

ABRIDGED EDITION

A
TAXONOMY
FOR
LEARNING,
TEACHING,
AND
ASSESSING

A REVISION OF BLOOM'S
TAXONOMY OF EDUCATIONAL OBJECTIVES

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A TAXONOMY FOR LEARNING,
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A REVISION

8.3 ANALYSIS OF THE NUTRITION VIGNETTE IN TERMS OF THE TAXONOMY TABLE BASED ON ASSESSMENTS

THE KNOWLEDGE DIMENSION	THE COGNITIVE PROCESS DIMENSION					
	1. REMEMBER	2. UNDERSTAND	3. APPLY	4. ANALYZE	5. EVALUATE	6. CREATE
A. FACTUAL KNOWLEDGE	<i>Activities during teaching of Objective 1</i>					
B. CONCEPTUAL KNOWLEDGE	Objective 1	Objective 1 <i>Activities during teaching of Objective 1</i> Assess 1		<i>Activities during teaching of Objective 1</i>	Objective 3 <i>Activities during teaching of Objective 3</i> Assess 3	<i>Activities during teaching of Objective 4</i> Assess 4; Element C, D
C. PROCEDURAL KNOWLEDGE			<i>Activities during teaching of Objective 4</i>			Objective 4
D. META-COGNITIVE KNOWLEDGE		Objective 2 <i>Activities during teaching of Objective 2</i>		<i>Activities during teaching of Objective 2</i> Assess 2	Objective 2	Assess 4 Elements E, F

Key

Objective 1 = Acquire knowledge of a classification scheme of "appeals."

Objective 2 = Check the influences commercials have on students' "senses."

Objective 3 = Evaluate commercials from the standpoint of a set of principles.

Objective 4 = Create a commercial that reflects understandings of how commercials are designed to influence people.

Assess 1 = Classroom exercise—classifying and exemplifying.

Assess 2 = "Higher-order" classroom questions.

Assess 3 = Commercials on videotapes.

Assess 4 = Scoring guide.

Dark shading indicates the strongest alignment—an objective, an instructional activity, and an assessment are all present in the same cell. Lighter shading indicates two of the three are present.

students from *remembering* and *understanding conceptual knowledge* (Objective 1) to *understanding* and *analyzing metacognitive knowledge* (Objective 2) to *evaluating* commercials based on *conceptual knowledge* (Objective 3) to *creating* commercials based on *procedural knowledge* (Objective 4).

Generally speaking, the activities in which Ms. Nagengast engaged her students are consistent with her learning intentions. She used positive and negative examples to teach types (categories) of appeals (*Conceptual knowledge*). She gave students practice in classifying and exemplifying (*Understand*). She used so-called higher-order questions in her pursuit of *Metacognitive knowledge* (e.g., “What do you think?”). She worked with the students to develop the criteria (*Conceptual knowledge*) used to evaluate the commercials, and students practiced using the criteria in *Evaluating*. Finally, with respect to *Creating* commercials, she asked students to prepare plans, provide and receive feedback on the plans, rehearse the plans “in action,” and ultimately implement the plans in front of several audiences.

THE ASSESSMENT QUESTION

The teacher used both informal and formal assessments. As shown in Table 8.3, she used the informal assessments to determine students’ progress on the first three objectives. Thus, these assessments were formative in nature. The scoring guide used in the informal assessment relative to Objective 3 was developed in part by the students. Once developed, it formed the basis for the more formal assessment of Objective 4.

There was both a formative and summative assessment of the fourth objective. Both assessments relied on the aforementioned scoring guide. The formative assessment was a peer assessment of the plans for the commercials. The summative assessment was a teacher assessment of the production of the commercial.

THE ALIGNMENT QUESTION

Overall, the alignment among objectives, instructional activities, and assessments is quite strong. This alignment is most evident for Objectives 1 and 3 (see Table 8.3). If we look at the cells of the table, the alignment is less clear for the other objective. By focusing on the rows of the table, however, we see a reasonable degree of alignment for the second objective. The emphasis on *Metacognitive knowledge* is clear in Objective 2 and in the related instructional activities and assessments. The misalignment stems from a slight difference in the process categories *Analyze* and *Evaluate*. A similar point can be made for the fourth objective. This time, however, the misalignment comes from the columns of Table 8.3. The stated objective, instructional activities, and assessments all focus on *Create*. The differences pertain to the types of knowledge tapped by the formal assessment. In addition to *Procedural knowledge*, the scoring guide includes criteria relating to *Conceptual knowledge* and *Metacognitive knowledge*.

Most of the anomalies in Table 8.3 may be explained fairly easily. For example, Objective 1 is placed in two cells: *remember conceptual knowledge* and *understand conceptual knowledge*. After reviewing the entire unit, we believe our initial classification of the stated objective as *remember conceptual knowledge* is inaccurate. Similarly, although some of the instructional activities related to Objective 1 are placed in the cell corresponding to *remember factual knowledge*, these activities involve associating the names of the appeals (*Factual knowledge*) with the categories of appeals (*Conceptual knowledge*). This activity is important, but it may not justify an objective in and of itself (or a formal assessment). Finally, some activities related to Objective 1 are placed in the cell corresponding to *analyze conceptual knowledge* rather than *understand conceptual knowledge*. The difference between *attribute* and *classify* is substantial and worthy of discussion (see below). In retrospect, then, we would eliminate the entries in cells A1 (*remember factual knowledge*) and B1 (*remember conceptual knowledge*), but keep the entry in cell B4 (*analyze conceptual knowledge*).

PART 5: CLOSING QUESTIONS

As with the analysis of all our vignettes, we were left with a few unanswered questions. We raise three of the most interesting in this closing section.

1. **Is it sufficient to align objectives, instructional activities, and assessments in terms of the rows or columns alone?** This question comes from our examination of Table 8.3 (see above) coupled with our analysis of the activities related to the first objective. It seems clear to us that the objective and activities focus on *Conceptual knowledge*. There is, however, a difference between *Understand* (*exemplifying* and *classifying*) and *Analyze* (*attributing*), which is implicit in the objective and is made explicit in the teacher's reaction to student performance of the assessment tasks. As we mentioned on our commentary on the activities related to Objective 1, students who classify based on their own reactions to a commercial (*Understand*) are likely to arrive at appeals that are different from those of students who classify based on appeals they attribute to the writers/designers of the commercials (*Analyze*). This question is important because, in common practice, alignment decisions are often based solely on the knowledge dimension or the cognitive process dimension. Alignment decisions based on either dimension alone may be misleading in terms of the interaction between the two dimensions that, we believe, define intended student learning.
2. **Is it possible that student input into developing scoring rubrics produced rubrics with less than optimum validity?** On the one hand, it is difficult to criticize teachers who involve students in setting criteria for evaluating their own work. On the other, a problem may result if too much reliance is placed on student input. Of the six criteria developed by the students, only two (A and E) or three (C) relate clearly to the knowledge intended to be developed in the instructional unit. The other criteria

are a bit vague (B), or tangentially related (D and F) to nutrition, the content of the unit. As a consequence, students who master the *Conceptual knowledge* (e.g., the classification of appeals) and *Procedural knowledge* (e.g., the “technical” aspects of designing “appealing” commercials) may still receive low overall evaluations based on the less than optimally valid criteria used to evaluate the prepared commercials. One way of preempting this problem may be to establish a set of meta-criteria, that is, a set of criteria to be used jointly with the students in determining the criteria to include on the scoring rubric. Alternatively, the teacher may critique the criteria along with the students, leading them to recognize any problems with the criteria (e.g., irrelevancy).

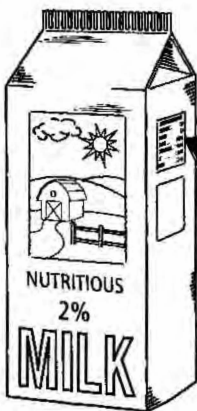
3. **What are the advantages and disadvantages of having instructional activities serve both a learning and an assessment function?** The practice of using instructional activities for both learning and assessment purposes, though fairly common, causes at least two problems. The first is blurring the distinction between objectives and instructional activities; that is, students who perform well on a single activity (i.e., the production of a single commercial) are assumed to have mastered the objective (i.e., the ability to produce commercials that meet specified criteria) when the activity is but a single example of the realm of activities circumscribed by the objective.

The second problem comes in delineating where teaching ends and assessment begins. Traditionally, teachers help students with instructional activities, whereas students are “left alone” when performing assessment tasks. Assessment tasks, then, provide an “independent estimate” of learning (that is, independent of teacher assistance and involvement). When instructional activities serve both learning and assessment functions, this independence is lost. The result is that an assessment is made of both teaching and learning for that individual, not of learning alone. It may be difficult, even impossible, for teachers to separate these functions in their own minds.

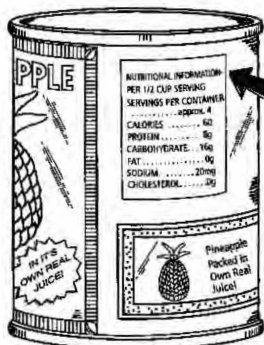
The primary advantage of using instructional activities for both purposes is a general increase in the authenticity of the assessment and, hence, its instructional validity. The issue to be addressed is whether this trade-off is reasonable. Probably teachers are less focused on keeping instruction and assessments independent than are supervisors and administrators, who are concerned about the impact on their schools if students do poorly. Where punishment of low-scoring schools is a real concern, then perhaps the trade-off balance involved in combining instruction and assessment needs to be adjusted.

Read the Label!

Read these food labels to find out the nutritional value of the food shown on this page.



NUTRITION INFORMATION	
SERVING SIZE	.....1 CUP
CALORIES	..... 120
PROTEIN	..... 8 GRAMS
CARBOHYDRATE	..11 GRAMS
FAT	..... 5 GRAMS
SODIUM	.....125 mg



NUTRITION INFORMATION – PER 1/2 CUP SERVING	
SERVINGS PER CONTAINER	..... APPROX. 4
CALORIES	..... 60
PROTEIN	..... 0 g
CARBOHYDRATE	... 16 g
FAT	..... 0 g
SODIUM	..... .20 mg
CHOLESTEROL	..... 0 g

Use a red crayon to circle the fat found in each food. Use a blue crayon to circle the calories found in each food.



NUTRITION INFORMATION	
SERVING SIZE	..... 3.3 OZ.
CALORIES	..... 80
PROTEIN	..... 3 GRAMS
CARBOHYDRATE	... 20 GRAMS
FAT	..... .1 GRAM
SODIUM	..... .5 mg



NUTRITION INFORMATION		
CALORIES	.. 250	PROTEIN .. 5 g
FAT	.. 2 g	SODIUM .. 25 mg
CARBOHYDRATE	.. 20	

Read the food labels on the food you eat at home. Can you find the nutrition information?

ATTACHMENT B IDENTIFICATION OF PRODUCTS FROM THEIR “HOOKS”

Can you identify the following products from their hooks?

1. Have you had your break today? _____
2. Where a kid can be a kid _____
3. Just do it _____
4. Pizza Pizza _____
5. I love what you do for me _____
6. Melts in your mouth, not in your hand _____

ATTACHMENT C SCORING GUIDE

Performance Task: Working as a team from an advertising agency, study a food product that you eat every day in terms of its nutritional values. Plan and present a compelling yet truthful commercial aimed at your classmates to induce them to eat more of your product. Promote your product by appealing to their individual needs and wants. Use various techniques to convince your viewers that your product is worth buying, but make sure your claims are accurate and your techniques realistic.

Scoring Element	Performance Levels
A. Did the commercial focus on nutrition and the nutritional value of food?	4—Principal focus was on food and nutrition. 3—Nutrition was only one of many ideas in the commercial—the others were a distraction. 2—Nutrition was mentioned but drowned out by other topics. 1—Nutrition was ignored in the commercial.
B. Did the commercial appeal to individual's wants and needs?	4—Message grabbed kids in class. 3—Message caused most kids to sit up and notice. 2—Message caught some students' attention. 1—Message was hard to follow or to engage.
C. Did the commercial make use of techniques to convince viewers?	4—Techniques were thoughtful and distinctive. 3—Techniques were copy-cat of commercials on TV. 2—Techniques were included but were not really a part of the design; they seemed simply added on. 1—No techniques.
D. Did the commercial use realism in its techniques?	4—Very realistic. It was like "being there!" 3—One (or two) unrealistic elements, but on the whole quite real. 2—Many unrealistic elements in the commercial. 1—Hard to find what's real.
E. Did the commercial make the audience want to buy the food?	4—Members of the audience would rush out to buy the product. 3—Members will buy the product during the next shopping trip. 2—Members might consider buying it. 1—Probably not.
F. Was the commercial aimed at the intended audience?	4—Commercial was right on target. 3—Some elements of the commercial would have gone over their heads, but on the whole all right. 2—A large part of the audience was lost. 1—Almost no one got the message.

Macbeth Vignette

This instructional unit, developed and taught by Ms. Margaret Jackson, is intended for “low-level” high school seniors.

I had my first experience teaching Shakespeare to these students when I decided to quit torturing myself with what passed for a literature text for these students. The educational philosophy reflected in the literature text was predicated on the assumption that students, particularly those labeled “educationally challenged,” could neither comprehend nor appreciate literature that was not “relevant” to their particular situation.

In contrast, I believe that great literature is everyone’s birthright because it does not require that “relevancy” be externally imposed. Rather, a street-wise teenager from the projects—which these students were—can possess Shakespeare as completely and comfortably as a college professor.

I initially had some misgivings about the language—many students were reading below a fifth-grade level and had difficulty writing coherent sentences. But they had less trouble and complained far less than my college-bound students. I realized that these students considered English in any form to be completely beyond their ken; a modern novel was as unintelligible to them as a 16th-century drama! They also immediately understood Macbeth’s character and motivations; the world they live in has some striking similarities to 11th-century Scotland. In both places, if someone gets in the way of an ambitious person, he or she is likely to get knifed.

I felt under a certain amount of self-imposed pressure to reduce the amount of time on this unit. My general experience had been that if *Macbeth* isn’t finished by Christmas, I won’t get to the Romantics until just before the May examination. However, these students put up definite resistance to being rushed and I was unable to pare the unit down to less than five weeks. This schedule allowed for a little under one week per act, leaving time at the end for review and testing.

PART 1: OBJECTIVES

The major objective of this five-week unit is that students will learn to see the relevance of literary works such as *Macbeth* to their own lives. A secondary objective is for students to remember important details about the play (e.g., specific events, characters, and their relationships).

COMMENTARY

In the major objective, the verb phrase is “see the relevance” and the noun phrase is “literary works in their own lives.” In order to “see the relevance,” it seems likely that students will compare characters and events in the play with characters and events from their own experience. In Table 5.1 (see inside back cover) *compare* is a cognitive process in the category *Understand*. With respect to the noun phrase, the emphasis is on literary works, with *Macbeth* being one example (“such as”). Because “literary works” denotes a category of writings, knowledge of literary works is *Conceptual knowledge*. Furthermore, because literary works contain concepts such as “character,” “plot,” and “setting,” knowledge of these concepts is also classified as *Conceptual knowledge*. *Macbeth* is a specific literary work. Within *Macbeth* there are specific characters, a specific plot (and subplots), and specific settings. Knowledge of these specifics is *Factual knowledge*.

Because the second objective clearly emphasizes the details of a specific literary work, we classify it as *remember factual knowledge*. The first objective, on the other hand, suggests a more general concern of the teacher. Consequently, we classify it as *understand conceptual knowledge*.

The placement of these two objectives in the cells of the Taxonomy Table is shown in Table 9.1.

PART 2: INSTRUCTIONAL ACTIVITIES

Introductory Activity

The first day I focused on what I considered some of the play’s primary concepts. I put the words “ambition,” “temptation,” and “fear” on the board and divided the class into three groups. The individuals in each group were asked to write for five minutes on one of the three words. They very quickly understood how ambition can help or hinder a person, how temptation can be resisted, and how fear can be handled or conquered. This led into a discussion of how these three terms are central to an understanding of *Macbeth*.

I then told the students that Shakespeare would have been dealing with an extremely diverse audience whose attention was difficult to capture and hold; therefore, he would have found it necessary to hit the ground running, establishing in the opening scene a mood that would permeate the entire play. Students were then asked to follow along in their books while I read Act I, scene i aloud, paying particular attention to the key words that aid in creating

9.1 ANALYSIS OF THE *MACBETH* VIGNETTE IN TERMS OF THE TAXONOMY TABLE BASED ON STATED OBJECTIVES

THE KNOWLEDGE DIMENSION	THE COGNITIVE PROCESS DIMENSION					
	1. REMEMBER	2. UNDERSTAND	3. APPLY	4. ANALYZE	5. EVALUATE	6. CREATE
A. FACTUAL KNOWLEDGE	Objective 2					
B. CONCEPTUAL KNOWLEDGE		Objective 1				
C. PROCEDURAL KNOWLEDGE						
D. META- COGNITIVE KNOWLEDGE						

Key

Objective 1 = Students will see the relevance of literary works such as *Macbeth* to their own lives.

Objective 2 = Students will remember important details about the play.

the predominant mood. (The scene is only 11 lines long, but almost every word is loaded with significance.)

I drew the students' attention to the line "Fair is foul and foul is fair" and asked them to put it in their own words. They ended up with the paradoxical concept: "Good is bad and bad is good," which led into a discussion of how something good could be bad and vice versa. Examples included alcohol, drugs, and sex. I stressed, as I continued to do throughout the unit, how this seemingly contradictory statement begins to develop what I see as the play's principal theme: Things are not as they seem.

COMMENTARY

The emphasis in this introductory activity is on *understanding conceptual knowledge*. Key concepts include ambition, temptation, fear (in the first paragraph of the Introductory Activity Section), mood (in the second paragraph), and paradox (in the third paragraph). In addition to the knowledge clues, students are asked to "put things in their own words" (third paragraph) and come up with contemporary examples (third paragraph). In Table 5.1 (see inside back cover), "paraphrase" is associated with *interpreting* and "generating examples" is *exemplifying*. Both *interpreting* and *exemplifying* are cognitive processes associated with the category *Understand*.

Activities Related to Act I

I began by telling students they had to write scene-by-scene synopses. Next, I initiated a discussion of the "tragic hero"—a person of great stature and distinction who is destroyed as a result of a character defect. The students all had observed first hand the "pity and fear" engendered by someone who sows the seeds of his or her own destruction while pursuing a dream. Students were helped to see the relevance of *Macbeth* to their own lives in that, given the right circumstances, the same thing could happen to many of them.

Students were assigned parts and the play was read aloud, stopping after each scene for whatever explication was necessary. I asked questions which focused primarily on understanding (e.g., "What are Macbeth's strengths of character?" "What would have happened if Macbeth had never met the witches?").

Despite initial reluctance and self-consciousness on the part of students, I insisted that students "act out" key scenes, with the class assuming the role of director. Initially I had to do almost all the directing, but once the students grasped the concept of there being actions behind the words, the effect was energizing.

After reading and discussing Act I, students were shown three different film versions: the 1940s version directed by and starring Orson Welles; Roman Polanski's graphic and bloody 1972 treatment; and the BBC version from "The Shakespeare Plays" series. Before I showed Act I of these three versions,

students were asked to write for five minutes on what a good movie version of *Macbeth* should include by way of cinematography and characterization. I then distributed a chart (see Attachment A at the end of the chapter) to be used to compare the three films. Following the viewing of the three versions of Act I, I distributed an outline for a comparison/contrast paper on the three film versions (see Attachment B at the end of the chapter), with the introduction to be written the next day in the writing lab and the rough draft due the next week.

The activities relative to Act I took about one week to complete.

COMMENTARY

As in the introductory activity, the focus is on *Conceptual knowledge*. Key concepts include tragic hero, character defects, cinematography, and characterization. The nature of Ms. Jackson's questions is consistent with *Understand* (e.g., *exemplifying* and *inferring*). The chart (Attachment A) contains seven key concepts that are used as the basis for comparing and contrasting three film versions of the play. The first four concepts (setting, sound, lighting, and special effects) concern elements of the films; the last three concepts pertain to the characterization of the witches, Macbeth, and Lady Macbeth. Since comparing is a cognitive process in the category *Understand*, the focus of these activities is, once again, *understanding conceptual knowledge*.

Activities Related to Act II

I allowed the class to select the film version they would continue to view act by act throughout the unit. After some deliberation they cautiously agreed on Polanski's (although they were less enthusiastic about his depiction of the witches). Students were expected to keep a film journal (see Attachment C at the end of the chapter), an expectation which required rather close guidance from me.

I began the study of Act II by introducing the concept of *motif*. Students were asked to be aware of three *motifs* as they read Act II: blood, sleep, and darkness. They were asked to write for five minutes on these three terms and the feelings they engendered, both singly and in combination.

