Evidenced-based Models of Teaching

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Indeed, the single most powerful variable in student achievement—more than socioeconomic status or school funding—is the quality of the teaching learners receive.

—Daniels & Bizar, 2012

Learning Objectives

After reading this chapter, you should be able to:

- Explain the theoretical research base for today's best educational practices.
- Identify models of teaching that are based on scientific evidence, using information from effect sizes to help determine this designation.
- Describe teacher-directed models of teaching.
- Analyze the indicators of student-centered models of teaching.

Introduction

The No Child Left Behind Act (NCLB), passed by the U.S. Congress in 2001, aimed to close student achievement gaps by providing all children with a fair, equal, and significant opportunity to obtain a high-quality education. The four mainstays of the legislation were accountability, flexibility, parent options, and research-based education. This last area, research-based education, served as a wake-up call because of the growing consensus among educators and legislators that bringing scientifically based research into our classrooms was long overdue. Under NCLB, the term, **scientifically based research** referred to research "that involved the application of rigorous, systematic and objective procedures to obtain reliable and valid knowledge relevant to education activities and programs" (NCLB, 2001).

This revolution in educational practices that began in the early part of the 21st century might be compared to what happened with medical practices almost a century ago. When the "great influenza," commonly known as the "flu of 1918," broke out in the United States, Johns Hopkins University turned the existing medical model upside down by insisting that *only proven* medicine be practiced, meaning only medicine that was based on the scientific method of research.

Similarly, in education, the decade that followed the passage of NCLB witnessed intensified activity in universities and research centers throughout the United States intent on identifying exactly which classroom and teaching practices were deemed the most effective. In classrooms all over the nation, we are currently seeing the results of those efforts—programs and teaching practices that are predicated on "scientifically based research." This chapter highlights these evidence-based instructional practices and underscores that these have been found to be effective at all grade levels and all subject areas. Moreover, we assert that, in many ways, teachers function as CEOs. Even as they must adhere to strict district policies and teach approved standards, they also have almost universal control over how they structure their classrooms for learning and which instructional strategies they choose to use in teaching those same standards. We contend that since teachers do have this choice, why wouldn't they choose practices that research has shown to be most effective for student learning? Robert Slavin, director of the Center for Research and Reform in Education at Johns Hopkins University, also believes that we are headed in the direction of using evidence-based teaching strategies:

> Sooner or later, schools throughout the U.S. and other countries will be making informed choices among proven programs and practices, implementing them with care and fidelity, and thereby improving outcomes for their children. Because of this, government, foundations, and for-profit organizations will be creating, evaluating, and disseminating proven programs to meet high standards of evidence required by schools and their funders. The consequences of this shift to evidence-based reform will be profound immediately and even more profound over time, as larger numbers of schools and districts come to embrace evidence-based reform and as more proven programs are created and disseminated. (Slavin, 2014)

INTASC TEACHING STANDARDS ADDRESSED IN CHAPTER 6

Standard #8: Instructional Strategies. The teacher understands and uses a variety of instructional strategies to encourage learners to develop deep understanding of content areas and their connections, and to build skills to apply knowledge in meaningful ways.

21ST CENTURY FRAMEWORK ELEMENTS ADDRESSED IN CHAPTER 6

21st Century Curriculum and Instruction

Create meaningful opportunities for student demonstration/mastery of 21st century skills. Ensure that students have real world opportunities to synthesize, apply and demonstrate their mastery of key concepts and 21st century skills.

Deliver learner-centered instruction that enables 21st century skills. Commit to meeting the unique 21st century skills needs of each student. Connect curriculum to learners' experiences and frames of reference to build upon each student's knowledge and experience and help them systematically expand their abilities and master new concepts and proficiencies.

6.1 Best Practice Classrooms

What do we mean, exactly, by the term *best practice*? To answer this question, we examined the research published by some of the nation's most prestigious professional associations, including the American Association for the Advancement of Science, National Board for Professional Teaching Standards, National Council of Teachers of English, National Council of Teachers for Social Studies, National Council of Teachers for Mathematics, National Science Teachers Association, National Research Council, and the work of the committees that developed the Next Generation Science Standards and Common Core State Standards. In all of these organizations, we found general agreement about specific classroom practices that were more effective than other practices (Daniels & Bizar, 2005). Similarly, Zemelman, Daniels, and Hyde (2012) examined best classroom practices from these same professional sources—all of which based their recommendations upon scientific research and classified them as being more or less effective. Table 6.1 itemizes these practices.

Table 6.1: Best classroom practices

Less effective	More effective
• whole-class, teacher-directed instruction (e.g., lecturing) • student passivity: sitting, listening, receiving, and absorbing information • solitude and working alone • one-way transmission of information from teacher to student • rigidity in classroom seating arrangements • prizing of silence in the classroom • classroom time devoted to fill-in-the-blank worksheets, dittos, workbooks, and other "seatwork" • student time spent reading textbooks and basal readers • focus on "covering" large amounts of material in every subject area • rote memorization of facts and details • reliance on shaping behavior through punishments and rewards • tracking or leveling of students into "ability groups" • use of pull-out special programs • emphasis on competition and grades in school • time given to standardized test preparation • use of and reliance on standardized tests	• experiential, hands-on learning • student-student interaction • flexible seating and working areas in the classroom • diverse roles for teachers, including coaching, demonstrating, and modeling • emphasis on higher-order thinking • deep study of a smaller number of topics, so that students internalize the field's way of inquiry • development of students' curiosity and intrinsic motivation to drive learning • reading of real texts: whole books, primary sources, and nonfiction materials • responsibility transferred to students for their work: goal setting, record keeping, monitoring, sharing, exhibiting, and evaluating • choice for students (e.g., choosing their own books, writing topics, team partners, and research projects) • enacting and modeling of the principles of democracy in school • attention to affective needs and varying cognitive styles of individual students • cooperative, collaborative activity • heterogeneous classrooms • delivery of special help to students in regular classrooms • use of formative assessments to guide student learning including observational/anecdotal records, conference notes, and performance assessment rubrics

Source: Best Practice, Fourth Edition: Bringing Standards to Life in America's Classrooms *by Zemelman, Daniels, and Hyde (2012) (pp. 6–7).*

CONSIDER THIS

Review the list of practices identified as "less effective" and "more effective." Which ones do you personally agree with, from your own perspective as a learner? Do you disagree with any of these examples?

Daniels and Bizar (2005) identified seven classroom structures that rigorous scientific research supports. They are:

1. *Reading as thinking*—Reading is key to every subject area, but the new emphasis from the Common Core State Standards (see Chapter 3) promoting deep understanding of text has led to the recognition that reading is primarily a thinking process. These standards ask students to think more deeply and to be able to locate evidence from textual sources for their answers. In the classroom, this practice would

take the form of what has been termed *close reading*. Close reading has been defined by Fisher and Frey (2012) as an "instructional routine in which students critically examine a text, especially through repeated readings" (p. 179).

2. *Representing to learn*—This structure addresses new research cognitive scientists have developed on learning. We are finding that visual-spatial strategies assist long-term memory. The most well known of these strategies are graphic organizers, such as concept mapping, Venn diagrams, and flowcharts. However, classrooms may also incorporate other approaches, such as music, art, drama, and simulations.
3. *Small group activities*—John Dewey, Lev Vygotsky, and Jean Piaget all observed a social aspect to learning. For instance, Dewey believed that students working collaboratively with one another would learn more about themselves and about the world (Dewey, [1938] 1963). Recent research into classroom structures supports Dewey's conjectures. The efficacy of what we now call *cooperative learning* is supported by more than 20 years of research involving more than 80 research studies and a series of extensive reviews of existing research on cooperation and learning (Johnson & Johnson, 2009). Working collaboratively, in small groups with relevant activities, works to the benefit of students, teachers, schools, and communities.

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■ Research has shown that collaborative learning helps students to learn more about themselves and the world.

