

EDUCATIONAL PSYCHOLOGY: An Integrated Approach To Classroom Decisions

© 2005

Thomas Fetsco, Northern Arizona University
John McClure, Northern Arizona University

0-321-08088-2

Visit www.ablongman.com/relocator to contact your local Allyn & Bacon/Longman representative.

The colors in this document are not
an accurate representation
of the final textbook colors.

s a m p l e c h a p t e r

The pages of this Sample Chapter may have
slight variations in final published form.

Allyn & Bacon
75 Arlington St., Suite 300
Boston, MA 02116
www.ablongman.com



Introduction to the Study of Educational Psychology

Standards in This Chapter

The Interstate New Teacher Assessment and Support Consortium (INTASC) has developed a set of standards that define the knowledge, skills, and attitudes that contribute to the success of teachers beginning their careers. (A full listing of these standards appears on p. 4 and on in the inside cover of this text.) Learning the material presented in this book will contribute to your ability to master the INTASC standards. Chapter 1, in particular, correlates most closely with:

- **Standard 9:** Reflective Practice and Professional Growth

If you are reading this chapter, you are most likely beginning a course in educational psychology that is part of a teacher-training program. Like most people in your position, you are likely to be asking yourself two questions:

- “Exactly what is educational psychology?”
- “Why do I need to study educational psychology?”

The answers to these questions are related and complex. This chapter begins with brief answers. The remainder of the chapter clarifies and elaborates those answers. However, you should keep in mind that this first chapter is only the beginning of an explanation and that the entire book is, to a certain extent, an attempt to help you answer these questions.



Close-ups^{on} the Classroom

Elementary

Maria Lucero
Student Teaching
in the Fourth
Grade

I am really enjoying student teaching in the fourth grade with Greg Henson. I'm learning so much that I know will help me when I get my own classroom. One thing I've learned about teaching is that I didn't know as much about it as I thought. We really only barely scratched the surface in my methods classes, and it's a lot harder and more complex than I thought it was going to be.

I've been observing and helping out for three weeks, but now Mr. Henson wants me to plan and teach my own lesson for next week. This will be the first lesson of a unit on fractions and will introduce the basic concept of fractions and their uses. Now that I am going to teach a real lesson to real kids, I have a number of questions. For instance, what is the

best learning activity to use? I've noticed that Mr. Henson uses quite a variety of techniques, but I'm not sure how he decides what to use when. I am also worried about the students' motivation and discipline during my lesson. I wonder if the kids will behave as well for me as they do for him. Finally, I am concerned about how to deal with student differences. The students come from a variety of different ethnic backgrounds, and there are several students whose families have recently emigrated from other countries.

When I raised these questions with Mr. Henson, he asked that I try to put together a lesson tonight and then suggested we could talk about it tomorrow before class starts. We both always arrive early, so we should have a good hour to talk before we have to get ready for the first lesson.

Decision Point: What information about the learners in Mr. Henson's class might help Maria answer her questions?

Before proceeding with Chapter 1, be sure you read the Close-ups on the Classroom features about Maria Lucero and Jeffrey Larkin. At various points in the chapter, you will revisit both teachers in their classrooms and follow their decision-making progress. Their classroom experiences are closely integrated with the key concepts of this chapter and serve as important models for understanding Educational Psychology.

What Is Educational Psychology?

What is educational psychology? An exact answer to this question depends on whom you ask. However, for the purposes of this book, **educational psychology** is defined as that branch of psychology that is concerned with the study of the mental processes and behaviors associated with human learning and instruction. Educational psychologists ask questions about the nature of learners and learning, the characteristics of effective teaching, and how the nature of classrooms affects learning.

Educational psychologists study a wide range of phenomena associated with learning, both in the laboratory and in the classroom. Over the last thirty years, however, educational psychologists' interest in classroom learning has increased dramatically. A review of research reported in recent issues of the *Journal of Educational Psychology* reveals the breadth of questions investigated by educational psychologists. In 1999, the *Journal of Educational Psychology* reported the results of studies investigating the teaching and learning of writing (four studies), mathematics and problem solving (eight studies), and reading (fifteen studies). In addition, some studies investigated questions about the effects of technology on learning, individual student differences affecting school achievement, and the effects of social influences on students.

When educational psychologists ask questions about learning, they apply the methods of science, careful observation, and rational analysis to answer their questions. The answers to their questions are used to formulate and assess theories that teachers use in their decision making.

Teaching is a complex activity, and effective teaching requires a complex set of knowledge and skills. These characteristics have been organized into various sets of standards that are used by many states in the certification of teachers, such as those

expect the world!
The New York Times
nytimes.com

THEMES OF THE TIMES

Expand your knowledge of the concepts discussed in this chapter by reading current and historical articles from the New York Times by visiting the "Themes of the Times" section of the Companion Website.

Secondary

Jeffrey Larkin
**Student Teaching
in Ninth Grade
General
Science**

After three and a half years of study I'm finally starting my student teaching, the last step before I get my certificate. For the next fifteen weeks I'll be working with Mr. William Goodman and his ninth grade general science classes. I've been observing the class for a week and have finally had my first one-on-one meeting with Mr. Goodman. He told me that he wants me to prepare a science unit on magnetism to be taught around the first of November.

As we talked, I told him that my most immediate concern was how to deal with the wide range of student diversity in his classes. Mr. Goodman suggested that we begin with the sequence of objectives for the unit and try to plan lessons

that would help the average student reach each object in the sequence. Then we could go lesson by lesson and determine how we might modify each lesson to accommodate the differences of any student or group of students within the class.

Mr. Goodman has also told me that I would have to design an assessment plan for the unit. I told him that I wasn't sure which assessment method would be best. Mr. Goodman said that I should choose an assessment method that made sense with respect to my objectives and the teaching activities within the unit. He suggested that I get started organizing objectives and roughing out some lesson plans, and then we would think about how to assess the students' learning.

Decision Point: What decisions will Jeffery have to make as he prepares his instructional unit? If you were in Jeffery's position, what questions would you have for your supervising teacher?

developed by the Interstate New Teacher Assessment and Support Consortium (INTASC), shown in Table 1.1. A glance at the principles that make up the INTASC standards will give you an idea of how important an understanding of psychology is to teacher effectiveness. Effective teaching results in student learning. Learning is a psychological process, and to influence this process teachers must understand the nature of this process and their students.

This book is intended to help you develop an understanding of learning and learners, in accordance with the INTASC principles. Our approach to this objective is based on three assumptions. The first is that teachers must make decisions in complex multidimensional environments, and that the quality of their decisions influences their effectiveness. The second assumption is that the scientific study of teaching and learning can provide teachers with information that helps them better understand their classrooms and therefore improve the quality of their decision making. The scientific study of teaching and learning leads to formal theories about how people learn and how teachers may assist and guide the learning process. The final assumption is that no single theory of learning or teaching is optimal for every situation that teachers will face in the classroom. Teachers need to know about, and flexibly apply, a variety of theories to make effective classroom decisions. Knowing how research is used to develop and evaluate theories allows teachers to make better decisions about which theory to use when. In summary, we believe that an understanding of scientific theories and how research is used to develop and modify theories can help you apply theories and research to your own classroom.

What are the three assumptions of this text?

Science, Theories, and Educational Practice

Without initiation into the scientific spirit one is not in possession of the best tools which humanity has so far devised for effectively directed reflection. (Dewey, 1916, p. 223)

Science is a method of studying the world. This method includes the collection and analysis of data and the generation of logical explanations for the data that have been gathered so far. These logical explanations are called theories. The effectiveness of

TABLE 1.1

INTASC Standards: What Beginning Teachers Should Know and Be Able to Do

Standard	Description
1 Content Pedagogy	The teacher understands the central concepts, tools of inquiry, and structures of the discipline(s) he or she teaches and can create learning experiences that make these aspects of subject matter meaningful for students.
2 Student Development	The teacher understands how children learn and develop, and can provide learning opportunities that support their intellectual, social, and personal development.
3 Diverse Learners	The teacher understands how students differ in their approaches to learning and creates instructional opportunities that are adapted to diverse learners.
4 Multiple Instructional Strategies	The teacher understands and uses a variety of instructional strategies to encourage students' development of critical thinking, problem solving, and performance skills.
5 Motivation and Management	The teacher uses an understanding of individual and group motivation and behavior to create a learning environment that encourages positive social interaction, active engagement in learning, and self-motivation.
6 Communication and Technology	The teacher uses knowledge of effective verbal, nonverbal, and media communication techniques to foster active inquiry, collaboration, and supportive interaction in the classroom.
7 Planning	The teacher plans instruction based upon knowledge of subject matter, students, the community, and curriculum goals.
8 Assessment	The teacher understands and uses formal and informal assessment strategies to evaluate and ensure the continuous intellectual, social, and physical development of the learner.
9 Reflective Practice and Professional Growth	The teacher is a reflective practitioner who continually evaluates the effects of his/her choices and actions on others (students, parents, and other professionals in the learning community) and who actively seeks out opportunities to grow professionally.
10 School and Community Involvement	The teacher fosters relationships with school colleagues, parents, and agencies in the larger community to support students' learning and well-being.

