GLOBAL EDITION

Educational Psychology

Developing Learners

NINTH EDITION

Jeanne Ellis Ormrod • Eric M. Anderman • Lynley Anderman

Pearson

EDUCATIONAL PSYCHOLOGY

DEVELOPING LEARNERS

JEANNE ELLIS ORMROD
University of Northern Colorado (Emerita)

ERIC M. ANDERMAN
The Ohio State University

LYNLEY ANDERMAN
The Ohio State University

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TABLE 7.1 • Metacognition at Different Grade Levels

GRADE LEVEL	AGE-TYPICAL CHARACTERISTICS	EXAMPLE	SUGGESTED STRATEGIES
 K–2	• Awareness of thought in oneself and others, albeit in a simplistic form; limited ability to reflect on the specific nature of one's own thought processes • Considerable overestimation of what has been learned and how much can be remembered • Belief that learning is a relatively passive activity • Belief that the absolute truth about any topic is "out there" somewhere, waiting to be discovered	An adult tells 6-year-old Brent that she will read him a list of 12 words; she then asks him to predict how many he'll be able to remember. Brent predicts "about 8 or 9 . . . maybe all of them," but in fact recalls only 6. Later, when the adult asks him what he did to try to remember the words, he says only "Think" and "Holded it, hold it in the brain."  MyEdLab **Video Example 7.1.** You can observe Brett's explanation here.	• Talk often about thinking processes (e.g., "I *wonder* if . . ." "How might you *remember* to . . .?"). • Provide opportunities for students to experiment with their memories (e.g., playing "I'm going on a trip and I'm going to pack . . .," in which each student repeats items previously mentioned and then adds another item to the list). • Introduce simple learning strategies (e.g., rehearsal of spelling words, repeated practice of motor skills).
 3–5	• Increasing ability to reflect on the nature of one's own thought processes • Some overestimation of memory capabilities • Emerging realization that learning is an active, constructive process and that people may misinterpret what they observe • Continuing belief in an absolute truth "out there"	After reading several explanations of how ancient humans migrated from Asia to North America, a cooperative learning group in a combined fifth- and sixth-grade classroom includes the following points in its summary of what it has learned: "The more that we learn, the more we get confused about which is fact and which is fiction . . . We have made [our] own theories using information we found and trying to make sense of it."	• Provide simple techniques (e.g., self-test questions) that enable students to monitor their learning progress. • Examine scientific phenomena through hands-on activities and experimentation; ask students to make predictions about what will happen and to debate competing explanations for what they observe.
 6–8	• Few and relatively ineffective study strategies (e.g., poor note-taking skills, little or no self-monitoring of comprehension) • Belief that "knowledge" about a topic consists largely of a collection of discrete facts • Increasing realization that knowledge can be subjective and that conflicting perspectives may each have some validity (e.g., "people have a right to form their own opinions") • Increasing differentiation among the underlying natures of various content domains (e.g., thinking that math involves right vs. wrong answers whereas social studies allows for diverse opinions)	The students in Ms. Gaunt's eighth-grade math class rarely take notes to help them remember new concepts and procedures, and most are more concerned about getting correct answers than about making sense of mathematical operations (see the opening case study).	• Teach and model effective strategies within the context of various subject areas. • Scaffold students' studying efforts (e.g., provide a structure for note taking, give students questions to answer as they study). • Introduce multiple perspectives about topics (e.g., asking whether Christopher Columbus was a brave explorer in search of new knowledge or, instead, an entrepreneur in search of personal wealth). • Explicitly ask students to reflect on their beliefs about the nature of various academic disciplines (e.g., "Can a math problem sometimes have two *different* right answers?").

