and context in which the information took place.
3. **Initiating event:** the event that starts the action rolling in the story.
4. **Internal response:** how the main characters react emotionally to the initiating event.
5. **Goal:** what the main characters decide to do as a reaction to the initiating event (the goal they set).
6. **Consequence:** how the main characters try to accomplish the goal.
7. **Resolution:** how the goal turns out.

Components 3–7 are sometimes repeated to create what is called an *episode*.

Frame Questions

1. Who are the main characters and what distinguishes them from others?
2. When and where did the story take place? What were the circumstances?
3. What prompted the action in the story?
4. How did the characters express their feelings?
5. What did the main characters decide to do? Did they set a goal, and, if so, what was it?
6. How did the main characters try to accomplish their goal(s)?
7. What were the consequences?

The following example shows how a 1st grade teacher used the Narrative Frame (Figure 3.4) to teach her students about summarization.

Mrs. Mason used the narrative frame to help her 1st graders summarize the story, "Ink-tomi Lost His Eyes" (a story from the Assiniboine tribe). First she introduced the frame questions, and told the students to think about them as she read the story aloud. Then she read the story again. This time, however, she occasionally stopped to let the students answer the frame questions as a class. Here are the questions and the answers generated by the students:

1. *Who are the main characters and what distinguishes them from others?* Ink-tomi, the curious little boy and the singing bird that could "throw" his eyes.
2. *When and where did the story take place? What were the circumstances?* The Assiniboine legend takes place in the forest where the little boy was walking.
3. *What prompted the action in the story?* The boy heard the bird sing in his language and then "throw" his eyes and sing them back.

4. *How did the characters express their feelings?* The little boy wanted the trick so he would be admired and have power. He asked the bird for the trick.
5. *What did the main characters decide to do? Did they set a goal, and, if so, what was it?* The boy abused the trick by not following the bird's warning. He lost his sight and set out to get it back.
6. *How did the main characters try to accomplish their goal(s)?* The little boy asked other animals to help him find the bird.
7. *What were the consequences?* The little boy got his sight back, but also learned to not be vain.

Finally, Mrs. Mason and the students used their answers to the frame questions to write the following summary:

In this Assiniboine legend that takes place in a forest, a curious boy heard a bird sing, and then "throw" his eyes, and sing them back again. The little boy, who wanted to be admired and have power, asked the bird for the trick. The boy did not follow the bird's warning, lost his sight, and asked forest animals to help get his sight back. In this lesson, the boy learned to not be vain.

Proceed to the next frame

FIGURE 3.5

The Topic-Restriction-Illustration Frame

T-R-I stands for topic, restriction, and illustration. This pattern is commonly found in expository material. The T-R-I frame contains the following elements:

Topic (T)—general statement about the topic to be discussed
Restriction (R)—limits the information in some way
Illustrations (I)—exemplifies the topic or restriction

The T-R-I pattern can have a number of restrictions and additional illustrations.

Frame Questions

1. T—What is the general statement or topic?
2. R—What information narrows or restricts the general statement or topic?
3. I—What examples illustrate the topic or restriction?

Figure 3.5 shows another summarization technique, the Topic-Restriction-Illustration Frame. The following example shows how a teacher used the frame to teach students in a geography class:

Mr. Burke uses the T-R-I frame in his 7th grade geography class as he presents information about the topic of interdependence of trade among nations. He first presents students with the following frame questions

1. T—What is the meaning of "trade"?
2. R—How does the definition of trade vary from different countries (e.g. in industrialized or in developing countries)?

3. I—What examples illustrate this?
4. R—How can a short-term positive balance of trade negatively affect long-term trade in developing countries?
5. I—What examples illustrate this?

Next, in lecture format, he presents information about trade. Occasionally, he stops and asks students to fill in answers to the frame questions based on the information he has presented. For homework, students translate the answers to their frame questions into a summary paragraph.

FIGURE 3.6

The Definition Frame

The purpose of a definition frame is to describe a particular concept and identify subordinate concepts. Definition patterns contain the following elements:

1. **Term**—the subject to be defined.
2. **Set**—the general category to which the term belongs.
3. **Gross characteristics**—those characteristics that separate the term from other elements in the set.
4. **Minute differences**—those different classes of objects that fall directly beneath the term.

Frame Questions

1. What is being defined?
2. To which general category does the item belong?
3. What characteristics separate the item from other things in the general category?
4. What are some different types or classes of the item being defined?