Source: The Council of Chief State School Officers, Washington, D.C.; available at website <http://www.ccsso.org/intasc.html>

teachers' decisions depends on their ability to understand their students and classrooms. Developing this understanding is the goal of reflective practice. As the quote by John Dewey suggests, the scientific approach provides teachers with one of the most effective means of achieving this understanding.

How do theories affect our ability to solve problems and make decisions?

In general, a **theory** is a set of beliefs about how the world works, or at least how some part of it works. Such beliefs help explain the world and allow us to make predictions and modify the world to achieve our objectives. For every aspect of our day-to-day lives we have sets of beliefs that we use to understand our situation and guide our response. Therefore, in a sense, anybody who tries to solve a problem begins with a theory.

For many people, such beliefs take the form of informal intuitions developed from their encounters with similar problems. These informal beliefs are sometimes referred to as common sense or **implicit theories** (Clark & Peterson, 1990). Teachers might have implicit theories about how students learn, how they are motivated, or the causes of students' misbehaviors. Research has shown that the implicit theories of teachers do influence their teaching practice (Ignatovich, Cusick, & Ray, 1979; Munby, 1983; Olson, 1981; Smith, 1989; & Torff, 1999).

Scientific theories are a set of formal statements that describe variables and relationships that are important to the understanding of some part of the world. For example, information-processing theory proposes that the rate of learning is limited by learners' ability to pay attention. That scientific theories comprise such a set of formal statements is important because it makes it easier to test the accuracy or preci-

sion of the described relationships. By testing these relationships, we develop a more accurate understanding of the world and are able to make more accurate predictions. For instance, a researcher might investigate what kinds of distractions are most likely to influence the rate of learning. In general, experts are more likely to use these types of formal theories when they solve problems within their domains of expertise.

It is important to note that scientists don't think of their theories as *the truth*. Theories are the best explanation they have so far. The development of theories is an evolutionary process. Theories compete to explain what we know, and as new information comes to light, some theories are modified and survive, whereas others are abandoned (Kuhn, 1970). The theories of educational psychologists are subject to these same evolutionary forces, meaning that as we learn more about human nature, the theories of educational psychologists change. Driving this evolutionary process is the scientific method.



Theories help teachers improve their practice by helping them understand how their students are motivated to learn.

Research and the Evolution of Scientific Theories

Scientific inquiry begins and ends with a theory. After developing a theory, the researcher uses the theory to formulate research questions. The questions that a scientist tries to answer are influenced by the scientist's theory. To answer these questions, scientists conduct research. The research is designed to gather information in a way that helps answer the research question. After planning their research, researchers make observations and gather data. The data are then analyzed to answer the original question. Sometimes the result of this research strengthens the theory that generated the question, but often the results of research require that the theory be refined or modified in some way. Frequently, the research process causes researchers to ask new questions and the process begins again. This cyclic process is illustrated in Figure 1.1.

What are the steps involved in a scientific inquiry?

Comparing Theories

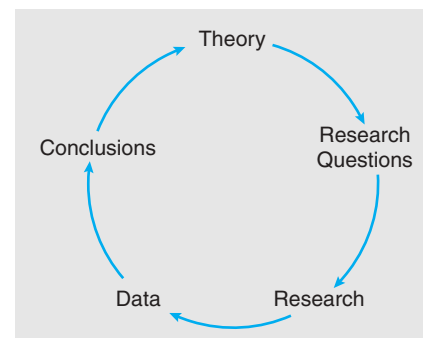
Teaching is a complex task and classrooms are complex environments. To study this complexity, researchers tend to focus on limited aspects of the teaching task or classroom environment. Generally, they choose their research topics based on their individual knowledge and interests. As a result, no single theory of teaching and learning exists. An important task for teachers is to compare various theories and select that theory that is most appropriate for a given situation.

Theories may be compared along three dimensions.

- The theory's characteristics, including the scope of the theory as well as the constructs and processes of the theory;
- Epistemic value, or the theory's potential to explain and make predictions about the world; and
- Applicability, or the theory's ability to guide people's decision making in everyday problem situations.

Characteristics of Theories. Because human beings are so complex, psychologists often focus on some restricted aspect of human nature. Their research concentrates on answering questions about a small set of psychological

FIGURE 1.1 The Theory/Research Cycle: The Relationship between Theory and Research



Looking in on



My meeting with Mr. Henson this morning has answered some of my questions, but has given me even more to think about. I think he was a little overwhelmed with my questions, because he suggested that we first plan the lesson and then worry about things like motivation, discipline, and the differences among the learners.

We began our discussion of the lesson by going over the plan I had developed the night before. My idea was to adapt an activity that I had learned in my mathematics methods class for my lesson on fractions. I had always found the activity enjoyable and thought it would be fun for our students as well. Mr. Henson thought the activity was creative, but seemed unsure about its appropriateness for this lesson. He suggested that maybe a better way to start would be to make a list of instructional objectives, in other words, things we wanted the students to learn from the lesson. We did some brainstorming and eventually came up with three objectives for the lesson. Then Mr. Henson asked

1.1

me to think about what the students could do that would prove to me that they had learned these three things. With Mr. Henson's help I came up with a set of questions and exercises I thought the kids should be able to do if they understood the concepts I would be presenting. Finally, Mr. Henson asked me what kind of activities would help the kids answer the questions and complete the exercises I had listed.

After our meeting I think I have a better idea about the lesson planning process, but I still have many questions. Mr. Henson has suggested that I work on the lesson and then we will meet again to discuss any other issues I might have.

- How would you describe Mr. Henson's theory of learners and learning?

Decision Point: Is it possible to adapt this approach to lesson planning to other subjects?

How are psychological constructs and psychological processes different?

phenomena, and the resulting theory tries to explain these phenomena. This characteristic is referred to as the scope of the theory. The **scope** of a theory refers to the type of phenomena that the theory attempts to explain. Because of this, it is important to consider the focus of different theories when making comparisons. For a teacher, the question becomes, "What classroom situations will this theory help me understand?" Consider the science teacher who wishes his or her student to learn how to use an analytic balance. This teacher needs a theory that describes the process of learning and the factors that affect it. Alternatively, a teacher evaluating a character-education curriculum might need a theory that specifically describes the factors that affect children's empathy and their ability to understand other people's perspectives.

All theories describe some aspect of the world, and psychological theories attempt to describe the human mind and human behavior. These theories involve the description of psychological constructs and psychological processes. A **psychological construct** is a hypothetical human characteristic that is used to explain patterns of behavior. Learning style, intelligence, mood, and personality are examples of psychological constructs. **Psychological processes** are actions that create or modify psychological constructs. Learning, motivation, and development are three psychological processes that are of particular interest to educational psychologists and teachers. The description of these processes is an objective in Chapters 2 through 6. Psychological theories differ in terms of the psychological constructs and processes used to explain human performance.

Psychological constructs may vary in terms of their permanence. A **trait** is a psychological construct that represents a relatively permanent and consistent mental characteristic. Personality and intelligence are typically described as traits. For instance, you may have friends who have been very outgoing for as long as you have known them. They enjoy meeting new people, and they like to interact socially with other people. You might explain the person's behavior by saying that she or he is friendly or extroverted. In other words, you seem to believe that there is some underlying psychological trait that explains this consistent pattern of behavior. A mental characteristic that arises from a specific situation and then goes away when the

situation changes is called a **state**. Many emotions are examples of states. In psychologically healthy people, fear or anxiety are mental states brought on by some situation. For instance, a student may feel anxious before an important test, but when the test is over, the anxiety subsides. The emotion is tied to the student's situation.