(*continued*)

TABLE 7.1 (*Continued*)

GRADE LEVEL	AGE-TYPICAL CHARACTERISTICS	EXAMPLE	SUGGESTED STRATEGIES
 9–12	• Growing (but incomplete) knowledge of study strategies that are effective in different situations; persistent use of rote rehearsal by some students • Increasing mastery of covert learning strategies (e.g., intentional use of elaboration, comprehension monitoring) • Increasing recognition that knowledge involves understanding interrelationships among ideas • Increasing recognition that mastering a topic or skill takes time and practice (rather than happening quickly as a result of innate ability) • Emerging understanding that conflicting perspectives should be evaluated on the basis of evidence and logic (seen in a small minority of high school students)	When 16-year-old Hilary is asked to describe the things she does to help her remember school subject matter, she says, "When I'm trying to study for tests, I try to associate the things I'm trying to learn with familiar things . . . with the Spanish words, I'll try to think of the English word that it sounds like . . . sometimes if I can't find any rule, then I just have to memorize it, just try to remember it, just go over it a lot."  MyEdLab **Video Example 7.2.** You can observe Hilary's explanation here.	• Continue to teach and model effective learning strategies; ask students to describe their strategies to one another. • Develop classroom assignments and assessments that emphasize understanding, integration, and application, rather than recall of discrete facts. • Present various subject areas as dynamic entities that continue to evolve with new discoveries and theories. • Have students weigh pros and cons of various explanations and documents using objective criteria (e.g., hard evidence, logical reasoning processes).

Sources: Agarwal, D'Antonio, Roediger, McDermott, & McDaniel, 2014; Andre & Windschitl, 2003; Astington & Pelletier, 1996; J. E. Barnett, 2001; Bendixen & Feucht, 2010; Buehl & Alexander, 2006; Chandler, Hallett, & Sokol, 2002; Elder, 2002; Flavell, Friedrichs, & Hoyt, 1970; Flavell, Miller, & Miller, 2002; Hatano & Inagaki, 2003; Hewitt, Brett, Scardamalia, Frecker, & Webb, 1995, p. 7 (migration example); P. M. King & Kitchener, 2002; Ku, Chan, Wu, & Chen, 2008; Kuhn, 2009; Kuhn, Garcia-Mila, Zohar, & Andersen, 1995; Kuhn & Park, 2005; Kuhn & Weinstock, 2002; Lovett & Flavell, 1990; McCrudden & Schraw, 2007; Meltzer, Pollica, & Barzillai, 2007; Muis, Bendixen, & Haerle, 2006; P. A. Ornstein, Grammer, & Coffman, 2010; Schneider, 2010; Schommer, 1994a, 1997; Short, Schatschneider, & Friebert, 1993; J. W. Thomas, 1993a; vanSledright & Limón, 2006; Wellman, 1985, 1990; J. P. Williams, Stafford, Lauer, Hall, & Pollini, 2009.

Some learning strategies are **overt strategies**; in other words, they're behaviors we can actually see. Others, such as elaborating and forming visual images, are **covert strategies**; they're internal mental processes we often *can't* see (Kardash & Amlund, 1991).