A third type of summary technique, the Definition Frame (Figure 3.6), is illustrated by students in a life sciences class in the following example.

Students in Mrs. Miller's 3rd grade life science class are studying about monotremes. This particular day she is showing a film. To guide their viewing of the film, Mrs. Miller presents students with the following frame questions with some answers filled in:

1. What is being defined? A *monotreme*.
2. To which general category do monotremes belong? *Mammals*.

3. What characteristics separate monotremes from other things in the general category?
4. What are some different types of monotremes?

Mrs. Miller explains to her students that all of the answers to the frame questions can be found in the film, but they will have to identify which information answers a specific question and which information does not. Students watch the film with an eye toward answering the questions. When the film is over, Mrs. Miller organizes students into groups where they compare their answers and construct a summary statement about monotremes as a group.

FIGURE 3.7

The Argumentation Frame

Argumentation frames contain information designed to support a claim. They contain the following elements:

1. **Evidence**: information that leads to a claim.
2. **Claim**: the assertion that something is true—the claim that is the focal point of the argument.
3. **Support**: examples of or explanations for the claim.
4. **Qualifier**: a restriction on the claim or evidence for the claim.

Frame Questions

1. What information is presented that leads to a claim?
2. What is the basic statement or claim that is the focus of the information?
3. What examples or explanations are presented to support this claim?
4. What concessions are made about the claim?

American author should exhibit the key characteristics of the American culture. These include: pioneering, rebelliousness, humor, and casualness.

2. What is the basic claim or focus of the information? Greg chose Mark Twain as the "quintessential American" author.
3. What examples or explanations are presented to support this claim? Mark Twain's various works along with literary criticisms of his works are presented.
4. What concessions are made about the claim? Other authors' works are also mentioned as exemplifying key American characteristics.

When all students have answered the frame questions, Mrs. Van Den Wildenberg organizes students into groups where they compare their answers and construct a group summary.

In a fourth type of summarizing technique, the Argumentation Frame (Figure 3.7), students in a literature class answer questions that clarify an article the teacher asks them to read.

Mrs. Van Den Wildenberg uses the argumentation frame as a way to help students summarize an article they are assigned to read about Mark Twain in her sophomore literature class. She first presents the argumentation questions and then asks students to answer them in writing as she reads the article. One student, Maune, answers the argumentation frame questions in the following way:

1. What information is presented that leads to a claim? The author says that a true

FIGURE 3.8

The Problem/Solution Frame

Problem/solution frames introduce a problem and then identify one or more solutions to the problem.

Problem:

A statement of something that has happened or might happen that is problematic.

Solution:

A description of one possible solution.

Solution:

A statement of another possible solution.

Solution:

Identification of the solution with the greatest chance of success.

Frame Questions

1. What is the problem?
2. What is a possible solution?
3. What is another possible solution?
4. Which solution has the best chance of succeeding?

The fifth type of summary framework is the Problem/Solution Frame (Figure 3.8); its use is shown in the following 6th grade example.

Mr. Farnington is teaching a unit to his 6th graders called, "Monterrey—The Big Cleanup." After a short introductory lecture about the biggest manufacturing center of Mexico, he shows some slides and videotape depicting the problems that have been

caused by mining. Because tailings from the mining process have caused land and water pollution, the government seeks solutions to their waste material problems. Mr. Farnington sets up various demonstration information centers for the students. Each center exemplifies a way to separate waste materials from earth or water. After visiting all of the centers, students answer the problem/solution frame questions. To summarize, the students use a graphic representation to show the best ways to extract waste material.

FIGURE 3.9

The Conversation Frame

A conversation is a verbal interchange between two or more people. Commonly, a conversation has the following components:

1. **Greeting:** some acknowledgment that the parties have not seen each other for a while.
2. **Inquiry:** a question about some general or specific topic.
3. **Discussion:** an elaboration or analysis of the topic. Commonly included in the discussion are one or more of the following:
 - Assertions:* statements of facts by the speaker.
 - Requests:* statements that solicit actions from the listener.
 - Promises:* statements that assert that the speaker will perform certain actions.
 - Demands:* statements that identify specific actions to be taken by the listener.
 - Threats:* statements that specify consequences to the listener if commands are not followed.
 - Congratulations:* statements that indicate the value the speaker puts on something done by the listener.
4. **Conclusion:** the conversation ends in some way.

