

CHAPTER

1

Introduction to Interdisciplinary Instruction



Water tower experiment.

OVERVIEW

This chapter provides an introduction to the interdisciplinary approach to instruction and its theoretical foundations. The essential concepts reviewed in this chapter present a framework for the planning strategies that are offered in subsequent chapters of the book. They are the following:

- Distinguishing features of the interdisciplinary approach
- Comparing interdisciplinary, multi-disciplinary, and integrated instruction
- Interdisciplinary and multidisciplinary studies: Their organization and design
- The rationale for using interdisciplinary instruction with diverse learners in elementary and middle schools

Distinguishing Features of the Interdisciplinary Approach

In 1933, a method of teaching that was strongly advocated by John Dewey involved students in “projects,” investigations that required the use of more than a single academic discipline. Dewey believed that to be educative, it was necessary that such projects “present problems that awaken new curiosity and create a demand for information” (p. 218). Although it is not identical to Dewey’s *project method*, interdisciplinary instruction is a problem-centered approach to the study of topics, themes, and major questions that is based largely on Dewey’s ideology.

Although the interdisciplinary approach is not new, it has never been widely practiced in American schools. Today, however, there is renewed interest in this approach because of the need to find alternative ways to address state and federal mandates for improvements in student achievement and the quality of instruction. We are searching for ways to raise test scores without “teaching-to-the-test.” As a result, many teachers are incorporating aspects of interdisciplinary instruction in their teaching.

A central purpose of this introductory chapter will be to examine the features of the interdisciplinary approach and the rationale for its use in elementary and middle schools. It will be suggested that the interdisciplinary approach may well be an alternative method that can help address the need to improve the quality of education in our schools, enhance personal meaning, and better meet the needs of our diverse student population.

The initial discussion will describe several distinctive features of interdisciplinary studies. These studies are organized as comprehensive instructional unit plans that are prepared using either an interdisciplinary or multidisciplinary format. An interdisciplinary study has at least four unique characteristics:

- Interdisciplinary studies are organized in comprehensive interdisciplinary or multidisciplinary unit plans that focus on a specific topic, theme, or problem.
- Interdisciplinary studies are explored by using the skills and techniques—*the ways of knowing*—associated with any academic disciplines that can inform the topic, theme, or problem under investigation.
- Interdisciplinary studies place equal emphasis on the mastery of the *processes* involved in learning about a topic, theme, or problem and the mastery of *content*—concepts, facts, generalizations, and principles.
- Interdisciplinary studies accommodate student diversity by providing for the differentiation of student investigating and reporting techniques.

Comparing Interdisciplinary, Multidisciplinary, and Integrated Instruction

Although some educators consider *interdisciplinary*, *multidisciplinary*, and *integrated* instruction to be identical or nearly the same, others suggest that they differ in specific ways. Interdisciplinary and multidisciplinary instruction both involve the use of “two or

more academic subjects or fields of study” during the exploration of a topic or theme (Encarta World Dictionary, 1999, p. 933). Integrated instruction is similarly defined as “learning experiences organized around developmentally appropriate topics, themes, or concepts which provide opportunities for students to draw on standards from more than one subject” (Early Elementary Resources Guide, 1996, p. 23). It should be noted that the terms *interdisciplinary approach* and *interdisciplinary instruction* are used throughout this text; the two terms refer to the overall method involved in teaching both interdisciplinary and multidisciplinary units. Variations in the two unit types are explained in detail in Chapters 3 and 4.

Parker (2005) suggests that the three approaches have distinct characteristics. For example, although *multidisciplinary* instruction makes use of two or more disciplines when exploring a specific topic or theme, it maintains a somewhat greater focus on the individual disciplines involved in the study. Information from the different disciplines involved in a study is combined and reported only at the conclusion of the study (Chatterton, 1968). There is an even clearer distinction between the interdisciplinary and multidisciplinary approaches in fields other than education. For example, in the medical field, “Multidisciplinary research teams work in parallel or sequentially from their specific disciplinary base to address a common problem. Interdisciplinary research teams work jointly but still from a discipline-specific base to address a common problem” (Slatin, Galizzi, Devereaux Melillo, & Mawn, 2004, p. 62).

Integrated instruction suggests the incorporation of one subject within others. It is an instructional approach to curriculum. An example of this is found in programs that emphasize reading and writing—taught as literacy—across all disciplinary areas in the curriculum of a school; literacy skills are taught as integral and essential to each discipline. Another view of integrated instruction is found in the subject, social studies, in which several disciplines—history, geography, economics, and other social sciences—are *integrated* to form a new subject within which its several disciplines become integral parts.

Another feature of the integrated approach is that it may provide clear connections with students’ lives apart from the school environment because it involves “learning constructed in an innovative and purposeful way that shows relationships between what happens within and outside of school” (Williams-Boyd, 1996, p. 179). Beane (1997) also emphasizes the social aspects of an integrated approach in his definition of it as a curriculum that “is concerned with enhancing the possibilities for personal and social integration” (p. 19).