4. *Classroom workshop*—This approach allows students to choose in-depth topics to study. These choices are delivered via "centers" or "stations" set up around the classroom or through digital technology. In all of these instances, students are allowed choices for selecting and representing what they learn. They take responsibility for their own learning and performance.
5. *Authentic experiences*—The term *authentic learning* refers to instructional strategies intended to connect school assignments to the real world. In Chapter 1 of this text, we discussed how the Common Core Standards were calling for teachers to provide students with real-world application of knowledge and skills. If what students are learning addresses topics that are relevant and applicable to their lives outside of school, they are more likely to be interested in what they are learning, more motivated to learn new concepts and skills, and better prepared to succeed in college, careers, and adulthood.
6. *Assessment as reflection*—As we indicated in Chapter 5, the trend in 21st century classrooms is moving in the direction of more *authentic* forms of assessments, those with which students can learn to be more self-reflective and increase ownership in their own learning.
7. *Integrative units*—These units have teachers helping students see the interdisciplinary aspects of subject matter. The Partnership for 21st Century Skills emphasizes this integration with their Interdisciplinary themes, such as global awareness; financial, economic, business, and entrepreneurial literacy; health literacy; and environmental literacy (p. 28).

6.2 Research Into Evidence-based Teaching Models

As we indicated at the beginning of the chapter, NCLB intended to bring about instructional reform at the classroom level by promoting the use of teaching strategies that were supported by a solid body of research. This section will lead you to a better understanding of these teaching methods.

Teaching Strategies and Effect Size

Teaching matters. We all have had personal educational experiences that substantiate this claim. Moreover, educational research is now demonstrating that teaching *does* matter. For example, research has shown that when a student has a "good" teacher for three years in a row, achievement scores will be 50 percent higher than with ineffective teachers during that same span (Zuckerman, 2011). If teaching matters this much, then we need to focus our attention on examining instructional strategies that *work*. What do we mean by instructional strategies that "work"? To address this question, we need to look at the **effect size**. Effect size is a statistical calculation used to determine if an effect is meaningful in a practical sense. It was developed as a means of judging the results of studies that showed statistical significance using differing numbers of participants. An effect size can be small, 0 to 0.30; medium, 0.30 to 0.50; large, 0.80; or very large (greater than 1.00) (Cohen, 1988).

Marzano's Research on Effective Strategies

In the early part of the 21st century, researchers at Mid-continent Research for Education and Learning (McREL) identified nine categories of instructional strategies that were most likely to improve student achievement across all content areas and grade levels. To identify these strategies, the investigators used a research procedure called a **meta-analysis**. Meta-analysis looks at several studies that use a particular strategy and calculates its average effect (Marzano, Pickering, & Pollock, 2001). Table 6.2 highlights the nine categories of strategies researchers analyzed in this manner and the corresponding effect sizes. An effect size is described in the following way:

> When conducting a meta-analysis, a researcher translates the results of a given study into a unit of measure referred to as an *effect size*. [In the case of the teaching strategies] an effect size expresses the increase or decrease in achievement of the experimental group (the group of students who are exposed to a specific instructional technique) in standard deviation units. (Marzano, Pickering, & Pollock, 2001, p. 4)

Effect sizes can range from none at all (zero), to small, medium, or large. In the field of statistics, an effect size of about 0.20 is very small. That means that the effect on student learning by the experimental intervention (in this case, the particular teaching strategy) is very weak. An effect size of 0.50 is considered medium, and an effect size of 0.80 is considered large. An effect size of more than 1.0 is rare and is considered very large (Cohen, 1988). In some instances, researchers will have a negative effect size, which means that not only is the intervention not effective, it actually has a negative effect. Teachers would likely never want to use a teaching strategy that has a negative effect on student learning.

Table 6.2: Nine best practices

Instructional strategy	Average effect size
Identify similarities and differences	1.61
Summarizing and note taking	1.00
Reinforcing effort and providing recognition	0.80
Homework and practice	0.77
Nonlinguistic representations	0.75
Cooperative learning	0.73
Setting objectives and providing feedback	0.61
Generating and testing hypotheses	0.61
Questions, cues and advance organizers	0.59

Haystead , M. W., & Marzano, R. J. (2009). Meta-analytic synthesis of studies conducted at Marzano Research Laboratory on Instructional Strategies*. Englewood, CO: Marzano Research Laboratory.*

The following is a description of each of these evidence-based groups of instructional strategies that are supported by averaging of the effects of thousands of studies in the field of education (Marzano, Pickering, & Pollock, 2001).

1. *Identifying similarities and differences*—Assisting students to locate similarities and differences between and among concepts greatly enhances their ability to learn.

   Applications:
   - Have students compare books, numbers, original colonies, documents using Venn diagrams or T charts.
   - Engage students in creating metaphors and analogies (How are trees and the economy alike? How are the numbers 16 and 64 alike and different?)

2. *Summarizing and note taking*—When students are required to summarize content using their own words, the information becomes more deeply understood and is more easily remembered.

   Applications:
   - When teaching out of a text or a primary document, assist students in identifying 5–10 key words of a passage. Then, ask them to use those key words to create a summary statement.
   - Use the 10–2 rule. When lecturing, lecture for about 10 minutes, and then have students work in pairs for 2 minutes to summarize what they just heard in the lecture.
   - Since note taking is a skill, and a critical one, teachers need to model for students how to take good notes.

3. *Reinforcing effort and providing recognition*—Students often miss the connection between effort and learning. They often attribute a good grade on a test to innate

ability or just pure luck. Research shows students who can learn the importance of effort, achieve at higher rates.

Applications:

- Have students keep a "personal best" log, noting how much effort they expended in learning.
- "Pause, prompt, and praise." If a student is struggling, pause to discuss the problem, and then prompt with specific suggestions to help her improve. If the student's performance improves as a result, offer praise.

4. *Doing homework and practicing*—Researchers have conducted numerous studies on the effectiveness of homework, and the data are mixed (Cooper, Robinson, & Patall, 2006). It appears that homework is less tied to achievement in the elementary grades, somewhat tied to it in middle school, and more so in high school. Teachers should explain the purpose of homework to both the student and the parent or guardian, and teachers should try to give feedback on all homework assigned.

   Applications:

   - The most effective homework has students apply that which they learned in school. Find ways that students can write, count, or recognize the real-life applications of school work.
   - In 21st century classrooms, the concept of homework is undergoing reform with the idea of **flipped classrooms**, an innovation in which students learn new content online by watching video lectures, usually as homework, and what used to be homework is now done in class with teachers offering more personalized guidance and interaction with students. (Please see Chapter 9 in this text for more information on flipped classrooms.)

5. *Using nonlinguistic representations*—According to advances in cognitive science, we are learning that knowledge is stored in two forms: linguistic and visual—with the visual accounting for the majority of learning for humans. Therefore, teachers need to activate these powerful visual-learning channels with students and have students represent that which they are learning with graphic organizers, pictures, charts, drawings, etc.

   Applications:

   - Vocabulary learning is enhanced by students' drawings of word and concepts.
   - Use graphic organizers (mind map, flowchart, matrix, Venn diagram) and physical models to represent information.

6. *Practicing cooperative learning*—Organizing students into cooperative groups to talk and work with one another is highly conducive to learning.

   Applications:

   - Vary group sizes according to your goal. For example putting students in pairs provides a structure that is highly engaging. One must talk with one other person and cannot "hide." In a larger group, more ideas can be generated, but some students will choose to talk more than others will.
   - Design group work around the core components of cooperative learning-positive interdependence, group processing, appropriate use of social skills, face-to-face interaction, and individual and group accountability.

7. *Setting objectives and providing feedback*—Having students set their own goals and objectives for learning provides for ownership of the experience. For student

feedback, research shows that the more specific the feedback, the more it has positive learning outcomes with students.

Applications:

- Use the K/W/L strategy of *What I know, what I want to learn, and what I have learned* to help students set goals for what they want to learn.
- Use individual learning contracts for a grading period for each student to set specific learning targets.
- Use rubrics, a very powerful way to make student feedback specific.
- For even more ownership, have students self-evaluate and share feedback with peers.

8. *Generating and testing hypotheses*—Having students predict what they think will happen increases their engagement and learning. When students give a hypothesis, they should clearly explain their thinking.

   Applications:

   - Ask students to predict what will happen at the end of a story or historical account, and then read to find out if they are correct.
   - Ask students to look at graphs or pictures in a textbook, and then ask them to hypothesize what they think the chapter will cover.

9. *Using cues, questions, and advance organizers*—Questioning helps students learn. However, the types of questions (lower or higher levels of thinking required) and the management structures (how much time is given for students to answer) also influence learning.