Frame Questions

1. How did the members of the conversation greet each other?
2. What question or topic was initiated, revealed, or referred to?
3. How did their discussion progress?
 - Did either person state facts?
 - Did either person make a request of the other?
 - Did either person demand a specific action of the other?
 - Did either person threaten specific consequences if a demand was not met?
 - Did either person indicate that he/she valued something that the other had done?
4. How did the conversation conclude?

Sometimes information comes in the form of a conversation, or dialogue, in a story. The following language arts example shows students using the Conversation Frame (Figure 3.9) as a summarization tool.

Mrs. Washington believes that teaching students how to summarize conversations will help them understand both character and plot as revealed in conversations. To prepare her 2nd grade students, she teaches them the conversation frame and helps them to practice with simple text from "The Billy

Goats Gruff: Mrs. Washington leads the discussion and calls on students to respond. She records the answers as follows:

1. How did the members of the conversation greet each other?
The mean troll grunted at Little Billy Goat Gruff. The little goat just gave his name.
2. What questions or topic was insinuated, revealed or referred to?
The topic of the conversation was about whether the goat could cross the bridge.
3. How did their discussion progress?
The troll threatened to eat the goat if the goat crossed his bridge.
4. What was the conclusion?
The goat talked the troll into waiting for his bigger brother.

Using the group answers to the conversation frame questions, the whole class then summarizes the story.

Gradually, Mrs. Washington increases the complexity of the conversations the students summarize until they are ready to try an example from Sherlock Holmes. She warns the students that the conversations in the text are long, but that summarizing them is the key to understanding the story. The class works together on the first Holmes example, a conversation in "A Study in Scarlet," during which Dr. Watson and Sherlock Holmes meet each other for the first time. To their surprise, students are able to summarize the conversation quite well using the frame questions.

Reciprocal Teaching

Reciprocal teaching, developed by Palincsar and Brown (1984, 1985), is one of the best researched strategies available to teachers (see Rosenshine & Meister, 1994).

The strategy involves four components: summarizing, questioning, clarifying, and predicting. Figure 3.10 briefly describes these phases.

Although reciprocal teaching begins with the generation of a summary statement, it might be considered a "first draft" of a summary. The questioning, clarifying, and predicting phases of reciprocal teaching helps students engage in the analysis activities described in Generalization 2 above. Reciprocal teaching, then, can be considered a strategy that provides for a deep level of understanding necessary for an effective summary. The following example shows how a teacher might use reciprocal teaching in a music class.

Collin was selected to be the leader in his reciprocal teaching group. After the students in Collin's group read the first few paragraphs in the passage the teacher had taken from the Internet, "Sound Is Energy" (<http://tqunior.advanced.org/5116/>), Collin explained the terms *tone* and *harmonics*. He also did a nice job summarizing the information about sound waves. The questions he asked the class about *frequency* and *hertz* indicated that most students understood that part of the passage. The "clarifying" part of reciprocal teaching was easy for him because he couldn't understand the statement that "even if pitch and volume change, the shape of the sound wave stays the same." Other students agreed that the information about pitch and volume was particularly difficult to understand, but some of them tried to help clarify it. Collin began to understand the concept a little better, but he admitted it was still fuzzy in his mind. Finally, Collin examined the list of topics along the side of the page from the

FIGURE 3.10
Reciprocal Teaching

Summarizing—After students have silently or orally read a short section of a passage, a single student acting as teacher (i.e., the student leader) summarizes what has been read. Other students, with guidance from the teacher, may add to the summary. If students have difficulty summarizing, the teacher might point out clues (e.g., important items or obvious topic sentences) that aid in the construction of good summaries.

Questioning—The student leader asks some questions to which the class responds. The questions are designed to help students identify important information in the passage. For example, the student leader might look back over the selection and ask questions about specific pieces of information. The other students then try to answer

these questions, based on their recollection of the information.

Clarifying—Next, the student leader tries to clarify confusing points in the passage. He might point these out or ask other students to point them out. For example, the student leader might say, "The part about why the dog ran into the car was confusing to me. Can anyone explain this?" Or, the student leader might ask students to ask clarification questions. The group then attempts to clear up the confusing parts.

This might involve rereading parts of the passage.

Predicting—The student leader asks for predictions about what will happen in the next segment of the text. The leader can write the predictions on the blackboard or on an overhead, or all students can write them down in their notebooks.