Different theories may use different psychological processes and constructs to explain the same event. These differences produce different ways of understanding a situation. For example, developmental theorists may use the psychological construct of readiness and the process of maturation to explain differences in children's academic performance and behavior across grade levels. From this perspective, if a child is having trouble in school, the problem may be that the child is just not mature enough to achieve at the expected level. The solution would be to provide the students with tasks that are appropriate for their levels of development. On the other hand, learning theories might explain students' performance in terms of the psychological construct of knowledge, which results from the psychological process of learning. Learning theory would explain a child's academic problem as indicating a lack of knowledge and suggest that instruction be designed to make use of what the child already knows to develop the knowledge necessary to achieve in the classroom.

Epistemic Value of a Theory. Howard (1985) suggests that scientists judge a theory based on its contribution to understanding the world, guided in their judgment by what he has termed epistemic value. **Epistemic value** refers to the power of a theory to contribute to our understanding of a specific situation or the world in general. Epistemic value includes the following:

- Predictive accuracy, or how closely predictions derived from a theory match real world outcomes;
- Internal coherence, or the degree to which the constructs and processes proposed by a theory are logically related;
- External consistency, or how well the theory describes objects and events in the real world;
- Unifying power, or the ability of a theory to identify, incorporate, and explain similarities in data from different fields of research;
- Fertility, or the ability of the theory to inspire and guide research that results in useful information; and
- Simplicity, or the number of constructs or processes comprising the theory. All things being equal, simpler theories are preferred.

What are the six characteristics of a theory that contribute to its epistemic value?

Practical Application. The practical application of the theory is a final comparison point for theories. Some theories provide attractive descriptions of situations, but are weak in terms of their applicability. Practitioners need theories that provide explanations and suggest a course of action to solve the problems they face. In some cases an older theory may simplify a problem even though the theory is known to be an incomplete, narrow, or inaccurate description of the world. For example, sailors still use a system of celestial navigation based on the assumption that the earth is at the center of the universe and the stars are in fixed positions relative to each other in space. These assumptions are incorrect, but by making these assumptions the calculation of their geographic position is simplified with no noticeable loss of accuracy.

One way to judge the practical application of a theory is to consider the types of principles that can be developed from that theory. By making predictions and testing the accuracy of the predictions, we are able to make judgments about the accuracy of our theories. When repeated test results reveal a consistent relationship between specific situations, actions, and outcomes, the relationship may be stated as a **principle**. For instance, cognitive learning theory proposes that learning depends on the active participation of the learner. This being the case, one prediction that might be made is that learners' intentions affect what they take away from a learning activity.

Looking in on

After looking over my lesson plan, Mr. Henson said that he had only a few suggestions, but that overall it was pretty good. Then we began talking about student motivation and differences.

Mr. Henson said that he thinks about classroom motivation and discipline in terms of behavioral learning theory. He noted that this theory has some practical recommendations for classroom teachers. He said he has found that by reinforcing the learners for doing things correctly and obeying the rules he is able to keep the kids on task most of the time. When I said that I hadn't seen him giving out any candies or gold stars as rewards Mr. Henson laughed and said he uses social reinforcers such as praise. He said candy and gold stars don't work all the time and can be somewhat expensive. Mr. Henson says most of his kids respond very well to praise, if it is sincere and explicitly related to a specific performance. One side effect of this is that the students seem to enjoy the class more

1.2
María Lucero

and are more willing to put effort into participating in new classroom activities. Another advantage of behavioral approaches is that they assume that people are people. For example, people generally like it when others who are important to them recognize their accomplishments. A teacher realizes that he has to modify how he shows recognition based on the students' background experiences and expectations, but he knows that it's helpful to find a way to recognize each student's accomplishments.

- **What is the advantage of learning a theory that has many practical applications?**

Decision Point: When you are trying to make a decision, how will you decide which psychological theory will be most useful?

This prediction has been supported by numerous studies. A principle that can be derived from these consistent research findings is: Learning is an active, goal-directed process.

Principles serve an important role in the application of theory. Principles often serve as the foundation for making decisions and formulating a solution to a problem. A good decision maker uses a theory to understand a problem. This understanding allows the decision maker to select the relevant principle. The principle then serves as the basis for a solution to the problem. This is how Ramona Mahoney applies this approach.

- I believe that what students learn from a lesson is greatly influenced by the students' intentions. Sometimes students need help in this area. One way to help the students is to begin with some activity designed to encourage them to set appropriate goals for the lesson. For instance, for my science unit on electricity I begin by having students observe the deflection of a compass needle when it is placed near a wire connected to a dry-cell battery. The students are always surprised, and the unexpected behavior of the compass needle arouses their curiosity. They then set out to discover what is causing this effect.

Using Theory and Research to Improve Teaching

As a teacher, you will make hundreds of decisions daily. As you plan for your classes, you must decide what to teach, how to teach, and how to assess your students' learning. As you deliver your lessons, you must decide if students are motivated and learning, or if a change of plan is required. To manage the classroom effectively, you must decide how to respond to the unique problems and behaviors of each student. After you have presented a lesson, you will probably start thinking about how to improve future lessons. Other decisions are associated with the administrative and

housekeeping actions required by schools, districts, and other governmental agencies. Teaching is the act of making decisions, acting on those decisions, and evaluating the effects of those decisions.

Teachers make their decisions in complicated environments. Classroom teaching requires the successful completion of many different types of tasks, a concept known as *multidimensionality* (Doyle, 1986). Teachers are managers, instructors, mediators, counselors, and at times medics. They are responsible for teaching a wide-ranging curriculum that includes facts, skills, problem solving, as well as interpersonal skills and attitudes. In addition, they must be able to relate effectively to their students and the adults in their students' lives.

The variety of the decisions that teachers face makes teaching complex and demanding. However, the teacher's task is made even more complex because teachers' decisions are rarely independent of decisions made previously. For example, a teacher deciding what concepts or skills to teach needs to consider the concepts and skills that were previously taught. A teacher deciding how to respond to a student's disruptive behavior may need to consider the student's past responses to similar situations.

The multidimensionality of teaching means that knowledge of a single theory may be insufficient for all the situations faced by teachers. No single theory is likely to be the most useful theory in all situations. Part of the decision-making process for teachers, therefore, is the selection of the theory that is most useful for a given situation. To make an informed selection of a theory, you need some method for comparing theories, and you need to know something about the nature of the educational research behind the theories.

The Contribution of Scientific Study to Teacher Decision Making

A decision is the end product of an often complex thought process. Research has focused on three aspects of teachers' decision making: their thinking processes as they plan for the various aspects of their classes; their thinking while they are interacting with students; and the nature and effects of the teachers' theories and beliefs on their planning and decision making (Clark & Peterson, 1986). It is this last aspect that is most directly affected by scientific research.

What people know or believe plays a central role in how they think and act in any given situation (Borko & Putnam, 1996). This applies to teachers and their decision making. Teachers' beliefs about the nature of their students and how they learn, about the purpose of education, and about themselves as teachers all influence their decision making (Calderhead, 1996). Specifically, teachers' knowledge and beliefs influence how they set goals in their classrooms, which student characteristics they identify as critical, and the instructional and management strategies they apply.

The theories that result from the scientific study of teaching and learning can be valuable tools that help teachers organize and clarify their thinking, thus improving the quality of their decisions and teaching practice. Much of what expert teachers know and believe about teaching is grounded in personal experience; and their decisions are often based on the intuitions derived from this experience. However, even experienced teachers may be stumped by unfamiliar circumstances or an unusual problem. In these situations, the results of the scientific study of teaching may be helpful.

For new teachers, understanding the insights derived from the scientific study of teaching can be even more valuable. As a new teacher you may lack the experiences and intuitions of experienced teachers; however, you will be required to make decisions the moment you enter your first classroom. Where will you begin? The theories derived from a scientific study of teaching can provide a valuable starting point for your decision making. Your purpose in studying educational psychology is to develop a theoretical base in preparation for making decisions in your future classroom.

On which aspects of decision making does scientific research have the most direct impact? Why?