A report to the Minnesota State Legislature by the Minnesota Board of Teaching (2006) also attempts to clarify the differences between interdisciplinary and integrated instruction:

Interdisciplinary curriculum, which draws content from particular disciplines that are ordinarily taught separately, is different from integrated curriculum, which involves investigation of topics without regard to where, or even whether, they appear in the typical school curriculum at all. (p. 2)

Perhaps the most important feature the three approaches have in common is that they all involve attention to more than a single academic discipline. Therefore, they

are all *interdisciplinary*. In Chapters 3 and 4, the design and planning of interdisciplinary units—which can be used at all grade levels—and multidisciplinary units—which are especially well-suited for departmentalized middle schools—are explained and illustrated with examples. The comparison of some of the main differences between these two unit types is shown in Figure 1.1.

FIGURE 1.1 A Comparison of Interdisciplinary and Multidisciplinary Units.

<i>Description</i>	<i>Interdisciplinary Unit Design</i>	<i>Multidisciplinary Unit Design</i>
The unit focuses on the study of a topic, theme, or problem.	X	X
The unit is appropriate for elementary grades K–3.	X	
The unit is appropriate for elementary grades 4–6.	X	X
The unit is appropriate for departmentalized middle school grades 5–8.		X
The unit is planned by a classroom teacher.	X	
The unit is planned by a departmentalized team of teachers.		X
The research process guides the development of the unit and its procedures.	X	X
Procedures of the unit parallel interdisciplinary research in fields other than education.	X	
Procedures of the unit parallel multidisciplinary research in fields other than education.		X
Students are actively involved in developing questions and suggesting areas to be researched.	X	X
The topic, theme, or problem can be subdivided for research either by discipline or sub-topic.	X	X
The unit design provides for a series of lessons and activities related to the unit topic, theme, or problem.	X	
The unit design can make provisions for student committee research.	X	X
The unit design provides for disciplinary instruction by a team of teachers.		X
Instruction in all or most disciplines is provided mainly by the classroom teacher.	X	
Instruction in each discipline is taught separately by members of a departmentalized teaching team.		X

Interdisciplinary and Multidisciplinary Studies: Their Organization and Design

The interdisciplinary approach involves students in the exploration of comprehensive interdisciplinary or multidisciplinary studies of topics, themes, and problems. Those studies have commonly been organized as *activity-centered* units for elementary and middle school students. Planning activity-centered units typically begins by first determining the specific lessons and activities that will make up the unit study. Unit objectives and assessments follow.

An alternative to activity-centered planning is *backward design*, a planning process developed by Wiggins and McTighe (2005). Backward design is a partial reverse of activity-centered planning. It involves consideration of unit objectives and assessments before deciding the specific lessons and activities the unit will include. The lessons and activities used will address those objectives and accommodate the assessments to be included. According to Wiggins and McTighe, backward design involves three stages (pp. 17–28).

Stage 1: Identifying the enduring understandings, learning standards, and essential questions of the unit

Stage 2: Determining unit assessment strategies

Stage 3: Planning the unit learning experiences

Backward design emphasizes the long-term development of *enduring understandings* and *big ideas*. “A big idea is a concept, theme, or issue that gives meaning and connection to discrete facts and skills” (p. 5). Scientific concepts like *adaptation* and *natural selection* are examples of big ideas. Backward design unit planning engages students in the exploration of the essential questions to which the unit topics, themes, or problems are related. This is a particularly appropriate for interdisciplinary and multidisciplinary unit planning.

Both backward design and activity-centered planning have positive attributes and some potential drawbacks. Activity-centered planning is familiar to most teachers, and students usually enjoy the activities that are planned for them. However, unit assessments may tend to be limited to the development of the isolated knowledge that the individual lessons and activities develop. Assessments may not be adequately related to or assess the major unit concepts. It is possible that activity-centered plans may also focus so much on the separate lessons and hands-on activities that the unifying, interdisciplinary concepts of the unit may not become clear to students.

Backward design is a logical and intellectually sound planning process. Following it helps to ensure that all components of the unit plan are related to one another, including the learning standards, objectives, essential questions, and assessments. However, backward design is not as familiar as activity-centered planning is to many teachers. Also, some teachers may find determining the big ideas and the enduring understandings for their units difficult and evasive. Even Wiggins and McTighe warn us about this with,

We predict that you will be somewhat disturbed by how hard it is to specify the understandings and what they look like in assessment, and how easy it is to lose sight of goals related to understanding in the midst of planning, teaching, and evaluating student work. (p. 9)

The unit planning strategies described in Chapters 3 and 4 of this text for interdisciplinary and multidisciplinary units combine features of both activity-centered and the backward design planning processes. The planning process that will be followed in those chapters involves the following components:

- Identifying the unit topic, theme, or problem
- Determining the unit objectives:
 - Learning standards
 - General objectives (knowledge, skills, and dispositions)
 - Essential questions (thought-provoking, often divergent questions)
- Determining the unit assessment plan
- Developing the unit learning plan: describing the lessons, activities, and strategies that will be designed to address the unit objectives

See Figure 1.2 for examples of topics, themes, enduring understandings, and essential questions.