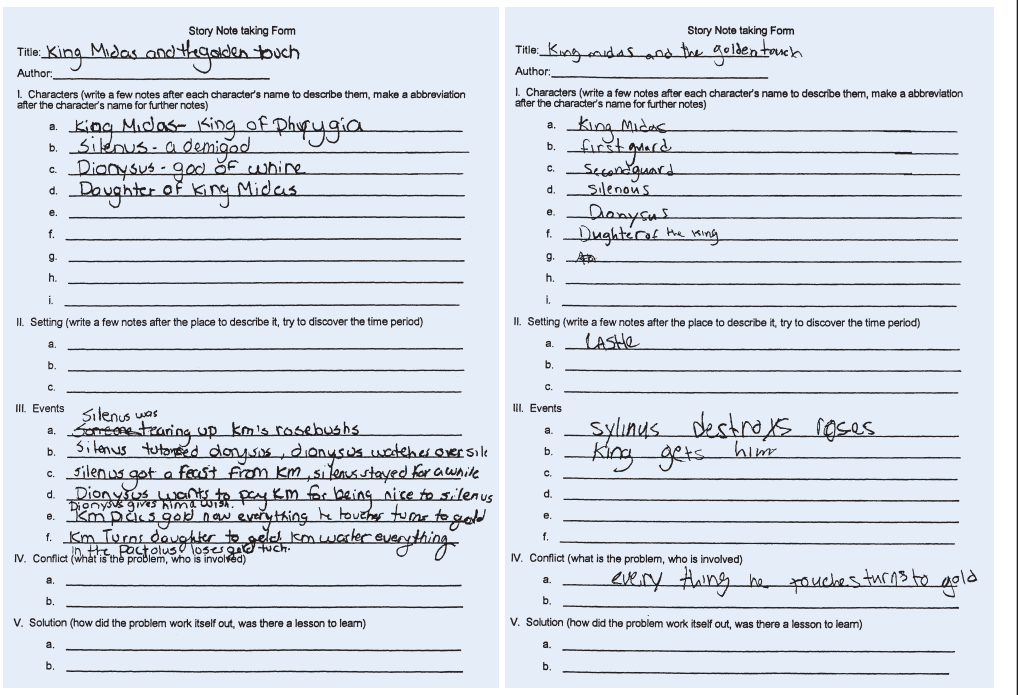
OVERT STRATEGIES

Successful learning and classroom achievement are partly the result of certain behaviors, such as keeping a calendar for assignments and due dates, devoting part of every evening to schoolwork, and asking questions in times of confusion. One especially effective overt strategy is *writing* about classroom subject matter (Bangert-Drowns, Hurley, & Wilkinson, 2004; P. D. Klein, 1999; Shanahan, 2004). Here we look at research on two writing-based learning strategies: taking notes and creating summaries.

Taking notes. By the time students reach the upper elementary or middle school grades, note-taking skills begin to play a role in their classroom achievement. In general, students who take more notes learn and remember classroom subject matter better. However, the *quality* of the notes is equally important. Useful notes typically reflect the main ideas of a lesson or reading assignment (A. L. Brown, Campione, & Day, 1981; Kiewra, 1985, 1989; J. Lee & Shute, 2010). Ideally, too, students should be *making sense* of the information they're writing down—perhaps elaborating on it in some way—rather than just copying it in a rote, word-for-word manner (P. A. Mueller & Oppenheimer, 2014).

Despite the advantages of note taking, many young adolescents take few or no class notes unless specifically instructed to take them (recall the infrequent note taking in Ms. Gaunt's eighth-grade math class). And the notes they do take differ considerably in quality. For example, Figure 7.1 shows the notes that two students took about King Midas in a Greek mythology unit

FIGURE 7.1 Two students' class notes on King Midas, taken in a seventh-grade language arts unit on Greek mythology.



Story Note taking Form

Title: King Midas and the golden touch

Author:

I. Characters (write a few notes after each character's name to describe them, make a abbreviation after the character's name for further notes)

a. King Midas- King of Phrygia
b. Silenus - a demigod
c. Dionysus - god of wine
d. Daughter of King Midas
e.
f.
g.
h.
i.

II. Setting (write a few notes after the place to describe it, try to discover the time period)

a.
b.
c.

III. Events

a. Silenus was ~~someone~~ tearing up km's rosebushs
b. Silenus tutored dionysus, dionysus watches over silenus
c. silenus got a feast from km, silenus stayed for a while
d. Dionysus wants to pay km for being nice to silenus
e. Dionysus gives King Midas wish. km picks gold now everything he touches turns to gold
f. km Turns daughter to gold km wishes everything in the Pactolus loses gold touch.

IV. Conflict (what is the problem, who is involved)

a.
b.

V. Solution (how did the problem work itself out, was there a lesson to learn)

a.
b.

Story Note taking Form

Title: King midas and the golden touch

Author:

I. Characters (write a few notes after each character's name to describe them, make a abbreviation after the character's name for further notes)

a. King Midas
b. first guard
c. Secondguard
d. silenous
e. Dionysus
f. Daughter of the king
g. ~~Ap~~
h.
i.

II. Setting (write a few notes after the place to describe it, try to discover the time period)

a. castle
b.
c.

III. Events

a. Sylinus destroys roses
b. King gets him
c.
d.
e.
f.

IV. Conflict (what is the problem, who is involved)

a. every thing he touches turns to gold
b.

V. Solution (how did the problem work itself out, was there a lesson to learn)

a.
b.

in their seventh-grade language arts class. The notes on the left provide a good overall synopsis of the King Midas story and might reasonably help the student remember the story fairly accurately. In contrast, the notes on the right are probably too brief and disjointed to be useful.