   Applications:

   - Increase the **wait time**, or the time between when the teacher asks a question and asks for a response. Doing so increases both the quantity and quality of student answers.
   - Make sure all students have an opportunity to respond to the teacher's questions. Too often, a select group of students are called on more often to answer questions in the classroom. Strategies teachers use to equalize response opportunities include:
     - writing student names on individual popsicle sticks and drawing them at random out of a cup,
     - writing student names on flash cards (or even a deck of playing cards) with one student's name on each card and then drawing cards at random to call on a student, or
     - using new apps for phones and tablets that randomize a group of student names to help teachers call on students in class.
   - Instead of having students answer your questions, have them compose questions for one another. They not only will learn more, they also will be more engaged.

CONSIDER THIS

Think about the questioning patterns you have seen in classrooms. Do some teachers call on a certain group of students more often than they call on other students? How might this practice affect student self-confidence to answer questions?

6.3 Teacher-Directed Models of Teaching

If students are to become self-regulated learners, the classroom should include both teacher-directed and student-centered structures (Slavin, 1997). Students always will need some direct instruction, some individual time, and some opportunities to practice metacognitive skills in a social context. **Teacher-directed instruction** involves explicitly teaching rules, concepts, principles, and problem-solving strategies and guiding students during their review and practice. Within this larger category that constitutes teacher-directed models are many sub-models of instruction. We will discuss two of them: direct instruction and concept learning.

Direct Instruction

Direct instruction has been shown by research to be a highly effective model (Hattie, 2009). The most recognized proponent of direct instruction was Madeline Hunter, whose model dominated classrooms in the later part of the 20th century. According to Hunter (1983), direct instruction consists of five interrelated elements.

1. *State learning objectives, and orient students to the lesson*—Tell students what they will learn and what will be expected of them. State the goals and objectives of the lesson. Establish a mental set or attitude of readiness to learn.
2. *Present new material*—Teach the lesson, presenting information by demonstrating or modeling the concepts.
3. *Provide guided practice, and conduct learning probes*—Students practice new material under teacher's guidance.
4. *Demonstrate closure*—Students formulate their own statement of the learning goal.
5. *Perform independent practice*—The teacher releases students to practice new material on their own. (p. 319)

Unfortunately, many educators have criticized the direct instruction model, misperceiving this instructional method as wholly teacher-dominated and simply comprised of lectures from the front of the classroom.

Direct instruction usually has two main components: expository teaching and questioning. While there are many forms of exposition (lecture, textbook, video, Internet), lecture is by far the most often used format of expository instruction (Bligh, 2000).

Lecturing

According to Moore (2015), "The lecture is an excellent way to set up an atmosphere for learning about a new topic, create a frame of reference, introduce a unit, or provide focus for student activities" (p. 320). There will always be a place for lecture in classrooms because every teacher employs some form of this method every day. The lecture is also time efficient and, when based on the textbook, requires virtually no advance preparation of materials. However, as we all know, lectures are passive and rarely are engaging for learners. Teachers need to understand both the advantages of the lecture method and also the limitations so that they may choose when and how to use it most effectively.

Advantages of lectures include:

- Lectures are an easy way to transfer knowledge to students quickly.
- Instructors, as the sole source of information, have more control over what they are teaching.
- A lecture is fairly easy to prepare and is familiar to most teachers since it was typically the way they were taught.

Disadvantages of lectures include:

- Humans receive more information visually than with any other mode of learning, and lectures are auditory.
- Lectures may present difficult content or be delivered too rapidly for students to follow.
- Because the instructor dominates the lecture, there is sometimes a gap in knowing what students did or did not understand.

Finally, since the lecture will always be a strategy that teachers use, many experts advise combining lecture with additional means of presentation of content (Meyer, Rose, & Gordon, 2013). Multimedia, technology, video, and questioning strategies offer options for understanding the content and make the direct instruction more interactive.

CONSIDER THIS

As a student, yourself, you have had to sit through many hours of teachers' lectures. With that idea in mind, what are some ways you might maximize the advantages of lectures and minimize the disadvantages?

Questioning

James Thurber, an American writer, remarked that it is better to ask some of the questions than to know all the answers. Teachers not only ask *some* questions, but they ask a *lot* of questions—some experts say about 300–400 per day (Vogler, 2008)—which makes questioning second only to lecturing as the most used direct instruction classroom strategy (Black, 2001). A vast research base has established that effective questioning significantly contributes to student learning (Brophy & Good, 1986; Wilen & Clegg, 1986; Gadamer, 1993; Mantione & Smead, 2003). However, just asking questions, per se, does not necessarily improve instruction. Teachers need to become *effective* questioners and ask questions that require students to think deeply and critically. This task is not easy; many decades of research confirms that teachers tend to ask many more literal questions than those that require more in-depth thinking (Hansen, 1993; Wilen, 2001). To move beyond these current practices, 21st century standards, curricula, and assessments are all advocating that teachers use more sophisticated questioning strategies (Roach, McGrath, Wixson, & Talapatra, 2010; Williams, 2007).

In Chapter 3, we described Bloom's Taxonomy of Educational Objectives (1956), both the original and the revised model. In addition to classifying objectives, Bloom's Taxonomy is also useful for identifying type of thinking processes necessary to answer questions. Educators

have used this taxonomy for decades to classify questions from lower level, or recall, to higher-level analytical levels. (See Figure 3.10 in Chapter 3.) Another way of looking at thinking, Depth of Knowledge (DOK; Webb, 1997, 1999), is beginning to see widespread use in curricular design. The DOK model describes the depth of content understanding and the skills required to complete a task from beginning to end (such as planning, researching, and drawing conclusions). DOK has four levels: (1) recall and reproduction, (2) basic application of skills, (3) strategic thinking, and (4) extended thinking. Teachers can use these DOK levels to recognize and plan for advanced levels of cognition learning activities and assessment (Olvera & Walkup, 2010).

Table 6.3 creates a teacher-friendly example of what each step of Webb's DOK model entails.

Table 6.3: Webb's depth of knowledge (DOK) levels

Level	Description
DOK-1, Recall & Reproduction	Recall a fact, term, principle, or concept; perform a routine procedure.
DOK-2, Basic Application of Skills/Concepts	Use information, conceptual knowledge; select appropriate procedures for a task; perform two or more steps with decision points along the way; solve routine problems; organize or display data; interpret or use simple graphs.
DOK-3, Strategic Thinking	Reason or develop a plan to approach a problem; employ some decision-making and justification; solve abstract, complex, or nonroutine problems, complex. (DOK-3 problems often allow more than one possible answer.)
DOK-4, Extended Thinking	Perform investigations or apply concepts and skills to the real world that require time to research, problem solve, and process multiple conditions of the problem or task; perform nonroutine manipulations across disciplines, content areas, or multiple sources.

Source: Webb, N. (1997). Research Monograph Number 6: Criteria for alignment of expectations and assessments on mathematics and science education*. Washington, D.C.: CCSSO; Webb, N. (1999, August).* Research Monograph No. 18: Alignment of science and mathematics standards and assessments in four states*. Washington, D.C.: CCSSO.*

We can apply DOK levels to most levels of Bloom's Taxonomy to further describe the skills students need to answer a question or complete a task. For example, DOK level 1 describes Bloom's cognitive process of *remembering* to recall facts, the *understanding* process of evaluating an expression or writing a simple sentence, the *apply* process of following simple directions or working an algorithm, the *analyze* process of identifying information on a chart, and the *create* process of brainstorming ideas. The process of *evaluate* does not have an example of DOK level 1 because it requires higher DOK levels, strategic thinking and extended thinking, to accomplish the task (Hess, Carlock, Jones, & Walkup, 2009). Hess et al. (2009) developed a matrix applying Webb's DOK levels to Bloom's cognitive processes with corresponding curriculum examples. This matrix can be used to further develop higher-order questions, even among very young students. It can be retrieved from http://www.nciea.org/publications/cognitiverigorpaper_KH12.pdf

CONSIDER THIS

Why do you believe teachers need to ask questions that require students to use higher-order thinking skills?