Regardless of the approach, all unit plans need to address the learning standards recommended by national professional organizations or that are required by state departments of education and local school districts. The organizational structure of the unit needs to encourage students to use any disciplines—subjects or domains—that can help them to gain a better understanding of the topic, theme, or problem they will investigate.

While many interdisciplinary and multidisciplinary studies are organized and planned to explore topics, themes, or problems associated with social studies, units can be planned that begin with any discipline, subject, or domain. An interesting and exceptionally well-developed example of an interdisciplinary study that begins with the arts and evolves to include history, literature, science, and other areas of the curriculum is *Spaces and Places* (Pappas, Kiefer, & Levstik, 2006). This is a unit for students in an upper elementary grade or middle school.

Much earlier, Elwyn Richardson (1969), an elementary teacher in New Zealand, also used the arts as the basis for his unusual interdisciplinary, crafts-oriented program. Richardson's students explored their natural rural environment and completed art projects made from raw materials found in that environment. Richardson also involved his students in interdisciplinary literacy, science, and mathematics activities related to their explorations and findings.

Using the Skills, Techniques, and Ways of Knowing in Applicable Academic Disciplines

While students are involved in studying holistic topics or themes, they are exposed to additional skills and ways of knowing inherent in the different disciplines used to investigate those topics. Although we must determine the understandings and essential questions of a study in advance, we need to encourage students to participate in the planning process. We do this by raising questions they would like to include about the topic, theme, or problem of the study. Guided by the essential questions and the topical questions they have added, students must think critically about the issues involved. They also learn to apply skills and techniques from various disciplines that can help them with their research.

FIGURE 1.2 Examples of Topics, Themes, Enduring Understandings, and Essential Questions.

Focus of Interdisciplinary Studies	Examples	
	<i>Lower Elementary Grades</i>	<i>Upper Elementary Grades and Middle School</i>
TOPICS	<ul style="list-style-type: none"> –Myself and Others –My Family and Other Families Now and Long Ago –My Community and Other United States Communities –Communities Around the World –Local History and Government 	<ul style="list-style-type: none"> –History and Government of the United States –History and Government of Canada –Latin America –Eastern Hemisphere Nations –Exploration and Colonization of the Americas
THEMES <i>Note that themes can span all grade levels.</i>	<ul style="list-style-type: none"> –Changes –Culture –Human Systems –Interdependence 	<ul style="list-style-type: none"> –Human Needs and Wants –Places and Regions –Economic Systems –Technology
ENDURING UNDERSTANDINGS	People make choices due to unlimited needs and wants and limited resources.	Constitutions, rules, and laws are developed in a democratic society to protect its citizens.
ESSENTIAL QUESTIONS	<ul style="list-style-type: none"> –Why has it been difficult to stimulate recycling in some communities? –How can we help others in our community? –What is a friend? 	<ul style="list-style-type: none"> –How can we prove global warming? –What were the major causes and effects of European exploration? –In what ways can we cope with our diminishing natural resources?

Note that the above examples are common topics that appear in many state curriculums.

The interdisciplinary approach provides students with many natural opportunities to observe the connections and to note relationships among the various disciplines involved in their studies. Jacobs (1989) emphasized the importance of this characteristic for teachers as well as students, suggesting that teachers need to intentionally “apply methodology and language from more than one discipline to examine a central theme, issue, problem, topic, or experience” (p. 8).

Emphasis on Process and Content

For many years, educators have debated the relative importance of process and content. Disciplinary, subject-centered instruction often tends to focus on helping students acquire *content*—facts and general information. Another distinguishing feature of the interdisciplinary

approach is that not only is there an emphasis on important *content*, but the approach also attributes equal significance to learning the *processes*, *skills*, and *ways of knowing* that are unique to the different disciplines, subjects, or domains.

Although no consensus exists among educators about which focus is more important, the *processes* involved in inquiry and scientific investigation are clearly important and useful in interdisciplinary and multidisciplinary studies. Teachers who use this approach tend to agree with Dewey's (1916) advice that equal importance be attributed to content and to process in student investigations. It is assumed that students need to amass facts and develop concepts while they become proficient in the application of important academic learning processes that then "become the models [they will use] for later exploratory behaviors" (Gardner, 1993a, p. 31). In this way, students gain insights about and practice the different ways of knowing.