Theories and Decision Making

How do theories affect the decision-making process of teachers? To answer this question, we first need to think about the nature of decision making and what makes a good decision maker. Then, we need to think about how theory might assist the decision-making process.

How are the steps of the problem-solving process similar to a scientific inquiry?

Decision Making as Problem Solving. Making a decision is a form of problem solving that usually means choosing a course of action. Psychologists who study human problem solving typically identify a series of steps in the process of solving a problem. These steps include (a) understanding the nature of the problem, (b) developing a plan to solve the problem, (c) implementing the plan, and (d) looking back and evaluating the effectiveness of the planned solution (Polya, 1985).

To understand the nature and role each of these steps plays in the problem-solving process, researchers have compared the problem-solving performances of experts and novices. An expert is someone who has demonstrated a great deal of proficiency in solving problems in a particular area, such as classroom teaching, chess, physics, mathematics, and so on. A novice is someone with limited experience within a specific domain. Typically, experts are better able to understand the important characteristics of a problem and formulate effective solutions more efficiently than are novices (Chi, Feltovich, & Glaser, 1981).

What accounts for these observed differences? Experts' ability to understand and solve problems in their domain of expertise seems to be related to their extensive and well-organized knowledge of the problem domain (Glaser, 1984). Experts' knowledge makes them especially sensitive to important relationships among the elements that define the problem situation. Having an effective theory allows them to:

- Identify the important characteristics of the problem situation and ignore unimportant characteristics;
- See the underlying pattern of relationships in the problem situation; and
- Identify principles that can be used to guide the generating of a solution.

To illustrate these points, consider how an expert teacher might use her understanding of behavioral learning theory to respond to a child whose talking is disrupting learning. First, she focuses on the misbehavior as part of a sequence rather than as a single event. By taking this focus, the teacher is able to identify those factors that trigger the misbehavior. Perhaps the student's talking only occurs during certain types of activities or when the student is with a particular student or students. By seeing the student's misbehavior as a sequence, the teacher also focuses on the consequence of the misbehavior. The teacher may try to determine what rewards the student receives for the misbehavior.

By understanding these cause-and-effect relationships, the teacher may try to use principles derived from behavioral learning theory to modify the disruptive behavior. For instance if the student talks when with certain students, the teacher can arrange for these students not to be together. Alternatively, she may arrange her class to make some other behavior more attractive than talking.

Expert teachers' theories about teaching also influence how they perceive a problem and the principles that they apply in the classroom. You probably already have developed some of these theories, and certainly others will develop as you gain experience as a teacher. The intent of this book is to supplement these personal theories with knowledge of some scientific learning and teaching theories. We believe that understanding these scientific theories of instruction and learning is an important step toward becoming an expert decision maker in your classroom.

The next section gives you suggestions for how theory and research can help improve your classroom teaching. One of the major goals of this text is to provide you with a mechanism for evaluating theories that are proposed for classroom use.

Decisions in the Classroom

A lot is required of teachers as decision makers, and your authors believe that the scientific study of teaching can help you make more effective decisions in your multidimensional world. One approach that scientists frequently use when studying a complex process is to break the process into parts and study the parts separately. Once the parts of the process have been adequately described, the scientist may then study the relationships between the parts. The advantage of this approach is that it makes it easier to ask and find the answers to specific questions. To simplify the discussion of the kinds of decisions teachers make, your authors have decided to divide the teaching process and the types of decisions teachers make into three areas, referred to as **decision points**. The three decision points are:

1. *Planning decisions*. These include decisions that are made before a specific interaction with the learners occur.
2. *Teaching and managing decisions*. These decisions include those made while interacting with the students.
3. *Assessment decisions*. These decisions are made to assess the effectiveness of an interaction with a student.

This division aids our discussion of how the various psychological theories may help your practice as a teacher, but it is important to keep in mind that all types of decisions are interconnected. Decisions that are made while planning a lesson often determine the types of interactions you have with the students. For instance, if you decide to have your students do group work, you are presented with a set of opportunities and challenges that differ from those you would have face if you had decided to do a lecture. Group work may present you with more opportunities to monitor students' understanding one on one than will a lecture. The challenge of keeping the students focused and on task is also likely to be greater if you decide to do group work rather than present a lecture. Relationships also exist between the decisions you make when planning and the decisions you face when assessing the effectiveness of your lesson, and between the decisions you make while teaching and your assessment decisions. While reading the following chapters, keep in mind how the choices you make in one part of your teaching activity influence the decisions you will need to make later on.

A Decision-Making Guide for Selecting Theories

As noted earlier, theories that may help you understand and make a decision in one situation may not be useful in another situation. So the first step in making a good decision is to select a theory that is appropriate to the situation. When making this first decision, you may want to consider and weigh all the dimensions we just discussed. Your goal is to find the theory that gives the best description of and provides the best practical guidance for the situation you are facing.

Teachers and Research

The development of theories is an evolutionary process, that is, theories change as new information becomes available. This means that for teachers to get the most benefit from theories, they must keep up with current developments in the field. In other words, teachers should be aware of and use current research to expand and modify their understanding and application of theory. Although the actual impact of educational research on classroom teaching can be debated, we tend to believe that a conceptual understanding of educational research can be beneficial to teachers in two ways: as consumers of research and as researchers in their own right.

Teachers as Consumers of Research

First, teachers may benefit as consumers of the information produced by others. Teachers have multiple sources of information about learning and teaching in classrooms. They are exposed to interpretations of educational research in their college classes, through on-site training experiences, through informal conversations with colleagues, through professional journals, and through other outlets such as the Internet. It is important that you become critical consumers of the information you gather. A critical interpretation of research helps you understand and appropriately apply the results of research to your own teaching.

Teachers as Researchers

Research is not an activity limited to professional researchers. Teachers conduct research every day in their own classrooms. When they evaluate the effectiveness of new ideas, instructional techniques, or materials, teachers are conducting a form of research. For example, a teacher who is trying different instructional approaches to help a student who is having trouble grasping the course content is conducting research. While not formally stated, the teacher is testing a hypothesis about the nature of learning and the learner. The results of this informal research may help the teacher improve his or her ability to teach the learner and improve professional skills.

A more formal approach to teacher research in classrooms is action research. **Action research** is defined as teacher-initiated, school-based research (Gay & Airasian, 2000). Consider how an action-research approach might be used in the example given in the preceding paragraph. First, the teacher would use the information the teacher had about the student, the course content, and the teacher's beliefs about learning to make an explicit statement of the problem. The statement might include information about the student and the learning situation that the teacher believed was relevant. The statement would also describe the current state of the student's learning and a description of what a solution would accomplish. Here is an example of a problem statement developed by Jane Forbes for a student in her tenth grade chemistry class:

- William is not doing well on his chemistry examinations. He seems to be bright and motivated, but doesn't volunteer to participate much in either large group discussions or when working within his lab group. I talked to him about his work and he seemed embarrassed. He appeared to understand chemistry concepts at a very basic level, but had difficulty discussing what he knew. He says he finds the textbook and class discussions hard to follow. I talked to some of his other teachers and they have confirmed that his reading skills are poor. The school psychologist has told me that William's performance on tests of reading comprehension are below average, but that he doesn't have a disability. I believe if I can improve his comprehension of the text and class discussions, he will do better on the tests.

Next the teacher would identify specific instructional modifications that might help the student and apply the modifications and collect data through appropriate observational techniques to determine which modifications yielded results that were closest to the desired solution. Here's how Jane Forbes decided to handle William's situation.

- I've talked to William and he has agreed to try a new reading comprehension strategy called concept mapping. I will teach him how to construct concept maps, then for each reading assignment I will require him to create a map from the main concepts of the assignment. At first I will identify the concepts for him, but eventually I want him to find the main ideas for himself. I will also provide him questions for each reading assignment. He will justify his answers with reference to his concept map. He has a study hall during my prep-period

so he will stop by to discuss his map and answers before class starts. In addition to monitoring his performance on quizzes and test, I will keep track of how often he contributes to class and group discussions.

Finally, having determined which techniques were most effective for the student, the teacher would apply the technique more generally to the instruction of that student. This is how Jane Forbes accomplished this last step.