Class sessions consisted of reading and discussion. Again, I used questions to guide the discussion (e.g., "Why does Macbeth refuse to return to Duncan's room in order to plant the bloody dagger on the guards?" "What difference would it have made if Lady Macbeth had been able to murder Duncan herself?")

I divided the class into three equal groups; each group was assigned one of the three motifs. The only instruction given to the groups was to find every mention of their motif in scenes i and ii of Act II and to arrive at a consensus regarding the significance of the motif in the context of the play.

The activities related to Act II took about a week to complete.

COMMENTARY

The emphasis on *understanding conceptual knowledge* continues. The film journal requires comparing and contrasting (hence *Understanding*). Two superordinate concepts—cinematography and characterization—are used to organize the journal. In the study of Act II, the major concept is motif. Specifically, students are to examine three motifs as they read Act II: blood, sleep, and darkness. The affective aspect of concepts is acknowledged when Ms. Jackson has the students write about the “feelings [that each concept] engendered.”

The final activity also emphasizes *understanding conceptual knowledge*. Students are asked to find instances of the specific motifs in the play and describe each motif’s significance in the context of the play. Finding instances is *exemplifying* (hence *Understand*). The concern for the significance of the motifs as well as Ms. Jackson’s questions during the discussion of Act II require process categories beyond *Understand*. Determining significance “in the context of the play” is *attributing*. Similarly, the question pertaining to Macbeth’s refusal to return to Duncan’s room requires that attributions be made.

Finally, the question asking students to speculate on what would have happened if Lady Macbeth had murdered Duncan requires *generating*. In Table 5.1 (see inside back cover), *attributing* is associated with *Analyze*, whereas *generating* is related to *Create*. Thus, although the emphasis on *understanding conceptual knowledge* continues throughout these activities, two additional cognitive process categories are involved: *Analyze* and *Create*. Several knowledge types are likely to be involved in *Analyzing* and *Creating* in this instance; *Factual* and *Conceptual knowledge* seem particularly relevant.

Activities Related to Act III

I began the discussion of Act III by asking the students to predict what direction Macbeth would take now that he is well versed in murder. Most agreed that he would most likely kill again, that killing would become easier and easier for him. Some were able to predict Banquo’s murder, sensing that Macbeth would begin to be uncomfortable with how much his friend already knew.

All of Act III was read and then discussed. Once again, I used questions to guide the discussion (e.g., “How would you direct an actor to portray a man feeling the constant fear that Macbeth obviously feels?” “Is the murder of Banquo more or less understandable than the murder of Duncan? Why or why not?”).

At this point in time, I took class time to allow students to work on their group projects. (See Section III, Assessment, for examples and Attachment D at the end of the chapter for scoring criteria.)

The activities related to Act III took about three days to complete, with the projects requiring an additional five days.

COMMENTARY

The discussion of Act III begins by asking students to predict what will happen next. In terms of the process dimension, “predicting” is an alternative name for *inferring*, and *inferring* is a cognitive process in the category *Understand* (see Table 5.1). As the class begins to read and discuss Act III, Ms. Jackson once again uses questions to guide the discussion. The first discussion question (“How would you direct?”) is quite complex, requiring concepts from cinematography and from the play itself. In terms of the cognitive process dimension, the focus is on the category *Create*. The second discussion question requires *Evaluating*, with the tag “Why or why not?” asking students to state the criteria they are using to make their judgments. Five additional days are spent in class on the major project, which is also the major unit assessment. Ms. Jackson is borrowing instructional time for the purpose of assessment, believing that her students need structured classroom time, with supervision, to complete their projects. *Creating* and *Evaluating* in this context quite likely require some combination of *Conceptual* and *Factual knowledge*.

Activities Related to Act IV

Because of the time lag between finishing Act III and taking up Act IV, I felt the need to do a fairly extensive review of the previous three acts before beginning Act IV. By way of preparation, I asked the students to consider Act IV in the light of a steady downward progression for Macbeth, who at this point is becoming overwhelmed with his fears and the increasing number of murders they inspire.

Following the reading of Act IV, I engaged students in a class discussion. Again, a series of questions served as a guide (e.g., “Explain Macbeth’s reasoning in having MacDuff’s family killed. How does this murder differ in character and motivation from others?” “Can the scene between Malcolm and MacDuff be rightly criticized for its lack of credibility? Why or why not?”).

The review period lasted about a day, with an additional four days spent on Act IV.

COMMENTARY

Once again the major clues for classifying in the Taxonomy Table come from Ms. Jackson’s questions. She asks students to “explain” (*Understand*), “compare” (*Understand*), and “critique” (*Evaluate*). Unlike in the previous evaluation question, however, the criterion to be used by the students in making their judgments (i.e., credibility) is given by Ms. Jackson.

Activities Related to Act V

Despite the fact that Act V is composed of a large number of short scenes, each involving complicated action and a bewildering influx of numerous minor characters, students enjoyed the fast pace and appreciated the rapidity with which the play hurtles toward its end. Almost every scene unravels more and more of the false securities with which Macbeth has surrounded himself.

The class delighted in the fiendish ironies in the fulfillment of the witches' prophecies, and it took very little prompting for them to see that Macbeth, who had confounded other characters throughout the play with the differences between what he seemed to be and what he actually was, is now himself the victim of appearance vs. reality. (Although I mentioned the term *irony* in passing, I considered it to be more important that these students recognize it rather than label it. Macbeth has a "right" ending, and this all of the students could understand and appreciate.)

Following the reading aloud of Act V, questions such as the following were used to guide the concluding discussion. "What is Macbeth's frame of mind in his famous 'Tomorrow' soliloquy?" "Predict what would happen if Macbeth had refused to fight MacDuff once he learned the truth of MacDuff's birth?" "What is the effect of Malcolm's speech at the end of the play?"

COMMENTARY

Continuing with her emphasis on *Conceptual knowledge*, Ms. Jackson introduces the concept of "irony." It is important to note that she is more interested in having students understand the concept than in having them remember the label attached to it. In Ms. Jackson's words, students should "recognize it rather than label it." To foster the development of *Conceptual knowledge*, her questions ask students to *Understand* (*inferring* and *explaining*) and to *Analyze* (*attributing*).

Our analysis of the instructional activities in terms of the Taxonomy Table is summarized in Table 9.2.

PART 3: ASSESSMENT

The primary assignment was a group project to complete and present to the class. A group consisted of two to four students. Examples include: "Choose any scene from the play and rewrite it, using a modern setting and language but retaining the sense of what is said. Present the scene before the class." "Create an edition of *The Scotland Chronicle* which deals with the newsworthy events of the play. Use a combination of news articles, feature articles, editorials, and special features such as political cartoons, advice columns, and want ads." The criteria for scoring the projects are shown in Attachment D at the end of the chapter.

9.2 ANALYSIS OF THE *MACBETH* VIGNETTE IN TERMS OF THE TAXONOMY TABLE BASED ON INSTRUCTIONAL ACTIVITIES

THE KNOWLEDGE DIMENSION	THE COGNITIVE PROCESS DIMENSION					
	1. REMEMBER	2. UNDERSTAND	3. APPLY	4. ANALYZE	5. EVALUATE	6. CREATE
A. FACTUAL KNOWLEDGE	Objective 2			<i>Activities for Act II</i>	<i>Activities for Act III</i>	<i>Activities for Acts II and III</i>
B. CONCEPTUAL KNOWLEDGE		Objective 1 <i>Introductory activity and activities for Acts I–V; Film journal; Film comparison</i>		<i>Activities for Acts II, IV, and V</i>	<i>Activities for Acts III and IV</i>	<i>Activities for Acts II and III</i>
C. PROCEDURAL KNOWLEDGE						
D. META-COGNITIVE KNOWLEDGE						

Key

Objective 1 = Students will see the relevance of literary works such as *Macbeth* to their own lives.

Objective 2 = Students will remember important details about the play.

COMMENTARY

The clues to the proper placement of this assignment in the Taxonomy Table come from two sources: (1) the directions given to the students and (2) the five criteria used to score the projects. The first example requires *interpreting* (*Understand*) and *producing* (*Create*), whereas the second example requires *differentiating* (*Analyze*) and *producing* (*Create*). Although both examples require students to *Create*, different projects require different additional process categories to be used by the students prior to or in conjunction with the act of creating. Thus, by virtue of student choice, some students are likely to work on projects that are more complex cognitively and, hence, likely to be more difficult. Also, consistent with the first objective, the examples attempt to get students to place *Macbeth* in a modern context (e.g., modern settings, a newspaper format).

If we consider the five criteria, accuracy (and perhaps thoroughness) seems to call for *remembering factual knowledge*. Creativity seems to call for *creating* [based on] *factual and conceptual knowledge*. The other three criteria—thoroughness, attractiveness, and correct form—all seem to require *understanding conceptual knowledge*. Students need to know what makes a project thorough, attractive, and in correct form. Other than accuracy, then, the criteria are unrelated to the content of the play; rather, they are related to desired qualities of the project per se.

I also administered a final test over *Macbeth*. The test includes three sections: (1) matching descriptions with specific characters; (2) short answers to “what,” “where,” “when,” “who,” “why,” and “how many” questions; and (3) quotations (for which students have to write who says it, to whom it is said, and what the circumstances surrounding it are). (See Attachment E at the end of the chapter.) The test was strongly “factually based”—I considered it important that students remain aware of the specific events in the play and could keep the characters and their relationships straight.

COMMENTARY

Both Ms. Jackson’s discussion about the test and a cursory examination of the test itself suggest that the final test clearly falls into cell A1 of the Taxonomy Table: *remember factual knowledge*.

At the same time, however, I was more pleased with the group projects and class dramatizations, which I felt were longer-lasting learning experiences. Over the unit, I saw improvement in the ease with which students could come up with a finished product, either a long-term project or dramatization based on only 15 minutes of planning.

I have always based the “bottom line” success or failure of any classroom enterprise on student responses, less formal measures such as enthusiastic

discussion and participation. As the unit progressed, students became less reluctant to venture opinions and to volunteer to read and act out scenes (which I took as a definite sign that they were not only learning but enjoying the challenge).

Apparently, challenging work was something that happened all too infrequently in their academic careers. One student actually said to me, "I wish we had read some hard stuff before this year!" I took this comment as a measure of the unit's success.

COMMENTARY

Ms. Jackson "puts more faith" in projects than in tests. Thus, her first objective is the "real" objective of the unit, whereas her second objective is included primarily because it is "expected" by the students and/or the school system. She also assessed the unit's effectiveness in terms of the students' affective responses (i.e., increase in ease, increase in enthusiasm, enjoyment in challenging work).

Our analysis of the assessments in terms of the Taxonomy Table is provided in Table 9.3.

PART 4: CLOSING COMMENTARY

In this section we examine the vignette in terms of our four basic questions: the learning question, the instruction question, the assessment question, and the alignment question.

THE LEARNING QUESTION

In terms of intended student learning, this unit clearly focuses on helping students *understand conceptual knowledge*. It is through concepts such as tragic hero, character defects, and irony that Ms. Jackson believes students will "see the relevance of literary works . . . in their own lives." At the same time, however, Ms. Jackson is somewhat of a pragmatist. She believes it is important for students to remember particular details about *Macbeth*. Students may need to remember these details on later tests; furthermore, there is a certain "social value" in being able to "talk about" *Macbeth*.

THE INSTRUCTION QUESTION

The vast majority of the time spent on this unit was devoted to activities that relate directly or indirectly to the first objective. For most acts of the play, students were engaged in activities related to the more complex cognitive process categories: *Analyze* (Acts II, IV, and V); *Evaluate* (Acts III and IV); and *Create* (Acts II and III). The stimulus for this engagement was teacher questioning.

9.3 ANALYSIS OF THE *MACBETH* VIGNETTE IN TERMS OF THE TAXONOMY TABLE BASED ON ASSESSMENTS

THE KNOWLEDGE DIMENSION	THE COGNITIVE PROCESS DIMENSION					
	1. REMEMBER	2. UNDERSTAND	3. APPLY	4. ANALYZE	5. EVALUATE	6. CREATE
A. FACTUAL KNOWLEDGE	Objective 2 Final test; Project C1	Project In1		Activities for Act II Project In2	Activities for Act III	Activities for Acts II and III Project In1; Project In2
B. CONCEPTUAL KNOWLEDGE		Objective 1 Introductory activity and activities for Acts I–V; Film journal; Film comparison Project In1; Project C2, 4, and 5		Activities for Acts II, IV, and V Project In2	Activities for Acts III and IV	Activities for Acts II and III Project In1; Project In2; Project C3
C. PROCEDURAL KNOWLEDGE						
D. META-COGNITIVE KNOWLEDGE						

Key

Objective 1 = Students will see the relevance of literary works such as *Macbeth* to their own lives.

Objective 2 = Students will remember important details about the play.

Project In1 = Instructions: Choose any scene and rewrite with modern language in modern setting.

Project In2 = Instructions: Create an edition of *The Scotland Chronicle* dealing with newsworthy events.

Project C1 = Criteria: accuracy.

Projects C2, 3, 4, and 5 = Criteria: thoroughness, creativity, attractiveness, correct form.

Dark shading indicates the strongest alignment—an objective, an instructional activity, and an assessment are all present in the same cell. Lighter shading indicates two of the three are present.

Because these cognitive process categories are not included in the statement of objectives or on the assessment, we believe Ms. Jackson used them in an attempt to increase her students' understanding of the play. This is a good illustration of the use of more complex cognitive processes in an effort to help students more thoroughly achieve less complex objectives. The intent in such instances is not mastery of the complex processes sufficient for them to be included as unit objectives, but just enough practice with them to result in deeper processing of the students' understanding.

It is interesting to note that not a single instructional activity related directly to the second objective (i.e., Students will remember important details of the play). Students apparently were expected to acquire this knowledge as they watched the film, read and acted out the play, and participated in the various activities.

THE ASSESSMENT QUESTION

The two formal assessments were the group project and the final unit test. These two assessments lay at opposite ends of the cognitive process continuum, with the group project requiring *Create* and the test *Remember*. Only one of the five criteria used to evaluate the group project focuses on *Create*. Two of the criteria focus on the content of the play: accuracy and thoroughness. The other two criteria emphasize the form of the finished product: attractiveness and correct form.

Table 9.3 shows some inconsistency between the instructions given to the students for completing the project (In1 and In2), which appear in cells A2, B2, A4, B4, A6, and B6, and the criteria used to evaluate the completed projects (C1 through C5), which appear in cells A1, B2, and B6. One would expect the instructions and criteria to be classified in the same cell. Instead, they are in two cells: B2 (*understand conceptual knowledge*) and B6 (*create [based on] conceptual knowledge*). However, the instructions are placed in four cells that have no criteria: A2 (*understand factual knowledge*), A4 (*analyze [based on] factual knowledge*), B4 (*analyze [based on] conceptual knowledge*), and A6 (*create [based on] factual knowledge*). Further, one criterion is in a cell that has no instructions: A1 (*remember factual knowledge*). Students could thus have trouble if their expectations for what counts toward a grade lead them to concentrate their efforts to the exclusion of other important aspects, such as not studying the factual knowledge aspects of the play.

THE ALIGNMENT QUESTION

We can clearly see the alignment of objectives, instructional activities, and assessments in Table 9.3. The final test is aligned with the second objective, remembering important facts about the play. As mentioned above, however, no instructional activities relate directly to either the objective or the final test.

There is reasonable alignment between the instructional activities and the group project. As mentioned earlier, Ms. Jackson allocated five days of classroom time for students to work on the project. In addition, most of the instructional activities focused on helping students develop *Conceptual knowledge* (row B of the Taxonomy Table).

The misalignment is more evident when we consider the cells of Table 9.3 rather than the rows and columns. For example, although most of the instructional activities emphasize *Conceptual knowledge*, they differ in the cognitive processes they demand from students. In many cases, these demands are beyond *Understanding*, which is the target of the second objective. As we mentioned earlier, however, it may well be that Ms. Jackson was attempting to develop a deeper and more enduring understanding by getting students to work at the so-called higher cognitive levels. Similarly, although the *Create* column contains both instructional activities and assessments, it does not contain an objective. It seems reasonable that *Understand* (the cognitive process in the objective) should be one of the criteria used to assess the group project.

PART 5: CLOSING QUESTIONS

As with the analysis of all our vignettes, we were left with a few unanswered questions. We raise two of the most important in this closing section.

- 1. What is the role of the more complex cognitive process categories in the development of *Conceptual knowledge*?** Ms. Jackson wanted to help students see relationships between the play and their own lives. The pathway to accomplishing this objective was to use *Conceptual knowledge*. Most students know “tragic heroes”; they experience “irony.” Concepts such as these enable them to make the connections desired by Ms. Jackson. Although her focus was on *understanding conceptual knowledge*, Ms. Jackson engaged her students in discussions at higher levels of cognitive processing (e.g., *Analyze*, *Evaluate*, and *Create*). It seems reasonable to assume that *Conceptual knowledge* can be developed via these activities.
- 2. What are the advantages and disadvantages of student choice of activities and assignments?** Ms. Jackson gave her students choices several times during the unit. For example, she let them choose which film to watch for the entire unit. This was an informed choice; that is, it was based on a comparison of the same scene presented in three different film versions of *Macbeth* (see Attachment A). Students also had a choice of group projects. In this case, however, students were undoubtedly unaware of the differences in cognitive demands among the projects as suggested by our analysis (see Table 9.3). Quite by accident, different groups of students could have chosen less complex or more complex assignments, less difficult or more difficult ones. Because the same scoring guide was used for all assignments, this choice of assignments could result in differences in the grades students earned simply because of the assignments, not

because of the quality of their work. Teachers often try to compensate for this in assessment, but it is difficult.

The two instances of student choice are quite different. In the first case, student choice of film is based on information and group consensus. As such, it quite likely contributed to increased interest and ownership on the part of students. In the second instance, choice of group project is perhaps a confounding factor in the grades assigned to them. The proper use of student choice and the amount of information students need to make "good" choices, as well as the implications of different student choices for achieving various objectives and for grading, are issues that need additional consideration by teachers and researchers.

ATTACHMENT A CHART COMPARING THREE FILM VERSIONS OF *MACBETH*

	Roman Polanski	Orson Welles	BBC
Setting			
Sound			
Lighting			
Special Effects			
Witches			
Macbeth			
Lady Macbeth			

ATTACHMENT B A COMPARISON/CONTRAST ESSAY ON THREE FILM VERSIONS OF WILLIAM SHAKESPEARE'S *MACBETH*

1. The **introduction** should address the questions of what a good film version of *Macbeth* should contain. The introduction should also take steps to engage the interest of the reader.
2. The **thesis statement** is the most important part of the introduction. The thesis should focus on cinematic effects (setting, sound, lighting, special effects) and characterization (Macbeth, Lady Macbeth, the witches) in the scenes viewed from each of the three films. Statements should be made regarding the relative merits of each film.
3. The **body** of the essay should develop the ideas established in the thesis statement. Use either the block form (each film discussed separately) or the subject form (the cinematic effects of each film are discussed, then the characterization).
4. The **conclusion** should restate the main idea and end with a statement as to which film version is the most effective and true to the play's purpose.

Write introduction here:

ATTACHMENT C *MACBETH* FILM JOURNAL

Approximately five class sessions will be devoted to watching the selected film version of *Macbeth*, one viewing session after we finish reading and discussing each act in class. Each student is asked to keep a journal of his or her impressions, opinions, and questions about the film. There should be one entry for each day of reviewing, each of 1 to 2 paragraphs.

The content of the journal is primarily up to you, but effort should be made to address certain criteria. As was done in the comparison/contrast essays written earlier, students should comment regarding the cinematography (setting, lighting, sound, special effects) and characterization (especially Macbeth, Lady Macbeth, Banquo, MacDuff, and the witches). Other points to consider would be how certain episodes are staged—for example, the dagger scene, the banquet scene, the sleepwalking scene, and Macbeth’s murder. Also, if there are any scenes left out or changed in any significant way, this needs to be addressed in the journal.

The last journal entry should state what you found most effective in the movie and what you objected the most. Remember there are no right or wrong opinions, but any opinion must be based on evidence.