At upper elementary and middle school grade levels, students undertake more complex forms of inquiry, using processes that naturally stimulate their higher level thinking and reasoning skills. In addition to gaining knowledge and practicing the learning processes, all students have numerous and meaningful opportunities through authentic investigations to practice their reading, writing, and computational skills.

Differentiation of Student Investigating and Reporting Alternatives

The interdisciplinary approach accommodates students' diverse strengths and learning preferences and offers many opportunities for the differentiation of instruction. Tomlinson (2001) describes four elements to be considered in the differentiation of instruction: 1) the *content* that is taught and the ways students are given to develop it; 2) the different opportunities students are given to *process* information; 3) the various ways students are encouraged to complete their culminating *products*; and 4) the way the *learning environment* is constructed to facilitate students' differing ways of working to gain information. We know that students do not all learn, nor are they able to demonstrate what they have learned, in the same ways.

"Designing and facilitating multiple paths to reach defined learning goals is one of the hallmarks of successful differentiation" (Carolan & Guinn, 2007, p. 45). When we plan for interdisciplinary studies, students are afforded many natural opportunities to follow "multiple paths" and use a variety of materials and equipment. For example, some students are capable of reading to gain information on a topic; others may need visual materials to process the same knowledge effectively. Others may profit more from other activities, such as conducting interviews, performing Internet searches, or using WebQuests. (A WebQuest is a carefully planned set of steps to be followed by students when they investigate a specific topic using the Internet.)

Differentiation in the interdisciplinary approach permits the students alternatives and opportunities to prepare their culminating reports in a variety of ways, including writing reports; organizing panel discussions or debates; presenting dramatizations; designing PowerPoint presentations; and preparing art projects. In early grades, some students may be able to report their findings by planning a puppet show, performing a dance, and so on.

In summary, features of interdisciplinary instruction that distinguish it from other educational approaches are the following:

- Units of instruction are organized to investigate topics, themes, problems, enduring understandings, essential questions, important issues, or concepts.
- The skills, techniques, and ways of knowing in applicable academic disciplines are all employed in the unit study.
- Equal emphasis is placed on the value of the processes involved in learning and the content knowledge that students gain.
- The interdisciplinary approach provides for differentiation of investigating and reporting methods that address student diversity.

The Rationale for Using Interdisciplinary Instruction for Diverse Learners in Elementary and Middle Schools

Why should an interdisciplinary approach be used for students in elementary and middle schools today? Before answering this question, consider how a group of children are likely to receive instruction about a specific social studies topic in a school with a conventional approach to its curriculum. Observe how one group was taught about the island nation of Japan during an eight-year period:

In the first grade, children usually study about families. Stories about families from several cultures around the world are read to them; one story might be about a Japanese family. A music teacher may have taught the children a Japanese folk song in the second grade and a traditional Japanese dance in the third grade. In the fourth grade, an art

teacher may have had the children experiment with origami. The children also study geographic regions of the world in fourth grade, including some discussion on islands and island nations. Finally, in middle school, the children study aspects of Asian cultures, including the Japanese culture.

The sequence in the description is characteristic of a traditional, or subject-centered, approach to a social studies topic. Instead of being provided with an interdisciplinary inquiry of Japan and Japanese culture at a specific grade level, the students are offered isolated bits of information in a fragmented study that are spread across eight years. Most lessons and activities are taught to the entire class at the same time, and typically, all students are required to meet the same requirements; there is little differentiation of instruction.

At first, it may appear logical to approach a topic this way. We know that adults can internalize related information received over a period of time. However, we also know that it is more difficult for children to do so, particularly because of the differences in their cognitive development and diversity.

The general assumption of the approach described in the Japan example is that students are all able to learn in the same ways and to show what they have learned by completing identical assignments. There is little consideration for what is known about cognition in young children. For example, in 1975, Piaget and Inhelder wrote that thinking in young children is often *centered*; in the child's mind, isolated concepts and bits of information remain unrelated. Later, Gardner (1991) suggested that we know that the mind of a young child—5 to 7 or even 10 years old—is intuitive, resourceful, highly imaginative, and creative. We also know that the same mind is limited by a “tendency to stereotype and simplify. . . . It contains a swirl of symbols, scripts, theories, and incipient notions and concepts, which can be involved in appropriate ways but which also remain to be sorted out in a more secure manner” (pp. 110–111).

In view of these cognitive limitations, an important reason for using an interdisciplinary method is that by using that method, students investigate topics holistically, and there are opportunities to differentiate both in the ways students gain information and show what they have learned. The contrast with the traditional method described in the Japan scenario is evident. As a result, young students may be less likely to misinterpret and more likely to make better sense of their world.