- It took a while for William to master the concept mapping techniques, but his maps gradually improved. As his maps improved so did his answers to the assigned questions and his ability to explain his answers during our pre-class meetings. I kept a record of William's participation in class discussions and found that as his maps improved he seemed to be participating more in the class discussions and lab groups. His test scores have also improved, but not to the level I would expect. Maybe he needs help in developing some test-taking strategies. The concept mapping approach seems to have worked, and I have suggested he try it with some of his other classes. I have talked to Bob Carson, William's history teacher, and he is enthusiastic about Bill's concept mapping in his class also.



Use other teachers' experiences to improve your teaching and to stay up-to-date in the profession.

As can be seen, action research is typically more focused on the specific problems and decisions of a teacher or group of teachers. As with all forms of research, action research is a systematic approach to problem solving and decision making in the classroom. Gay and Airasian identify four steps in the action research process: (1) problem/topic identification; (2) data gathering; (3) decision making; and (4) action.

Note the similarity between the steps in action research and the theory/research cycle presented in Figure 1.1 on page 5. Problem identification corresponds to the theory and research portions of Figure 1.1. The problems that teachers identify derive from their own unique situations, but the teacher's perception of a problem and the questions the teacher asks are influenced by the teacher's theories about learners and learning. Data gathering corresponds to the research and data portions of Figure 1.1. In action research, decision making is similar to the conclusion portion of Figure 1.1.

In action research, the decision leads directly to action on the part of the teacher. Action research is based on a specific classroom and directed toward solving a specific problem or answering a specific question within that classroom. For this reason the decision made is more likely to lead to a specific teacher action. The teacher's action leads directly to another question; that is, was the action effective? With this question the whole process begins again.

Some General Insights about Educational Research

Your authors would like to help you in your interpretation and application of educational research by providing some general insights gained from our own reading and interpretation of educational research:

- Different research questions require different data collection procedures.
- An effective understanding of classrooms requires both qualitative and quantitative data.
- There can be multiple competing explanations for the same data.
- The range of differences among individuals, even within the same group, is greater than the range of differences between groups.
- Learning is complex, and classroom learning must be understood in the context of many interacting variables.

Looking in on



Mr. Goodman has been working with me on developing objectives and lessons for my unit on magnetism, and now we are looking to see what accommodations we might need to make for student differences. The first lesson in the unit is a lab activity designed to familiarize the students with the general properties of magnets. Specifically, the students are to learn that different magnets produce magnetic fields of differing strengths, and that these differences can be measured. The students will be working in groups following the instruction in the lab manual and recording their observations in their notebooks.

At first I thought this lesson would be appropriate for students from all different backgrounds, but Mr. Goodman suggested that we look at the lesson more closely. First, he pointed out that because the students came from a wide variety of socioeconomic backgrounds, there might be some students who have played with magnets or observed their properties and other students who have not. Differences in the students' experiences with magnets may help or hinder

their observations and comprehension of the lab results. Mr. Goodman also pointed out that there are several students who speak English as a second language. Differences in students' English proficiency may affect their ability to complete and benefit from the lab activity.

Mr. Goodman suggested that we give careful thought to how we organize the groups so that differences in students' previous experiences would not prove a barrier to successful completion of the lab and may actually improve the overall learning of all of the students in the class.

- What might be the advantages and disadvantages of Mr. Goodman's approach to dealing with his students' differences?

Decision Point: In what way is the process of accommodating diversity in the classroom similar to the general processes of problem solving or research?

List examples of assessment situations for which a teacher might use direct observation.

Varied Data Collection Procedures. When teachers or researchers ask a research question, they must decide what type of data would be most useful in answering the question, and the best way to gather those data. Three commonly used data collection procedures are helpful for different types of questions: direct observation, performance assessment, and self-report.

If researchers or teachers want to know how often, how long, or under what circumstances a behavior occurs, they might use direct observation techniques. **Direct observation** techniques require an observer to record those behaviors as they occur. If researchers wanted to know how often teachers ask questions during an hour, then it makes sense to use direct observation techniques. The researcher might sit in the back of the room or watch a videotape of the classroom. Each time the teacher asks a question, the researcher might make a mark on a recording sheet. If a teacher wants to know how often a student participates in class, she might move a token from her left pocket to right pocket with every instance of participation. Later, a count of the chips in the right pocket provides an estimate of the amount of participation.

If researchers and teachers want to know if students understand and can apply what they have learned, they might employ performance assessments. **Performance assessments** evaluate students' learning by having them complete a predetermined task. For example, if a science teacher wants to know if students can correctly prepare a microscope slide, then that teacher could evaluate students as they prepare a slide. If researchers want to know if students can apply some problem-solving skills, then they could have those students problem solve and observe the desired skills.

If researchers and teachers want to know how people feel, or what they are thinking, they may want to use self-report techniques. **Self-report techniques** ask people to report or discuss their perceptions, beliefs, and thought processes. For example, teachers or researchers who want to understand students' math problem solving might ask students to talk aloud about their thinking as they solve problems. If they want to know how students feel about themselves, they might ask them to fill out a self-esteem inventory or survey.

Obviously, the three techniques can be used for other purposes than those included in these examples, and other data collection techniques exist besides these three. The purpose is to show how a data collection procedure should be matched to the type of research questions being asked. As researchers, we want to make sure we collect the data we need for decision making.

Qualitative and Quantitative Data. Our questions determine the types of data collection techniques we use, and the data collection techniques determine the types of data that result from our procedures. There are two general categories of data, qualitative data and quantitative data.

Qualitative data are observations of essential characteristics or differences and often take the form of verbal descriptions of a person, group, or situation. **Quantitative data** are a measure of the quantity or amount of something and are expressed as numbers such as scores or counts.

Collecting qualitative data is more than recording observations; it also involves an interpretive process. Through this interpretive process, the researcher tries to understand the significance of observed events. In his book, *Life in Classrooms*, Philip Jackson (1990) noted that when elementary school students raised their hands to attract the teacher's attention, they often supported the raised right arm by placing their left hand just under the elbow. The significance attached to this observation was that the arm was heavy, and children must often keep their hand up for long periods of time before the teacher responds. These qualitative data were combined with others to help understand classrooms as crowded places with limited resources. Extending this interpretation still further, Jackson concluded that in elementary schools children must learn to wait and be patient.

The process of collecting quantitative data often begins by creating an **operational definition** that describes the characteristic being measured in terms of a score or some other type of numerical observation. For example, in assessing the effectiveness of a specific instructional method, the researchers Jane Stallings and Eileen M. Krasavage (1986) collected quantitative data on (a) the quality of instruction, (b) student engagement during instruction, and (c) student learning. To assess the quality of instruction, trained observers assigned a score to teachers' classroom performances. The students' engagement during instruction was operationally defined by the proportion of time students were observed to be *off-task* (chatting, disrupting, waiting, etc.) during a class period. The researchers addressed students' learning by the change in their performance on standardized achievement tests.

Quantitative and qualitative data each have advantages and disadvantages. Quantitative data can be analyzed using powerful statistical methods to find patterns and make comparisons across many observations. As a result, the conclusions drawn from quantitative data are often more generalizable. The **generalizability** of a conclusion refers to the number of different situations to which the conclusion may be applied. A disadvantage of quantitative data is that sometimes important details are lost.

For example, consider a teacher who is assessing his students' mathematical problem-solving skills. One approach might be to give the students a set of word problems and ask them to solve the problems showing all their work. The quantitative data that may result from this might be a score indicating the proportion of problems correctly solved, or partially correct. However, the information that might be lost



Direct observation is an important way to assess students' progress.

How are qualitative and quantitative data different?

is the types of errors that the students are making. Examining the students' responses qualitatively may reveal patterns that point to students' misconceptions about various parts of the problem-solving process. This kind of information may allow teachers to give specific help to some students or alert them to problems with the way the problem-solving concepts and skills have been taught.

Qualitative data allow the researcher to preserve the fine details of observed situations. This often leads to important and interesting insights about the situation being studied. The trade-off is that qualitative data are often so specific to a particular situation that the researcher can only draw valid conclusions about the particular person or group being studied.

Returning to the previous example, through a qualitative analysis of students' problem-solving performance a teacher may identify a student's misconception. But, do all the students in the class share the same misconception? Because many student differences may affect whether or not a particular student develops a similar misconception, it would be dangerous to assume that all the students have the same problem. The question cannot be answered without completing a qualitative analysis of each student's response to the problem-solving exercise.