ATTACHMENT D TEACHER ASSESSMENT OF GROUP PROJECTS

Research _____

Accuracy (30%) _____

Thoroughness (30%) _____

Presentation _____

Creativity (15%) _____

Attractiveness (15%) _____

Correct Form (10%) _____

TOTAL _____

ATTACHMENT E FINAL TEST

I. Matching: Match the following with the names to the right. Some names will be used more than once. (2 points each)

- | | | |
|-------|--|--------------------|
| _____ | 1. Is executed and forfeits his title to Macbeth. | A. Hecate |
| _____ | 2. Reveals his suspicion of Macbeth's guilt by not attending the coronation. | B. Duncan |
| _____ | 3. Is seen approaching Macbeth's castle, to his great horror and disbelief. | C. Malcolm |
| _____ | 4. Is the cause of Macbeth's "fit" at the banquet. | D. Banquo |
| _____ | 5. Claims to be even more evil than Macbeth. | E. Lady Macbeth |
| _____ | 6. Is the Thane of Fife. | F. Lady MacDuff |
| _____ | 7. Names Malcolm, Prince of Cumberland. | G. Dunsinane |
| _____ | 8. Often brings bad news to the other characters. | H. Macbeth |
| _____ | 9. Macbeth's castle. | I. MacDuff |
| _____ | 10. Is killed by Macbeth during Macbeth's final battle. | J. Ross |
| _____ | 11. Will "get" kings. | K. Young Siward |
| _____ | 12. Smears blood on King Duncan's sleeping guards. | L. Fleance |
| _____ | 13. Gives instructions to trap Macbeth with a false sense of security. | M. Thane of Cawdor |
| _____ | 14. Flees to Ireland to avoid being unjustly accused of murder. | N. Banquo's ghost |
| _____ | 15. Is angry at being left alone without protection. | O. Birnam Wood |
| _____ | 16. Kills Duncan's guards. | P. Donalbain |
| _____ | 17. Is reported to have committed suicide at the end of the play. | |
| _____ | 18. Was "untimely ripp'd" from his mother's womb. | |
| _____ | 19. Barely escapes being murdered at the same time as his father. | |
| _____ | 20. Is with Macbeth when he first sees the witches. | |

(continued)

ATTACHMENT E FINAL TEST (CONTINUED)

II. Short Answer. Fill in the blanks with the correct word or phrase. (3 points each)

1. What country is the main setting of *Macbeth*?

2. What is Macbeth's tragic flaw?

3. What does the helmeted head tell Macbeth to beware of?

4. Why does Lady Macbeth not kill Duncan herself?

5. How many apparitions do the witches show Macbeth?

6. What is the only comic scene in *Macbeth*?

7. What does Macbeth think he sees just before Duncan's murder?

8. When does the old man report that there were great disturbances in nature?

9. Where does Malcolm go after his father is killed?

10. Who observes Lady Macbeth walking in her sleep?

ATTACHMENT E FINAL TEST (CONTINUED)

III. Quotes. In complete sentences tell (1) who says it, (2) to whom it is said, and (3) what the circumstances are. (5 points each)

1. "Lay on, MacDuff, and damned be him that first cries, 'Hold, enough!'"

2. "Fair is foul, and foul is fair."

3. "Fail not our feast."

4. "Is this a dagger I see before me, the handle toward my hand?"

5. "Look like the innocent flower, but be the serpent under it."

6. "Out, damned spot! Out, I say!"

Addition Facts Vignette

This unit on strategies for memorizing addition facts that sum to 18 or less was developed and taught by Ms. Jeanna Hoffman.

The unit is part of the school district's second-grade core curriculum, and addition facts are included on the currently used standardized test. The unit is taught early in the year. There is so much to teach in the core curriculum that it is beneficial to teach students how to memorize these facts early in the year. It is more efficient for students to have the basic facts memorized before they move on to the whole-number addition (and subtraction) algorithms. Students already have been exposed to the concept of addition (in first grade and again earlier in second grade) through the use of manipulatives. Memorizing addition facts is difficult for many students. Usually, a handful of students begin second grade knowing all of the addition facts to 18. Most students have a good understanding of addition facts to 10. Once sums to 18 are begun, however, well over half the students use their fingers. Some still do by the end of second grade.

Generally, the class of second graders contains from 20 to 24 students. The classes tend to be heterogeneous in terms of achievement, and the students, for the most part, are motivated. The unit lasts approximately three weeks depending on the students' previous experiences with memorizing addition facts. It would be better to spend more time on this objective, but there are so many other objectives to cover in the curriculum. Review of many of the memorization strategies will take place throughout the school year to remind students of them and to see whether they are retained and being used.

PART 1: OBJECTIVES

The major objective of this three-week unit is that students will recall addition facts (sums to 18) without manipulatives. The longer-term objectives are to help students (1) understand the efficiency of memorization (in certain circumstances) and (2) gain a working knowledge of various memorization strategies. In concrete terms, students should be able to compute horizontal and vertical

sums. The sums are of both two and three single-digit whole numbers (provided they do not exceed 18). Examples would include:

$$6 + 7 = \qquad 5 + 7 + 3 = \qquad \begin{array}{r} 7 \\ +9 \\ \hline \end{array} \qquad \begin{array}{r} 4 \\ +5 \\ +5 \\ \hline \end{array}$$

COMMENTARY

In terms of the Taxonomy Table, the major objective of the unit is straightforward: *remember factual knowledge*. The other two “longer-term” objectives are examples of *understand metacognitive knowledge* (specifically, knowledge of general strategies and knowledge about cognitive tasks) and *apply procedural knowledge* (assuming that “working knowledge” refers to knowledge that can be used or applied). The “various memorization strategies” constitute *Procedural knowledge*. Note that we classify this third objective as *Procedural knowledge* rather than *Metacognitive knowledge* because the “strategies” are specific to memorizing “math facts” (including addition, subtraction, multiplication, and division). Thus, the “strategies” have limited generalizability. The *Metacognitive knowledge* component comes from students understanding which strategies are most and least effective for them personally.

The placement of these three objectives in the Taxonomy Table is shown in Table 10.1.

PART 2: INSTRUCTIONAL ACTIVITIES

“Pocket facts” is an activity that begins the unit and is ongoing throughout it. Each day, as students enter the classroom, they pick a “fact strip” from a basket. Each student is expected to memorize this fact. Periodically, during the day, students are asked to recite their facts. Parents, the principal, custodians, cafeteria workers, and others know about the facts and can ask the students to recite them. The next morning each student writes his or her facts in his or her “pocket facts” book and picks a new fact.

COMMENTARY

“Pocket facts” emphasizes *remembering factual knowledge*. This activity takes place every day.

“Mad Math Minute” is an activity that begins the second week of school and continues daily throughout the school year. The students have one minute to complete 30 addition exercises. Halfway through the year, this is increased to 35. Mad Math Minute sheets are constructed so that within an eight-day period, students begin with exercises having a 2 as one of the addends, then

10.1 ANALYSIS OF THE ADDITION FACTS VIGNETTE IN TERMS OF THE TAXONOMY TABLE BASED ON STATED OBJECTIVES

THE KNOWLEDGE DIMENSION	THE COGNITIVE PROCESS DIMENSION					
	1. REMEMBER	2. UNDERSTAND	3. APPLY	4. ANALYZE	5. EVALUATE	6. CREATE
A. FACTUAL KNOWLEDGE	Objective 1					
B. CONCEPTUAL KNOWLEDGE						
C. PROCEDURAL KNOWLEDGE			Objective 3			
D. META-COGNITIVE KNOWLEDGE		Objective 2				

Key
 Objective 1 = Recall addition facts (sums to 18).
 Objective 2 = Understand the efficiency of memorization (in certain circumstances).
 Objective 3 = Gain a working knowledge of various memorization strategies.

move to 3, then to 4, and so on. Once the +9 facts are done, the process begins again with +1. The number of exercises each student gets correct is posted daily in the room.

COMMENTARY

This year-long activity also focuses on *remembering factual knowledge*. The strict time limit (30 to 35 facts in one minute) virtually requires memorization.

Days 1–4

After these initial daily activities have been performed, the first four days of the unit are spent completing the Great Addition Wall Chart. In advance, I prepare an outline for the chart using $3' \times 7'$ butcher paper. The numbers 0 through 9 are written along the top and left side. The students use two colors of Linker Cubes to make sticks and learn to say the addition facts they represent. They then write the facts in the appropriate cells of the chart. By the end of the second day, the chart is filled in completely. I tell the students there are 100 facts they will need to learn by the end of second grade and over the next several days they'll be learning strategies to help them memorize these facts.

COMMENTARY

Although the major objective states “without manipulatives,” Ms. Hoffman uses manipulatives early in the unit. The manipulatives enable students to “see” concrete examples of the addition facts. The emphasis is on the meaning of 5, the meaning of 3, the meaning of 8, and so on. Thus, the activity promotes *understanding conceptual knowledge*.

During the third and fourth days I ask students to look for patterns and relationships among the facts included on the Great Addition Wall Chart. For example, the +0 row and column are pointed out. Students are asked to explain how they already know these facts without counting. Similarly, the +1 row and column are examined.

Also, the commutative property is illustrated (e.g., $5 + 8 = 13$ and $8 + 5 = 13$). I tell the students that if they know one of the two facts, they know the other. I conclude the activity by pointing out how many facts they already know by virtue of the +0 row and column, the +1 row and column, and the commutative property. They will need to memorize the rest.

COMMENTARY

This activity, in part, has a motivational purpose. Ms. Hoffman wants to show students how much they already know and, thus, how “little” they have yet to

learn. In terms of the Taxonomy Table, the search for patterns involves comparing and the commutative property is a principle. Thus, the emphasis here is on *understanding conceptual knowledge*. Note that Ms. Hoffman does not use the phrase “commutative property” with the students. She is more interested in students understanding that “the order of numbers is not important when you add” than recalling the name “commutative property.”

Days 5–6

“Fact Friends” is an activity that takes place on the fifth and sixth days. In this activity students use “doubles facts” (which they usually know) to help them remember other addition facts. I ask students to look for patterns in the Great Addition Wall Chart, in the rows, and in the columns. I choose one student to point out the doubles facts (e.g., $3 + 3$, $4 + 4$) and to circle them. I tell the students that on the chart there are special “fact friends.” I use the doubles fact $4 + 4 = 8$ as an example and write it on the board. On either side I write $3 + 4 = 7$ and $5 + 4 = 9$.

I ask the students why I call these “fact friends.” (The answer is that they all have $+4$ in them.) I repeat this illustration with other doubles facts. Students are asked what they notice about the placement of these fact friends on the chart. (The answer is that they touch either on the sides or at the top and bottom.)

I then ask students how knowing one “fact friend” helps to know the others. As students share their thoughts, other students begin to catch on. I refer back to the Great Addition Wall Chart and have different students point out the fact friends around all of the doubles facts. I place check marks accordingly. I believe that this activity introduces the idea that mathematics is a network of relationships. It helps make facts and mathematics operations easier to remember and a lot more sense.

COMMENTARY

Like the preceding activity, these activities involve students looking for patterns and relationships. In terms of the Taxonomy Table, then, the emphasis is on *understanding conceptual knowledge* (more specifically, comparing knowledge of structures).

Days 7–8

On the seventh and eighth days, I introduce students to “fact families.” In this activity, students are asked to look closely at three numbers in an equation and explore other arrangements of these numbers to see relationships. I write an equation on the board (e.g., $2 + 3 = 5$). Students are asked if they can change it

around to make another addition fact (e.g., $3 + 2 = 5$). Students are then asked if they can make a subtraction fact with these same numbers (e.g., $5 - 2 = 3$). (Students generally need help with this. Clues such as “start with the largest number” are helpful.)

I then draw an outline of a house around the two addition facts and the two subtraction facts and write the numerals 2, 3, and 5 in the “attic.” I tell the students that these four equations (facts) belong to the same fact family and are the only facts that can live in this house. I then draw an outline of a house and place the numerals 4, 5, and 9 in the attic. Students are asked to work in pairs to identify the fact family for the house. Students continue to work in pairs to draw other houses. (“Doubles” live in apartments since there are only two numbers, e.g., 8, 16.)

I remind students that if they learn one of the facts in a family they’ll know the others. Therefore, fact families make the job of memorizing easier because they only have to remember half of the facts. During the second day of this activity, I lead a closing discussion that is intended to help students realize that subtraction is the opposite of addition.

COMMENTARY

As on the earlier days, students are asked to explore the relationships inherent in equations (e.g., change them around, seek connections). Without using the phrase “additive inverse,” Ms. Hoffman introduces students to this important concept within the equations. This activity is classified as *understanding conceptual knowledge*. Ms. Hoffman’s prompt—“start with the largest number”—can be viewed as the first step in a procedure that students can use to transform addition facts into subtraction facts. If she continues to build this procedure, the classification would be *applying procedural knowledge*.

The reminder in the closing paragraph returns the students to Ms. Hoffman’s main objective: remembering addition facts that sum to 18 or less. Nonetheless, the instruction during the first eight days has emphasized *understanding conceptual knowledge*. Her final discussion on Day 8 reinforces the concept of “additive inverse.”

Days 9–10

On the ninth and tenth days, I engage students in a procedure that I call “make-a-ten.” I begin by writing several addition exercises with 9 as the addend on the board. Each student is given a “ten-frame” (a piece of paper with two rows of five boxes). I ask the students to use two ten-frames to find a way to quickly figure out the answer to the first exercise (e.g., $9 + 7 =$). [The answer is that this is $(9 + 1)$ on one ten-frame, $+ 6$ on the other, which is $10 + 6$ or 16.] I continue with all the exercises in which 9 and 8 are addends.

I ask the students to record both the exercises and their answers on a separate piece of paper. We then discuss how the make-a-ten strategy works. I then point to the Great Addition Wall Chart and ask them how the make-a-ten procedure can help them memorize their addition facts.

COMMENTARY

This is a “cognitively rich” activity. Students are asked to *apply procedural knowledge* (i.e., carry out the make-a-ten procedure), *understand procedural knowledge* (i.e., discuss how the make-a-ten procedure works), and *understand metacognitive knowledge* (i.e., describe how procedures like make-a-ten can help them memorize knowledge like their addition facts).

Days 11–13

During the 11th through 13th days, I explore with the students the use of various approaches for memorizing addition facts whose sums are greater than 10. I begin by writing the exercise $5 + 8$ on the board and ask the students how they could find the answer. Answers should include counting up; using fingers, objects, a calculator, or number line; using the make-a-ten strategy; relying on fact families; and memorizing through practice (e.g., pocket facts, Mad Math Minute). Each student is asked to either suggest an approach or choose one of those already suggested.

Each student then uses the approach he or she suggested (or chose) to perform the exercise (i.e., $5 + 8$) and shares the strategy as it applies to that exercise with the class. As students explore and use the different strategies, I believe they will see that the fastest way to get the answer is having memorized it.

COMMENTARY

The focus of these three days is on the many ways students can approach learning addition facts that sum to 18 or less. Both *Conceptual knowledge* (e.g., fact families) and *Procedural knowledge* (e.g., make-a-ten) are available for students’ use. Regardless of the type of knowledge, there is little doubt that the cognitive process is *Apply*. Thus, students are to *apply conceptual and/or procedural knowledge*. In Chapter 5, *Apply* is defined in terms of *Procedural knowledge*; that is, *Conceptual knowledge* is generally “unpacked” as embedded in a series of steps (i.e., *Procedural knowledge*) before it is applied. Thus, we classify this activity (or set of activities) as *applying procedural knowledge*.

Ultimately, however, Ms. Hoffman wants individual students to know which approach works best for them and come to the realization that the most efficient means of performing the addition exercises in the time available is to memorize them. With this intent, the goal has become *understanding metacognitive knowledge*.

10.2 ANALYSIS OF THE ADDITION FACTS VIGNETTE IN TERMS OF THE TAXONOMY TABLE BASED ON INSTRUCTIONAL ACTIVITIES

THE KNOWLEDGE DIMENSION	THE COGNITIVE PROCESS DIMENSION					
	1. REMEMBER	2. UNDERSTAND	3. APPLY	4. ANALYZE	5. EVALUATE	6. CREATE
A. FACTUAL KNOWLEDGE	Objective 1 <i>Days 1–15 activities</i>					
B. CONCEPTUAL KNOWLEDGE		<i>Days 1–10 activities</i>				
C. PROCEDURAL KNOWLEDGE		<i>Days 9–10 activities</i>	Objective 3 <i>Days 9–13 activities</i>			
D. META- COGNITIVE KNOWLEDGE		Objective 2 <i>Days 9–13 activities</i>				

Key

Objective 1 = Recall addition facts (sums to 18).

Objective 2 = Understand the efficiency of memorization (in certain circumstances).

Objective 3 = Gain a working knowledge of various memorization strategies.

Days 14–15

The final activity takes place during the final two days of the unit. This activity requires students to put their memorization work into practice in a relay race format. In advance, I prepare strips of paper containing all the addition facts and place them randomly into four baskets. The class is divided into four teams and each team is in a line facing their basket. Each student draws a strip from the basket, studies it, and puts it away. The first student in line walks backward to the board, writes the fact, returns to the line, and taps the shoulder of the next person. This student then picks another fact from the basket and begins memorizing it. After a specified amount of time, “time” is called and the game ends. All teams with all correct facts win! The game is repeated.

COMMENTARY

In large part because the element of speed has been introduced, the final activity is classified as *remember factual knowledge*. Considering all of the unit activities, we produced Table 10.2. For ease of comparison, the stated objectives from Table 10.1 are listed in **bold** type in Table 10.2. The instructional activity analysis is *italicized*.

PART 3: ASSESSMENT

To assess student progress, I observed students, asked them questions, noted changes in the results of the daily Mad Math Minute, and scored their weekly quizzes. I observed students to determine which approaches they were using to arrive at answers. I noted that those students who completed the assignments quickly were beginning to memorize the addition facts. Slower students often began by counting on their fingers and then moved to “counting up.” For these students, I try to get them to use fact friends and fact families.

During class, I often ask students how they figured out an answer. As the unit progresses, students more often report they knew because of fact families or fact friends and, ultimately, because they had it memorized.

Daily Mad Math Minute scores gradually improve for most students. This finding also suggests that students are memorizing the facts. Mad Math Minute scores are posted daily so students can see how many they answered correctly the previous day and, thus, chart their progress. As mentioned earlier, Mad Math Minute is used throughout the year.

The weekly quizzes provide the least information on the approaches that students use to get the answers. They are direct assessments of the unit objective, however, and are useful in providing information to students’ parents. Initially I use a simple rubric (i.e., “is beginning to memorize addition facts” or “needs work memorizing addition facts”) to inform students and their parents how the students are progressing.

10.3 ANALYSIS OF THE ADDITION FACTS VIGNETTE IN TERMS OF THE TAXONOMY TABLE BASED ON ASSESSMENTS

THE KNOWLEDGE DIMENSION	THE COGNITIVE PROCESS DIMENSION					
	1. REMEMBER	2. UNDERSTAND	3. APPLY	4. ANALYZE	5. EVALUATE	6. CREATE
A. FACTUAL KNOWLEDGE	Objective 1 <i>Days 1–15 activities Assess 3; Assess 4</i>					
B. CONCEPTUAL KNOWLEDGE		<i>Days 1–10 activities</i>				
C. PROCEDURAL KNOWLEDGE		<i>Days 9–10 activities</i>	Objective 3 <i>Days 9–13 activities Assess 1; Assess 2</i>			
D. META- COGNITIVE KNOWLEDGE		Objective 2 <i>Days 9–13 activities</i>				

Key

Objective 1 = Recall addition facts (sums to 18).

Objective 2 = Understand the efficiency of memorization (in certain circumstances).

Objective 3 = Gain a working knowledge of various memorization strategies.

Assess 1 = Observations of students.

Assess 2 = Questions to students in class.

Assess 3 = Mad Math Minutes.

Assess 4 = Weekly quizzes.

Dark shading indicates the strongest alignment—an objective, an instructional activity, and an assessment are all present in the same cell. Lighter shading indicates two of the three are present.

COMMENTARY

Ms. Hoffman's questions focus on *applying procedural knowledge*. Through these assessments she is able to determine which procedures students are using. The changes in Mad Math Minute scores over time provide evidence of student improvement in *remembering factual knowledge*. Unlike the Mad Math Minutes, which are organized around a single addend, exercises on the weekly quizzes are drawn somewhat randomly from the universe of addition facts. Also, unlike the Mad Math Minute, the quizzes have more liberal time allocations. As a consequence, students have sufficient time to use a variety of approaches. Nonetheless, the emphasis remains on *remembering factual knowledge*.

The results of our analysis are shown in Table 10.3. Once again, initial analysis of the stated objectives is shown in **bold** type and analysis of the instructional activities is shown in *italics*.

PART 4: CLOSING COMMENTARY

In this section we examine the vignette in terms of our four basic questions: the learning question, the instruction question, the assessment question, and the alignment question.

THE LEARNING QUESTION

In terms of the learning question, we distinguish between what we term "focus" and "emphasis." The focus is clearly on *remembering factual knowledge*. This is quite clearly the desired end result of the three-week unit. The focus is evident in both the stated objectives and the assessments. In contrast, the emphasis is on *understanding conceptual knowledge*. With the brief exception of the Mad Math Minute, virtually all the activities in which students engaged during the first two weeks (approximately two-thirds) of the unit emphasize *understanding conceptual knowledge*. This discrepancy between focus and emphasis can perhaps best be explained by the difference between means and ends. For Ms. Hoffman, the end (her focus) is clear: students are to *remember factual knowledge*. On the knowledge dimension, *Conceptual*, *Procedural*, and to a certain extent *Metacognitive knowledge* are means to this end. Similarly, on the cognitive process dimension, *Understand* and *Apply* are the means. Thus, the emphasis in the unit reflects the means by which the end will be achieved.