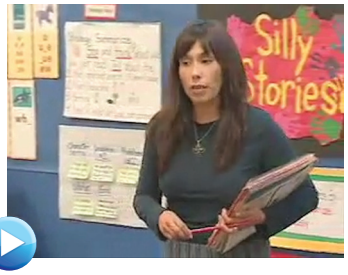
Especially when students are first learning how to take notes in class, we should scaffold their efforts by giving them an idea about which things are most important to include (Meltzer, Pollica, & Barzillai, 2007; Pressley, Yokoi, van Meter, Van Etten, & Freebern, 1997). One approach is to provide a specific structure to use, such as the one shown in Figure 7.1. Another strategy, especially if students are novice note takers, is to occasionally check their notebooks for accuracy and appropriate emphasis and then to give constructive feedback.

Scaffold students' early note-taking efforts.

Creating summaries. Many research studies have shown that writing a summary of material being studied can enhance students' learning and memory (A. King, 1992; R. E. Mayer, 2010b; Wade-Stein & Kintsch, 2004). Creating a good summary is a fairly complex process, however. At a minimum it includes distinguishing between important and unimportant information, synthesizing details into more general ideas, and identifying critical interrelationships. It's not surprising, then, that many middle school and high school students have trouble writing good summaries (Dunlosky, Rawson, Marsh, Nathan, & Willingham, 2013; Hidi & Anderson, 1986).

Ask students to summarize what they're learning, and scaffold their early efforts.

Probably the best way of helping students acquire this strategy is to ask them frequently to summarize what they hear and read. Initially we should scaffold the process for them—for example, by providing compare/contrast tables they can fill in as they read or having them develop summaries in collaboration with peers (Spörer & Brunstein, 2009; J. P. Williams, Stafford, Lauer, Hall, & Pollini, 2009). Computer software is also available to scaffold the summarizing process (e.g., Wade-Stein & Kintsch, 2004).



MyEdLab

Video Example 7.3.

What strategies does this second-grade teacher use to help her students gain skill in summarizing short stories?

COVERT STRATEGIES

Students' overt strategies—allocating some time for studying in their daily schedules, taking notes, summarizing, and so on—are probably valuable only to the extent that effective cognitive processes, or *covert strategies,* underlie them (Kardash & Amlund, 1991). For example, high-achieving students tend to benefit more from note taking than low-achieving students, perhaps

because the high-achieving students are more likely to elaborate on and organize what they're learning as they take notes (Kiewra, Benton, & Lewis, 1987; Ku, Chan, Wu, & Chen, 2008). In addition to engaging in meaningful learning processes (e.g., elaboration, organization), two covert strategies that may be especially critical for effective classroom learning and achievement are (1) accurately identifying important information and (2) regularly self-monitoring learning.

Identifying important information. The human memory system isn't a video or audio recorder; it simply can't take in and retain *all* the information a typical classroom curriculum presents. Thus, students must be quite selective when they're studying. The things they choose to study—whether main ideas and essential supporting details or, instead, isolated facts and trivia—inevitably affect their learning and school achievement (Dee-Lucas & Larkin, 1991; J. A. Dole, Duffy, Roehler, & Pearson, 1991; R. E. Reynolds & Shirey, 1988).

Students often have trouble identifying the most important information in a lesson or reading assignment, especially when they don't know very much about the topic at hand. Many use relatively superficial strategies in choosing what to focus on—for instance, zeroing in on definitions and formulas, taking notes only on things their teacher writes on the board, or reading only the first sentence of each paragraph of a textbook—and miss critical ideas as a result.

Let students know what things are most important to learn and remember.

As teachers, we can, of course, simply tell students exactly what they should study. But we can also highlight important ideas through more subtle means:

- Provide a list of learning objectives for a lesson.
- Write key concepts and relationships on the board.
- Ask questions that focus students' attention on central ideas.

Students—low-achieving ones especially—are more likely to learn the essential points of a lesson when such prompts are provided for them (Kiewra, 1989; McCrudden & Schraw, 2007; R. E. Reynolds & Shirey, 1988; Schraw, Wade, & Kardash, 1993). As students become better able to distinguish between important and unimportant information on their own, we can gradually phase out our guidance.

Regularly monitoring learning. One very powerful learning strategy is **comprehension monitoring**, a process of periodically checking oneself for recall and understanding. How well do *you* monitor your comprehension? The following exercise can help you find out.

EXPERIENCING FIRSTHAND
LOOKING BACK

Stop for a minute and ask yourself this question:

What have I learned from this chapter so far?

Quickly jot down what you can recall.