Multiple Competing Explanations. To explain their data, researchers try to make logical connections between the data and other knowledge possessed by the researcher, including theoretical knowledge. Researchers want these explanations to be valid. **Validity** refers to the quality or the correctness of an explanation or a decision. Researchers try to increase the likelihood that their explanations are valid by considering alternative explanations for their data. By eliminating alternative explanations, researchers can have more confidence in the conclusions they draw from their research.

Once researchers have collected and analyzed data, they are ready to draw some conclusions. Frequently, the researcher's conclusion is an explanation of the results. The idea that the same observation or data can have multiple explanations is an important idea for both teachers and researchers. It helps us avoid jumping to incorrect conclusions.

Consider a hypothetical study of the effectiveness of a new classroom management program in a school. The program is introduced enthusiastically by the principal, who states that this program will work and that discipline referrals to the principal's office will be a measure of its effectiveness. Not surprisingly, referrals to the principal's office do decrease once the program has been instituted. Certainly, the decreased referral rate could be attributed to the program. However, another plausible explanation is that teachers stopped referring discipline problems because they thought it would make them look bad to the principal. What other data do you think could be collected to evaluate which of these two hypotheses is correct?

Teachers also must consider the various plausible explanations for their observations. If their explanations are incorrect, they may select interventions that don't match the problem. For example, one explanation for why a student does not turn in his homework is because the student doesn't care. Obviously, there are other explanations, such as the student doesn't understand the lessons, or his home is so chaotic he can't complete his homework. Can you see how failure to consider alternative explanations in this case might prevent you from making good choices about how to help your student?

Within-Group and Between-Group Differences. Within-group differences and between-group differences are ideas that are borrowed from statistics. The **within-group differences** are how much members of the same group differ from each other. **Between-group differences** are how much members of one group differ, on average, from members of another group. In research as well as in classroom teaching, it's helpful to remember that the within-group differences often equal or exceed between-group differences. This is particularly important for issues of learner diversity. For

example, although children with different ethnic backgrounds may differ in important (between-group) ways, there are also important differences within each ethnic group. Assuming all the children from the same ethnic group learn the same way can cause problems for both researchers and teachers. Researchers may miss important subgroups they need to study, and teachers run the risk of stereotyping individual students from a particular group.

The Complexity of Learning. Much of the research conducted by educational psychologists and teachers is focused on answering questions about how instruction influences student learning. Trying to answer this question is a complex problem. Many factors affect how and what a person will learn in any given situation. In an effort to make sense of this situation, Jenkins (1979) proposed a model of learning research called the theorist's tetrahedron or simply **the tetrahedral model**. The tetrahedral model is a model of four key instructional variables and how they affect each other. Figure 1.2 provides a drawing of the tetrahedral model modified for use with both research and classroom learning.



Each child has his or her own unique set of abilities and needs.



Focus on Learner Diversity

Cross-Cultural Research

The influence of culture on many aspects of a person's experience, including experiences in the classroom, is generally recognized. However, consideration of some of the problems and issues of cross-cultural research suggests that teachers should be cautious about making inferences about individual students based on their cultural background.

Leung (1989) points out that one of the difficulties in conducting cross-cultural research is observer bias. Bias in this case refers to the unintentional influence of the observer's own background on the conclusions based on the observations made. This type of bias is especially likely in situations in which the observer has a cultural background different from that of the person observed (Banks, 2001). For instance, a researcher may observe that students with high levels of academic performance ask more questions during class. The researcher may conclude that learners ask questions because they are interested in the subject and are therefore motivated to engage in more behaviors that result in learning. While this interpretation may apply in some cultures it may not apply to students from a culture in which questioning elders is considered impolite. If a learner from such a culture is having academic difficulty, attempting a motivational remedy may be ineffective or even harmful.

Errors may also be made when the general characteristics associated with a particular cultural group are ascribed to an individual from that culture. Researchers may fail to appreciate the amount of variation among the members of a particular cultural group (Padilla & Lindholm, 1995). Members of different cultural groups may vary widely in terms of the socioeconomic class, education level, language proficiency, and acculturation, all of which may affect the experiences that an individual brings to the classroom.

The interaction between people and their culture is complex. Both researcher bias and variation among the members of cultural groups make cross-cultural research complex and researchers' conclusions tentative. In the meantime, teachers should keep an open mind and avoid judging students based on their cultural backgrounds. In other words, teachers should treat all students as individuals with unique abilities and motives.

● **How might the effects of observer bias and variation among members of a culture affect a teacher's decision making? (For your authors' perspective on this question, go to the text website for this chapter.)**



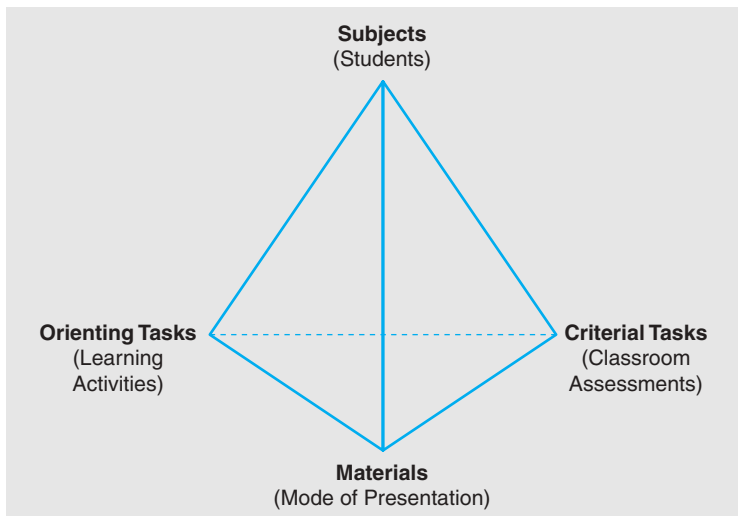


FIGURE 1.2 Adapted Tetrahedral Model (Adapted from Jenkins, J. J. (1979). Four points to remember: A tetrahedral model of memory experiments. L. S. Cermak & F. I. M. Craik (eds.). *Levels of processing and human memory*. Hillsdale, NJ: Lawrence Erlbaum Associates.)

Identify examples of the four variables of the tetrahedral model in a classroom you have recently observed.

A tetrahedron is a three-sided pyramid. In the model proposed by Jenkins, each of the four points of the pyramid is an important variable that affects learning. The four variables of the tetrahedral model are orienting tasks, materials, criterial tasks, and subjects. **Orienting tasks** refer to the type of instruction and learning activities being used by the teacher. For example, is the student to memorize a list, summarize the gist of a poem, and so on? **Materials** are the way in which the learning task is presented. Is it presented orally, on a computer, through earphones, and so on? **Criterial tasks** refer to the way in which learning is to be assessed. Will the teacher assess learning by asking learners to recognize learned materials, to recall learned materials, or to complete some more complex performance? **Subjects** refer to

the learners. In any learning situation it is important to consider any learner characteristics that might influence the learning process. Some of the important learner characteristics include abilities, interests, knowledge, and purposes.

A second important characteristic of the tetrahedron is that each point of the tetrahedron is connected to each of the other three points. Jenkins was trying to show with his model that a comprehensive understanding of classroom learning requires that we consider how each variable interacts with the other three. For example, the criterial tasks should make sense with the type of learning that is being studied.

Jenkins proposed the tetrahedral model as a way to conceptualize the key variables in learning research. However, the tetrahedral model can be adapted to describe and guide understanding of classroom situations. In your classroom setting the orienting tasks refer to the actions you expect of your students during a lesson. These expected actions might include taking notes, manipulating materials, or discussing a concept. Materials refer to the type of media you use in your lessons, for example, videos, diagrams, or books. It is interesting to note that as the teacher you may be considered part of the media from which your students are expected to learn. Criterial tasks refer to the way you test your students and assign grades. The subjects are your students and their diverse characteristics.

Both teachers and researchers can use the tetrahedral model to frame important questions. Both might be interested in how learner characteristics interact with different forms of media. For example, do some students do better with computerized instruction than others? Both might be interested in how learner characteristics interact with criterial tasks or assessment procedures. For example, are there important gender or cultural differences that affect performance on some forms of assessment? The tetrahedral model provides a useful framework for considering how different variables affect learning.