THE INSTRUCTION QUESTION

Primarily because of the Mad Math Minute activity, some instructional activities related to the major objective (*remember factual knowledge*) took place every day. Activities related to the two longer-term objectives were reserved for the end of the unit (i.e., Days 9–13). As shown in Table 10.2, numerous activities are placed in cells of the Taxonomy Table that do not contain the stated objectives. In her description of these activities, Ms. Hoffman suggested that they were in-

tended to help students develop a framework for efficient memorization. The activities during the first two weeks, for example, focused largely on *understanding conceptual knowledge*. Inherent in the structure of the Great Addition Wall Chart, for example, were patterns and connections that could make memorization easier.

Similarly, Ms. Hoffman introduced a variety of memorization strategies to her students. Her intention was for students to (1) choose the one or ones most useful to them, and (2) come to realize that memorization is more efficient than alternative ways of arriving at an answer. These activities had a dual focus: *apply procedural knowledge* and *understand metacognitive knowledge*.

Finally, what is interesting here is what Ms. Hoffman did not do. She did not give students a steady diet of “drill and practice.” Rather, she made use of five cells of the Taxonomy Table (see Table 10.2) even though her intended learning for her students fell into a single cell.

THE ASSESSMENT QUESTION

Ms. Hoffman used both informal and formal assessments. She observed her students and asked them questions in class to gather information about the procedures they used to remember the addition facts. She used Mad Math Minutes and weekly quizzes to get at the “bottom line”—had students memorized the addition facts? Thus, the informal assessments were intended to get information about the process; the formal assessments were intended to get information about the outcome.

THE ALIGNMENT QUESTION

As we show in Table 10.3, the alignment of assessments and instructional activities with the stated objectives is fairly strong. Cells A1 and C3 include an objective, several activities, and assessments. As described above, the assessments in cell A1 (*remember factual knowledge*) were more formal; those in cell C3 (*apply procedural knowledge*) were more informal.

Only a few examples of misalignment occur. Ms. Hoffman has no formal assessment of *understanding metacognitive knowledge*, although she did informally assess how students were arriving at answers and inferring processes. It is not clear if she evaluated (or taught) whether students saw using analogies as applicable to other than addition facts. Several activities in cells B2 (*understand conceptual knowledge*) and C2 (*understand procedural knowledge*) have no associated objective or assessment. The latter supports the distinction between emphasis and focus that we made in our discussion of the learning question.

PART 5: CLOSING QUESTIONS

As with the analysis of all our vignettes, we were left with a few unanswered questions. We raise three of the most important in this closing section.

1. **What is the relationship between *understanding conceptual knowledge* and *remembering factual knowledge*?** The assumption that *understanding* underlying *conceptual knowledge* helps one to *remember factual knowledge* lies at the heart of Ms. Hoffman's approach to planning and teaching this unit. Would a constant emphasis on memorization strategies (such as rehearsal strategies) prove to be equally or more effective in producing the desired result? An answer to this question would help us understand the relationship between *Factual* and *Conceptual knowledge* as well as the role of *Understanding* in *Remembering*.

Consistent with our emphasis on the importance of the more complex cognitive processes, Ms. Hoffman introduced students to these processes early in their school careers. Furthermore, she helped them learn early that as complex material is mastered conceptually, its use often becomes automatic. (Incidentally, in doing so, she used interesting and motivating activities that relieve the tedium of drill and practice—an insight that may come in handy in other heavy memorization subjects such as foreign languages.)

Finally, Ms. Hoffman introduced her students to mathematical concepts they will encounter in later grades, an aspect not examined when we focus the Taxonomy Table on the unit level. The Taxonomy Table can be used, however, for grade-level planning and even multigrade planning. Indeed, when one is dealing with objectives that require lengthy periods of development, the table may be an especially helpful tool for examining when, where, and how efforts to develop them should be scheduled.

2. **Would direct assessment of *understanding conceptual knowledge* have been useful in separating what students understand from what they are able to do?** It is hard to determine whether the students are really developing a conceptual knowledge of number relationships and mathematical procedures. They clearly are learning their number facts, but are they learning about number concepts? Stated somewhat differently, is it likely that students who do not understand "fact families" would use "fact families" to aid their memorization of addition facts? A set of exercises that focus exclusively on "fact families" would allow the teacher to distinguish between students who understand but do not use a strategy and those who do not understand and therefore, perhaps, cannot use it. This information would help us understand the role of *understanding conceptual knowledge* in *applying procedural knowledge*.
3. **What information would a direct assessment of *understanding meta-cognitive knowledge* have yielded?** Inherent in the information that Ms. Hoffman obtained from her observations and questions of students is a continuum of development that begins with "counting on fingers," moves to "counting up," moves further (generally with her assistance) to examining the structure of addition facts, and culminates with memorization. Interviews with students at various stages may provide useful information about the progression toward memorization and the role of *Metacognitive knowledge* in this progression.

Parliamentary Acts Vignette

This vignette, developed and taught by Ms. Gwendolyn K. Airasian, describes a unit that integrates colonial history prior to the Revolutionary War and a persuasive writing assignment.

I have taught for 17 years, the past 10 in fifth grade in a suburban middle school. Students are heterogeneously grouped into classes, with 26 students in my class, 16 males and 10 females. Five students have special learning needs and receive part-time support from aides when they are with me. The remaining students present a broad range of abilities, interests, and motivation.

Both persuasive writing and colonial history are required topics in the district's fifth-grade curriculum. I teach persuasive writing at various junctures from the middle to the end of the school year. As part of our writing program, students are taught to assess their own as well as others' writing. Colonial history in the 1760s and 1770s is taught in social studies in April, after study of early exploration of the "new world." My prior experience teaching this unit, along with the characteristics of my class (their prior writing experience, observed library skills, attention span, and ability to work together in groups), guided the number and selection of my objectives. I estimated that the unit would take from 10 to 12 days given an instructional period of 45 minutes three times a week and 90 minutes twice a week. If students caught on quickly to the most conceptual aspect of the unit, it would likely take 10 days. If students did not and/or if they had difficulty writing their editorials, it likely would be a 12- to 14-day unit.

PART 1: OBJECTIVES

My general objective for this unit is to have students gain knowledge of Colonial America in the 1760s and 1770s, particularly knowledge of King George's various taxes and the American colonists' reactions to them. More specific objectives are needed to clarify the meaning of this general objective. I want my students to:

1. remember the specifics about the Parliamentary Acts (e.g., the Sugar, Stamp, and Townshend Acts);

2. explain the consequences of the Parliamentary Acts for different colonial groups;
3. choose a colonial character or group and write a persuasive editorial stating his/her/its position on the acts (the editorial must include at least one supporting reason not specifically taught or covered in the class); and
4. self and peer edit the editorial.

COMMENTARY

Rather than starting with the four specific unit objectives, Ms. Airasian begins with an overarching objective: to gain knowledge about a particular period in American history. To provide the focus needed to plan instruction and assessment, she states four more focused objectives.

In the first specific objective, the verb is “remember” and the noun phrase is “specifics about the Parliamentary Acts.” Thus, we classify this first objective as *remember factual knowledge*.

The essence of the second objective is to explain the effect of the acts on various colonial groups. In Table 5.1 (see back inside cover), *explaining* means constructing a cause-and-effect model and is a cognitive process in the category *Understand*. In terms of knowledge, “consequences for different colonial groups” most closely resembles “theories, models, and structures.” Thus, we classify this second objective as *understand conceptual knowledge*.

The third objective resembles an activity or assessment task more than an objective. The verb is “write a persuasive editorial”; the noun is “colonial character or group.” If we assume, however, that Ms. Airasian expects students to learn to write persuasive editorials on a variety of topics during the year, we can classify this objective. “Write persuasive editorials” suggests *Create*. “Variety of topics” suggests some combination of *Factual* and *Conceptual knowledge*. Thus, we place this objective in cells A6 (*create [based on] factual knowledge*) and B6 (*create [based on] conceptual knowledge*) of the Taxonomy Table.

A similar argument can be made for the fourth objective. The verbs are “self edit” and “peer edit”; the noun is “the editorial.” We can proceed in two ways (assuming Ms. Airasian’s intent is for students to learn to edit rather than simply engage in the editing activity). We can assume that editing, particularly self-editing and peer-editing, is a form of evaluation. Hence, *Evaluate* is the process category. The evaluation would be based on some criteria; hence, we have *evaluate [based on] conceptual knowledge*. Alternatively, one might think of editing as *Applying*, that is, applying the rules of punctuation and grammar. This is a frequent classification problem, where a less complex process, *Apply*, is involved in a more complex one, *Evaluate*. We solve this problem by arbitrarily classifying the objective in the more complex of the levels—in this case, *Evaluate*.

Still another way of looking at editing is as one step in the process of writing the editorial. Then we would be back to the previous objective: *create [based on]*

factual and conceptual knowledge. For the time being, we follow our first instinct and place this objective in cell B5 (*evaluate* [based on] *conceptual knowledge*).

The placement of these objectives in the cells of the Taxonomy Table is shown in Table 11.1.

PART 2: INSTRUCTIONAL ACTIVITIES

Day 1

I considered a number of ways to teach my general objective, including having students write a letter to a relative in England describing the impact of the Parliamentary Acts on his/her family or having students write petitions against the taxes. In the end, I decided to have students write a newspaper editorial from the perspective of either a Patriot or a Tory colonial. To obtain editorials written from both a Patriot and Tory perspective, I randomly selected two student groups based on the total number of letters in their first and last names. Odd-numbered students were Patriots (cheers) and even-numbered students Tories (grumbles). Randomizing student groups provided balanced ability groups and peer support for students who needed it. I then reconvened the entire class and talked with them about the nature of the unit: a combination of social studies and persuasive writing requiring a number of steps to complete. Students were told that the unit would last approximately 10 days. I gave each student a copy of the checklist I would use when assessing the editorials (Attachment A at the end of the chapter). I read each criterion aloud and asked individual students to explain in their own words what each criterion meant.

COMMENTARY

Ms. Airasian recognizes that many instructional activities could form the basis for the unit, and she selects one. Her recognition points up the difference between objectives and instructional activities; stated somewhat differently, it points out the flexibility and creativity teachers have in planning, teaching, and assessing after they have identified specific objectives.

The phrase “a combination of social studies and persuasive writing requiring a number of steps to complete” suggests *Procedural knowledge*. Thus, we assume that students are going to *apply procedural knowledge* as they complete their primary task, writing the editorial. However, for the time being, none of the activities is related to such an objective. Overall, on the first day Ms. Airasian provides students with an overview of the unit, including the expected final product and the criteria that will be used to evaluate it. Since the set of criteria constitute *Conceptual knowledge*, we classify Day 1’s activities as ultimately related to *understanding conceptual knowledge* (because students have to “explain in their own words what each criterion meant”).

11.1 ANALYSIS OF THE PARLIAMENTARY ACTS VIGNETTE IN TERMS OF THE TAXONOMY TABLE BASED ON STATED OBJECTIVES

THE KNOWLEDGE DIMENSION	THE COGNITIVE PROCESS DIMENSION					
	1. REMEMBER	2. UNDERSTAND	3. APPLY	4. ANALYZE	5. EVALUATE	6. CREATE
A. FACTUAL KNOWLEDGE	Objective 1					Objective 3
B. CONCEPTUAL KNOWLEDGE		Objective 2			Objective 4	Objective 3
C. PROCEDURAL KNOWLEDGE						
D. META-COGNITIVE KNOWLEDGE						

Key

Objective 1 = Remember specifics about the Parliamentary Acts.

Objective 2 = Explain the consequences of the Parliamentary Acts on different colonial groups.

Objective 3 = Choose a colonial character or group and write a persuasive editorial stating his/her/its position.

Objective 4 = Self and peer edit the editorial.

Day 2

I began the second day with the social studies unit. I showed a video of the colonial period that described the tax acts and gave a sense of the attitudes of the colonists toward England. I followed the video with a class discussion of the various taxes (listed on the board for students) and the attitudes of different groups of colonists toward the taxes. ("How do you think people in the colonies felt about the taxes? Did everyone feel the same? Why?") For homework students read their textbook chapter on the tax acts.

COMMENTARY

Instruction on the first two objectives has begun. The video provides information on both the tax acts (Objective 1) and the attitudes of the colonists toward England (Objective 2). The textbook chapter provides additional information pertaining to the first two objectives. With respect to knowledge, the emphasis is primarily on *Factual knowledge*. Although Ms. Airasian introduces different groups of colonists, the key word is *introduce*. Thus, we suggest that these activities relate primarily to the first objective, *remember factual knowledge*.

Day 3

The third day was spent reviewing the homework. Class discussion of the various tax acts, the reasons for them, and their impact on the colonists occupied the whole class period. Students were told to prepare for a quiz on the various tax acts the next day. They were to reread the prior day's chapter and review their notes. I told them that the quiz would require them to match parts of a tax act to the name of the tax act.

COMMENTARY

The continued emphasis on *Factual knowledge* is evident. Ms. Airasian believes that *Factual knowledge* provides a "scaffold" for the other objectives. She believes that without *Factual knowledge* of the tax acts, students will have difficulty explaining the consequences of the acts and writing an editorial from a given colonist's point of view. The "matching" quiz is consistent with our classification of these activities as *remembering factual knowledge*.

Day 4

The fourth day began with a quiz that counted one-fifth of the final unit grade. After the quiz, I started a review of persuasive writing. I reminded the students that persuasive writing tries to make the reader agree with the writer's opinion, so the writer must provide facts and examples to back up the opinion.

Otherwise the writer would not persuade or convince the reader. Students were referred to their writing portfolios to examine their prior persuasive writing. I emphasized the difference between opinion (what one believes is true) and facts (what can be supported by evidence). I told them that an editorial is a type of persuasive writing and showed examples of student editorials from *Scholastic Magazine*. I outlined criteria for the editorial: a strong and clear opening sentence stating a position; at least three supporting reasons for that position based on facts, not opinions; and a convincing ending (Attachment A). I also had the School District's Grade 5 Focus Correction Areas (FCAs) (Attachment B at the end of the chapter), but did not find them sufficient without adding my own assessment criteria. I reminded students that one of their reasons had to be original, a reason they identified on their own, not one discussed in class or in the textbook.

COMMENTARY

Attention shifts to a review of persuasive writing. Clearly, writing an editorial requires *Procedural knowledge* (i.e., how to write persuasive essays) and *Conceptual knowledge* (i.e., the criteria used to evaluate a piece of persuasive writing). Chapter 4 explained that criteria are associated with *Procedural knowledge* (p. 54). Those criteria, however, are of a particular kind. They are used to determine when specific *Procedural knowledge* should be put to use. Criteria used to evaluate, as in this instance, are different. They tend to be classifications and categories (here, for example, "supporting reasons" or "character-appropriate reasons"). Because they are classifications and categories, we consider them *Conceptual knowledge*. Because persuasive writing had been introduced and practiced earlier in the school year, Ms. Airasian chooses to review persuasive writing conceptually (e.g., what makes persuasive writing persuasive writing, examples of persuasive editorials) and procedurally (e.g., three-step sequence). She also reviews a set of criteria for evaluating writing in general (also *Conceptual knowledge*). The Day 4 activities relate primarily to *understand conceptual knowledge* and secondarily to *apply procedural knowledge*.

Day 5

On the fifth day the whole class brainstormed about specific taxes and the colonists' reactions to them. I wrote their ideas on the board and students took notes. In preparing students for selecting a character whose views the editorial would represent, the larger Patriot and Tory groups were broken into small subgroups of three to five to discuss how the taxes and events affected different groups in the colonies (e.g., merchants, farmers, bankers, housewives, etc.). After 15 minutes of small group discussion, the class was called together to share the results of these discussions.

COMMENTARY

The focus returns to the tax acts and the colonists' reactions to them. During the brainstorming and small group discussions, students are asked to make inferences. According to Table 5.1, *inferring* means drawing a logical conclusion from presented data. Inferences are to be made based on students' *Conceptual knowledge* of Patriots and Tories (i.e., beliefs and attitudes of two different categories of colonists) and their *Factual knowledge* of the tax acts. Thus, these activities relate to *understand conceptual knowledge* and *remember factual knowledge*.

Days 6 and 7

The sixth and seventh days focused on students selecting a colonial character who would "author" their editorial and identifying reasons to support that character's position in the editorial. I provided social studies texts, trade books, classroom encyclopedias, and books containing brief biographies of colonial people and descriptions of life in the colonies. The materials presented a range of reading levels and content related to the effects of the Parliamentary Acts on different colonial characters. I passed out guidelines to help students think about and identify their character (Attachment C at the end of the chapter). Before identifying their character, I required students to read at least two short biographies of colonists representing their Patriot or Tory designation.

COMMENTARY

Here students select the character or group to "author" their editorials. This activity is clearly related to Objective 3. Students are given some latitude in selecting their characters or groups, but they must provide specific information about their choice. Attachment C provides criteria to guide students in making their choices—hence, *Conceptual knowledge*. Implicit in the selection of a character, however, is analyzing prior information in the unit as well as the readings for Days 6 and 7. In particular, to make their selection and respond to Attachment C, students must differentiate (that is, distinguish relevant from irrelevant or important from unimportant parts—see Table 5.1). *Differentiate* is a cognitive process in the category *Analyze*. Thus, these activities relate to *understand conceptual knowledge* and *analyze* [based on] *conceptual knowledge*, respectively.

At the end of the seventh day, students were required to submit a written description of their character, why they chose that character, what position he/she would take in the editorial, and one reason that supported that position. I read each student's description and made suggestions, usually about the appropriateness of his/her choice or the quality of his/her novel reason. I provided suggestions for the few students who had difficulty choosing a character.

COMMENTARY

Ms. Airasian is making a formative assessment of student learning, presumably to check students' status and completeness before allowing them to begin their editorials. Some students had difficulty finding a novel reason to support their character's or group's position. Coming up with a new example of an element within a category is *exemplifying*, a process in the category *Understand* (see Table 5.1). Thus, the students' task is classified as *understand conceptual knowledge* (with Patriots and Tories representing two categories).

Days 8–10

On the succeeding three days, students worked individually on their own editorials, starting with an outline and using the evaluation form (Attachment A) for guidance. During the writing, I moved around the room answering students' questions, helping them identify issues for their draft, guiding a few students in beginning their writing, asking questions to focus students on needed historical information, and listening to students' thoughts and problems. I often prompted students to help them solidify the sense of their character. For example, if the character was a printer, I might ask, "What taxes were most important to the character and how did they affect him or her?" I also referred students to the guidelines for identifying a colonial character (Attachment C). Some students were able to begin writing their draft almost immediately, while others needed more discussion.

COMMENTARY

During these three days students are expected to produce their editorials. Since *produce* is a cognitive process in the category *Create*, we classify this activity as *create* [based on] *factual knowledge* (i.e., specific knowledge about the colonists and the Parliamentary Acts) and *conceptual knowledge* (i.e., knowledge about Patriots vs. Tories; knowledge of the evaluation criteria).

At this time, objectives, instructional activities, and assessments are interacting simultaneously in the classroom. Although the main emphasis is on Objective 3, writing a persuasive editorial, Ms. Airasian spends most of her time helping students with Objectives 1 and 2. Mastery of these objectives provides the "raw material" for the editorials. Unfortunately, Ms. Airasian finds that some students still have questions about their character or group or have not even selected a character or group.

As expected, the time needed to complete a first draft varied considerably among the students. Some writers completed a first draft in one class period, while others needed all three periods. When several students completed their drafts, I stopped the class and did a mini-review of the evaluation checklist

11.2 ANALYSIS OF THE PARLIAMENTARY ACTS VIGNETTE IN TERMS OF THE TAXONOMY TABLE BASED ON INSTRUCTIONAL ACTIVITIES

THE KNOWLEDGE DIMENSION	THE COGNITIVE PROCESS DIMENSION					
	1. REMEMBER	2. UNDERSTAND	3. APPLY	4. ANALYZE	5. EVALUATE	6. CREATE
A. FACTUAL KNOWLEDGE	Objective 1 <i>Days 2, 3, 5 activities</i>					Objective 3 <i>Days 8-10 activities</i>
B. CONCEPTUAL KNOWLEDGE		Objective 2 <i>Days 1, 4-7 activities</i>		<i>Days 6-7 activities</i>	Objective 4 <i>Days 8-10 activities</i>	Objective 3 <i>Days 8-10 activities</i>
C. PROCEDURAL KNOWLEDGE			<i>Day 4 activities</i>			
D. META- COGNITIVE KNOWLEDGE						

Key

Objective 1 = Remember specifics about the Parliamentary Acts.