Now go back and look at the pages preceding this one. Do the notes you've just written include all of the key points presented in those pages? Is there something you thought you understood but realize now that you don't? Is there something you never learned at all—perhaps something you were supposedly "reading" when your mind was thinking about something entirely different?

Successful learners continually monitor their comprehension both *while* they study something and at some point *after* they've studied it (Hacker, Dunlosky, & Graesser, 2009b). Furthermore, when they realize that they don't understand, they take steps to correct the situation, perhaps by rereading a section of a textbook or asking a question in class. In contrast, low achievers rarely check themselves or take appropriate action when they don't comprehend something. For example, they're unlikely to reread paragraphs they haven't understood the first time around (L. Baker & Brown, 1984; Haller, Child, & Walberg, 1988; Veenman, 2011).

Many children and adolescents engage in little or no comprehension monitoring (J. A. Dole et al., 1991; McKeown & Beck, 2009; Nokes & Dole, 2004). When they don't monitor their learning and comprehension, they don't know what they know and what they don't know; consequently, they may think they've mastered something when they really haven't. Although this

illusion of knowing is especially common in young children, it's seen in learners at all levels, even college students. As paper-and-pencil exams become increasingly prevalent at upper grade levels, an illusion of knowing can lead students to overestimate how well they'll perform on these assessments (Hacker, Bol, Horgan, & Rakow, 2000; Stone, 2000; Zimmerman & Moylan, 2009). For example, we authors occasionally have students come to us expressing frustration with low test scores. "I knew the material so well!" they might say. But as we begin to talk with them about the exam material, it usually becomes clear that they have only vague understandings of some ideas and incorrect understandings of others.

Comprehension monitoring doesn't have to be a solitary activity, of course. If students work in small study groups, they can easily test one another on classroom material and may detect gaps or misconceptions in one another's understandings (Bol, Hacker, Walck, & Nunnery, 2012; Dunning, Heath, & Suls, 2004; Vaughn et al., 2011). Ideally, the questions they ask one another should encourage them to elaborate on rather than simply recall what they're studying. For example, we might teach them to ask questions beginning with such phrases as *Explain why, What do you think would happen if,* and *What is the difference between* (A. King, 1992, p. 309).

Teach students strategies for monitoring their own and others' learning progress.

Yet to be truly effective learners, students must ultimately learn how to test *themselves* as well. One effective strategy is **self-explanation**, in which students frequently stop to explain to themselves what they're studying (Berthold & Renkl, 2009; Fonseca & Chi, 2011; McNamara & Magliano, 2009). Another, similar approach is **self-questioning**, in which students periodically stop to ask themselves questions—essentially internalizing the mutual question-asking process they may have previously used in small-group study sessions. Their self-questions should, of course, include not only simple, fact-based questions but also elaborative ones (Bugg & McDaniel, 2012; Dunning et al., 2004; Wong, 1985).

This internalization of the question-asking process should remind you of Vygotsky's theory of cognitive development (see Chapter 2).

FACTORS AFFECTING STRATEGY USE

As we've seen, students become increasingly capable of using effective learning strategies as they grow older, in part because they can better control and direct their cognitive processes. With age, too, comes an ever-expanding knowledge base that supports students' efforts to engage in elaboration, identify important information, and effectively monitor their comprehension. Several other factors also influence students' choice and use of various strategies, as reflected in the following principles.

- *Learning strategies depend partly on the learning task at hand.* In some situations teachers may assign tasks for which truly effective learning strategies are either counterproductive or impossible. For instance, if we insist that facts and definitions be learned verbatim, students will understandably be reluctant to engage in elaboration and other meaningful learning processes (Turner, 1995; Van Meter, Yokoi, & Pressley, 1994). And if we expect students to master a great deal of material for a single exam, they may have to devote their limited study time to getting only a superficial impression of everything or to studying only the easy material they're confident they can master (Son & Schwartz, 2002; J. W. Thomas, 1993b). Sometimes working memory's limited capacity discourages metacognitive processing: If a learning task involves thinking about a lot of information all at once—that is, if it imposes a heavy **cognitive load**—students may have insufficient "room" in working memory to use strategies that might otherwise be effective (Kalyuga, 2010; H. S. Waters & Kunnmann, 2010).
- *Students are likely to acquire and use new, more effective strategies only if they realize that their current strategies are not working.* Students will come to such a conclusion only if they have been regularly monitoring their comprehension in previous learning tasks and have become aware of their learning difficulties. Comprehension monitoring, then, doesn't just affect students' understanding of classroom subject matter—it also plays a pivotal role in the development of *other* metacognitive strategies (Kuhn, Garcia-Mila, Zohar, & Andersen, 1995; Lodico, Ghatala, Levin, Pressley, & Bell, 1983; Loranger, 1994). In some cases, too, feedback that students haven't yet mastered a learning task will spur them to adopt more effective strategies, at least for the short run (Starr & Lovett, 2000).
- *Students' beliefs about the nature of knowledge and learning influence their strategy choices.* One of us authors once had a conversation with her son Jeff, then an 11th grader, about the Canadian