Web site, and predicted that they were now going to learn about tone, harmonics, sound waves, and frequencies as they are applied to the brass, string, percussion, and woodwind instruments.

Research and Theory on Note Taking

Note taking is closely related to summarizing. To take effective notes, a student must make a determination as to what is most important, and then state that information in a parsimonious form. As we have seen, this is at the heart of summarizing. Researchers have conducted many studies on the effects of note taking on student achievement. Figure 3.11 shows the results of some of these studies.

A useful source for a review of many of these studies is the monograph entitled *Note-Taking: What Do We Know About the Benefits?* (Beecher, 1988). We have found several generalizations drawn from the research that can be used to guide instruction on note taking.

1. **Verbatim note taking is, perhaps, the least effective way to take notes.** A fair amount of research supports the intuitive perception that verbatim note taking is not an effective strategy (see Bretzing & Kuhlary, 1979). It is probably true that when students are trying to record everything they hear or read, they are not engaged in the act of synthesizing information. Trying to record all of what is heard or read takes up so much of a student's working memory

FIGURE 3.11
Research Results for Note Taking

Synthesis Study	No. of Effect Sizes (ESs)	Ave. ES	Percentile Gain
Henk & Stahl, 1985 ^a	25	.34	13
Marzano, Gnaet, & Jesse, 1990	11	1.56	44
Hattie et al., 1996	3	1.26	40
Gancke, 1981	3	1.05	35
	24	.52	20

^a Two categories of effect sizes are listed for the Henk and Stahl study because of the manner in which the effect sizes were reported. Readers should consult that study for more details.

that she does not have "room" to analyze the incoming information.

2. Notes should be considered a work in progress. Once students initially take notes, teachers should encourage them to continually add to the notes and revise them as their understanding of content deepens and sharpens (for discussions, see Anderson, T. H., & Armbruster, 1986; Denner, 1986; Einstein, Morris, & Smith, 1985). This implies that teachers should systematically provide time for students to go back over their notes—reviewing and revising them. The review-and-revision process can be a particularly powerful activity if encouraged and directed by the teacher. Specifically, a teacher might help students identify and correct misconceptions in notes they have previously taken.

3. Notes should be used as study guides for tests. One of the more practical uses of notes is as test preparation tools. If

notes have been well designed and students have systematically elaborated on them, they can provide a powerful form of review for students (for discussions, see Carrier & Titus, 1981; Carter & Van Matre, 1975; Van Matre & Carter, 1975). Interestingly, fewer students than might be expected take advantage of notes to this end. This might be because they are simply unaware of this potentially powerful use of notes, or they do not know how to structure their time to adequately prepare for tests using their notes.

4. The more notes that are taken, the better. One of the common misconceptions about note taking is that "less is more." That is, sometimes students are advised to keep their notes very short. Indeed, researchers Nye, Crooks, Powlie, and Tripp (1984) explain that in their examination of study guides prepared by universities to teach students how to take notes, "Five out of ten

guides examined emphasized the importance of keeping notes brief, and not putting too much material in notes" (p. 95). Yet, in their study of the effects of note taking, Nye et al. found that there was a strong relationship between the amount of information taken in notes and students' achievement on examinations.

Classroom Practice in Note Taking

Teacher-Prepared Notes

Teacher-prepared notes (Figure 3.12) are one of the most straightforward uses of

FIGURE 3.12

Teacher-Prepared Notes: The Bill of Rights

I. What It Is

The Bill of Rights is the first 10 amendments to the U.S. Constitution. It protects fundamental individual rights and liberties.

II. The History of the Bill of Rights

- A. James Madison, congressman from Virginia, proposed a series of amendments to the Constitution. Madison introduced these amendments in the House of Representatives in May, 1789.
- B. Committees of the House of Representatives and the Senate rewrote the amendments.
- C. The House and Senate approved 12 amendments in September, 1789.
- D. Ten of the 12 proposed amendments were ratified on December 14, 1791.
 - 1. "Ratification" is the name of the process by which constitutional amendments are approved. To be adopted, an amendment must be passed by two-thirds of each house of Congress and then by three-fourths of the state legislatures.
 - 2. The state legislatures voted on each of the 12 amendments separately. The first 2 proposed amendments were not ratified by three-quarters of the states.