Objective 2 = Explain the consequences of the Parliamentary Acts on different colonial groups.

Objective 3 = Choose a colonial character or group and write a persuasive editorial stating his/her/its position.

Objective 4 = Self and peer edit the editorial.

(Attachment A), since it would guide both self and peer review of the drafts. First, each student reviewed his or her draft using the checklist. After the self review, the student's partner also reviewed the draft using the checklist. (In this classroom students served as reviewing partners on a regular basis.) After identified corrections and/or additions were discussed between the partner and the author, the necessary changes were made as part of a second draft. Next, the student scheduled a private conference with me to review the second draft. Each student brought his or her redrafted editorial and the checklist completed by the student and partner. Each student read the second draft to me while I made notes about the content, writing style, and mechanics. Suggestions related to style, appropriateness of supporting information, and historical accuracy were provided. My written checklist notes, my oral comments, and the student's and partner's reviews guided the independent writing of the final draft. In general, writing the final draft took one class period. During this stage of writing I continued to hold conferences with students, mainly aiding those still working on an early draft. I held another mini-review for the last group of writers when their drafts were finished to review the checklist and/or revision and for grading.

COMMENTARY

When a group of students complete their first draft of the editorial, Ms. Airasian prepares them for the fourth objective, self and peer editing of the draft editorial. Because students rely on the evaluation checklist (Attachment A) as they edit the editorials, the emphasis in the review appears to be on *Evaluating* the editorial based on the *Conceptual knowledge* included in Attachment A. As we mentioned earlier, editing also can be viewed as *Procedural knowledge*. A major distinction between the two is whether students use the criteria "on their own" (*Conceptual knowledge*) or follow a series of steps in conducting the review, with at least some of the steps containing the criteria (*Procedural knowledge*). Although Attachment A is a checklist, there is no evidence that students must follow the checklist in a specified order (nor are they taught to do so). Thus, our classification of the activity as *evaluating* [based on] *conceptual knowledge* seems reasonable.

The third formative assessment of the editorials (self and peer review being the first two) is performed by Ms. Airasian. The use of the same evaluation criteria increases the likelihood of consistency across these three sources of feedback.

Our analysis of the instructional activities in terms of the Taxonomy Table is shown in Table 11.2.

PART 3: ASSESSMENT

I assessed my students during and at the end of the unit. Much of my assessment was informal and individual, noting student questions, requests for help,

and response to my questions. I used these assessments mainly to help individuals or groups of students to be sure everyone was clear on the area of concern. I also used assessments that were individual and somewhat more formal, for example, my conferences with individual students to discuss the second draft of their editorial. The answers and suggestions students received from these two forms of individual assessment helped them to understand and improve their editorials. I did not grade students on these “helping” assessments, although it was clear from the conferences that there was a range in depth of understanding among the students.

COMMENTARY

All this assessment is formative. From the closing sentence, Ms. Airasian’s emphasis seems to be on *Understanding*. However, we are not certain what type of knowledge is involved. Most likely, the comments made by Ms. Airasian focus on *Conceptual knowledge* (e.g., the evaluation criteria) as well as *Factual knowledge* (e.g., the specific historical details included in the editorial).

My quiz on the tax acts and the final grades I assigned to students’ completed editorials constituted the more formal, group-based assessments. For grading purposes, I reviewed students’ first draft, the self and peer reviews, the second draft, and the final product. I was interested in both the process of creating an editorial and the quality of the finished product. I think it is important for students to follow the various steps so they recognize that a number of activities and products are required to produce the finished editorial. Two-fifths of the final grades were allocated to whether students completed the drafts, peer and self reviews, redrafts, and a final draft of the editorial, that is, whether they completed the entire process. Most students did complete the process. Two-fifths of the final grade was based on the quality of the unit’s product, the final editorial (see Attachment A). I reviewed what students presented, compared it to the checklist, assigned a grade, and wrote a note to each student explaining the basis for the grade (Attachment D at the end of the chapter). The quiz accounted for the final fifth of the grade.

COMMENTARY

The quiz focuses on the specifics of the various tax acts and, hence, relates to *remember factual knowledge*. In grading the editorial, Ms. Airasian is concerned with both the process (i.e., *apply procedural knowledge*) and the product (i.e., *creating* [based on] *factual and conceptual knowledge*). She expects all students to follow a nine-step procedure: (1) select a character, (2) read about the character, (3) prepare an outline, (4) write a draft, (5) self and peer review the draft, (6) revise the draft, (7) submit the editorial to Ms. Airasian, (8) receive feedback, and (9) possibly revise again. This is the procedure Ms. Airasian wants students to follow not only on this project but on future projects as well. The editing

process involves *Evaluating* the editorial based on the criteria (*Conceptual knowledge*) in Attachment A.

I was generally pleased with the editorials my students produced. They completed them in a reasonable time, except for two students who needed extra time. I judged that students had done very well in identifying and using historical facts. They also did well in identifying and selecting supporting reasons to justify the position adopted in their editorials. For the most part, students' supporting reasons were accurate and appropriate to their chosen character. They followed the procedures required. However, it was also quite clear that many students had substantial difficulty inferring a supporting reason that was not taught in class or found in the text. This difficulty was evident in both the draft and completed editorials. Next time I teach this unit I would put more instructional emphasis on higher-level processes like interpreting and inferring.

COMMENTARY

Our analysis of the assessments in terms of the Taxonomy Table is presented in Table 11.3.

PART 4: CLOSING COMMENTARY

In this section we examine the vignette in terms of our four basic questions: the learning question, the instruction question, the assessment question, and the alignment question.

THE LEARNING QUESTION

This instructional unit has a dual focus. The first is on the Parliamentary Acts as seen through the eyes of various American colonists. The second is on persuasive writing. The first two objectives pertain to the first focus; the last two objectives are concerned with both foci. We can see the dual focus of the last two objectives most clearly by examining the criteria used to evaluate the editorial (Attachment A). The first two "content" criteria have to do with persuasive writing (i.e., stating a point of view and supporting that point of view). The last three "content" criteria have to do with the Parliamentary Acts (i.e., appropriate reasons, historically accurate reasons, and can tell whether character is a Patriot or a Tory). The remaining "content" criterion is a requirement that *Understanding* in addition to *Remembering* is displayed in the editorial.

11.3 ANALYSIS OF THE PARLIAMENTARY ACTS VIGNETTE IN TERMS OF THE TAXONOMY TABLE BASED ON ASSESSMENTS

THE KNOWLEDGE DIMENSION	THE COGNITIVE PROCESS DIMENSION					
	1. REMEMBER	2. UNDERSTAND	3. APPLY	4. ANALYZE	5. EVALUATE	6. CREATE
A. FACTUAL KNOWLEDGE	Objective 1 Days 2, 3, 5 activities Assessment B	Assessment A				Objective 3 Days 8-10 activities Assessment C
B. CONCEPTUAL KNOWLEDGE		Objective 2 Days 1, 4-7 activities Assessment A		Days 6, 7 activities	Objective 4 Days 8-10 activities	Objective 3 Days 8-10 activities Assessment C
C. PROCEDURAL KNOWLEDGE			Day 4 activities Assessment C			
D. META- COGNITIVE KNOWLEDGE						

Key

Objective 1 = Remember specifics about the Parliamentary Acts.

Objective 2 = Explain the consequences of the Parliamentary Acts on different colonial groups.

Objective 3 = Choose a colonial character or group and write a persuasive editorial stating his/her/its position.

Objective 4 = Self and peer edit the editorial.

Assessment A = Classroom questions and observations; informal assessments.

Assessment B = Quiz

Assessment C = Editorial (with ten evaluation criteria—Attachment A).

Dark shading indicates the strongest alignment—an objective, an instructional activity, and an assessment are all present in the same cell. Lighter shading indicates two of the three are present.

THE INSTRUCTION QUESTION

The dual focus of this unit results in an interesting pattern of instructional activities. After a general orientation day, the next two days were spent on the Parliamentary Acts and the colonists; then the focus shifted to persuasive writing for a day. During the following two days, the focus was back on the Parliamentary Acts and the colonists. In the final three days, the focus returned to persuasive writing. The instructional activities addressed all six of the process categories (see Table 11.2). In the first week, the activities emphasized *Remember*, *Understand*, and *Apply*. During the second week, the activities moved from *Analyze* to *Evaluate* and *Create*.

THE ASSESSMENT QUESTION

Ms. Airasian used three different assessments for three different purposes. Classroom questions and observations were used to check students' *understanding conceptual knowledge*. Do students understand the differences between Patriots and Tories? Do they understand the criteria that will be used to evaluate their editorials? The quiz focused exclusively on *remembering factual knowledge*. Do students know the details of the various Parliamentary Acts? Both of these are classified as formative assessments. The summative assessment was the editorial. As mentioned earlier, the editorial assessed in part *creating* based on *factual* and *conceptual knowledge*.

THE ALIGNMENT QUESTION

Strong alignment is evident in cells A1 (*Remember Factual knowledge*), B2 (*Understand Conceptual knowledge*), and a combined A6/B6 (*Create [based on] Factual knowledge* and *Conceptual knowledge*). Each of these cells contains an objective, several days of activities, and some sort of assessment. We find minor indicators of misalignment: cells A2 (*Understand Factual knowledge*), B4 (*Analyze [based on] Conceptual knowledge*), B5 (*Evaluate [based on] Conceptual Knowledge*), and C3 (*Apply Procedural knowledge*). One of these cells is worthy of comment. The *Procedural knowledge* in cell C3 (*Apply Procedural knowledge*) is a "meta" procedure that applies to all writing: get information, prepare an outline, write a draft, review the draft and have a peer review the draft, revise the draft, submit the draft to the teacher, and prepare a final draft. Because this procedure had been emphasized throughout the school year, it was reviewed only briefly in this unit, with no objective stated and no assessment made.

PART 5: CLOSING QUESTIONS

As with the analysis of all our vignettes, we were left with a few unanswered questions. We raise two of the most important in this closing section.

1. **What are the advantages and disadvantages of integrated (or cross-disciplinary) instructional units?** This is a very nice example of an in-

structional unit linking history with language arts. This approach offers some advantages. For example, persuasive writing can make history “come to life”; students must put themselves in the place of historical characters in order to write the editorial. Similarly, integrated units help students see that real-world problems frequently require knowledge and skills from multiple academic disciplines or subject areas.

At the same time, however, this unit illustrates potential problems in designing and delivering such units. How should teachers sequence activities related to the dual focus of such units? How should teachers score and grade assessments that require integration of the two disciplines? How can teachers best deal with the individual differences among students on both dimensions: historical facts and concepts, and persuasive writing concepts and procedures? To fully understand the last question, consider that integrated units contain two sets of *Factual knowledge*, two sets of *Conceptual knowledge*, and two sets of *Procedural knowledge*. Finally, what role do cognitive process categories play in fully integrating cross-disciplinary units? Answers to these questions will go a long way toward designing “workable” interdisciplinary or cross-disciplinary units.

- 2. What are the dangers of using generic rating scales or scoring rubrics in assessment?** Ms. Airasian was expected to use a district-adopted set of Focus Correction Areas (FCAs) to evaluate her students’ writing of persuasive editorials. In addition, she included four generic writing criteria on her own evaluation form. The result was four sets of criteria on the evaluation form: (1) criteria pertaining to persuasive writing, (2) criteria pertaining to ensuring understanding rather than remembering, (3) criteria pertaining to the content of the editorial, and (4) criteria pertaining to writing in general. How are these four sets of criteria to be weighted in determining the quality of the editorial? How much value do generic writing criteria have in evaluating the quality of the editorial? These questions (and others) are worth addressing when multiple evaluation criteria are used with writing assignments.

ATTACHMENT A EVALUATION FORM: COLONIAL EDITORIAL

Name _____ Date _____

Read the editorial and decide if the content and writing conventions are met.
Put a check mark for Yes and leave a blank for No.

	Author	Partner	Teacher
Content			
1. The author states a clear point of view at the beginning of the editorial.			
2. The author has at least three reasons to support the character's point of view.			
3. The author includes one reason that is not from the textbook or class discussion.			
4. The reasons given are appropriate to the character.			
5. The reasons given are historically accurate.			
6. The reader can tell whether the character writing is a Patriot or a Tory.			
Writing Conventions			
7. The author writes in complete sentences.			
8. The author punctuates correctly.			
9. The author uses correct spelling.			
10. The author writes legibly.			

ATTACHMENT B GRADE 5 FOCUS CORRECTION AREAS (FCAs)

1. Use complete sentences (no sentence fragments or run-on sentences).
2. Write proper paragraphs.
 - a. Indent the first line.
 - b. Write a topic sentence.
 - c. Write supporting details.
 - d. Write all sentences on the same topic.
 - e. Write a concluding sentence.
3. Use correct spelling.
4. Write legibly.

ATTACHMENT C IDENTIFYING A COLONIAL CHARACTER

Here are some questions that can help you identify a character for your editorial:

Are you a man or a woman, a boy or a girl?

In which of the colonies do you live? Do you live in a city, in a small town, or on a farm?

How many people are in your family?

How long has your family been in the colony?

Does your family have a trade or occupation?

Do you have any ties to England, such as a cousin, grandparent, brother, or aunt?

How important are the things that the Parliament taxes (sugar, stamps, tea, glass, paper) for you or your family?

ATTACHMENT D STUDENT GRADING SAMPLES

John, your editorial was excellent. The writing was clear throughout. I understood exactly why Thomas Goodson, the Boston banker, was a supporter of King George and the Parliamentary actions. You have carefully explained the position of Mr. Goodson and his ties to his family in London. This writing shows significant improvement over your last editorial. Keep up the good work.

I read your editorial, Karen, and knew very clearly why Abigail Jones was a supporter of the Patriots. This Cambridge widow certainly had her reasons to feel the actions of King George were unjust. You have explained why her husband grew so despondent after the establishment of the Stamp Act impacted so harshly on his printing business. Be sure to proof your writing carefully to avoid run-on sentences. This is an area in which you can improve.

Ben, I still do not understand your reasoning in this editorial. Andrew Dennis, as a Charleston landowner and cousin of the Duke of Lancaster, had many reasons to support the position of the English government. He shipped rice from his low country plantation to Europe for sale. He maintained close ties with his family in England and secured many loans from the family bank. Even when you have mentioned all of this, you have made him a Patriot and not supported his position with reasons. We discussed this during our conference. It appears to me that your final copy is basically the same as the rough draft we examined. It is important that you make necessary changes on the final copy. Also, Ben, the writing mechanics have not been polished. There are still many spelling errors, as well as sentence fragments. Please meet with me again to discuss how this editorial can be improved.

Volcanoes? Here? Vignette

This vignette describes a unit on volcanoes that was taught to a seventh-grade science class in a large school district in Pennsylvania by Mr. Duane Parker. (The vignette was written by Dr. Michael Smith.)

This class, comprised of 15 boys and 12 girls, met five times per week for 45-minute periods. In terms of their science achievement, I would rate 4 of the students as “high achievers,” 11 as “low achievers,” and the remaining 12 students as “average achievers.”

I planned the unit to last eight days. It actually lasted twice as long (16 class sessions)—almost a month of the school year.

PART 1: OBJECTIVES

The unit was designed to promote conceptual restructuring and meaningful learning in earth science. It was based on the dominant research paradigm in geology, the theory of plate tectonics. In contrast to the memorization of information about volcanoes, the emphasis was on “reasoned argument” which integrated evidence with theory. The major goal of the unit was for the students to “get smarter about volcanoes.”

COMMENTARY

In the vocabulary of the Taxonomy Table, “conceptual restructuring” probably is similar in meaning to *understand conceptual knowledge*. More specifically, the *Conceptual knowledge* the students encounter in the unit is intended to “shape” or “modify” the conceptual framework that students bring to the unit. As used in Chapter 5, the phrase “meaningful learning” captures all of the cognitive process categories beyond *Remember*. Finally, unlike the objectives that follow, the stated goal (“get smarter about volcanoes”) is extremely vague (as is true of most goals—see Chapter 2).

More specifically, the students were to achieve four objectives:

1. understand the theory of plate tectonics as an explanation for volcanoes;
2. examine and interpret a set of data on the geology of the local region (geologic maps, oil well drill records, and rock samples);
3. compare the geology of the local region to places that have volcanoes, such as the states of Hawaii and Washington; and
4. taking into account the learning reflected in Objectives 1 through 3, write a letter to the County Commissioner that is responsive to his request (see Attachment A at the end of the chapter).

COMMENTARY

This set of objectives is interesting. The verbs in the first three objectives (“understand,” “interpret,” and “compare”) are all associated with the cognitive process category *Understand* (see Table 5.1 inside the back cover). The noun phrases (“theory of plate tectonics,” “geology of the local regions,” “places that have volcanoes”) are more difficult to classify. “Theory” is clearly related to *Conceptual knowledge* (see Table 4.1 inside the front cover). The focus on *Conceptual knowledge* in the first objective is also supported by the phrase “as an explanation of volcanoes.” Explaining requires the construction of a causal model (see Table 5.1). Thus, we classify the first three objectives as *understand conceptual knowledge*.

The fourth objective is a culminating activity, not an objective, so it will not be classified. However, in the third section on assessment we classify the components of the scoring rubric.

In summary, then, we place the first three objectives in a single cell of the Taxonomy Table, B2 (*understand conceptual knowledge*). Table 12.1. shows the placement.

PART 2: INSTRUCTIONAL ACTIVITIES

Day 1

I began the unit by presenting the students with a letter from County Commissioner Fred Luckino that posed a problem for them to consider. The letter (Attachment A) asked whether it would be prudent to develop, at considerable cost, a plan for evacuating the county in case a volcanic eruption occurred in the region. The Commissioner was asking for their help in making this decision. I told the students they were to submit a written recommendation based on scientific thinking and evidence by the end of the unit. I reminded them that three general criteria, emphasized throughout the course, were to be used in this regard: clarity, relationships among parts, and consistency with evidence. I told them they were required to prepare a portfolio of facts, analyses, findings, and authoritative statements to support their recommendation.

12.1 ANALYSIS OF THE VOLCANOES VIGNETTE IN TERMS OF THE TAXONOMY TABLE BASED ON STATED OBJECTIVES

THE KNOWLEDGE DIMENSION	THE COGNITIVE PROCESS DIMENSION					
	1. REMEMBER	2. UNDERSTAND	3. APPLY	4. ANALYZE	5. EVALUATE	6. CREATE
A. FACTUAL KNOWLEDGE						
B. CONCEPTUAL KNOWLEDGE		Objective 1; Objective 2; Objective 3				
C. PROCEDURAL KNOWLEDGE						
D. META- COGNITIVE KNOWLEDGE						

Key
 Objective 1 = Understand the theory of plate tectonics as an explanation for volcanoes.
 Objective 2 = Examine and interpret a set of data on the geology of the local region.
 Objective 3 = Compare the geology of the local region to places that have volcanoes.

Furthermore, their recommendation should be based on the likelihood that the region would experience a volcanic eruption in the next several decades. This introduction took the better part of the first day.

COMMENTARY

In combination, the three criteria provide a framework to be used by students throughout the unit. The framework provides the link between the Commissioner's letter and the data examined during the unit. Because this is a general introduction to the unit, we do not classify it in the Taxonomy Table.

Day 2

On the second day, the students were asked to respond to two questions: (1) What am I being hired to do? and (2) What do I need to know? I asked the students to read silently through the letter and underline unfamiliar words and phrases. When a student asked, "Why are we talking about volcanoes when we don't have any here?" I responded by distributing a newspaper article dated February 1, 1986, reporting on volcanic activity in a nearby metropolitan area.

COMMENTARY

The two questions require that students analyze the information in the letter. Within the process category *Analyze*, the emphasis here is on *differentiating*—that is, distinguishing relevant from irrelevant or important from unimportant parts (see Table 5.1). We consider knowledge of the details presented in the letter to be *Factual knowledge*. Thus, we place this activity in cell A4, *Analyze Factual knowledge*.

Days 3, 4

The lessons on Days 3 and 4 were designed to determine students' current conceptions about how volcanoes "work." I asked them to draw what a volcano looks like above and below the ground and to explain why volcanoes erupt. After students had been engaged in their work for some time, I interrupted their efforts to set the stage for the next assignment—the creation of a class word bank relevant to a discussion of volcanoes. Students were asked to nominate words for inclusion in the word bank. As the class on Day 3 ended, I asked students to read about volcanoes in selected references and to come to class ready to discuss the material they read.

On Day 4, the students developed a 32-item word bank. The students then resumed work on the drawing task that had been suspended overnight. I urged them to use the word bank vocabulary to label elements of their

drawings. They also were to identify needed additions to the word bank. I reviewed with them how the three criteria—clarity, relationships among the parts of the volcano, and consistency with the evidence—were to be applied to their drawings.