Studies program that a local university had just added to its curriculum. Jeff's comments revealed a very simplistic view of what history is:

Jeff: The Canadians don't have as much history as we [Americans] do.

Mom: Of course they do.

Jeff: No they don't. They haven't had as many wars.

Mom: History's more than wars.

Jeff: Yeah, but the rest of that stuff is really boring.

Once Jeff reached college, he discovered that history is a lot more than wars and other "really boring" stuff. In fact, he majored in history and now, as a middle school teacher, actually *teaches* history. But it's unfortunate that he had to wait until college to discover the true nature of history as an academic discipline.

Children and adolescents have misconceptions about other subject areas as well. For example, in the opening case study, Ms. Gaunt's students think that math consists simply of a bunch of procedures that yield single right answers but don't necessarily have to make sense. Furthermore, many students have misconceptions about the general nature of learning. For instance, Ms. Gaunt's students think they should be able to learn mathematical concepts and procedures quickly and easily—with little or no effort on their part—so long as their teacher does her job.

Students' beliefs about the nature of knowledge and learning are collectively known as **epistemic beliefs** (you may also see the term *epistemological* beliefs). Such beliefs often influence studying and learning (Bendixen & Feucht, 2010; B. Hofer & Pintrich, 1997; Muis, 2007). For example, when students believe that learning happens quickly in an all-or-none fashion—as Ms. Gaunt's students apparently do—they're apt to think they've mastered something before they really have. Furthermore, they tend to give up quickly in the face of failure and express discouragement or dislike regarding the topic they're studying. In contrast, when students believe that learning is a gradual process that often takes time and effort, they're likely to use a wide variety of learning strategies as they study and to persist until they've made sense of the material (D. L. Butler & Winne, 1995; Kardash & Howell, 2000; Muis, 2007; Schommer, 1990, 1994b).

As another example of variability in learners' epistemic beliefs, some students believe that when they read a textbook, they're passively soaking up many separate pieces of information from the page. In contrast, other students recognize that learning from reading requires them to construct their own meanings by actively interpreting, organizing, and applying new information. Learners who realize that reading is a constructive, integrative process are more likely to engage in meaningful learning as they read and to undergo conceptual change when they encounter ideas that contradict their existing understandings (Mason, Gava, & Boldrin, 2008; Muis, 2007; Schommer-Aikins, 2002; Sinatra & Pintrich, 2003).

Epistemic beliefs tend to evolve over the course of childhood and adolescence (Kuhn & Park, 2005; Muis, Bendixen, & Haerle, 2006; Schommer, Calvert, Gariglietti, & Bajaj, 1997). Children in the elementary grades typically believe in the certainty of knowledge: They think that for any topic there's an absolute truth "out there" somewhere. As they reach high school, some of them—and *only* some—begin to realize that knowledge is a subjective entity and that different perspectives on a topic can occasionally be equally valid. Additional changes can occur over the course of the high school grades. For example, 12th graders are more likely than 9th graders to believe that knowledge consists of complex interrelationships rather than discrete facts and that most learning happens gradually over time rather than in a quick, one-shot effort. And throughout adolescence, students' epistemic beliefs become increasingly specific to particular content domains (Buehl & Alexander, 2006; Muis et al., 2006). For example, students may believe that, in math, answers are always either right or wrong (again recall Ms. Gaunt's students) but that in social studies conflicting perspectives might all have some validity. Such developmental trends are reflected in some of the entries in Table 7.1.