In addition to taxonomies, teachers may use a number of questioning methods to increase student engagement and thinking. They are:

- *Use wait time*—Waiting 5–10 seconds after asking a question will increase the number of students who volunteer to answer and will encourage longer, more complex answers. Most students need some time to process the question and reflect on an answer. Many teachers ask questions in rapid-fire style, and thus, limit the number of students who are cognitively prepared to answer.
- *Encourage student-to-student discourse*—Having students respond to other students' answers increases thinking and engages students. As a teacher, refrain from the practice of confirming the correctness of an answer and allow other students to respond to an idea that one student has just presented.
- *React to incorrect or weak answers*—The teacher should provide the student with the correct answer, and then immediately repeat the question for that the same student. That practice will allow the student to repeat back the answer the teacher just modeled and, in so doing, have a positive questioning experience that, in turn, increases confidence.
- *Ask more open-ended questions*—Open-ended questions have more than one answer. Also termed *divergent questions*, as opposed to convergent questions having only one correct answer, open-ended questions allow for the maximum amount of student critical and creative thought. Examples of open-ended questions could be: "Think of a math problem where 7 is the correct answer"; "Name at least one cause of the American Revolutionary War"; "Select one of the characters in the reading that displayed courage"; or "Which of the materials do you believe will be able to float?" Also, students should always be asked to give reasons for their answer—or describe how they went about solving the problem. In fact, the Common Core Standards in literacy now require students to be able to use textual references to provide evidence for their answer or point of view. Because the use of open-ended questions is such a powerful vehicle for promoting student reflective thinking, we are highlighting the following list of ways to use divergent questions:

    1. **To summarize learning:**
        - *In your opinion, what is the central idea in today's lesson?*
        - *Can you explain this concept in your own words?*
    2. **To ask a student to clarify a comment:**
        - *Could you give us more information to help us understand your point of view?*
    3. **To prompt students to explore attitudes, values, or feelings:**
        - *Identify some examples of the values or beliefs that inform this argument.*
        - *What is your initial reaction to this argument?*

4. **To prompt students to see a concept from another perspective:**
   - *How do you think this issue may be understood by those with whom you disagree?*
5. **To prompt students to support their assertions and interpretations:**
   - *How do you know that?*
   - *Identify the part of the text that led you to that conclusion.*
6. **To direct students to respond to one another:**
   - *What do you think about the idea your classmate just presented?*
   - *Do you agree with your classmate, or do you see the issue differently? Explain.*
7. **To prompt students to investigate a thought process:**
   - *What are the assumptions that informed the design of this experiment?*
   - *What are the assumptions that these two arguments share?*
8. **To prompt students to connect and organize information:**
   - *Compare this text with what we read last week.*
   - *Can you develop a graph or table that organizes this information in a helpful way?*
9. **To ask students to apply a principle or formula:**
   - *How does this principle apply to the following situation?*
   - *Who can suggest how we might use this new formula to solve the problems we examined at the start of class today?*
10. **To ask students to illustrate a concept with an example:**
    - *Can you provide an example of this concept from the text?*
    - *Can you point us to a specific part of the text that led you to that conclusion?*

Concept Learning

All learning requires learning **concepts**. A concept is an abstract idea that represents all of the items in a given category. There are two types of concept learning. (1) **Concept formation** is the thought process that occurs when creating concepts in the mind. It is an inductive process that can be taught and learned. (2) **Concept attainment** is a teaching model used by teachers who have specific concepts to be taught. Concept attainment was developed by Joyce and Weil (1972) to assist students in learning concepts. Concept attainment not only is engaging for students, it also helps them make connections between what they know and what they will be learning. Concept attainment can be used to introduce or conclude a unit of study. To shift the thinking more to students, as is suggested by the Common Core State Standards, have students introduce concepts to their peers, rather than starting with the teacher's concept. Following is an example of the concept-attainment teaching strategy, using a concept from mathematics:

- First, the teacher chooses a concept to be developed. (For instance, a number representing multiples of 3.)
- Begin by listing both positive "yes" and negative "no" examples: The examples are written onto chart paper, the white board, or on flash cards.
  - *Positive examples*—Positive examples contain attributes of the concept to be taught; e.g., 3, 6, 18, 24, 99, 300.
  - *Negative examples*—For negative examples, choose facts that do not have multiples of 3 as the answer; e.g., 13, 37, 100, 87, 41, 19, 34.
  - You could set up a chart at the front of the room with two columns, one marked *YES* and the other marked *NO*.

- Present the first example by saying, "This is a *yes*." Place it under the appropriate column. (For example, the number *3* is a yes.)
- Present the next example and say, "This is a *no*." Place it under the NO column. (For example, the number *13* is a no.)
- Repeat this process until there are three examples under each column.
- Ask the class to look at the three examples under the YES column and discuss how they are alike. (For example, compare 3, 6, and 18.) Ask, "What do they have in common?"
- For the three examples under each column, ask the students to decide if the examples go under YES or NO.
- At this point, there are six examples under each column. Several students will have identified the concept, but it is important that they not tell it aloud to the class. They can show, however, that they have caught on by giving an example of their own for each column. At this point, the examples are student-generated. Ask the class if anyone else has the concept in mind. Students who have not yet defined the concept are still busy trying to see the similarities of the YES examples. Place at least three more student-generated examples under each column.
- Discuss the process with the class. Once most students have caught on, they can define the concept. Once they have pointed out that everything under the YES column is a multiple of 3, then print a new heading at the top of the column (Multiples of 3). Then print a new heading for the NO column: (Not multiples of 3).

(To see a video example of Concept Attainment, please go to https://www.youtube.com/watch?v=VxvX6B_0nnI)

Try It!

Create an example of concept attainment using another concept that would suit either an elementary, middle school, or high school lesson. In the YES column, put examples of the concept, and in the NO column put non-examples of the concept.

Try It!

Try to solve this example of a concept suggested by a second grader. What do you believe all of the YES responses have in common? (What concept could *ice, stick*, and *people* have in common with each other that *table, dog*, and *paper* do not share?)

YES	NO
ice	table
stick	dog
people	paper

Answer: Ice hockey

6.4 Student-Centered Models of Teaching

The implementation of the Common Core State Standards has meant more and more teachers are committed to having students gain the knowledge, understandings, and skills (KUD) they will need in the 21st century. A few examples of those needed skills, reiterated here from those that were described in Chapter 1, are:

- Flexibility, adaptability, and innovation.
- Critical thinking, creativity, and nonroutine problem solving.
- Complex communication, collaboration, social, and cross-cultural skills.
- Self-direction, productivity, and accountability.

For students to gain these foundational skills of self-reliance, they will need, in addition to the more teacher-directed models, more student-centered strategies. We will now discuss several of the most effective of these student-centered teaching strategies.

Cooperative/Collaborative Learning

Cooperative learning involves the use of small groups in the classroom so that students work together to extend their own and each other's learning. Cooperative learning, as an innovation, entered our schools in the mid-1980s. It was not a welcomed reform. At that time, classrooms were very teacher-dominated. It was the teacher's job to teach and the student's job to be quiet and listen. Perhaps this is why cooperative learning came to be one of the most investigated teaching strategies of all time—it was in direct opposition to the way classrooms were then taught. Today, we are able to examine a robust research base supporting cooperative learning that spans decades. This body of research strongly indicates that, compared to traditional instructional methods, students engaged in small-group learning achieve higher grades, retain information longer, have reduced dropout rates, and have improved communication and collaboration skills (Terenzini, Cabrera, Colbeck, Parente, & Bjorklund, 2001; Oakley, Felder, Brent, & Elhajj, 2004). These benefits are evident across grade levels, academic subjects, gender, ethnicity, and achievement level (Slavin, 1996). Additional recommendations regarding cooperative learning are:

- Researchers recommend three- to four-person teams for most collaborative-learning assignments (Johnson & Johnson, 2009).
- Lower-ability students tend to work best in mixed groups and medium-ability students in homogeneous groups. For higher-ability students, group ability levels make no difference (Lou, Abrami, Spence, Poulsen, Chambers, & d'Apollonia, 1996).
- Group contracts also help to keep students accountable. Typically, groups collectively agree upon norms and expectations at the beginning of projects, while reflecting on the group process and product throughout (Oakley et al., 2004; Mergendoller & Thomas, 2005).
- Public or classroom presentations also encourage full participation and help to promote accountability (Barron & Darling-Hammond, 2008).
- When students are assigned specific responsibilities and tasks within the collaborative group, student learning and engagement increases (Slavin, 1996; Johnson & Johnson, 2009).