Learner Diversity and Multiple Intelligences—Theories of Sternberg and Gardner

An especially strong argument for differentiation of instruction is evident in Sternberg's (1985) theory. Sternberg proposed that we all possess three kinds of intelligence—*analytical, creative, and practical*; these are accommodated particularly well in interdisciplinary instruction. Sternberg (2006) has also explained the importance of recognizing the diversity that exists among the ways learners process information. Sternberg has found that this is particularly important to recognize in non-mainstream cultural groups, and he supports his theory by citing examples of several cognitive and practical differences he has found among students in Alaskan Eskimo and Kenyan cultures.

Gardner's *multiple intelligences* (MI) theory expands upon Sternberg's three kinds of intelligence (1983, 1993b). Gardner initially proposed that there are at least seven areas of intelligence. Later, he added an eighth intelligence, *naturalist intelligence*, and a ninth, *existential intelligence*, both of which have since been analyzed (Kane, 1999). At first, Gardner was reluctant about including existential intelligence, and he considered it to be a *half-intelligence* mainly because the part of the brain that deals with existential questions was unclear (Gardner, 1999; Smith, 2002). Even so, Gardner (1999) seems to suggest that existential intelligence meets the criteria he has established for an intelligence area. He states: “Perhaps surprisingly, existential intelligence scores reasonably well on the eight criteria. . . . Although empirical psychological evidence is sparse, what exists certainly does not invalidate the construct” (p. 64), and he concludes that “existential intelligence . . . may well be admissible” (p. 64).

It is clear that both Gardner and Sternberg maintain that students process information in multiple ways. An interdisciplinary approach can facilitate these ways because students routinely use multiple sources of information to investigate topics and are encouraged to choose from a variety of media and methods to report their findings. In Gardner's

MI theory, human beings operate in the nine—and possibly more—intelligence areas listed in Figure 1.3.

Gardner suggests that his “theory gives educators a way of thinking about individual gifts and how to accommodate teaching to them” (Brandt, 1988, p. 34). Thus, if students are developing in any or all of these intelligence areas, they need opportunities to grow in the others. Clearly, such opportunities will occur naturally when educators link “the multiple intelligences with a curriculum focused on understanding” (Checkley, 1997, p. 11). This is a primary focus of the interdisciplinary approach. Thus, replacing isolated, subject-centered, disciplinary instruction with interdisciplinary methods in elementary and middle schools may help to facilitate optimal development for our students who have diverse abilities and ways of learning.

Although Gardner’s theory is widely accepted among educators, learning theorists, sociologists, and psychologists, its acceptance is not universal. For example, Allis (1999) cites a number of social scientists who hold more traditional views of intelligence and who disagree with multiple intelligences theory. Even though there are concerns about MI theory, it continues to have considerable support among other educators and learning

FIGURE 1.3 Gardner’s Multiple Intelligences.

<i>Intelligence</i>	<i>Strength</i>
<i>LINGUISTIC, OR VERBAL, INTELLIGENCE</i>	The ability to use language well and to learn through verbal methods such as reading, note taking, listening, writing summaries and reports, and conducting interviews
<i>LOGICAL– MATHEMATICAL INTELLIGENCE</i>	Using mathematics and logic, forming hypotheses, and conducting scientific inquiries
<i>SPATIAL INTELLIGENCE</i>	Detecting spatial relationships, noticing likenesses and differences visually, creating art and design, and thinking by visualizing in pictures
<i>MUSICAL INTELLIGENCE</i>	Using music as a tool for thinking, demonstrating feelings and attitudes with music, and associating thought with music
<i>BODILY– KINESTHETIC INTELLIGENCE</i>	Using the entire body to help master or to explain ideas and concepts
<i>INTERPERSONAL INTELLIGENCE</i>	Understanding others, working effectively and cooperatively with other people, and sharing tasks and responsibilities
<i>INTRAPERSONAL INTELLIGENCE</i>	Understanding oneself and being able to analyze one’s personal performance in order to grow and change
<i>NATURALIST INTELLIGENCE</i>	Recognizing flora and fauna, discriminating among them, and having a sensitivity to phenomena in the natural environment
<i>EXISTENTIAL INTELLIGENCE</i>	Having interest in and raising questions about the meaning of life, death, and why things are the way they are

theorists, including Sylwester (1995, pp. 108–116) who prepared a comprehensive overview of MI theory indicating that it is supported by research on the human brain. Also, many teachers find MI theory to be one that is comparatively easy to relate to and apply practically in their classrooms.

Campbell, Campbell, and Dickinson (2004) have suggested that MI theory supports the interdisciplinary approach: “With MI-based teaching, discrete subject matter distinctions begin to dissolve, enabling teachers to plan interdisciplinary units” (p. 289), and interdisciplinary lessons, ones “that cross subject-area lines,” accommodate students’ multiple intelligences (Moran, Kornhaber, & Gardner, 2006, p. 25).