Theory, Research, and Textbook Reading

At the beginning of this chapter, it was noted that knowledge of research and theories allows educators to make better decisions. By knowing about and understanding theory teachers are better able to understand how and why their students learn. This allows them to make better decisions when planning lessons, when delivering a lesson, or when evaluating and improving on the effectiveness of a lesson. Knowledge of research allows teachers to understand the latest techniques and strategies and to incorporate those strategies and techniques into their own classrooms. However, it is not only teachers who can benefit from an understanding of learning;

Looking in on



I have made good progress in developing lesson plans for the unit on magnetism. Today Mr. Goodman and I began discussing how I would assess whether or not the students reached our objectives. I told Mr. Goodman that the one thing I have learned about this process is how all the decisions are related. Choosing an objective affects the kind of learning activities that make sense. He pointed out that the same thing applied to thinking about assessment. Assessment tasks had to make sense given our objectives and given the learning activities we used to help the students reach those objectives.

However, one of my concerns was whether the assessment would be fair to all of the students regardless of their backgrounds. Mr. Goodman suggested that we use the same strategy for developing fair assessments as we used for developing the lessons. First, we would develop an assessment

that made sense with regard to our objectives, and then we would consider which student differences might interfere with making a fair assessment of the students' progress. One approach was to consider what knowledge and skills beyond what was taught were required to successfully perform on an assessment. If some students lacked those skills, we might have to modify the assessment procedure or integrate the teaching of those skills into our lessons.

- How does the approach to designing lessons and assessment activities relate to the tetrahedral model presented in Figure 1.2?

Decision Point: What does the tetrahedral model suggest about the need for teachers to be flexible in planning and performance?

students may also benefit from such understanding. Good learners are, in a sense, their own teachers and make good decisions about what and how to study. By learning about how good readers learn from text you can help your students use their textbooks more effectively. In this section we present some theory and research that will help you as a learner use this text to your best advantage.

Mayer (1984, 1999) suggests that there are three different types of readers and that these types may be classified by how well they are able to learn from the texts they read. After reading a passage from a textbook some learners remember only a small amount of the information and are unable to apply the information from the reading to new situations. Other learners can remember many of the facts and details of what they have just read, but are nevertheless unable to apply the information to new situations. Finally, some readers remember the main ideas from the reading and apply what they've read to new situations. The difference in these three groups seems to be in the way they mentally process the concepts from the material they are reading.

Starting from a constructivist/information-processing theory Mayer (1984, 1999) suggests that meaningful learning depends on how well learners perform three cognitive activities: (a) selecting important information, (b) organizing the information selected, and (c) integrating the organized information with what they already know. Readers who fail to select important concepts within the text are able to remember very little of what they read. Readers who are able to select the important ideas are able to recall what they read, but if they fail to organize and integrate the new material, they will not be able to apply the material to new situations.

Selecting Important Information

Selection refers to the process of focusing attention. In any situation, what is learned is determined by how attention is directed. Things we attend to are likely to be remembered, and things that do not attract our attention are more likely to be forgotten. Whether or not a reader focuses on some idea or concept depends on the reader's knowledge and the characteristics of the material being read (Cook & Mayer, 1988). If the reader is familiar with a topic he or she is able to select important ideas from what is read. When the information presented is new, then the selections are likely to be less efficient.

Authors can assist readers unfamiliar with the material by providing cues within the text that signal the importance of the concepts presented (Mayer, 1984, 1999). In

the current text, we signal the importance of a concept by changing the font, for instance, using either bold or italicized letters, by separating important concepts by bulleting and by questions in the margins that can be answered by attending to specific facts or concepts within the text. As you read this text, attending to these cues will help you select those ideas that are most important. This in turn will prepare you for the next learning process, organization.

Organizing Information

Organization refers to the learner's creation of logical connections among ideas and concepts presented in the text (Mayer, 1984). Research suggests organizing the information presented in a text helps learners form a mental representation or model that increases their ability to recall and apply what they remember (Mayer, 1989). As with selection, organization also depends on the knowledge of the reader. But in addition to knowledge of the content, readers' abilities to organize the information from a passage also depends on whether or not they are able to recognize the underlying structure of the text. If readers are able to recognize these structures, they are better able to organize the new information.

Science texts, such as the one you are reading, have organizational structures that are different from those found in narratives. Cook and Mayer (1988) investigated whether training readers to recognize structure in scientific texts lead to better understanding. They found that even good readers benefited from learning how to recognize some of the common ways in which science books organize information. Some of the structures that appear in our text book include:

- *Generalizations.* This structure is built around a topic sentence that presents a main idea or concepts. Additional information in the passage describes various aspects of the main idea or provides examples. The key to organizing this type of passage is to identify the main idea and then understand how the additional information relates to that idea.
- *Sequence.* This structure describes a series of events or steps of a process. To organize information from this type of structure you first identify the topic, then list the steps in the sequence, and finally describe the change that occurs from one step to the next.
- *Classification.* This type of structure organizes facts, concepts, or events into categories. The structure is often hierarchical in that the passage may describe subcategories within categories. To organize this information you first need to identify the main class or category, then find the subcategories, and note what distinguishes each subcategory from the others at the same level.
- *Compare and Contrast.* These structures identify the similarities and differences between two concepts. To organize this structure, you first must identify the two concepts being compared. Then list their similarities and differences.

Looking for these structures and using them to organize the information being read have been shown to increase readers' ability to recall and apply what they have read (Cook & Mayer, 1988; Mayer, 1999). As you read this text, be on the lookout for these types of structures. Headings, bullets, diagrams, and tables have been included to provide you with clues to help you find these structures and organize what you are reading. Developing coherent organization for the facts and concepts you have learned allows you to take the next step toward meaningful learning, integration.

Integrating Information

Integration refers to actions that learners take to find connections between new facts and concepts and things that are already known (Mayer, 1984, 1993). As with selection and organization, the ability of readers to integrate new information depends on the reader's initial knowledge base. Obviously, readers cannot connect what they've learned with things they don't know, but even when readers have knowledge

that could be usefully connected with the information presented in a text, readers may still fail to make the connection. In this case, there are text features that can help readers remember what they already know and make the connections. Examples of some of the text features that serve this function are analogies, examples, cases, and questions that remind readers of previously presented materials. You will find features such as these in this text. Remember, the purpose of these features is to help you integrate the information being presented.

Selection, organization, and integration are all actions that are under the control of the learner. What this means is that the meaningfulness of what you learn depends on choices you make. This text provides some guidance for your choices and additional guidance is likely to come from your instructor. But ultimately, you must make the choice to learn and invest the effort needed to select, organize, and integrate what is presented.

What text features may help you as a reader integrate the important facts, concepts, and ideas within a chapter?

Teachers as Decision Makers

A major theme of this text is that teachers are decision makers. To give you a feel for how theories can guide decision making, you were asked to think about questions and issues as you read about the teachers presented in two cases. In this section we present our perspectives on the cases and then discuss how the learning principles of this chapter may be connected to applications in later chapters.

Maria Lucero's Decision Points

Planning a lesson always requires a consideration of characteristics that can be placed in one of two categories: (a) characteristics that affect the students' ability, and (b) characteristics that affect their motivation to learn. While different theories provide different perspectives on what these characteristics are and how they relate to students' performance in classrooms, there are some that seem to turn up in all theories. One of the characteristics that affects students' ability to learn is the things they've learned through their previous experiences. Previous experiences affect what people are able to do and what they choose to do. Therefore, in Maria's case she might want to know what experiences these kids have had, in and out of school, that might be relevant to her lesson topic.

One of Maria's concerns is that she provide a lesson that will help all her students learn regardless of their backgrounds or individual differences. The strategy recommended by her supervising teacher is to begin the lesson planning process by considering her instructional objectives, planning the lesson, and then making adaptations for student differences as necessary. This strategy can be applied to the planning of any lesson and is the perspective taken in this text. The idea is that not all individual differences are relevant to students accomplishing all instructional objectives. A well-planned lesson is likely to be effective for a majority of students. Once this initial plan is made, the teacher can consider modifications that address those student differences that are logically related to the objectives the students are to reach.