Role-Play Models

Role-playing is part of a family of teaching strategies that includes skits, newscasts, simulations, debates, and mock trials. Joyce and Weill (2000) refer to these as *the social family of models*, because they highlight, in addition to content, the social nature of learning. Many advantages result from using role-playing as an instructional model (Jarvis, Odell, & Troiano, 2002). First, according to Poorman (2002), "integrating experiential learning activities in the classroom increases interest in the subject matter and understanding of course content" (p. 32). Second, as students are "acting," they are constructing meaning for themselves, not being merely passive recipients in the lesson; "true learning cannot take place when students are passive observers of the teaching process" (Poorman, 2002, p. 32). A third advantage to using role-playing as a teaching strategy is that it teaches empathy and understanding of different perspectives. Poorman (2002) found "a significant increase among students in feeling another's distress as their own" (p. 34). Students in elementary school could role-play the landing of the Pilgrims on Plymouth Rock. Middle school students might enjoy role-playing several American inventors and their moment of discovery. In high school, students might role-play a contemporary world issue, like the deterioration of the rain forests. Role-play may be divided into four stages (Cherif, Verma, & Somervill, 1998):

1. Preparation and explanation of the activity by the teacher
2. Student preparation of the activity
3. The role-playing
4. The discussion or debriefing after the role-play activity

Following, we will discuss, in detail, three forms of role-play that align well with 21st century skills: simulation, debates, and mock trials.

Simulation

Simulations are role-plays involving real-life situations. They are effective both in skill development and in helping students gain insights and understandings of things they would not otherwise get to experience. Many remember the Oregon Trail game that was a simulation. The Oregon Trail is an historic east-west large wagon-train route that connected the Missouri River to settlements in Oregon in the mid-1800s. The simulation begins with teams of students receiving a sum of money and being asked to make group decisions regarding how much to spend on food, supplies, and ammunition. The object of the game is to make correct decisions that will allow the team to "arrive" in Oregon. By participating in the simulation and actually experiencing, rather than just reading about, actual hardships that pioneers faced as they traveled westward during the early years of our new nation, students gain deeper understandings of the content they are learning.

An example of a middle or high school simulation would be becoming a model United Nations. In this simulation, students assume the roles of different nations' ambassadors to the United Nations and debate a current world issue.

Debate

In debates, participants adopt a solution or approach to a specific situation and attempt to persuade others that their solution is the correct one. Debate is an especially effective strategy

because it aligns nicely with the Common Core State Standards' push for students to present arguments and evidence, especially from informational text. When the debate involves an actual public issue, students may change policy or sway public opinion on important issues. Elementary students could debate whether we should continue to have zoos in our world. Middle and high school students could debate issues of global warming.

Mock Trials

Mock trials are classroom recreations of actual or imaginary trials. The teachers should make every attempt to create an actual courtroom setting in the classroom. Examples of issues for mock trials would be:

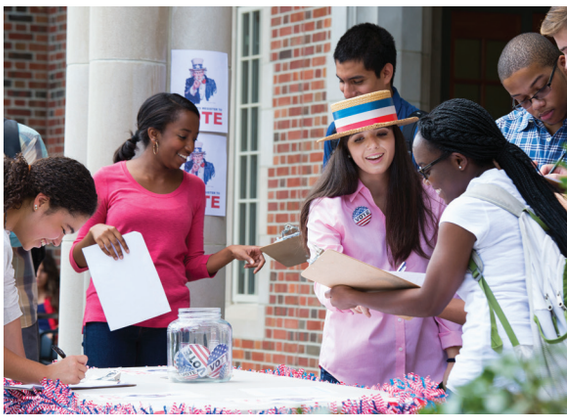
- *Elementary school*—Goldilocks faces an "imaginary" trial for breaking and entering the Bears' home.
- *Middle school*—Patriots are put on trial for their participation in the Boston Tea Party.
- *High school*—Students participate in a mock trial around issues of censorship.

CONSIDER THIS

Do you have any recollection of plays, simulations, debates, or mock trials that you participated in as a student? What were some learning benefits you received from these experiences?

PBL

Both project-based learning (PBL) and problem-based learning (PBL) are forms of classroom inquiry that are experiencing a renaissance in 21st century classrooms. Since both share the acronym PBL, you may wonder how they are different. Though many people use the terms *project*-based learning and *problem*-based learning interchangeably, we can make a distinction based on whether the focus is on the product or the process. The difference lies in the *goal* of the learning experience. Typically, with *project-based* learning, the focus is on the outcome, the *product*. In *problem-based learning*, the focus is on the problem-solving process itself.



Blend Images/SuperStock

■ Both project-based and problem-based learning allow students to actively participate in learning and gain a deeper understanding of content.

We consider problem-based learning a subset of project-based learning, a particular type of project-based learning with the distinguishing feature of learning via a problem, one that is open-ended, messy, and focuses on the complex process of solving it.

As far as likenesses, both are seen as useful pedagogies in a variety of settings—businesses, medical schools, and K–12

classrooms. Why are so many educators across the United States and around the world interested in these teaching methods? The answer is explained through a combination of recent developments (Buck Institute for Education (BIE), n.d.). (Note: We are going to use the term PBL to mean both *project-based learning* and *problem-based learning*.)

- Today's students, more than ever, often find school to be boring and meaningless. In PBL, students are active, not passive, as they engage their hearts and minds and gain real-world relevance for learning.
- After participating in PBL, students remember what they learn and retain it longer than is often the case with traditional instruction. Because of this result, students who gain content knowledge with PBL are better able to apply what they know and can do so with new situations.
- In the 21st century workplace, success requires more than basic knowledge and skills. In PBL, students not only understand content more deeply, but also learn how to take responsibility and build confidence, solve problems, work collaboratively, communicate ideas, and be creative innovators.
- The Common Core and other present-day standards emphasize real-world application of knowledge and skills, and the development of the 21st century competencies such as critical thinking, communication in a variety of media, and collaboration. PBL provides an effective way to address such standards.
- Students have and use so much technology in their lives that it is a perfect fit with PBL. Using technology, teachers and students can connect with experts, partners, and audiences around the world, and use tech tools to find resources and information, create products, and collaborate more effectively.
- PBL allows teachers to work more closely with active, engaged students doing high-quality, meaningful work, and, in many cases, to rediscover the joy of learning alongside their students.

Project-Based Learning

Project-based learning has garnered much attention and excitement in 21st century classrooms. Through this teaching method, students gain knowledge and skills by working for an extended time on a real-world challenge to produce a product. Project-based learning is not new. As far back as the 1900s, John Dewey, the father of experiential learning, was a proponent of project learning. His original writings postulated that students learn best by experiencing and solving real-world problems. Over the last 100 years, the popularity of project learning has waxed and waned. Now, with the advances in technology and digital learning, these ideas have greatly expanded and been given a 21st century make-over as students engage in critical thinking, collaboration, communication, reasoning, synthesis, and creativity, all identified as critical 21st century skills (Barron & Darling-Hammond, 2008). According to researchers (Barron & Darling-Hammond, 2008; Thomas, 2000), project-based learning is based on the following:

- *Significant content*—Whether teaching the new Common Core Standards or state-driven content standards, PBL should concentrate on the very knowledge and skills that students most need to learn in the content disciplines.
- *21st century competencies*—In PBL, students will need to actually use workplace skills of the future and think critically, solve problems, communicate, and innovate.
- *Voice and choice*—As teachers construct PBL experiences, students voice and choice needs to a critical component as they are permitted to make decisions regarding the products, themselves, and how they structure their time.

- *Revision and reflection*—Students need to learn how to reflect and revise. Good models of PBL should give them practice with each skill.
- *Public audience*—In traditional classrooms, teachers are the sole recipients of student work. In classrooms of the future, guided by PBL practices, the audience needs to be expanded to real-life examples such as businesses, other classrooms, and virtual public forums.

The research base for PBL is accumulating rapidly. Studies comparing student learning through project-based learning to traditional methods show PBL can increase students' learning of content, performance on high-stakes tests, problem-solving abilities, and attitudes toward learning (Strobel & van Barneveld, 2009; Walker & Leary, 2009).

An extensive video collection of PBL lessons may be found at Edutopia (http://edutopia.org). Other examples of elementary, middle school, and high school classroom projects are highlighted below:

Elementary

- *Math*—Students plan the different sizes for classroom plots for a school garden.
- *Social studies*—Students have the opportunity to participate in a local community revitalization effort by developing a walking tour throughout town. Teams of students identify community landmarks the walking tour should include, research history surrounding those landmarks using primary and secondary resources, and communicate their findings by writing and recording a narrative that will guide the tour.
- *Science*—Students can work to find a way to reduce the amount of trash and garbage students and teachers at the school produce each day and, then, present findings both to the school community and the larger virtual community on the Internet.