Social Interaction: Theories of Piaget and Vygotsky

Students also need opportunities for the kind of social interaction and guidance that teachers and capable peers can provide naturally in interdisciplinary studies. Piaget (1970) believed that social interaction between students and teachers was necessary to develop arbitrary social concepts, but he also cautioned about the use of too much direct verbal instruction or reliance on demonstrations in teaching, especially with very young children. Piaget believed that these approaches might inhibit the development of operational (generalizable, useful) knowledge. In particular, Piaget expressed concern about the use of excessive direct instruction in developing scientific and mathematical knowledge.

It is possible that Piaget may have attributed less importance to the value of the kind of social collaboration that is typical with interdisciplinary methods in fostering the development of some concepts. The value of social interaction in promoting optimal learning is clearer in Vygotsky’s (1978, 1986) premise of a *zone of proximal development* (ZPD). According to Vygotsky, the ZPD is “the distance between the actual developmental level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers” (1978, p. 86). In the ZPD, Vygotsky is plainly suggesting the importance of instructional methods that promote learning through social interaction among students, teachers, and peers.

Learning theorists agree with Vygotsky about the value of both culture and social interaction in the process of knowledge acquisition. A comprehensive discussion of Vygotsky’s theory and the significance of social interaction for student learning is provided by Wertsch (1985), and Case’s (1985) Canadian studies of early development also support Vygotsky’s theory about the impact of social interaction and instruction in early childhood on children’s cognitive development. Case also suggests that interdisciplinary instruction promotes children’s problem-solving skills.

In *Acts of Meaning*, Bruner (1990) also discusses the importance of social interaction and the value of adult instruction and *scaffolding*—providing a temporary support system for students until they are able to work independently. In their review of Vygotsky’s theory and its implications for classroom practice, Forman, Minick, and Stone (1993) provide a compelling argument for interdisciplinary studies by suggesting that such studies provide natural opportunities for students to interact with one another as well as with their teachers. The authors also stress that this kind of social interaction is essential for optimal learning.

Support from Research on the Human Brain

The interdisciplinary approach is also supported by findings from research on the human brain. In recent years, educators have been examining those findings to determine the need for changes in curriculum and instructional practice. As a result, several educators have prepared research-based materials that can be helpful for teachers.

Robert Sylwester's (1995) straightforward overview of the brain and its functions is a succinct yet comprehensive discussion of this important topic. In his book, Sylwester explains the value of helping students to make connections and detect relationships between what they are taught and their personal experiences. He also mentions teaching techniques that help to foster these links and which are often used by interdisciplinary teachers, including "debates, role playing, simulations, songs, games, films, and novels" (p. 103). Sylwester also recommends activities, such as "student projects, cooperative learning, and portfolio assessments" (p. 132), all of which address diversity in learners and are activities that are routinely found in interdisciplinary instruction.

We also know that learning is more likely to occur when the brain is not threatened. Students need to be willing to risk making mistakes in a classroom environment where they feel that they will not be ridiculed when wrong. Such a safe learning environment can also encourage students to be more honest about what they know and do not know. Honesty and willingness to admit errors are fostered in an atmosphere where the brain is not constantly defending itself from ridicule, either from peers or teachers. Willingness to admit one's errors is one of several *dispositions* or *habits of mind* that also include openness to new ideas, having a questioning attitude, being persistent at tasks, and so on (Heck & Roose, 2005; Wiggins, 1993). These are all ways of thinking that are critical to students' success and which can be fostered through interdisciplinary instruction.

Another implication for the interdisciplinary approach from human brain research indicates the need for holistic studies. It has been found that information learned in isolation tends to remain in isolation and appears to be more difficult for young students to process, recall, and use (Hardiman, 2001; Lowery, 1998; Westwater & Wolfe, 2000).

Although research on the human brain has been the topic of a number of conferences for educators and has stimulated the production of new curriculums and instructional materials, it is important to realize that there is yet no consensus about its educational implications. For example, Jorgenson (2003) has voiced concern about developing curriculum and materials based on human brain research. He recommends that "educators must recognize the limitations of the fledgling cognitive-neuroscience movement as it currently can contribute to our profession" (p. 364). Willingham (2006) has voiced similar concerns about endorsing changes in teaching based on brain research until there is evidence that such changes will make a difference.

Even though the debate over the educational applications of brain research is likely to continue, Eric Jensen (2005) reminds us of findings from brain research suggesting that the brain makes associations and constructs meaning better when it finds patterns like those that interdisciplinary, holistic methods provide. Jensen feels that, in general, interdisciplinary instruction is more meaningful at all age levels because it helps students to note relationships among the various disciplines for the topics they study. He also suggests that interdisciplinary studies may be especially meaningful to older students because they may be more capable of detecting patterns due to their greater knowledge base.