I instructed the students to write an explanation of how a volcano works to go along with their drawings and to complete the task without looking at each others' papers. I wanted to know what each student knew about volcanoes. Their work revealed a diversity of conceptions about underground structure and the causes of volcanic eruption

COMMENTARY

In terms of cognitive processes, the emphasis is on *explaining* (*Understand*). *Explaining* requires constructing a cause-and-effect model of a system—in this case, a system that produces a volcanic eruption. The model itself is *Conceptual knowledge* (see Table 4.1). Therefore, we classify the drawing and writing activity as *understand conceptual knowledge*.

To talk about their models, the students need a vocabulary. In the Taxonomy Table, vocabulary is the same as knowledge of terminology. Thus, the emphasis here is on *Factual knowledge* (see Table 4.1). Since the terminology is to be used with the drawings, we see this activity as *understanding factual knowledge*. The word bank serves as a memory aid; thus, *recalling* is downplayed and the emphasis shifts to *recognize*.

This activity is a nice illustration of the difference between knowledge of terminology (*Factual knowledge*) and knowledge of categories the terminology represents (*Conceptual knowledge*). For example, "magma" is a term for "volcanic rock." Placing the label "magma" on their drawings enables students to talk about their drawings. Without proper labels, students would be forced to point to various aspects of the drawing and make references to "this" and "that."

In many ways, the activity on Days 3 and 4 serves as a pre-assessment. The teacher is interested in knowing what students understand about the causes of volcanic eruptions before instruction really begins. Since each picture invites numerous explanations, a written explanation is needed to get at student understanding. Thus, we are dealing with two related cells of the Taxonomy Table: *understand conceptual knowledge* and *remember factual knowledge*.

Day 5

The entire class session on the fifth day consisted of a class discussion about students' conceptions of the causes of volcanic eruptions. Having carefully examined the student work, I selected five diverse, high-quality pieces for students to present and "defend" to their classmates. I handed out photocopies of the selected work and told students that the goal of the discussion was to con-

sider all possible explanations of what makes volcanoes erupt. The discussion turned out to be incredibly challenging to direct. Even with careful planning, the scene was full of improvisation, both on my part and on the part of the students.

In the midst of the debate I reminded students that consensus about why volcanoes erupt was not the goal of the conversation. Rather, the goal was to explore the diversity of drawings and ideas to find out why students understand what they do. The real battles would have to be fought with evidence and arguments; these would have to wait.

COMMENTARY

At this point, Mr. Parker recognizes the diversity of individual student knowing, rather than shared knowledge. Although this is consistent with his emphasis (“all possible explanations of what makes volcanoes erupt”), it is not consistent with his intent as expressed in the first objective (i.e., explanations consistent with the theory of plate tectonics). Eventually, the shift to a common understanding will be made based on “evidence and arguments.” Thus, although all the activities on Day 5 are tangentially related to the first objective, *understand conceptual knowledge*, the first objective remains (purposely) unattained.

Day 6

On the sixth day, students began their work on the major task at hand: the examination of the geological evidence for volcanoes in their county. I began by asking questions such as “What kinds of rocks are volcanic?” “What do they look like?” “Do we have any old magma around here?” Students worked on this task for the next six days.

COMMENTARY

The emphasis now shifts to the second objective. The focus is on classifying rocks (*understanding conceptual knowledge*).

I introduced a geologic map that could be used to search for evidence of volcanism. Holding up the map, I directed students’ attention to the variety of colors (a different color for each type of rock), acquainted them with the scale of the map, and described how the map key relates the colors to the rock names. I also told them how the map relates to the videotape on local geology I was about to show them. Next, I led the class through a page-by-page overview of their Research Materials Packet, a 20-page text containing background information and newspaper clippings about earthquakes.

COMMENTARY

These activities are intended to provide students with an accumulation of *Factual knowledge*. Cognitively, the focus seems to be on *remembering factual knowledge*. Eventually, students may have to select the relevant knowledge (*Analyze*), but we have to wait and see.

I then talked to them about the theory of plate tectonics, using three-dimensional models and a filmstrip to convey its major elements. I asked questions throughout the presentation, honing in on the utility of the information for the overall task.

COMMENTARY

Knowledge of theories and models is *Conceptual knowledge* (see Table 4.1). Eventually, Mr. Parker intends for students to use this theory and these models to explain what happens when volcanoes erupt. Thus, the implicit objective once again takes the form *understand conceptual knowledge*.

Finally, I played a 15-minute videotape on earthquakes and geological work. The first part of the video contained footage from recent earthquakes and a seismogram from a local museum. The second part showed a local geologist on a rock exposure in the northern part of the county. The geologist described how geologists collect and log rock samples. He also discussed how geologic maps are used to determine the age of rocks and concluded by telling the students that the rocks he has collected are the ones they will be examining in class. I provided a running commentary during the videotape, informing students of important features related to their task (e.g., the examination of evidence, the use of maps, the dating of rocks).

COMMENTARY

The first part of the videotape contains a great deal of *Factual knowledge*. Rather than having students remember this knowledge, however, the purpose seems to be motivational (i.e., to "legitimize" the task the students are facing). The second part of the videotape shifts to *Procedural knowledge* (e.g., how to collect and log rock samples, how to determine the age of rocks). Eventually, the students will be expected to *Apply* at least some of this as *Procedural knowledge*; however, the primary focus at this point seems to be *remember procedural knowledge*.

Day 7

On the seventh day, I led a more extensive discussion of the state geologic map, teaching students how to use the map, and making sure they knew that igneous rocks are critical evidence for volcanism. I then set them to work in groups on a task that took the remainder of the seventh day and most of the eighth. The task was to complete a data table according to rock type (e.g., igneous, sedimentary, and metamorphic), listing every kind of rock that appears in the state.

COMMENTARY

The focus shifts to *apply procedural knowledge* (i.e., how to use the map) as well as *remember factual knowledge* (e.g., igneous rocks are critical evidence for volcanism). The task, when completed, produces a written classification system of rocks. Thus, we move back to *understanding* (e.g., classifying) *conceptual knowledge*.

After the students completed this group task, they were to answer four questions:

1. What are the major rock types found in our county?
2. What kinds of igneous rocks are in the county (intrusive or extrusive)?
3. According to the geologic map, how far from our city are the closest igneous rocks? How old are they?
4. What conclusions can you draw from the data in terms of the possibility of volcanic activity in our county?

COMMENTARY

These questions tap a variety of types of knowledge and cognitive process categories. The first requires *remembering* (i.e., recalling) *factual knowledge*, the second *understanding conceptual knowledge*, and the third *applying procedural knowledge* (i.e., how to determine distances on maps using their scales). The fourth question requires students to make inferences. *Inferring* lies in the category *Understand* (see Table 5.1). These inferences are to be based on students' knowledge of the data (i.e., *Factual knowledge*)—hence, *understand factual knowledge*.

Day 8

On the eighth day, I led an "assessment conversation." I selected a volunteer from each group to come to the board to write the group's responses to one of the four questions. When each had done so, I asked the class to either confirm or challenge the responses. Whereas the responses to the first two questions

were confirmed with little argument, the responses to question 3 created controversy. To answer this question, students had to measure the distance between their county and the closest igneous rocks. The groups came up with quite different answers, ranging from 120 to 250 miles. In a move to save time, I measured the distance on an overhead transparency of the map and arrived at an answer of 150 miles for intrusive igneous rocks that are 570 million years old.

COMMENTARY

Based on this “assessment conversation,” Mr. Parker learns that the students are able to *remember* the relevant *factual knowledge* (question 1) and they *understand* the important *conceptual knowledge* (question 2). The problem resides in *applying procedural knowledge* (question 3).

At this point I was ready to elicit students’ responses to the fourth question. There was quick consensus that volcanic activity in the county was highly unlikely. Nevertheless, they agreed with me that it could not be conclusively ruled out. I then proceeded to introduce students to the next task: comparing rocks collected in their region of the country with rocks collected at Mt. St. Helens.

COMMENTARY

After addressing the problem with *applying procedural knowledge*, students are able to make a proper inference about the likelihood of a volcanic eruption in their community (evidence that they *understand conceptual knowledge*).

I distributed ten rock samples to groups of students, five from a volcanic region and five collected locally. Students were asked to match the rock samples to descriptions of different types of rocks. Students completed this task within 15 minutes, but as I circulated around the room, I noticed that many had confused pumice with sandstone, a critical misinterpretation since pumice is volcanic rock and is not found in their county. As a result I decided to lead a brief “assessment conversation” to attain consensus about the identities of the samples and what these “findings” indicated about the local geology.

COMMENTARY

This activity involves *classifying*—hence, *Understand* (see Table 5.1). The classifying involves rock samples and rock “types” (i.e., categories). Types, classifications, and categories all suggest *Conceptual knowledge* (see Table 4.1).

Days 9–12

The next four days presented my students and me with the greatest challenge. Students were required to search for evidence of volcanic rocks on the geologic maps of five states surrounding their state, transfer igneous rock locations to a base map of the six-state region, measure the distance to the closest igneous rocks, and decide what this implied about the likelihood of volcanic activity affecting their county.

COMMENTARY

The activities during these four days are a repetition of those on Days 7 and 8 within a larger geographic context. The focus on the county is enlarged to multiple states, including one with recent volcanic activity. Therefore, our earlier analysis of the activities in terms of the Taxonomy Table applies here.

I began the ninth day by getting the students to think about the extensiveness of volcanic eruptions and the fact that their county is only 30 miles away from three other states, yet they have only looked at the geologic map of their own state. When students' responses indicated they did not seem to understand the magnitude of volcanic eruptions, I reminded them that when Mt. St. Helens erupted, cities 100 miles away were covered with ash. Once convinced that the students understood why they were doing the task, I gave them specific instructions about how to complete it. These instructions included warnings about the different colors and different scales used on different states' maps, suggestions as to how to measure distances on their base maps, and a reminder that the table of major rock types they had constructed should be used as a key in determining whether or not a specific rock is igneous.

COMMENTARY

The instructions given to the students are a combination of *Factual knowledge* ("warnings"), *Procedural knowledge* ("how to"), and *Conceptual knowledge* ("table of rock types"). Students are expected to *remember factual knowledge, apply procedural knowledge, and understand conceptual knowledge.*

The next three days (Days 10–12) I spent nearly all my time visiting groups and assisting students with difficulties. Among the major difficulties I noted were the following:

- large amounts of data to be searched;
- determining the "status" of metamorphosed igneous rocks;
- differences in map keys between states;

differences in map scales;
variable methods of plotting data on base maps; and
variable methods of measuring the distance of the closest igneous rocks.

COMMENTARY

In combination, these difficulties suggest problems with *Factual knowledge* (e.g., the sheer amount of data), *Conceptual knowledge* (e.g., rock types, map scales), and *Procedural knowledge* (e.g., methods of plotting data and measuring distances on different maps). Any and all of these difficulties are likely to interfere with the primary unit goal, *understanding conceptual knowledge*.

Day 13

On Day 13, as part of an “assessment conversation,” I selected several of the base maps prepared by the students and projected them on the wall using an opaque projector. As I projected each map, one student from the group that prepared it was asked to describe it. I spent most of my time helping students resolve discrepancies and disagreements about the types and ages of the rocks, as well as the distance of the closest igneous rocks from their county. Unfortunately, the time and effort required to evaluate and improve the quality of each map prevented me from helping students realize the limitations inherent in the evidence they were examining.

COMMENTARY

The conflicts among students seem to relate to the areas of *Conceptual knowledge* (types of rocks) and *Procedural knowledge* (how to determine the ages of rocks; how to determine distances of rocks from the county). Unfortunately, data on type, age, and distance are perhaps the key factors in determining the likelihood of volcanic activity in their county.

The time came to ask students about the likelihood of volcanoes in their county given the new evidence they had considered. About one in eight students said they did not have sufficient evidence to make a decision about the potential for volcanic activity. The rest of the students were ready to do so. About half of these students said it was possible that a volcano could affect the local region, citing the distant old igneous rocks as evidence to support their conclusion. The other half said that a volcano was not possible because the volcanic rocks from the past were too far away to affect them now.

COMMENTARY

The net result of the activities on Days 9–12 is to move students from consensus (*understand conceptual knowledge*) to disagreement and dissension.

Day 14

By Day 14 I felt pressured for time. I hastened students through a portfolio item in which they examined the location of their city in relation to the boundaries between tectonic plates. They examined a cross-section through the earth's crust and mantle from the Pacific Ocean to the Atlantic Ocean. Mt. St. Helens was near a plate boundary; their county was roughly 2,000 miles away from the nearest plate boundary.

COMMENTARY

At this point in the unit, Mr. Parker re-introduces the theoretical basis for examining and discussing the evidence: the theory of plate tectonics (*Conceptual knowledge*). In addition, he provides one key piece of *Factual knowledge*: the students' county is nowhere near a plate boundary. Thus, he refocuses students on the primary objective: *understand conceptual knowledge*.

I managed to direct students' attention to the fact that Mt. St. Helens and Yellowstone, two volcanic regions in the continental United States, have something in common: rising magma. I also directed students to the first pages of the Research Materials Packet, which showed a map of the world's tectonic plates and a cross-section through the crust and mantle which shows how magma rises near plate boundaries. With these materials, students proceeded to answer questions about the implications of the theory of plate tectonics for the argument they were to construct.

COMMENTARY

This is more *Factual knowledge* ("volcanic regions have rising magma," "magma rises near plate boundaries"): *Factual knowledge* is intended to help clarify key issues and thus enhance *understanding conceptual knowledge*.

A summary of our analysis of the instructional activities in terms of the Taxonomy Table is shown in Table 12.2.

PART 3: ASSESSMENT

On the fifteenth day, I realized that the class remained split about the possibility of a volcano affecting the area. Some students were convinced that ancient igneous rocks located 150 miles away are still a possible threat. Nonetheless, I was ready to have students begin drafting their letter to the County Commissioner. My instructions to the class emphasized the importance of coming to an agreement within each group and persuasively arguing for whatever position they took.

I evaluated each of the letters the students drafted to submit to Mr. Luckino according to a rubric (see Attachment B at the end of the chapter). Before

12.2 ANALYSIS OF THE VOLCANOES VIGNETTE IN TERMS OF THE TAXONOMY TABLE BASED ON INSTRUCTIONAL ACTIVITIES

THE KNOWLEDGE DIMENSION	THE COGNITIVE PROCESS DIMENSION					
	1. REMEMBER	2. UNDERSTAND	3. APPLY	4. ANALYZE	5. EVALUATE	6. CREATE
A. FACTUAL KNOWLEDGE	<i>Days 3, 4, 6-14 activities</i>	<i>Days 3, 4, 7 activities</i>		<i>Day 2 activity</i>		
B. CONCEPTUAL KNOWLEDGE		Objective 1; Objective 2; Objective 3 <i>Days 3-14 activities</i>				
C. PROCEDURAL KNOWLEDGE	<i>Day 6 activities</i>		<i>Days 7-13 activities</i>			
D. META-COGNITIVE KNOWLEDGE						

Key

Objective 1 = Understand the theory of plate tectonics as an explanation for volcanoes.

Objective 2 = Examine and interpret a set of data on the geology of the local region.

Objective 3 = Compare the geology of the local region to places that have volcanoes.

applying this rubric, however, I invited students to share their letters with the other groups. Students in those groups were to use the rubric to evaluate each letter they read. After this exercise, some student groups sought permission to revise their letters and were permitted to do so. Even though the letters represented a wide range of opinion about the central question and contained recommendations that were diverse and divergent, I was pleased with the high level of thinking and understanding they reflect.

COMMENTARY

The rubric contains four criteria. The first criterion, “accuracy of information in summary,” pertains primarily to *remembering factual knowledge*. The second criterion, “consistency with the evidence,” requires *understanding conceptual knowledge*. A recommendation can only be consistent with evidence that is interpreted in some way. The theory of plate tectonics provides the conceptual framework for that interpretation. The third and fourth criteria are difficult to classify. The third is “acknowledgment of alternative explanations.” Explanations, as mentioned earlier, require the construction of cause-and-effect models. The constructed model is a form of *Conceptual knowledge*. The word “alternative,” however, suggests that multiple models can be constructed and students can generate alternatives from the various models. If this is the case, the verb would be “generating” (*Create*), with “alternative models” (*Conceptual knowledge*) as the noun. The generation of models different from the theory of plate tectonics contradicts the first objective, however. Finally, the fourth criterion is equally challenging. If we assume that a procedure for writing such a letter was taught to students in advance, then this criterion requires *applying procedural knowledge*. If, however, students have to “figure it out on their own,” then *planning* and *producing* are more likely the cognitive processes involved. In this case, then, the fourth criterion requires *creating* [based on] the vast array of *Factual, Conceptual, and Procedural knowledge* included in the unit.

In addition to this formal assessment, I engaged in two “assessment conversations” during the unit. The first took place on Day 8 following the assignment in which students answered four questions about rock types and volcanism. The second took place on Day 13 and involved a class discussion of the students’ base map projects.

COMMENTARY

As mentioned in our analysis of the instructional activities, the questions included in the first assessment conversation can be classified as (1) *remember factual knowledge*, (2) *understand conceptual knowledge*, and (3) *apply procedural knowledge*. In addition, the discussion of the base maps focuses on (1) *understanding conceptual knowledge* and (2) *applying procedural knowledge*.

The summary of our analysis of the assessments in terms of the Taxonomy Table is presented in Table 12.3.

12.3 ANALYSIS OF THE VOLCANOES VIGNETTE IN TERMS OF THE TAXONOMY TABLE BASED ON ASSESSMENTS

THE KNOWLEDGE DIMENSION	THE COGNITIVE PROCESS DIMENSION					
	1. REMEMBER	2. UNDERSTAND	3. APPLY	4. ANALYZE	5. EVALUATE	6. CREATE
A. FACTUAL KNOWLEDGE	<i>Days 3, 4, 6-14 activities</i> Assess A1; Assess B(1)	<i>Days 3, 4, 7 activities</i>		<i>Day 2 activity</i>		Assess B(4)
B. CONCEPTUAL KNOWLEDGE		Objective 1; Objective 2; Objective 3 <i>Days 3-14 activities</i> Assess A1, 2; Assess B(2)				Assess B(3, 4)
	<i>Day 6 activities</i>		<i>Days 7-13 activities</i> Assess A1, 2			Assess B(4)
D. META-COGNITIVE KNOWLEDGE						

Key

Objective 1 = Understand the theory of plate tectonics as an explanation for volcanoes.

Objective 2 = Examine and interpret a set of data on the geology of the local region.

Objective 3 = Compare the geology of the local region to places that have volcanoes.

Assess A = Assessment conversations 1 and 2.

Assess B = Scoring rubric for letter to commissioner; criteria 1, 2, 3, and 4.

Dark shading indicates the strongest alignment—an objective, an instructional activity, and an assessment are all present in the same cell. Lighter shading indicates two of the three are present.

PART 4: CLOSING COMMENTARY

In this section we examine the vignette in terms of our four basic questions: the learning question, the instruction question, the assessment question, and the alignment question.

THE LEARNING QUESTION

The actual focal point of this unit is the culminating activity, the letter to the County Commissioner. In the letter the students were to offer their recommendation concerning the need for a “volcano emergency” plan. Objective 1 is intended to provide the theoretical basis for the recommendation; Objectives 2 and 3 are intended to provide the empirical support for the recommendation. Whether the data do or do not lend support, however, the students must interpret the data. Interpretation requires some combination of *Procedural knowledge* (i.e., how to read geologic maps), *Conceptual knowledge* (i.e., types of rocks), and *Factual knowledge* (i.e., igneous rocks are critical evidence for volcanism).

THE INSTRUCTION QUESTION

After the first few lessons, Mr. Parker relied extensively on “hands-on” activities. For the last half of the unit, or about seven days, students were working simultaneously on *remembering factual knowledge*, *understanding conceptual knowledge*, and *applying procedural knowledge*. Unfortunately, these activities took so long that Mr. Parker had to move to a lecture mode near the end of the unit (Day 14) and students had only two class sessions to complete their projects (Days 15 and 16).

THE ASSESSMENT QUESTION

Mr. Parker used what he referred to as “assessment conversations” to determine whether students were making progress toward achieving the unit objectives. Both assessment conversations contained questions that addressed *remembering factual knowledge*, *understanding conceptual knowledge*, and *applying procedural knowledge*. The questions served a formative assessment purpose.

The major unit assessment was the group project. Each group had to prepare a letter to send to the County Commissioner indicating whether he should or should not fund an evacuation plan and giving reasons for the specific recommendation. Each group’s project was evaluated in terms of a set of criteria. The criteria fell into five cells of the Taxonomy Table: A1 (*remember factual knowledge*), B2 (*understand conceptual knowledge*), A6 (*create [based on] factual knowledge*), B6 (*create [based on] conceptual knowledge*), and C6 (*create [based on] procedural knowledge*).