Secondary

- *Math*—Students explore principles of physics and math through the development of bridge proposals and working-scale models.
- *Social studies*—After studying various civil rights issues in class, the students create a culminating project to showcase one specific movement in our Civil Rights Museum for exhibition night. Examples of products could be: biographies, art pieces, modern world connections, informational pamphlets, timelines, and a podcast or video.
- *Science*—Students will examine the physics of sailing while building their own sail cars that can move upwind.

Problem-Based Learning

Problem-based learning is a delivery system that recognizes the need for students to develop problem-solving skills as an end in itself. It is in the process of struggling with actual problems that students learn both content and critical-thinking skills. Problem-based learning entails:

1. *Reliance on problems to drive the curriculum*—The problems do not test skills; they assist in development of the skills themselves.
2. *"Messy" problems*—They do not have a rigid structure, nor are they meant to be have a single solution.
3. *Student-solved problems*—Teachers are coaches and facilitators.

Stepien, W. J., & Gallagher, S. A. (1993). Problem-based learning: As authentic as it gets. Educational Leadership, 50*(7), 25–28.*

You'll find a high school video example of problem-based learning at https://www.youtube.com/watch?v=J63e_YSntuo. Additional examples of problems include the following:

Elementary

- *Math*—Students research the marketability of different types of stuffed animals and present their proposals to the class.
- *Social studies*—As legislators, students will work to solve problems around the school (e.g., school calendar, hot lunch requirements, playground rules) through writing their own legislation, while experiencing the entire legislative process.
- *Science*—Students encounter the question: What kind of pet should we choose for our classroom? They investigate options and present their findings to the class.

Secondary

- *Math*—Students investigate several phone service providers to find the plan that best suits their family's needs and finances.
- *Social studies*—As time travelers, students plan how to keep Europe out of religious wars.
- *Science*—Students investigate the role of microorganisms in causing disease.

Service learning is a unique type of problem-based learning in which the problems that students try to solve are actual ones encountered in the local, state, national, or international community. Service learning is not community service or volunteerism because it combines community service with actual content standards, thus allowing students to learn content as well as experience pride in personal and civic responsibility. A lovely example of service learning was recently showcased in Georgia as high school students used their math skills to build nesting boxes for wood ducks. The boxes feature a cone-shaped piece of metal to help keep predators away.

You can view a video example of service learning in the classroom at https://www.youtube.com/watch?v=qDAQDg56VDs

Try It!

Create a list of several projects, problems, or inquiries that could be used at the grade levels or content areas in which you are preparing to teach.

Inquiry Learning

Project-based learning isn't the only model of teaching that has enjoyed periods of both immense popularity and decline within the national and global communities. **Inquiry learning** has had a similar history. Inquiry learning is a teaching model that provides learners with opportunities to develop skills that enable them to locate, gather, and apply information in a wide range of contexts. Researchers in many countries have found that students in inquiry-based groups attained higher levels of achievement than students who experience traditional instruction attain (Wilson, Taylor, Kowalski, & Carlson, 2010; Geier, Blumenfeld, Marx, Krajcik, Fishman, & Soloway, 2008; Crawford, 2007). While most often associated with the discipline of science, this student-centered model is also very effective in learning concepts

in social studies and mathematics. In more recent times in the United States, the National Research Council (1996) led the call for inquiry instruction to promote student understanding. At the heart of inquiry is the ability to identify, ask, and answer questions (Hansen & Buczynski, 2013). Even as the teacher assumes a nontraditional role, an inquiry-based approach requires extensive planning, preparation, and direct involvement. An inquiry-based approach to learning incorporates the following basic steps or components:

- Explore and observe a phenomenon.
- Create hypotheses.
- Carry out investigations.
- Analyze and describe findings.
- Communicate and share by writing and discussing.
- Reflect on what has been learned.

Although inquiry learning is most often associated with the teaching of science, all subject areas can be taught through this engaging approach. See a video example of an elementary inquiry science lesson at https://www.youtube.com/watch?v=XEnrDXPxFo4. Also, here are some other examples for elementary and secondary classrooms organized by content area:

- *Science*—Younger students investigate which materials will sink and which will float, or which materials magnets will attract. Older elementary students investigate what materials will best keep things hot or cold or what completes an electrical circuit. Secondary students investigate invasive plants on the school campus and find how they affect the native plants.
- *Social studies*—Teaching social studies by having students "think like a historian" is a powerful way to learn history. According to the Teaching History website, a **historical inquiry** involves a lesson where students analyze historical evidence so they can form and test hypotheses about past events (http://teachinghistory.org/teaching-materials/teaching-guides/24123). Elementary students could use a variety of information and support materials, and be able to formulate an opinion about whether Christopher Columbus was a hero. Secondary students could analyze a given president's term of office to determine if that individual was an effective U.S. president.
- *Mathematics*—With the coming of the CCSS, the content area of mathematics is rich with opportunities for the use of inquiry learning. Elementary students could use the inquiry process to hypothesize and determine what numbers are divisible by eight. Middle school students could test different strategies to determine an answer to the question, "How many peas would fit into this classroom?" High school students could make and test conjectures about characteristics and properties (e.g., sides, angles, symmetry) of two-dimensional figures and three-dimensional objects.

CONSIDER THIS

Can you name any projects or inquiries that you participated in as a student? Did they teach you any other skills besides the particular content area?

6.5 Cases From the Classroom

From the Desk of: Ace

January 6

Dear Dr. Z.:

Today is the Feast of Epiphany or *Día de los Tres Reyes Magos* (Three Kings' Day). Some of my fourth-grade students are a bit tired, since there were festivities last night. A few students were absent—too much celebration—or time with family. Isabella wanted to tell us all about the note she sent up in a helium balloon last night. She wrote that she likes school this year and has improved her reading, and therefore should get a nice gift in return. Maria and Isaiah said they didn't do balloons in their family, but they had to leave a shoe by the door and when they awoke they had some candy in it. Many of the students got a few small gifts this morning, like a hair ribbon or an action figure. For breakfast, they had *rosca*, a special bread for the holiday. Carmen's mother brought one to school today, and our first-period class got to cut into it. Demarrias said it looked a lot like a King Cake, except the *rosca* had dried fruit on it instead of colored icing. His family moved here from New Orleans after Katrina, and although he doesn't remember much about his family's former home, he still enjoys their food traditions. He said you can eat a King Cake all the way up to Mardi Gras. Anyway, there was a small toy baby baked inside the *rosca*—he got that piece and said it was the same kind of toy that is baked inside a King Cake. These kids have all these wonderful traditions, but they don't know how or why they are celebrated. And their similar traditions express very different cultures.

The holiday break was good for me. I had time to sleep late, eat well, and visit family and friends. And I did a lot of thinking about my classes, and how I could make things better. I mentally outlined a plan for the next quarter. I want to do something different and fun—especially since the first weeks of the next quarter are devoted to review for the annual tests.

You have asked about whether we thought our teaching approach was teacher-centered or student-centered. I came in at the start of the year all prepared to do both, but then things fell apart on me—with organization and classroom management. So I decided to just do direct instruction for the first semester; I guess that you would call that a teacher-centered approach. But it saved my sanity. I organized the class into guided reading groups, and taught the concepts associated with that unit directly, using an *I do, you do, we do* routine. As you know, in the 4th grade, we are still teaching foundational skills in reading. So I felt the need to teach word recognition and analysis skills, like syllabication, root words and affixes, directly. And for the most part, this strategy worked well for skill development. I still have some students who are struggling with phonics and who read very slowly. But I don't want to keep doing direct instruction for everything! I think that I am boring my stronger readers, and yet not giving the slower readers enough time with me. Our benchmark tests are focusing more on comprehension and text evidence, so I have to get them to think about what they are reading and how to write about it—on their own, too. Some of them think that if I haven't taught a skill directly that they shouldn't be expected to know or do it. I began to realize that I've got to make them more independent!

I remembered learning about the reciprocal teaching (RT) technique from reading methods class, and I have been trying to use it. In each guided reading group, I begin by asking the students to predict what the passage is about. After we read for a while, I ask questions that get them to summarize, question and clarify what was read. If you are using the technique correctly, you then get the students to ask these kind of questions about the reading. Reading

(continued)

From the Desk of: Ace (continued)

the passage like this is supposed to become like a discussion dialogue, and you are able to tell if and how the students are comprehending what they are reading. It also helps them to think about what they are reading. This technique worked for some of the reading groups, but others were still struggling. They expected me to ask all the questions and had a hard time learning to ask questions instead of worrying about the answer.