Mr. Henson and Maria are approaching their decision making from the perspective of behavioral learning theory, which is presented in Chapter 2. Different theories let you think about problems and decisions in different ways. One theory may be useful in one situation, whereas another theory may be more useful in a different situation. One of the purposes of courses in educational psychology and this text is to provide you with information about various psychological theories so that you choose the theory that will be most helpful to your own decision making.

Jeffrey Larkin's Decision Points

Jeffrey's situation is similar to Maria's, and once again Jeffrey, will need to think about what experiences his students have had, that will influence their ability to benefit from the learning activities. In addition, Jeffrey must consider how a sequence of lessons

fits together. The questions that Jeffrey will ask will depend on his beliefs about learners and learning. Learning theories are formal expressions of such beliefs, and because of the scientific process, are likely to be more precise and consistent in the way they formulate a decision-making situation.

The strategy for accommodating diversity used by Mr. Goodman and Jeffrey is very similar to the one applied by Maria and her supervising teacher. In both cases the goal of instruction is to assist all students to reach the objectives of the lessons. The theory chosen will help the teacher determine what activities students must engage in to reach the objectives, and which student characteristics will affect the ability of students to reach the lesson's objective.

The tetrahedral model is a meta-theoretical perspective of the learning situation. It provides teachers a way to think about instruction in their classrooms. The model suggests that there are a series of interacting variables that teachers must keep in mind as they make decisions in their classrooms. Because of the complexity of these interactions, much of the decision making of teachers is really a parallel process that requires the teacher to consider decisions in light of decisions already made. In addition, teachers must sometimes reconsider decisions made previously in light of later decisions.

Looking Ahead

The theme of this book is that effective teachers are good decision makers. In order to make good decisions in the complex, multidimensional environment of the classroom, teachers must be able to organize their thinking about students, learning, and instruction. Theories provide teachers with a valuable perspective, a frame of reference, from which to analyze and understand classrooms and students.

Once teachers understand a situation, they must make a decision and act on it. This means that teachers must formulate and implement plans. They must then monitor the progress of the plans to determine if they are working, and if any modification of the plans is required. Principles, derived from theories, provide a framework for the formulation of a plan of action.

A goal of educational psychology is to provide teachers with tools to assist in their analysis and understanding of classrooms. Developing theories and identifying principles of learning and instruction accomplish this goal. The purpose of this text is to provide prospective teachers with a foundation of theories and principles that will help them: (a) understand students and classrooms, (b) make decisions and formulate plans, and (c) monitor the effectiveness of their actions.

Name _____ Date _____

Chapter 1 Study Guide

Use this Study Guide to review and test your knowledge of key concepts introduced in this chapter and to search out further information on issues and topics raised in this chapter.



Key Terms



Review the following key words from the chapter and then connect to Research Navigator (www.researchnavigator.com) either directly or through this book's Companion Website to explore research on the topics as they relate to education today.

Chapter 1 Study Guide *continued*

Action research (p. 12)	Operational definition (p. 15)	Selection (p. 19)
Between-group differences (p. 16)	Organization (p. 20)	Self-report techniques (p. 15)
Criterion tasks (p. 18)	Orienting tasks (p. 18)	State (p. 7)
Decision points (p. 11)	Performance assessments (p. 14)	Subjects (p. 18)
Direct observation (p. 14)	Principle (p. 7)	Tetrahedral model (p. 17)
Educational psychology (p. 2)	Psychological construct (p. 6)	Theory (p. 4)
Epistemic value (p. 7)	Psychological process (p. 6)	Trait (p. 6)
Generalizability (p. 15)	Qualitative data (p. 15)	Validity (p. 16)
Implicit theory (p. 4)	Quantitative data (p. 15)	Within-group differences (p. 16)
Integration (p. 20)	Scientific theory (p. 4)	
Materials (p. 18)	Scope (p. 6)	

Alternative Response Items

1. What term best describes a set of formal statements describing relationships that explain events in the real world?
 - a. Implicit theory
 - b. Scientific theory
 - c. Principle
 - d. Psychological construct
2. Which statement best defines the psychological concept of a trait?
 - a. A mental characteristic that arises from a specific situation and changes when the situation changes.
 - b. A mental characteristic that remains relatively constant from one situation to another.
 - c. A mental process that is associated with a specific situation stops when the situation changes.
 - d. A mental process that remains constant from one situation to the next.
3. Which of the following is best thought of as a state?
 - a. Intelligence
 - b. Personality
 - c. Friendship
 - d. Emotion
4. Which of the following research topics would be examples of the types of research questions typically addressed by educational psychologists?
 - a. How does learners' prior knowledge affect their ability to problem solve?
 - b. How does the amount of teacher praise affect learning in a classroom?
 - c. How does frequency of reinforcement affect learning of new behaviors?
 - d. All of the above
5. Research consistently indicates that practice results in an increase in performance speed and a reduction in the error rate. What term refers to a statement that describes this relationship?
 - a. Scientific theory
 - b. Implicit theory
 - c. Principle
 - d. Psychological process
6. What term best describes the actions of a classroom teacher who develops an explicit description of a classroom problem, develops a plan for dealing with the problem, collects data to analyze the effectiveness of the plan, and then uses the results to deal with similar problems in the classroom?
 - a. Action research
 - b. Scientific research
 - c. Explicit research
 - d. Principle development
7. What term best describes data in the form of rich complex verbal descriptions?
 - a. Quantitative data
 - b. Qualitative data
 - c. Subjective data
 - d. Observational data
8. Mr. Garrison decides not to use a particular learning theory because it only seems suitable for understanding how students learn science. With which characteristic of a theory is he concerned?
 - a. Scope
 - b. Predictive accuracy
 - c. Internal coherence
 - d. External consistency
9. When comparing qualitative data with quantitative data, which of the following statements is most correct?
 - a. Conclusions made from qualitative data are less likely to be generalizable.
 - b. Conclusions made from quantitative data are less likely to be generalizable.
 - c. Conclusions made from qualitative data are less likely to be valid.
 - d. Conclusions made from quantitative data are less likely to be valid.
10. Which of the following is an example of data collected through self-report?
 - a. Test scores from a standardized achievement test.
 - b. A school psychologist's notes on a student's demeanor while taking an intelligence test.
 - c. The results of career counseling survey that indicates students' likes and dislikes.
 - d. Letter grades assigned to student presentations in a speech communications class.

Constructed Response Items

Short Answer/Completion Items

1. Teachers who have developed an intuitive understanding of what works and what doesn't work in their classes may be said to have a(n) _____ theory.
2. What are the steps of action research?
3. What are the five aspects of the epistemic value of a theory?
4. Traits and states are both examples of _____.

Essay Items

1. Describe the relationship between theories and research.
2. Discuss how knowledge of psychological theories might help teachers become better decision makers.
3. Compare and contrast the nature and utility of quantitative and qualitative data.

Practicing Your Decision Making

In this chapter, we've described three decision points in the teaching process. Because teaching and learning are closely related activities, it is possible to apply the same decision points to understanding the decisions that learners must make. Use this idea to analyze your own studying. What decisions must you make when you are planning to study, while you are studying, and when you assess the effectiveness of your study?

INTASC in Action

Use the following activity to think about how research and theory relate to INTASC Standard 9.

Standard 9: Reflective Practice and Professional Growth. Teachers learn a lot through their personal experience in the classroom. However, what are the limitations of relying solely on their personal experience for these types of decisions?

- A school district must decide whether or not to purchase a thinking skills curriculum.

- A school district needs to determine whether or not an educational program has been successful. How might educational research help with these decisions?



Web Resources

If you would like to read more about scientific theories and their applications, go to the following sites.

American Educational Research Association (AERA)
www.aera.net/index.htm

AERA is the premier educational research organization in the country. Visit their homepage to become familiar with the scope of research conducted in education.

American Psychological Society (APS)
www.psychologicalscience.org/

This is the homepage of the American Psychological Society (APS) and will allow you to become familiar with the psychological issues that may be investigated through empirical research.

Eisenhower National Clearinghouse Online
www.enc.org/topics/

ENC Online is a K–12 math and science teacher center dedicated to disseminating useful information and offering products to improve K–12 mathematics and science teaching and learning. The Educational Topics section of the site will help you locate articles that cover some of today's most important topics for math and science educators and parents.