Benefits to Our Diversity of Learners and Students with Special Needs

Another important reason for using the interdisciplinary approach is its effectiveness as an alternative to traditional approaches for students with special needs. In 1975, Public Law 94-142, the Education of All Handicapped Children Act, was enacted, mandating that children with handicapping conditions be placed in the least restrictive instructional environment possible, preferably in regular classrooms. To comply with this regulation, classroom teachers began working with children who were previously taught in special classes apart from other students. At that time, most teachers had little or no preparation for their new role, so they had to experiment on their own and try creative approaches and methods in order to include—not just accommodate—their “new” students.

Many children with special needs must still spend part of the school day in special assistance settings outside their regular classrooms. Their frequent absence from the classroom can make including them in the regular program of activities difficult for teachers. The flexibility afforded by the interdisciplinary approach can help teachers overcome this problem to some extent. Because interdisciplinary units are usually completed over a period of time, not all children need to be present in the classroom at the same time, especially during periods of individual and group research and project development. Those who leave the room for special help can rejoin their classmates and work on unit assignments when they return as well as at other times during the day.

Differentiation of research and reporting techniques is also fostered during an interdisciplinary study. Students are encouraged to use a variety of resources to locate information, so those who have difficulty reading for information can use alternative methods. Such methods include interviewing; studying pictures; listening to recorded books on CDs or audiotapes; viewing DVD or videotaped programs, teacher-prepared computer or DVD presentations; films; and filmstrips. Students can also interact with computer software programs and Web sites on the Internet. Materials can be selected carefully to ensure that minimal reading is required. Reports need not be limited to writing papers or answering questions from a textbook selection. Students can use alternatives that interest them, such as performing demonstrations, painting pictures and murals, and preparing dioramas and other constructions, in order to show the concepts they have gained.

The Use of Multiple Sources of Information

In contrast to the conventional approaches, no single textbook is used exclusively in an interdisciplinary program. Classrooms are equipped with textbooks from many publishers on topics and themes in social studies, science, language arts, and other disciplines. In each classroom, the available materials are written at, below, and above grade level to accommodate as many ability levels as possible. Instead of relying on one or two sources, students consult multiple sources, helping to ensure that they will gain a more inclusive view of history and historical events.

An adequate supply of textbooks is needed for students; in fact it is often helpful to have texts in social studies and other disciplines from several different publishers available for students to use. However, textbooks alone are not sufficient for interdisciplinary studies

because they “belong in the reference category, along with encyclopedias, dictionaries, and thesauruses” (Daniels & Zemelman, 2004, p. 36). Students need access to other materials, such as trade books—single topic non-fiction books—and literature related to unit topics. Multimedia items, including DVD and video programs, as well as access to the Internet can provide up-to-date information for students. Some items can usually be borrowed from public and school libraries and media centers.

A variety of materials also helps to ensure that students have access to information about the contributions of all segments of our population. Some topics require that we have resource materials in the classroom that adequately address the diversity of our people as well as historical issues, such as slavery, the Holocaust, the Armenian genocide, as well as human rights issues and world problems that are sometimes given minimal treatment or neglected in a single textbook.

The significance of this kind of exposure for students is effectively dramatized in a statement by Milagros Henriquez (1995) as she accepted an award at her graduation for outstanding work related to multicultural education. “Multicultural education is *basic* education for students in the twenty-first century.” In our multicultural society, the interdisciplinary approach offers students access to information that only a rich variety of materials can provide.

Meaningful Applications of Ways of Knowing and Skills in the Academic Disciplines

Most real problems in life are investigated or solved by using more than one discipline. For example, when we purchase a new home, economics is a major factor but not the only one. Location (geography), architectural style (art), nearby educational facilities, and other community resources also need to be considered before a final decision can be made. Interdisciplinary instruction routinely and realistically follows this example by encouraging students to use the ways of knowing associated with any disciplines that can be applied logically to the topics they investigate.

We are all concerned about students’ academic skills and with providing sufficient practice in those skills. In many schools, workbook and duplicated exercises may have little or no relationship to the unit studies students are pursuing at a given time. If so, those exercises are simply practice-for-the-sake-of-practice. We know that skills practice as well as the investigation of “almost any subject is best taught when it is needed to accomplish something else” (Wakefield, 1993, p. 137).

The interdisciplinary approach responds to Wakefield’s suggestion because it always provides for the application of skills in meaningful contexts. As topics, themes, and problems are explored, students find that they *need* to use their inquiry skills, *need* to read for information, *need* to compose e-mail, letters, and reports, and they often *need* to give oral presentations to their class. Students use mathematical skills as they prepare charts, graphs, and maps; they make use of technology to search for information or invent new designs for their projects; they follow the scientific method while working on related science experiments and activities; and they explore drama, music, and dance and gain experience with various art media. In fact, the interdisciplinary approach can provide so many spontaneous, purposeful opportunities for students to practice their academic skills,

prepare projects, and work with construction materials that teachers who have previously used artificial duplicated materials and other conventional practice items may no longer feel the need to use them as often.