So, I had to modify the strategy. I use a form of cooperative learning along with RT. First, I arrange students in groups of four. Then, I give a 3 × 5 card to each member of the group, identifying each person's role as a summarizer, questioner, clarifier, or predictor. The students read a few paragraphs of the assigned reading. At the stopping point, the summarizer highlights the key ideas up to this point, and the questioner poses questions, such as unclear parts or connections to other concepts. The clarifier explains confusing parts and answers the questions just posed. The predictor suggests what the next events will be. The roles then switch one person to the right, and the next section is read. Students repeat the process using their new roles. I then float among the groups, and join in as needed to make sure the students are using the four strategies. I also mix up the groups—making sure that there is at least one strong reader and one struggling reader in each group. That way, they can learn from each other. We do this activity for at least 35 minutes, and we have about 10 minutes for the whole class to discuss what was read and the questions they had.

Then, we regroup for foundational skills, writing, and individual conferences. I teach the foundational skills—such as fluency and word attack—in heterogeneous groups of 4 or 5. (I guess you could call these groups direct instruction, because that is what is happening there.) These are the students that need more attention. I rotate through about 3 or 4 of these groups while the rest of the class is doing an independent writing assignment. Once a week I use this time for individual conferences, meeting with each student while we go over their writing in their portfolio folder or having them discuss their readings with me—whatever needs the most work. This last part takes about 45 minutes—then the bell rings and a new group of 4th graders comes in!

I am surprised at how well this is working. We are really settling in to a routine. The RT groups give students a structured opportunity to talk about what they are reading and helps with our current objective, which is to read with a close lens. The struggling readers get to hear fluent reading from their peers, and this is helping them to improve. I am able to schedule time for individual attention and direct instruction as needed. And the students are beginning to act more like independent readers and writers.

Since giving them a bit more independence is going so well, I would like to try one more strategy for the second half (4 weeks) of quarter 3. I would love to do either a problem-based, a project-based, or an inquiry learning activity, but haven't figured out the particulars yet. Is anyone else doing this with a language arts class? Do you know where I can go for suggestions? The next unit is about how the past affects cultural practices. This is an especially great unit for this school. These students' cultures are so very rich (as they continue to show me with their customs), but they do not seem to be aware of how their practices developed over time. I also need to do something that makes them analyze what they have read and be able to write about it, forming an opinion and using evidence to back it up. I'll send you our district's suggested reading list for this quarter—maybe you can see something in it—I am out of ideas right now.

—Ace (Angel Aceves)

(continued)

From the Desk of: Ace (continued)

Further information about RT may be found at the following websites:

Reciprocal teaching. Retrieved from http://www.readingrockets.org/strategies/reciprocal_teaching

Pilonieta, P., & Medina, A. L. (2009, October). Reciprocal teaching for the primary grades: "We can do it, too!" *The Reading Teacher, 63*(2), 120–129. Retrieved from http://www.readingrockets.org/article/reciprocal-teaching-primary-grades-we-can-do-it-too

Reciprocal teaching explanation from North Central Regional Educational Library. Retrieved from http://www.ncrel.org/sdrs/areas/issues/students/atrisk/at6lk38.htm

Observation Notes From Dr. Zwijacz

January 7

What a difference the holiday break has made! The teachers are all excited to be back. They used their newfound freedom for sleep, relaxation, and time with family. As a result, maturing teachers returned to their posts, full of hope and renewed energy.

The topic for this week's discussion was to explain practices and strategies they used within classroom. What do they find most useful? Do they consider their strategies *teacher-directed* or *student-directed*? What learner-centered strategies do they use?

Ace is leading the way in considering the differences between teacher-centered and learner-centered approaches. He understands the need to directly instruct certain foundational skills. He also sees the need to develop more independent readers who can construct meaning from the text, accurately and thoughtfully summarize what they have read, and monitor their own comprehension. RT and cooperative learning are excellent strategies to use during close lens reading. These strategies incorporate a focus on comprehension while allowing the learner's voice to emerge. And he still has time for guided reading groups where he can introduce or reinforce foundational skills.

At this point, Ace has a vague idea of his next steps in developing more student-centered learning strategies. He wants to extend this idea of independent readers by using a problem-based learning unit—but is not sure where to begin.

Here is his problem, as I understand it and as he explained to me. He would like to use either a problem-based, a project-based, or an inquiry approach in the upcoming unit. There is quite a bit of ethnic and cultural diversity in his school; 75 percent identify as Hispanic, 15 percent African American, and 10 percent identify as either White or Native American. So the topic of the unit is very authentic. One other consideration is the school's location and the poverty level of the students. The school is situated in an urban area and has a 90 percent poverty rate (as measured by the number of students who qualify for free or reduced price lunches). So, while there is good access to museums and other cultural attractions for his students, other outside resources requiring parental funding (such as field trips) can be limited. Ace is fortunate in that his school has excellent technology services available, with wifi in every

(continued)

Observation Notes From Dr. Zwijacz (continued)

classroom, access to a cart of tablet computers, interactive white boards, and three desktop computers in a center in his room. The school and the district have made good use of federal e-rate funding and other grant opportunities to keep current with technology offerings.

Additional information

The standards for the unit are:	
CCSS.ELA-Literacy.RI.4.1	Refer to details and examples in a text when explaining what the text says explicitly and when drawing inferences from the text.
CSS.ELA-Literacy.RI.4.5	Describe the overall structure (e.g., chronology, comparison, cause/effect, problem/solution) of events, ideas, concepts, or information in a text or part of a text.
CCSS.ELA-Literacy.RI.4.9	Integrate information from two texts on the same topic in order to write or speak about the subject knowledgeably.
CCSS.ELA-Literacy.W.4.1	Write opinion pieces on topics or texts, supporting a point of view with reasons and information.

The essential questions for this unit are:

1. How do we read with a close lens to determine how a writer communicates information?
2. How do past people, places, ideas, and events affect cultural movements?

Here is the suggested reading list. Students should read one extended text and 2–4 short texts in this unit.

Extended text (teacher and/or students may choose one of these texts).

- *The Trail of Tears* by Michael Burgan. A preview of this book may be found at http://books.google.com/books?id=Q9RV8OlDA5sC&printsec=frontcover#v=onepage&q&f=false
- *Morning Girl* by Michael Dorris. A look inside this book, with a short written and audio excerpt, can be found at http://www.amazon.com/Morning-Girl-Michael-Dorris/dp/078681358X

Short texts (choose two to four).

- *The American Story: 100 True Tales from American History* by J. Armstrong. An excerpt of this text may be viewed at http://www.christianbook.com/american-story-true-tales-from-history/jennifer-armstrong/9780375812569/pd/812563
- "Ain't I A Woman?" 1851 Sojourner Truth speech. Retrieved from http://www.nps.gov/wori/historyculture/sojourner-truth.htm
- Excerpts from *Adventures of Huckleberry Finn* by Mark Twain. Retrieved from http://www.gutenberg.org/files/76/76-h/76-h.htm#c1
- *Cultures Collide: Native American and Europeans 1492–1700* by A. Rossi.

(continued)

Observation Notes From Dr. Zwijacz (continued)

Given these resources, there is great potential for developing student-centered strategies. Ace mentioned the possibility of three, either a problem-based or project-based strategy, or an inquiry unit. I also think that role-playing or cooperative learning strategies could easily be incorporated into this unit.

The suggested texts also seem to vary in reading levels and sophistication. This may help Ace in moving forward as he could assign (or let students choose) readings appropriate to skill levels. He might also consider adding alternate readings, or allowing the students to research other readings that would fit a particular theme.

I found a few other vetted sites that could help him form the ideas for his unit.

- Problem- and Project-Based Learning Activities (Mrs. O'Hora's House) is a listing of links to problem statements and project ideas: http://www.mrsoshouse.com/pbl/pblin.html
- *Project-Based Learning vs. Problem-Based Learning vs. X-BL* by John Buck. Retrieved from http://www.edutopia.org/blog/pbl-vs-pbl-vs-xbl-john-larmer
- PBL checklists allow teachers to readily develop an evaluation checklist. They can be retrieved from http://pblchecklist.4teachers.org/index.shtml
- "The Toy Unit: Problem-Based Learning Puts Students in Charge" is an article from *Education World* that offers an example of a fourth-grade toy project. It is accessed from http://www.educationworld.com/a_curr/stenhouse/project-problem-based-learning.shtml

I will get this list out to Ace tomorrow and ask the rest of the group to supply any other web-sites or ideas to help him with this unit.