III. Rights Protected by the Bill of Rights

- A. More than 30 liberties and rights are protected by the 10 amendments that make up the Bill of Rights.
 - 1. Each amendment protects specific rights:
 - 1. Protects freedom of speech, press, assembly, and religious belief; prohibits the government from creating a state religion or giving support to any or all religions.
 - 2. Protects the right to bear arms.
 - 3. Prohibits the government, even the military, from invading our homes.
 - 4. Prohibits unreasonable searches and arrests; declares that there must be probable cause for a search or arrest warrant to be issued.
 - 5. Prohibits double jeopardy; protects right to remain silent; prohibits government from taking away anyone's life, liberty, or property without due process of law.
 - 6. Protects right to a fair trial, including right to be represented by counsel in a speedy trial before an impartial jury.
 - 7. Protects right to trial by jury; prohibits courts from reexamining facts tried by a jury.
 - 8. Prohibits excessive bail or fines, or the infliction of cruel and unusual punishment.
 - 9. Preserves any individual rights or liberties not specifically mentioned in the Constitution.
 - 10. Preserves the power of the states.
- B.

notes. First, these notes provide students with a clear picture of what the teacher considers important. Second, they provide students with a model of how notes might be taken. The example in Figure 3.12 shows a few notes a teacher might give students for the topic of the Bill of Rights.

Formats for Notes

There is no one correct way to take notes. In fact, different students might prefer different note-taking formats. Consequently,

it is advisable to present students with a variety of formats. One common format is the *informal outline*. The informal outline uses indentation to indicate major ideas and their related details. Figure 3.13 depicts notes generated by a student on the topic of blood. The student has simply indented ideas that are more subordinate in nature.

Webbing is a note-taking strategy that uses the relative size of circles to indicate the importance of ideas and lines to indicate relationships. The more important ideas have larger circles than the less impor-

FIGURE 3.13

Student Notes: Informal Outline

The Circulatory System

One of the transport systems of the body

3 functions:

- carries food and oxygen to cells
- carries away wastes from cells
- protects the body from disease

3 parts:

- heart
- blood vessels
- blood

One of the parts of the circulatory system is blood

4 parts:

- plasma
- red blood cells
- white blood cells
- platelets

The liquid part of the blood—plasma

- yellowish in color and mostly water
- contains food and wastes
- makes up over half of the blood

One of the solid parts of the blood is the red blood cells

- pick up oxygen in the lungs and carry it to cells

pick up carbon dioxide from the cells and carry it to the lungs

shaped like a doughnut without the hole—is very small.

contains hemoglobin to help it do its job
about 5 million red blood cells in one drop of blood

Second solid part of the blood is white blood cells

- help the body fight infection
- have no color and change shape as they move
- fight infection by surrounding bacteria and digesting it

Third solid part of the blood is platelets

- stop bleeding by causing blood to thicken and clot
- not whole cells, but parts of cells
- have no color and are smaller than red blood cells

Hemoglobin is a chemical in red blood cells

- contains iron
- makes the color of red blood cells
- helps the red blood cells transport materials to and from cells