THE ALIGNMENT QUESTION

If all three objectives are related to *understand conceptual knowledge*, as our initial analysis of the statements of the objectives suggests, then several alignment

problems are evident in this unit (see Table 12.3). Reclassifying the second and third objectives would produce a better alignment. Both of these objectives can be written in a “how to” form: Students will learn **how to** examine and interpret a set of data on the geology of the local region. Students will learn **how to** compare the geology of the local region to places that have volcanoes. In fact, when we consider the instructional activities themselves, **how to** is what students were expected to learn. As restated, these objectives now fall into cell C3 (*apply procedural knowledge*). As such, both would be aligned with the activities on Days 7–13 and the two assessment conversations.

Even with this change, however, other alignment problems are evident in Table 12.3. For example, only one of the criteria on the scoring rubric relates directly to the “theoretical” objective (Objective 1). The other criteria are associated with *remembering factual knowledge* and *creating* [based] on *factual, conceptual, and procedural knowledge*.

Similarly, the alignment would be strengthened if students had spent more class time “pulling things together” in preparing the group project. Apparently, the project was done with little, if any, input from the teacher. As such it was clearly an assessment of student learning independent of teacher guidance and assistance, unlike so many of the projects in the other vignettes.

PART 5: CLOSING QUESTIONS

As with the analysis of all our vignettes, we were left with a few unanswered questions. We raise three of the most important in this closing section.

- 1. What is the proper role of pre-instructional activities in the overall delivery of instruction?** Mr. Parker planned a unit that was supposed to last eight days. By the end of the first four days, halfway through the “planned” unit, he had provided an orientation to the students about the unit, had them determine their task, and had them draw their conceptualization of a volcano (labeling it appropriately and explaining how it “works”). These activities, though important, are not truly instructional activities. We consider them “pre-instructional activities”; that is, they are a “jumping off” point for instruction. In light of Mr. Parker’s perceived need for these activities, he should have extended the initial time estimates for the unit. This extension would likely have reduced the time constraints that he felt later in the unit. Finally, it is somewhat surprising that students were not asked to re-draw their conceptualization of a volcano as a post-assessment. That would have been a direct assessment of learning relative to the initial unit objective.
- 2. Should instructional units be planned primarily in terms of the achievement of objectives or the completion of activities?** All available evidence suggests that midway through the eighth day the students agreed that volcanoes were very unlikely to occur in their community. On that basis, they could have begun to write their letters to the County Commissioner. Mr. Parker had more activities planned for the students, however, that re-

quired students to enlarge the scope of their investigation beyond the county lines. Enlarging the scope was certainly a worthwhile activity, but the result in relation to attaining the overall unit goal seems negative. The consensus achieved at the end of Day 8 was replaced by a diversity of opinion by the end of Day 12. The additional activities interfered with the consensual understanding each group needed to write the letter to the County Commissioner. This example raises the issue of the proper relationship between objectives and instructional activities in planning and, perhaps more important, in delivering an instructional unit.

3. **What role can the Taxonomy Table play in diagnosing learning problems?** On the seventh day, Mr. Parker's students were given four questions to answer. The first concerned *remembering factual knowledge*, the second and fourth questions pertained to *understanding conceptual knowledge*, and the third question asked students to *apply procedural knowledge*. The next day, Mr. Parker engaged in an "assessment conversation" with his students based on their answers to these four questions. During this conversation he learned that students did *remember the factual knowledge* and had achieved some degree of *understanding of the conceptual knowledge*. But they apparently had difficulty *applying procedural knowledge*. Once this problem was addressed, students gained the level of understanding that Mr. Parker sought. This example points to the possibility of using the Taxonomy Table to pinpoint deficiencies in student learning. When deficiencies are identified, future instruction can be altered to help students overcome them.

ATTACHMENT A LETTER FROM COMMISSIONER LUCKINO

Department of Engineering and Public Safety
County Commissioner's Office
Anytown, USA 12345

April 10

Re: Earthquake and Volcano Hazard Study for Our County

It is well known that earthquakes and volcanoes can destroy property and injure or even kill people. In January, a major earthquake rocked Los Angeles, California. The earthquake killed many people and caused an estimated 30 billion dollars in damage to homes, businesses, roads, and bridges. In May of 1980, the Mt. St. Helens Volcano in Washington erupted violently. The force of the volcanic eruption tore trees out of the ground 15 miles away. Closer to home, two earthquakes struck a town 100 miles from us in January, and an earthquake shook Metropolis in 1986. Could an earthquake strong enough to destroy bridges and buildings strike our county? Need we be concerned about a volcano?

We need you to study the geology of our area and tell us whether or not a damaging earthquake or volcano might happen here. Your results will help us decide if our county should prepare a plan for a geologic hazard. Such a plan would involve preparing for an evacuation and making emergency medical plans.

This challenging and important problem will require effort and creativity to solve. To assist you in this task, we gathered geologic data from federal and state geological offices. This information includes geologic maps, cross-sections, oil well drilling records, and rock samples. We also asked that a *Research Materials Packet* be sent to you. We think it will help you to interpret geologic evidence. The packet has a summary of the theory of plate tectonics, which will help you understand the causes of earthquakes and volcanoes. It also contains newspaper clippings about recent earthquakes and volcanoes, and information on the geology of places that have frequent earthquakes and volcanic eruptions.

Your task is to use this information to interpret the geology of our area, compare your results to places that have many earthquakes (California) and volcanoes (Mt. St. Helens, Washington), and decide if our county needs a safety and evacuation plan.

The final report that you submit to our office should include:

- A. Your *decision* as to the likelihood that a damaging earthquake and/or a volcano will affect our county.
- B. An *explanation* of your decision that is supported by comparing the *evidence* you have studied to *scientific theory* for the causes of earthquakes and volcanoes.
- C. Maps that show any volcanic rocks and past earthquakes in our region.
- D. A geologic cross-section through our county showing the underground structure of rocks.
- E. Any other items and explanations that you think support your decision.

During the next several weeks, professional geologists may visit your classroom to look at your work. They may ask you to talk about the way you are thinking and reasoning about this problem. These scientists will be involved in the review of your final report.

Thank you for your attention to this most important matter. Good luck!

Sincerely yours,

Fred Luckino
County Commissioner

ATTACHMENT B RUBRIC FOR SCORING PERFORMANCE ON THE EARTHQUAKE UNIT TERMINAL TASK

Definition of the task: Acting in the capacity of a scientist who understands volcanoes and theories concerning their causes and geographical distribution, examine the geological data of our region and compare those data with corresponding data from California. Based on your findings, write a letter to our County Commissioner that includes a summary of your findings that is accurate and a recommendation concerning the need to invest money in preparing an Earthquake Evacuation Plan for our region. The recommendation should be consistent with the evidence you have collected and it should acknowledge alternative explanations.

Criteria	Levels of Performance
Accuracy of information in summary	<p>3—The information in the summary is complete and accurate.</p> <p>2—Some important information is missing, misconstrued, misrepresented in the summary.</p> <p>1—Significant portions of the summary are inaccurate and/or important data are missing.</p>
Consistency with the evidence	<p>3—Recommendations are consistent with the evidence that is available.</p> <p>2—Recommendations are generally consistent with the evidence that is available—slight inconsistencies are ignored in the letter.</p> <p>1—Recommendations are in large part inconsistent with the evidence.</p>
Acknowledgment of alternative explanations	<p>3—Recommendations are nicely qualified in terms of rival explanations for the findings of the study.</p> <p>2—Recommendations are advanced, with a caveat added to acknowledge rival explanations, but the caveat appears more as an "add-on" than as a fully integrated piece of thinking.</p> <p>1—Recommendations appear to be shrill and definite—with only little (or no) acknowledgment of rival explanations.</p>
Clarity	<p>3—Recommendations are stated succinctly and presented in a logical order. Diagrams and drawings are labeled and easy to understand.</p> <p>2—The link between narratives and diagrams is difficult to make. Recommendation is vague.</p> <p>1—Recommendation is not responsive to the task. Recommendation is not supported with evidence.</p>
Perfect Score = 12	

Report Writing Vignette

This vignette describes a unit on report writing developed by Ms. Christine Evans and Ms. Deanne McCreadie, both of whom also taught it. Ms. Colleen Vandie, the teacher in the vignette, represents them and their experiences.

This unit was taught to a class of fourth-grade children during the early spring, after the class members had learned to work with one another and after some basic writing criteria had been studied and mastered by most of the class. The class included 28 students, 13 boys and 15 girls. About half of the class were minorities—Asian Americans, African Americans, and Hispanic Americans. The class represented a considerable spread in academic ability. However, none of the children was identified as needing special education services.

There is a strong sense of educational accountability in the state, with students, teachers, and parents being very conscious of the state content standards and the consequences of not meeting those standards. As a consequence, I carefully selected the objectives for this unit so they closely corresponded with the state Content Standards for English Language Arts. Indeed, even the language in which the objectives are phrased reflects the standards. My students will be assessed on these standards at the close of the fifth-grade year, and students who fail to meet the standards will be required to attend summer school and/or be retained in fifth grade until they meet them. Thus, I was concerned about preparing all the students for this “high stakes” assessment. Finally, because of the state emphasis on teaching thematically, in ways that integrate various disciplines, this unit emphasizes language arts topics while at the same time addressing important fourth-grade social studies topics.

Based on my previous experience with this unit, I allocated six weeks to complete it. Each day, we spent about 90 minutes on the unit.

PART 1: OBJECTIVES

There were four principal objectives. The students should learn to:

1. identify, locate, and select sources of information related to writing a report on a famous person in American history;

2. select information about a famous person in American history that is relevant to the purposes of their written and oral reports;
3. write informative text that communicates to classmates and other appropriate audiences in the school important aspects of the life of a famous person in American history and which includes students' opinions of how the famous American's contributions impacted society; and
4. deliver a talk to the class about a portion of the written report. (The talk should include the essential information pertaining to the segment of the famous person's life the student has elected to share, and be well organized and delivered in an effective manner.)

COMMENTARY

Objective 1 contains three verbs: “identify,” “locate,” and “select.” The key to classifying this objective is the verb “select.” In Table 5.1, on the back inside cover, selecting is an alternative name for *differentiating*, which is a cognitive process in the category *Analyze*. From all available materials, students are to differentiate those that are relevant to writing a report on a person famous in American history from those that are not. The noun phrase in Objective 1 is “sources of information.” As noted in previous vignettes, sources of information are materials. Thus, the noun phrase provides us with little help in determining the relevant type of knowledge. One scenario is that students will learn (or have learned) criteria for distinguishing relevant from irrelevant materials. This suggests *Conceptual knowledge* (e.g., “What makes relevant materials relevant materials?”). A second scenario is that students will be taught a procedure for identifying, locating, and selecting relevant materials. This case involves *Procedural knowledge*. If *Procedural knowledge* is at issue here, however, then students would be expected to *apply procedural knowledge* (i.e., carry out the steps). If we stay with *Analyze*, the most appropriate placement of the objective in the Taxonomy Table is in cell B4, *analyze* [based on] *conceptual knowledge* (although the alternative inference, *apply procedural knowledge*, is certainly not unreasonable).

Objective 2 contains the single verb “select.” Again, then, we are dealing with *differentiating* (*Analyze*). The noun is “information” (rather than “sources of information”). The statement of the objective includes qualifiers that pertain to the information to be selected from the located sources. The information must be (1) about a famous person in American history and (2) relevant to preparing written and oral reports. The first qualifier is simply a restatement of what was already included in the first objective. The second qualifier, however, is unique. Of all the information available about the famous American, students must select the most relevant—relevant to the preparation of written and oral reports. In combination, all of these clues support the placement of Objective 2 in the same cell as the first one, B4 (*analyze* [based on] *conceptual knowledge*).

For her last two objectives, Ms. Vandie is interested in having her students learn to construct products: a manuscript (“informative text”) for Objective 3 and a talk (based on the written text) for Objective 4. Thus, the meaning of the two ambiguous verbs, “write” and “deliver,” is clarified within the context of the entire objective. They both signify “constructing,” an alternative term for *producing*, which is a cognitive process in the *Create* category.

Much of the information contained in these two objectives pertains to the criteria that will be used to evaluate the products. The manuscript will be evaluated in terms of (1) communication with an identified audience, (2) important aspects of the person’s life, and (3) the writer’s opinions of the impact of the person’s contributions on society. The talk will be evaluated according to whether it (1) includes essential information, (2) is well organized, and (3) is delivered in an effective manner. Because these are the criteria used for the purpose of evaluation, knowledge of them constitutes *Conceptual knowledge*. In addition to this *Conceptual knowledge*, students need to have knowledge of fairly specific details about the person being written or spoken about (i.e., *Factual knowledge*). Thus, these last two objectives are placed in two cells of the Taxonomy Table: A6 (*create [based on] factual knowledge*) and B6 (*create [based on] conceptual knowledge*).

A summary of the analysis of the objectives in terms of the Taxonomy Table is provided in Table 13.1.

PART 2: INSTRUCTIONAL ACTIVITIES

Lesson 1

I introduced the unit to the students by describing in some length what comprises the format of a written and an oral informative report. Through class discussion, and using the blackboard to record relevant contributions from the class, emphasis was given to purpose, audience, sources of information, and other elements derived from the state standards document and elsewhere. In combination, these criteria were adapted from the Delaware General Rubric for Writing. I ended the discussion by displaying a “kid-friendly” rubric for the written report (Attachment A) and set of rating scales for the oral presentation (Attachment B). These were to be used by students as they planned their reports and by me as I assessed the quality of their work.

COMMENTARY

As shown in Attachment A (at the end of the chapter), the rubric contains five criteria for guiding and evaluating written reports: development, organization, word choice, sentence formation, and writing rules. The class discussion guidelines include other criteria: purpose, audience, and sources of information. Finally, the ratings scales in Attachment B (at the end of the chapter) provide a third set of criteria. In our framework, knowledge of criteria is associated with

13.1 ANALYSIS OF THE REPORT WRITING VIGNETTE IN TERMS OF THE TAXONOMY TABLE BASED ON STATED OBJECTIVES

THE KNOWLEDGE DIMENSION	THE COGNITIVE PROCESS DIMENSION					
	1. REMEMBER	2. UNDERSTAND	3. APPLY	4. ANALYZE	5. EVALUATE	6. CREATE
A. FACTUAL KNOWLEDGE						Objective 3 Objective 4
B. CONCEPTUAL KNOWLEDGE				Objective 1 Objective 2		Objective 3 Objective 4
C. PROCEDURAL KNOWLEDGE						
D. META-COGNITIVE KNOWLEDGE						

Key

Objective 1 = Select sources of information related to writing a report on a famous person in American history.

Objective 2 = Select information about a famous person in American history that is relevant to the purposes of students' written and oral reports.

Objective 3 = Write informative text that communicates to classmates and other appropriate audiences in the school important aspects of the life of a famous person in American history and that includes students' opinions of how the famous American's contributions impacted society.

Objective 4 = Deliver a talk to the class about a portion of the written report.

Conceptual knowledge. At this point, we are not certain of the appropriate cognitive process to use with *Conceptual knowledge*. It seems reasonable to assume, however, that because Lesson 1 is introductory, the teacher's intent is simply to provide an overview of the criteria. Consequently, the objective we infer from this activity falls into the process category *Remember*; that is, students should *remember conceptual knowledge*.

Lesson 2

The second lesson dealt with "taking notes" and identifying themes. I began by showing the class a short video, asking the students to take notes on large pieces of construction paper, cut into fourths. (I believed that using the video instead of a passage from a book as a prompt decreased the chances that students would elect to copy passages straight from the text.) The plan was to post the notes the students took on the blackboard so that the whole class could see them and comment on them. Students shared their notes and as I taped them to the blackboard, the class discussed the fact that some notes could be grouped together on the same topic or theme. I moved the notes around on the blackboard at the direction of class members until there were several groupings. The students were then invited to give each grouping a title.

COMMENTARY

It seems fairly clear that the cognitive process emphasized is *classifying (Understand)*. Since students are placing specific "notes" into thematic categories and then naming them, two types of knowledge are involved: *Conceptual knowledge* and then *Factual knowledge*. The *Conceptual knowledge* is for *Understanding*; the *Factual knowledge* is to be *Remembered*.

Ms. Vandie begins to implement a sequence of activities often used in connection with producing (*Create*) a product. The procedure illustrates scaffolding and modeling. Scaffolding is seen in moving the task from scaled-down simpler versions of the materials under study to "the real thing" when students are working on their class projects. Ms. Vandie's modeling procedures show the students how to proceed and also prompt them by "thinking aloud" behaviors on the teacher's part.

Lesson 3

During the next lesson, I read a book aloud and modeled how I would take notes on the passages that I read. The students also took notes as I was reading. As before, the notes were posted on the blackboard, placed into groups, and the groups of notes were given titles. Students then read in unison a passage displayed on the overhead projector. They watched as I modeled note

taking and the classification of notes. As I was pasting my notes on the board, I prompted the students by “thinking aloud” about the decisions I was making about grouping the notes and about titling the groups.

After a question-and-answer session, I engaged the students in note taking with another common reading, one that was considerably longer than the passage on the overhead projector. Each student had a photocopy of a four-page essay about George Washington Carver, and they were instructed to take notes on the passage. Working in small groups, with approximately four students in each group, students entered the notes they had taken on “Post-It” slips and grouped them on a large sheet of poster paper. As a group, the students classified their notes and attempted to name the groups they formed.

As I observed the students’ progress at this point, I decided the students needed additional instruction in note taking. I called the class back together and once again modeled note-taking procedures. The students then returned to working within their groups. When the lesson was complete, the groups reported the results of their work to the entire class. In the discussion that ensued, the class identified those groupings that seemed to be most helpful in learning about George Washington Carver.

COMMENTARY

In this lesson the teacher is teaching by modeling. The issue becomes what students are expected to learn from this approach to teaching. Are they to develop *Procedural knowledge*, which they are then to *Apply* to the note-taking–grouping–naming sequence? Are they to develop *Metacognitive knowledge* (i.e., their own unique strategy) for performing the task? To complicate matters further, the second step of the sequence involves cognitive processes in the category *Analyze*. At present, then, we opt for two objectives: *apply procedural knowledge* and *analyze conceptual knowledge*. Although not an objective in its own right, *apply metacognitive knowledge* may be part of the *analyze conceptual knowledge* activity.

Lesson 4

During the next lesson, I asked the students, still working in groups, to read a book that focused on the life of Matthew Henson, a famous American. All the children in the class were expected to read the same book. Students who were not reading at grade level were paired with a partner or listened to the book on audiotape. The members of each group were then asked to select as a group the aspect of his life they would like to emphasize and describe to the class. Each group needed to choose one aspect of Matthew Henson’s life—childhood, adulthood, awards, contributions to society, and so forth. Each group used the note-taking–grouping–naming approach to record and to organize the important facts concerning their single aspect of Henson’s life. I made overhead transparencies of each group’s “final” product, and the notes and

classifications with titles were shared in class and critiqued by the class. I made a point to commend those elements apparent in the groups' work that complied with my standards of good note taking.

COMMENTARY

At least four verbs help us decide on the cognitive processes being sought by the teacher: "select" (*Analyze*), "use" (*Apply*), "organize" (*Analyze*), and "critique" (*Evaluate*). The first three verbs suggest that Lesson 4 is a follow-up activity to Lesson 3. Thus, we continue with *analyze conceptual knowledge* and *apply procedural knowledge*. We add *evaluate* [based on] *conceptual knowledge*. Students are evaluating based on the categories (concepts), not on the process (procedure) students use to arrive at them.

Lessons 5–8

During the next several lessons the emphasis shifted to having students identify famous persons they wanted to nominate to their group members as an object of intense study. I gave them a list of famous Americans from which they could choose. The list included men, women, Whites, African Americans, Asian Americans, Native Americans, Hispanic Americans, Presidents, inventors, civil rights workers, and many others. Besides making an effort to allow students to make choices from options that reflected the cultural and ethnic diversity of the United States, I was careful to see to it that the school library had several appropriate books for each of the names on my list.

Students were given time to explore the options available to them. Some students had never heard of the "famous" people on the list. Some students looked them up on the Internet or in the library, or asked me questions about them.

After several class periods of exploration, the students were ready to engage in a process for making group decisions about the person they would be studying. Interestingly, some boys chose to report on women and some girls elected to write about men. Both white and black students opted to study famous Americans of different races. Although their reasons were not clear to me, I was pleased with the variety of student choices. In their groups, students tried to "sell" their preferred choice to the others in the group. Using democratic procedures, each group chose one famous American to study for the purposes of addressing the objectives of this unit.