—Celina Zwijacz, Ph.D.

Note: This case study was developed from ideas generated from Literacy Content Framework, Fourth Grade Toolset, v 1.0 developed by the Chicago Public Schools. The essential questions and suggested reading list were taken from Quarter 3, Unit 4, of that document. The toolset can be retrieved from http://www.cps.edu/commoncore/Documents/Toolset_Fourth_Grade_v1.0.pdf

Discussion Questions

1. Given the requirements, resources, and student population in Ace's situation, develop a one-page description of a student-centered project appropriate for the theme of this unit.
2. Find two additional Internet resources for the student-centered project described in item 1.
3. Given the diversity of the student population in Ace's classroom, suggest at least one other short text that may be appropriate for this unit.
4. In what ways does your description of the student-centered unit emphasize real-world application of knowledge and skills, and the development of the 21st century competencies of critical thinking, communication in a variety of media, and collaboration?

Summary & Resources

Chapter Summary

What teachers do matters! Recently, researchers have begun to quantify to what degree it matters. In this chapter, you were introduced to the concept of *effect sizes*, which indicates a high, medium, or low probability that the teaching strategy in question helps or hinders student learning. Furthermore, you learned about teacher-directed teaching models and those that are student-centered. While a teacher will use both types of teaching strategies, it has been suggested that adding more student-centered instructional strategies to the classroom will enable students to gain important 21st century skills—including solving problems, communicating and working with others, and flexing their creative abilities. Several powerful student-centered models were presented in the discussions on project-based learning and problem-based learning, which included service learning and, finally, inquiry learning. All of these models assist students in learning the critical 21st century skills that they will need in the future as they embed collaboration, problem solving, communication, and innovative thinking. In the next two chapters, we will examine in depth the planning process: both long-range planning and lesson planning.

Key Terms

concept An abstract idea that represents all of the items in a given category.

concept attainment A teaching model used by teachers who have specific concepts to teach.

concept formation The thought processes that occur when creating concepts in the mind; an inductive process that can be taught and learned.

cooperative learning A learning model that involves the use of small groups in the classroom so that students work together to extend their own and each other's learning.

direct instruction A model of instruction that usually consists of two main components, expository teaching and questioning.

effect size Will answer the question, "Does the technique produce a large enough impact that it's worthwhile to pursue?"

flipped classroom A relatively new innovation in which students learn new content online by watching video lectures, usually as homework, and what used to be homework is now done in class with teachers offering more personalized guidance and interaction with students.

historical inquiry Involves a lesson where students analyze historical evidence to form and test hypotheses about past events.

inquiry learning A teaching model that provides learners with opportunities to develop skills that enable them to locate, gather, and apply information in a wide range of contexts.

meta-analysis An analysis that looks at several studies using a particular strategy and calculates its average effect.

problem-based learning A delivery system that recognizes the need for students to develop problem-solving skills as an end in itself.

project-based learning A teaching method in which students gain knowledge and skills by working for an extended time on a real-world challenge to produce a product.

scientifically based research Research that involves the application of rigorous, systematic, and objective procedures.

service learning A form of problem-based learning that combines community service with content standards, focusing on critical, reflective thinking as well as personal and civic responsibility.

teacher-directed instruction Involves explicitly teaching rules, concepts, principles, and problem-solving strategies and guiding students during their review and practice.

wait time The time between when the teacher asks a question and asks for a response.

Key Ideas

1. Teachers are encouraged to organize instruction around proven classroom structures that enhance learning for all students.
2. Using instructional strategies that are evidence-based (that is, have a high effect size) is likely to increase learning for students.
3. Many teacher-directed models of teaching have been proven to be highly effective for student learning.
4. In 21st century classrooms, teachers need to use a variety of student-centered instruction strategies to maximize opportunities for students' higher-level thinking.
5. Project-based learning is one instructional strategy that has been proven to work and also has many 21st century skills embedded.

Critical Thinking Questions

1. What advantages are there to student learning when teachers intentionally choose evidence-based teaching strategies?
2. Describe five of the best-practice teaching structures, using a classroom example for each. What factors should be considered when teachers engage in classroom questioning?
3. Describe how a study's effect size influences the credibility of the findings.
4. What are some things to think about when questioning students?
5. Is it possible that the difficulty of a level 1 Depth of Knowledge task (DOK-1, Recall & Reproduction) could be greater than a level 3 task (DOK-3, Strategic Thinking)? Explain your answer, and offer an example.

Additional Resources

Readings

Bellanca, J., & Brandt, R. (2009). *21st century skills: Rethinking how students learn.* Bloomington, IN: Solution Tree.

Kilbane, C., & Milman, N. (2014). *Teaching models: Designing instruction for 21st century learners*. Boston, MA: Pearson.

Marzano, R. J., Pickering, D., & Pollock, J. E. (2001). *Classroom instruction that works: Research-based strategies for increasing student achievement*. Alexandria, VA: Association for Supervision and Curriculum Development.

Moore, K. (2015). *Effective instructional strategies*. Los Angeles, CA: Sage.

Websites

Best Practice: What Students and Teachers Think: This clip from Best Practice Video Companion showcases teachers and students sharing their thoughts about how the best practice structures improve teaching and learning. http://www.youtube.com/watch?v=qBu68vuK7Cc

Project-based Learning: Buck Institute for Education has assembled a wide array of PBL-related resources, some created by BIE and some collected from other project-based learners; the featured resources include a "How Can You Use It" section to take a Do-It-Yourself (DIY) approach to learning about PBL. http://bie.org/objects/cat/videos

Project-based Learning: This in-depth tutorial about PBL discusses the core elements of this approach, how it differs from more traditional approaches—and how it's more than simply doing projects. http://www.newtechnetwork.org/about/video/tutorial-what-pbl

Depth of Knowledge (DOK): Common Core Standards expect students to perform more cognitively challenging tasks, and Webb's DOK system provides a way to measure performance. http://www.youtube.com/watch?v=WMqKN7edRcU

Best Practices: Here's a link to Marzano's Best Practice Instructional Strategies, Classroom Instruction That Works. http://scoesc.k12.oh.us/Downloads/Instructional%20startegies%20delivery%20method.pdf

Cooperative Learning: This website provides insight into how students can improve learning by interacting with each another, not simply with teachers and instructional materials. http://www.co-operation.org/home/introduction-to-cooperative-learning/

Project-based Learning: Edutopia provides resources for project-based learning, an approach that allows students to explore real-world problems and challenges and inspires them to obtain a deeper knowledge of the subjects they're studying. http://www.edutopia.org/project-based-learning

Project-based Learning: Buck Institute: This site explores why so many educators around the world are interested in this teaching method; a combination of timeless reasons and recent developments confirms that PBL is an effective and enjoyable way to learn and develop deeper learning competencies. http://bie.org

Depth of Knowledge—Questioning: Access Webb's DOK Guide documents a process and criteria for analyzing the alignment between standards and standardized assessments. http://www.aps.edu/rda/documents/resources/Webbs_DOK_Guide.pdf

Because many of the chapter's instructional strategies were associated with major theorists in education, we are listing web links for you to access more information on these individuals.

- Jean Piaget: Piaget was the first psychologist to make a systematic study of cognitive development; he also developed a theory of cognitive child development. http://www.simplypsychology.org/piaget.html

- John Dewey: Dewey, known as the father of experiential education, pointed out that the strict, authoritarian approach of modern traditional education was too concerned with delivering knowledge, and not enough with understanding students' actual experiences. http://www.wilderdom.com/experiential/ExperientialDewey.html
- Lev Vygotsky: Vygotsky, a Russian teacher and psychologist, stated that we learn through our interactions and communications with others and examined how our social environments influence the learning process. http://jan.ucc.nau.edu/lsn/educator/edtech/learningtheorieswebsite/vygotsky.htm

All of the major content disciplines invite teachers to join their professional organizations. All of these associations sponsor websites that offer teachers an abundance of resources for classroom lessons. Visit the following association websites for their specific content.

- National Council of Teachers of Mathematics (NCTM): http://www.nctm.org
- National Science Teachers' Association (NSTA): http://www.nsta.org
- National Council for the Social Studies (NCSS): http://www.socialstudies.org
- National Council for English Teachers (NCTE): http://www.ncte.org
- International Reading Association (IRA): http://www.reading.org
- Council for Exceptional Children (CEC): http://www.cec.sped.org