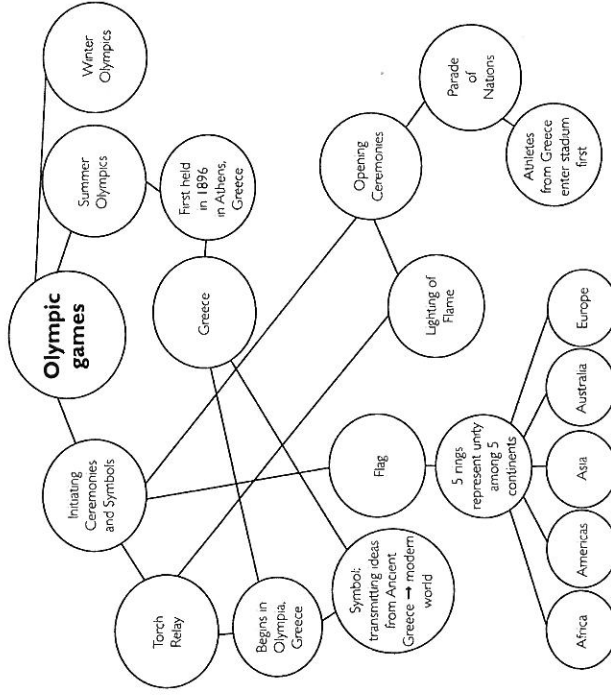
Combination Notes

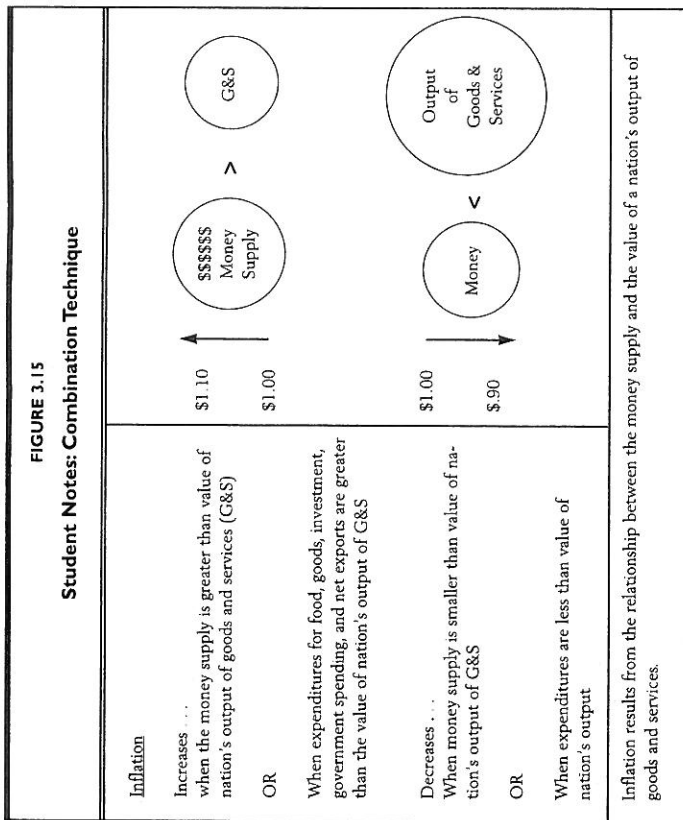
One flexible note-taking strategy employs both the informal outline and the web formats. It might be referred to as a combination technique. With this strategy, each page of notes is divided into three parts by a line running down the middle of the page and a horizontal line near the bottom of the page. The left-hand side of the page is reserved for notes taken using informal outlining or a variation of it. The right-

hand side of the page is reserved for notes taken using informal outlining or a variation of it. The right-

FIGURE 3.14

Student Notes: Webbing





hand side of the page is reserved for notes taken using webbing or some variation of it. Finally, the strip across the bottom of the page is reserved for summary statements. Figure 3.15 shows combination notes a student might take for the topic of inflation.

The important aspect of the right-hand side of the page is that students portray the information in some visual way. To employ this note-taking strategy, students must stop periodically and make a graphic representation of their notes on the right side of the page. This note-taking method takes extra time but forces students to consider the in-

formation a second time. At the end of their note taking, or periodically throughout the process, students record summary statements of what they have learned in the space at the bottom of the page. This forces them to process the information a third time.

♦ ♦ ♦

Although we sometimes refer to summarizing and note taking as mere "study skills," they are two of the most powerful skills students can cultivate. They provide students with tools for identifying and understanding the most important aspects of what they are learning.

REINFORCING EFFORT AND PROVIDING RECOGNITION

Ian MacIntosh was a new student at Prairie Elementary School. It did not take him long to discover that even though the teachers and students seemed nice enough, the school was considered to be what they called a "low-performing school." They had low scores on the state tests, and everyone knew it because the results were published in the local newspaper. The test was given soon after Ian arrived and, like other students, he just wanted to get through it.

The next year, the school got a new principal, Ms. Heichman. Things began to change. Ian's teachers started telling stories of famous people who achieved their goals because they believed that if they tried hard enough, they could do anything. Even students were asked to give examples, and Ian told the story of his grandfather's belief that he could make his farm successful. Ian's teachers started giving students "E for Effort" certificates. Ian earned two in one week. It made him feel more confident and made him want to do better. His classmates all seemed a bit more confident, too, especially when the whole class received the principal's "E for Effort" award because the class beat their own previous class average on math quizzes, twice in one month. He was proud when the banner went up over the door—and he enjoyed the ice cream the room mothers had promised them if they hit their goal.

The best news came when the state test scores returned. The school was in the headlines as the school that had improved the most. Ian knew he and his schoolmates still had a long way to go, but he believed they could do it.

The approach used by Ian's principal exemplifies the third category of general instructional strategies. Unlike the others, it does not deal directly with enhancing or engaging the cognitive skills of students. Rather, this set of instructional techniques addresses students' atti-