Other studies have found that the interdisciplinary approach results in greater enthusiasm on the part of teachers, students, and their parents, higher attendance rates among students, and improvement in standardized test scores (Bolak, K., Bialach, D., & Dunphy, M., 2005). Teaching teams using the interdisciplinary approach in middle schools have expressed greater job satisfaction and have found that their students achieve at higher levels [Flowers, Mertens, & Mulhall (1999)].

In summary, the rationale and support for interdisciplinary instruction includes:

- Gardner's theory of multiple intelligences and the importance of social interaction in the learning process
- Support from research on the human brain
- Benefits to our diversity of learners and students with special needs
- The benefits derived from the use of multiple sources of information
- Meaningful applications of the ways of knowing and skills in the academic disciplines
- Increased enthusiasm of teachers, students, and parents and increases in scores on standardized examinations

Summary

The discussion in this chapter has attempted to clarify the underlying theoretical base and rationale and to establish the framework for designing interdisciplinary and multidisciplinary units of instruction. Chapter 2 will focus on requirements of interdisciplinary teachers and challenges to interdisciplinary programs in the schools today.

ACTIVITY

Read the following description of how two fifth grade teachers introduce a new unit on *Westward Expansion* to their classes. Consider the distinguishing features of the interdisciplinary approach that have been outlined in this chapter and the main differences between the ways the two teachers approached the same unit study.

Ryan Jackson teaches fifth grade in an urban elementary school. His students are ready to begin studying a new unit on an important topic in American history for the next several weeks. During the usual time for social studies, Mr. J. began his introduction to the topic with several questions. First, he asked the students to relate anything they know about how our country grew from the original thirteen states to its present size. One student, Emily, said that she thought that new land was bought by the United States after the Revolutionary War. Another student, Bryan, said he believed that there were wars that were fought to take over new land. Other students offered several additional ideas. While the students were contributing their thoughts, Mr. J. made a list of what the students said they knew or thought they knew on the board at the front of the room. He recorded what the students said without editing their responses or commenting about the ideas they expressed.

After the students had no additional contributions, Mr. J. stated that the new study the students would be pursuing was one that would explore what is known historically as the period of *Westward Expansion*, an important topic in American history. Then, he asked the students what they would first need to do to prepare for the study. One student, Jimmy, said that they would need to search the Internet for information. Aisha, another student, said that they would need to know what they wanted to find out before they could do that. Then another student, Katherine, said she agreed with Aisha and that they would need to make a list of some questions before they would be able to begin their study. At that point, Mr. J. explained that he also agreed that the class would need to prepare questions for the study and that making such a list would be the first task.

Mr. J. then gave the students an assignment in preparation for the next social studies period. Everyone was asked to make a list of three questions that he or she thought would be helpful in exploring *Westward Expansion*. During the next research period, their questions would be listed on the board, and discussion would be held to determine the most important questions that the class would research. He also explained that, at that time, a decision would also have to be made about how to approach the research, and he suggested two possible ways to proceed. The questions could be divided among several student committees, or everyone could undertake researching all the questions. To end the lesson, Mr. J. asked students if they had any questions about what they needed to do before the next class.

In another fifth grade class, Grace McAllister was also beginning a new study of *Westward Expansion*. She started the first lesson during her regular time for social studies by asking the students to take out their social studies textbooks. When the students appeared to be ready, Ms. M. told the students to turn to page 168 in their books, and then she asked one of the students, Michael, to read the title of the chapter on that page. Michael read: “Westward Expansion: The Growth of the Union”. Ms. M. then asked the students if they had any ideas about what the title meant. One student, Allison, said that it probably meant that people were going west. Another student, Shannon, said that it could mean that our country is growing in some way. Several other students offered ideas that were similar.

Next, Ms. M. told Anthony, another student, to begin reading the chapter aloud. After he had read one paragraph, another student was asked to continue. The entire chapter was read in this manner—each student reading a paragraph at a time. At the end of the reading, the students were told to take out a sheet of paper and to answer a set of 10 questions about Westward Expansion at the end of the chapter for homework. Ms. M. also explained that answers to the questions would be collected the next day.

- How does each teacher involve students in the study of the topic?
- Which of the two classes do you think will engender the greatest interest in the topic? Why?
- Consider each of the distinguishing features of the interdisciplinary approach that are reviewed in this chapter. Which teacher has planned an interdisciplinary study? Cite evidence from the descriptions to support your answer.

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SUGGESTED READINGS

The following are additional recommended readings on selected topics that are included in this chapter. Some are classic writings; others are recent publications on these topics.

Learning and Diversity

The following are several classic readings on development and learning that may be found to be helpful in explaining the theories of Piaget and others.

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Instructional Methodology

The following sources support the interdisciplinary, multidisciplinary, and integrated instructional approaches.

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Multiple Intelligences Theory

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