COMMENTARY

This four-day process of choosing a person for study does not relate directly to any of the objectives associated with this unit. Certainly, though, learning to work together, learning to take the views of others into account, and learning to value democratic processes are important outcomes of schooling. In fact, the

teacher may well have course or year-long objectives that deal with these intended outcomes. The point is that we will not attempt to classify these activities in terms of the Taxonomy Table for this unit.

Lesson 9

The next lesson dealt with preparing a bibliography. Students were encouraged to search their family's libraries, the school library, the Internet, and other sources to find books and articles on the famous American they had selected. I helped students with reading difficulties to locate appropriate resources. I began this lesson by sharing books about George Washington Carver, describing how this first collection of books could be sorted in terms of usefulness and how they might be entered into a bibliography. One or two books were clearly quite difficult and included information not accessible to fourth-grade students. Another was a picture book written for primary students that included very little text about George Washington Carver. Four or five books were "on target" in terms of their appropriateness for the assignment. The students watched as I sorted the books and discussed why some of the sources were more useful than were others. I then demonstrated how to prepare a bibliography chart for the sources deemed most useful.

COMMENTARY

Two objectives seem important here. The first is learning to differentiate books (i.e., sources of information) in terms of their usefulness for the project (the criteria on which to differentiate them). This objective is classified as *analyze* [based on] *conceptual knowledge*. The second objective is learning how to prepare a bibliography chart. Without more information, we classify this objective as *apply procedural knowledge*. If it were taught as a generic strategy rather than as unique to social studies, however, the activity would be *apply metacognitive knowledge*.

Lessons 10–16

Beginning with Lesson 10 and lasting about five days, the students began re-searching the famous American their group had selected for study. Students searched in the library and on computers to find relevant sources. Working closely with the Media Specialist in the school, I had arranged for the class to spend several periods in the library. Students pored over the sources that were available to them, determining whether the sources provided potentially useful information about their famous American.

My intent was that students would behave as "real" researchers and determine topics as they began the research process. For the first two days (Lessons 10 and 11), the students only reviewed books and took notes on Post-It notes.

It was a quiet time for everyone to do some reading and to take notes. At the end of each day, the group members simply stuck the notes onto their poster board. At the end of these two days, the group members began to review their notes and began moving them around to determine the themes that individual group members might address. I emphasized the importance of cooperation during group work so that all group members were able to participate. Post-It notes that included several ideas often needed to be rewritten so the notes fit only one category. These categorization activities lasted another three days (Lessons 12–14).

In monitoring their work, I found that some groups of students were unable to locate themes—even after preparing as many as 50 Post-It notes. When the students tried to sort the cards into themes, no common threads seemed apparent to them. After they had struggled with the “finding themes” assignment unsuccessfully for two days, I elected to help students. Either I would suggest a theme or two that I saw reflected in the group’s notes or I would urge the student to reread particular passages from the books they had located.

COMMENTARY

The emphasis in this set of seven lessons is on students using the three-step procedure they had been taught in Lessons 3 and 4: (1) take notes, (2) categorize notes according to themes, and (3) name the theme. Here we have *Analyze* embedded within *Procedural knowledge*; that is, the second step of the procedure requires that students engage in the process of differentiating. Because this step is a part of the application process, we categorize the objective here as *apply procedural knowledge*.

Now, after several days of note taking, the groups’ reading and research became more focused as group members began reading more deeply into the themes that had “bubbled up” from the note-taking process. By Lesson 15, I asked the groups to determine how the themes would be divided among the group members for presentation. Each group member was to be assigned a unique theme. In this way, the individual student reports were less likely to be overlapping in content and each would be more likely to look and sound quite different.

After reviewing the sources pertinent to the selected themes, each student prepared a carefully constructed bibliographical chart, as they had been previously taught (Lessons 15 and 16). These were given to me at the end of Lesson 16. I found that some of them were skimpy, listing only one or two sources. I tried to help these students either to find more material or to choose another famous person. Other students included books or other materials that were well beyond their reading levels. I assisted these students in finding more appropriate sources.

COMMENTARY

The phrase that helps us categorize this activity is “as they had been previously taught.” The students were taught a particular procedure for preparing their bibliographic chart and are expected to follow it. Thus, we place this activity in the Taxonomy Table in cell C3 (*apply procedural knowledge*).

In Lesson 15, the students determined how the themes would be divided among the group members for presentation. This activity falls in the same category as the activities of Lessons 5–8 and so also is not classified in the Taxonomy Table for this unit (see the discussion on pages 216–217).

Lessons 17–20

Beginning with Lesson 17 and continuing through Lesson 20, we moved into a “Writers’ Workshop” mode. Students drafted their written reports on the themes reflected in the lives of their famous persons. I held conferences with individual students on the content and organization of their written reports. Several students needed more than one conference. Early drafts were read by fellow students who gave suggestions in peer conferences about how the reports could be improved. In reading the drafts, the students used the “kid-friendly” rubrics that were introduced to them on the first day of the unit to guide their comments and suggestions. The rubric was somewhat confusing to some students, so I brought them together in a small group to explicitly teach the criteria and descriptors that were designed to guide their writing. In addition, the students had access to a Revision and Editing Checklist (see Attachment C at the end of the chapter) that had been used often in previous Writers’ Workshop activities in the class. After intensive work in class (and at home), the projects were handed in on time.

COMMENTARY

The activities during these four lessons focus on producing the written reports (*Create*) and critiquing early drafts of them (*Evaluate*). “Producing” requires both *Factual knowledge* (the specifics) and *Conceptual knowledge* (the themes). “Critiquing” requires primarily *Conceptual knowledge* (namely, the scoring rubric and the Revision and Editing Checklist). Thus, we place these activities in cells A6 (*creating* [based on] *factual knowledge*), B6 (*creating* [based on] *conceptual knowledge*), and B5 (*evaluating* [based on] *conceptual knowledge*).

Lessons 21–30

However, the unit was not finished when the written reports were submitted. What remained was the oral reporting! At this point, students were asked to review the rating scales used to evaluate oral reports (see Attachment B). Students

were asked to select and share with their group members the aspect of their famous person's life they intended to present. The group listened to the plans each of its members had for sharing—and how they might make the oral presentation informative and interesting. Some students planned to wear a costume that would represent the person they were describing. Others planned to share various artifacts that would provide some concrete examples. Still others prepared displays. Each student understood that his/her report was to take no longer than five minutes. I allocated 25 minutes a day for 10 days to the oral reporting—giving students a brief time to respond to an oral report with questions and/or comments (Lessons 21–30). This activity culminated six weeks of instruction on the unit.

COMMENTARY

To analyze this activity in terms of the Taxonomy Table, we must rely on the rating scales used to evaluate oral reports (Attachment B). Because the rating scales are criteria we suggest that they represent *Conceptual knowledge*. The presentations are based on *Factual knowledge*. We further suggest that students are expected to use the ratings scales in planning their oral presentations. Thus, we believe the appropriate cognitive process category is *Create*. The inferred objective, then, takes the form *create* [based on] *conceptual knowledge* and *factual knowledge* (since factual knowledge comprises the raw material for the written report).

A summary of our analysis of the entire set of instructional activities in terms of the Taxonomy Table is shown in Table 13.2.

PART 3: ASSESSMENT

I assessed and evaluated my students' learning throughout the unit. Specifically, I assessed and coached them in their use of research procedures, in their evaluations of materials, in their selections of themes, and in their writing assignments. When students needed more individual guidance, I provided them with explicit instruction to improve their understanding. In this effort, I relied on the judgments of my colleague, the Media Specialist, who also observed very carefully the progress the students were making.

I worked closely with the students as they located and selected information about the famous Americans they were studying. Some students were facile in using the library and the computer to locate information. Others were less resourceful. I continued to coach those students who were having difficulty and engaged the more sophisticated students in helping their fellow group members who were having some difficulty. After consulting with the Media Specialist and considering my own notes in my journal, I was convinced that almost everyone improved in this area by the end of the unit.

13.2 ANALYSIS OF THE REPORT WRITING VIGNETTE IN TERMS OF THE TAXONOMY TABLE BASED ON INSTRUCTIONAL ACTIVITIES

THE KNOWLEDGE DIMENSION	THE COGNITIVE PROCESS DIMENSION					
	1. REMEMBER	2. UNDERSTAND	3. APPLY	4. ANALYZE	5. EVALUATE	6. CREATE
A. FACTUAL KNOWLEDGE	<i>Lesson 2 activities</i>					Objective 3; Objective 4 <i>Lessons 17–20 activities;</i> <i>Lessons 21–30 activities</i>
B. CONCEPTUAL KNOWLEDGE	<i>Lesson 1 activities</i>	<i>Lesson 2 activities</i>		Objective 1; Objective 2 <i>Lessons 3, 4, 9 activities</i>	<i>Lesson 4 activities;</i> <i>Lessons 17–20 activities</i>	Objective 3; Objective 4 <i>Lessons 17–20 activities;</i> <i>Lessons 21–30 activities</i>
C. PROCEDURAL KNOWLEDGE			<i>Lessons 3, 4 activities;</i> <i>Lessons 9–14 activities;</i> <i>Lesson 16 activities</i>			
D. META-COGNITIVE KNOWLEDGE						

Key

Objective 1 = Select sources of information related to writing a report on a famous person in American history.

Objective 2 = Select information about a famous person in American history that is relevant to the purposes of students' written and oral reports.

Objective 3 = Write informative text that communicates to classmates and other appropriate audiences in the school important aspects of the life of a famous person in American history and that includes students' opinions of how the famous American's contributions impacted society.

Objective 4 = Deliver a talk to the class about a portion of the written report.

Note: As discussed in the text, activities related to Lessons 5–8 and 15 are not analyzed in terms of the Taxonomy Table.

The Media Specialist and I paid strict attention to the judgments students made in selecting resources to use in their reports. As in most areas, some students needed more help than others. The selection process was confounded not only by the factor “relevance” but also by “accessibility.” Some students were able to select relevant sources, but the reading levels of the sources were too difficult for them. Individual assistance at this time became very important. Nevertheless, by the end of the unit, we were confident that most of the students grasped the idea of “relevance” in making their choices of materials.

To evaluate the third and fourth objectives, I was able to use the Primary Trait Scoring Guide (see Attachment D) and the ratings scales for oral reports (Attachment B), respectively. The results suggest that while most of the students seemed to have met the standards set for these two objectives, some had not. I carefully studied the efforts of those who had not performed well to identify areas of weakness. Since the unit was taught in early March, there was time to re-teach some of these important skills and understandings in subsequent units.

COMMENTARY

Both informal and formal assessments are made of student learning. The informal assessments take place during Lesson 3, Lessons 10 and 11, and Lesson 16. In Lesson 3, the assessment focuses on students’ note-taking skills (i.e., how to take notes). This represents *apply procedural knowledge*. In Lessons 10 and 11, the assessment focuses on students’ ability to locate themes (i.e., to analyze the information on the Post-It notes). This represents *analyze conceptual knowledge* (with *Conceptual knowledge* used in the themes or categories formed by the students). Finally, the assessment during Lesson 16 focuses on the bibliography prepared by the students. Concerns are raised by the teacher over the number of entries and reading levels of the materials included. Since this assessment clearly relates to the first two objectives, we classify it as *analyze conceptual knowledge* (although, as mentioned in our discussion of these objectives, there is an element of *apply procedural knowledge* as well).

The two formal assessments are the written reports and oral presentations. To analyze these assessments, we focus first on the Primary Trait Scoring Guide (Attachment D) and the rating scales used to evaluate oral reports (Attachment B). Both are conceptual frameworks that can be used to evaluate the quality of the products produced by the students. It is important to note that the verb “evaluate” here pertains to the teacher, not the students. The issue for us is what is being evaluated, and simply stated, it is the products that the students have created. The products contain both *Factual knowledge* (details) and *Conceptual knowledge* (themes). We suggest, therefore, that we are dealing with *creating* [based on] *factual* and *conceptual knowledge*. Hence, we place our inferred objectives in two cells: A6 (*create* [based on] *factual knowledge*) and B6 (*create* [based on] *conceptual knowledge*).

A summary of our analysis of both the informal and formal assessments in terms of the Taxonomy Table is shown in Table 13.3.

PART 4: CLOSING COMMENTARY

In this section we examine the vignette in terms of our four basic questions: the learning question, the instruction question, the assessment question, and the alignment question.

THE LEARNING QUESTION

As the vignette title suggests, this is a unit on report writing. The overall purpose of the unit is for students to learn to write research papers and to learn to deliver portions of those papers orally. This purpose is best captured in Objectives 3 and 4 (see Table 13.1). In terms of the Taxonomy Table, this main purpose can be represented as *create* [written reports and oral presentations from] *factual* and *conceptual knowledge*. Within the context of the entire unit, Objectives 1 and 2 are best considered prerequisites to or facilitative of Objectives 3 and 4. They are very important prerequisites or facilitators, though. When students achieve the first two objectives, they have acquired the “raw material” they need for Objectives 3 and 4. Achieving Objectives 1 and 2, however, requires that students are able to *Analyze* material in terms of its relevance, importance, and, in the case of fourth-grade students, readability. To do this, they need to understand the meaning of “relevance,” “importance,” and “readability,” which requires *Conceptual knowledge*.

THE INSTRUCTION QUESTION

The early activities (Lessons 1 and 2) were intended to introduce the unit to the students (see Table 13.2). Ms. Vandie told students about criteria that would be used to evaluate their final products, and the students began to explore how they were to go about choosing the information that would eventually find its way into the final products.

As shown in Table 13.2, many lessons were devoted to *applying procedural knowledge*. The teacher expected students to use a three-step procedure in moving from the available resources to preparation for writing the report: (1) take notes, (2) group the notes according to themes, and (3) assign a name to each theme. In these lessons, the teacher modeled the procedure. In addition, she provided individual assistance (i.e., “coaching”) to those students who were unable to apply the procedure. It is instructive to note that the three-step procedure assumes that proper materials have been selected. The validity of this assumption is called into question by the teacher’s descriptions of Lessons 15

13.3 ANALYSIS OF THE REPORT WRITING VIGNETTE IN TERMS OF THE TAXONOMY TABLE BASED ON ASSESSMENTS

THE KNOWLEDGE DIMENSION	THE COGNITIVE PROCESS DIMENSION					
	1. REMEMBER	2. UNDERSTAND	3. APPLY	4. ANALYZE	5. EVALUATE	6. CREATE
A. FACTUAL KNOWLEDGE	<i>Lesson 2 activities</i>					Objective 3; Objective 4 <i>Lessons 17–20 activities; Lessons 21–30 activities Assess F1, F2</i>
B. CONCEPTUAL KNOWLEDGE	<i>Lesson 1 activities</i>	<i>Lesson 2 activities</i>		Objective 1; Objective 2 <i>Lessons 3, 4 activities Assess In2, In3</i>	<i>Lesson 4 activities; Lessons 17–20 activities</i>	Objective 3; Objective 4 <i>Lessons 17–20 activities; Lessons 21–30 activities Assess F1, F2</i>
C. PROCEDURAL KNOWLEDGE			<i>Lessons 3, 4 activities; Lessons 9–14 activities; Lesson 16 activities Assess In1, In3</i>			
D. META-COGNITIVE KNOWLEDGE						

Key

Objective 1 = Select sources of information related to writing a report on a famous person in American history.

Objective 2 = Select information about a famous person in American history that is relevant to the purposes of students' written and oral reports.

Objective 3 = Write informative text that communicates to classmates and other appropriate audiences in the school important aspects of the life of a famous person in American history and that includes students' opinions of how the famous American's contributions impacted society.

Objective 4 = Deliver a talk to the class about a portion of the written report.

Assess In1, In2, and In3 refer to three separate informal assessments; assess F1 (written report) and F2 (oral presentation) refer to the two formal assessments.

Note: As discussed in the text, activities related to Lessons 5–8 and 15 are not analyzed in terms of the Taxonomy Table.

Dark shading indicates the strongest alignment—an objective, an instructional activity, and an assessment are all present in the same cell. Lighter shading indicates two of the three are present.

and 16. Apparently, many students had not located a sufficient number of appropriate sources.

About halfway through the unit (Lessons 17–20), the emphasis shifted to the more complex objectives: *evaluate* [based on] *conceptual knowledge*, and *create* [based on] *factual* and *conceptual knowledge*. The format for these lessons was a “Writers’ Workshop.” Students worked on their written reports and critiqued the draft reports of other students.

Finally, the last ten days of the unit were given over to the oral presentations. Students had a set of rating scales to use in planning their oral presentations (see Attachment B). *Planning* is a cognitive process in the category *Create*; the rating scales represent criteria (*Conceptual knowledge*). Additionally, however, the students possess *Factual knowledge* about the famous Americans they have studied, which is organized around the themes they have identified (*Conceptual knowledge*). Thus, we classify this two-week-long activity as *create* [based on] *factual* and *conceptual knowledge*.

THE ASSESSMENT QUESTION

Both formal and informal assessments were used. As shown in Table 13.3, the informal assessments tapped some combination of *analyze conceptual knowledge* and *apply procedural knowledge*. It is interesting that *analyzing conceptual knowledge* was an integral part of the *Procedural knowledge* students were taught to apply. In this case, then, one objective (*analyze conceptual knowledge*) is embedded within the other (*apply procedural knowledge*). Table 13.3 shows that the informal assessments provided information to the teacher about student progress on the first two objectives.

In contrast with the informal assessments, the formal assessments focused on the second two objectives. What is interesting, however, is the use of fairly generic rating scales and scoring rubrics to assess Objectives 3 and 4. What gets lost in the generic approach is the specific criteria embedded within the statement of the objectives (e.g., “how the famous American’s contributions impacted society” in Objective 3 and “essential information pertaining to the segment of the famous person’s life the student has elected to share” in Objective 4).

THE ALIGNMENT QUESTION

Table 13.3 provides the information we need to address the alignment question. In fact, some of the alignment issues were either addressed or alluded to in our discussion of the previous questions. In our treatment of the instruction question, for example, we mentioned that the initial activities provided students with a general overview of the unit. It is not surprising, then, that they are not aligned with any of the specific objectives or with the assessments. Similarly, in our discussion of the assessment question, we noted that the informal

assessments are aligned with the first two objectives, whereas the formal assessments are aligned with the last two objectives.

Strong alignment is evident in cells A6 (*create* [based on] *factual knowledge*), B4 (*analyze* [based on] *conceptual knowledge*), and B6 (*create* [based on] *conceptual knowledge*). Each of these three cells has at least one entry from the objectives, the instructional activities, and the assessments. In contrast, the major misalignment seems to be in cell C3 (*apply procedural knowledge*) and, particularly, cell B5 (*evaluate* [based on] *conceptual knowledge*). But, while cell C3 contains nine lessons of activities, no explicit objective, and two informal assessments as noted above, it is integrally related to cell B4. Similarly, cell B5 relates to five lessons, has no explicit objective and no assessments, either informal or formal, but is linked to the activities in cell A6 and cell B6.

PART 5: CLOSING QUESTIONS

As with the analysis of all our vignettes, we were left with a few unanswered questions. We raise two of the most important in this closing section.

1. **What can be done to improve the learning of *Procedural knowledge* that involves more complex cognitive processes?** One of the major emphases in this unit is getting students to follow a three-step procedure in moving from “raw information” to information that is organized for the purpose of writing a report. The procedure is taking notes, organizing the notes around topics or themes, and then naming the theme. Taking notes involves *differentiating* relevant parts of the material from irrelevant parts. *Organizing* involves determining how the elements (e.g., notes) fit within a structure. Thus, two of the three steps involve cognitive processes associated with *Analyze*. At several points in her discussion, Ms. Vandie suggested that students were having difficulty applying the procedure. Based on our analysis, the difficulty most likely resides with *Analyze* rather than *Apply*. What can be done to help students develop the cognitive processes they need to successfully *apply procedural knowledge*?
2. **In assessing objectives that fit within the process category *Create*, how important is it to have evaluation criteria specific to the content knowledge component of the objective?** We mentioned earlier that the rating scales and scoring rubrics include fairly general criteria. Students would likely benefit from knowledge of these criteria as they work on their written reports or oral presentations. Within our framework, knowledge of criteria used to evaluate is *Conceptual knowledge*. Knowledge of evaluation criteria should not be confused with *knowledge of criteria for determining when to use appropriate procedures*, which is a component of *Procedural knowledge* (see page 54). Yet another type of *Conceptual knowledge* is relevant here. In organizing the information gleaned from reading about the famous Americans, the students placed the relevant information in categories called themes. Knowledge of these categories is also *Conceptual*

knowledge. The rating scales and scoring rubrics include criteria relevant to only knowledge of evaluation criteria, not knowledge of the content categories. Do the themes have a unity to them? Do the titles accurately and appropriately represent the underlying information? How important is it for rating scales and scoring rubrics to include at least some criteria relevant to this second type of *Conceptual knowledge*—knowledge of principles and generalizations?