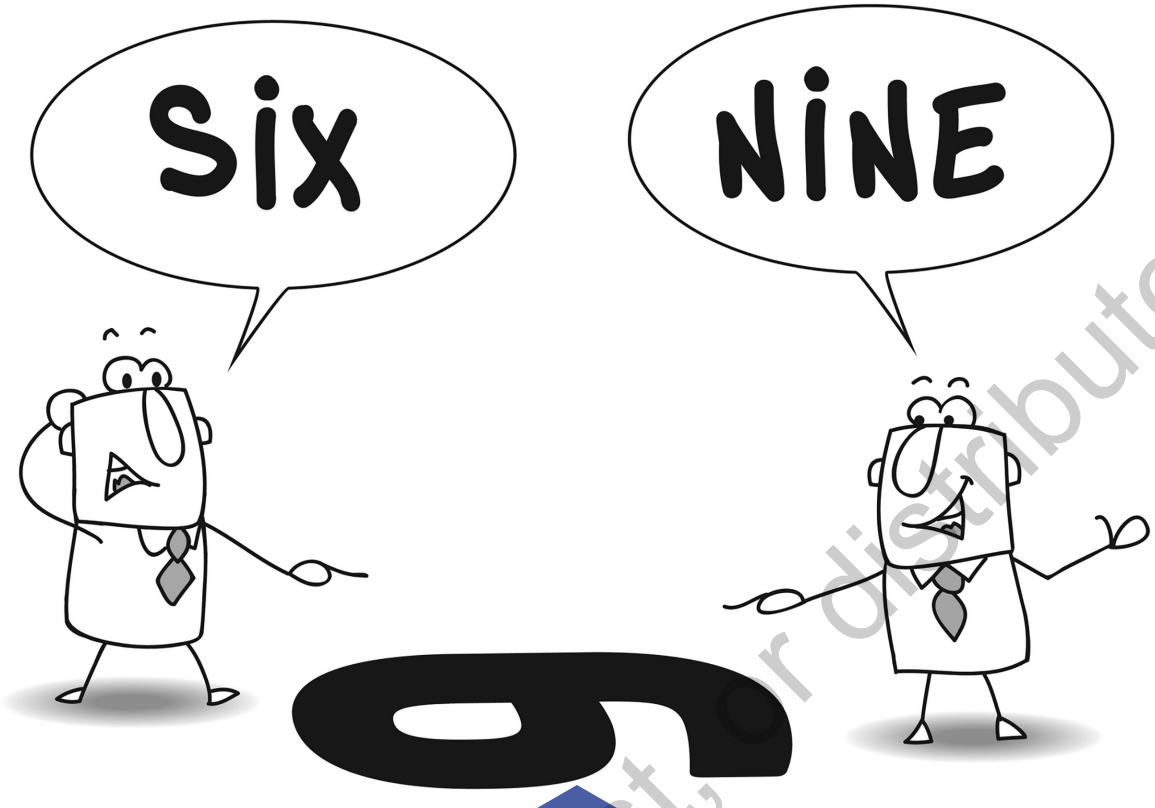

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2

INTRODUCING THE DISCIPLINES AND THEIR PERSPECTIVES

LEARNING OUTCOMES

By the end of this chapter, you will be able to

- Explain the concept of disciplinary perspective
- Describe how disciplinary knowledge is typically reflected in the organization of the academy
- Explain how to use disciplinary perspective
- Identify the defining elements of disciplinary perspective

GUIDING QUESTIONS

What is a discipline?

What is disciplinary perspective? Why is it important?

How has the academy been organized around disciplines?

CHAPTER OBJECTIVES

Before you can engage in interdisciplinary work by identifying disciplines that are relevant to the problem (Chapter 4), you must have a firm grasp of the disciplines and their perspectives on reality.

We explain the concept of disciplinary perspective and describe how disciplinary knowledge is typically reflected in the organization of the academy. We next explain how to use disciplinary perspective and introduce the defining elements of disciplines (i.e., their phenomena, epistemology, assumptions, concepts, theory, and methods). This information, presented in easily accessible tables, is foundational to interdisciplinary research and critical to developing adequacy in relevant disciplines as called for in STEP 5 of the research process (see Chapter 6).

The definition of interdisciplinary studies presented in Chapter 1 implies that interdisciplinarity has a high degree of dependence upon and interaction with the disciplines. Therefore, understanding the role of the disciplines and their perspectives on reality is essential to fully understand interdisciplinarity and successfully engage in interdisciplinary inquiry.

DEFINING DISCIPLINARY PERSPECTIVE

In an overall sense, disciplinary perspective is each discipline's unique view of reality.[1] Raymond C. Miller (1982), the first to assert that disciplines have distinct perspectives or worldviews that are pertinent to interdisciplinary understanding, states that perspective should be "the primary means of distinguishing one discipline from another" (p. 7). We agree. A discipline's "perspective" is the lens through which it views reality. Each discipline filters out certain phenomena so that it can focus exclusively on phenomena that interest it. Disciplines such as history and biology are not collections of certified facts; rather, they are *lenses* through which we look at the world and interpret it (Boix Mansilla, Miller, & Gardner, 2000, p. 18). In the sciences, disciplines are most easily distinguished by the phenomena they study. A conventional physicist, for example, would not be interested in studying the declining salmon populations in the Columbia and Snake Rivers, but a biologist would. A conventional sociologist would not be interested in theological representation in a fifteenth-century oil painting, but an art historian would. Similarly, a conventional historian would likely not be interested in the regulatory hurdles involved in the building of a new oil refinery, but a political scientist would.

Some have a narrow conception of the term *perspective*, viewing it as but one of several elements that define a discipline, the others being its phenomena, epistemology, assumptions, concepts, theories, and methods.[2] This book shares the broader conception of perspective, viewing it as the *source* of all other disciplinary elements.[3] Rick Szostak (2004), for example, explains how disciplinary perspective both reflects and influences a discipline's choice of phenomena, theory, and method. These are the **defining elements of a discipline's perspective**:

- The phenomena it studies
- Its epistemology or rules about what constitutes evidence
- The assumptions it makes about the natural and human world
- Its basic concepts or vocabulary
- Its theories about the causes and behaviors of certain phenomena
- Its methods (the way it gathers, applies, and produces new knowledge)

Together, these elements comprise a discipline's cognitive map (Klein, 2005a, p. 68). From it, the discipline frames the "big" questions or "perennial issues and problems" that give the discipline its definition and signature characteristics (Becher & Trowler, 2001, pp. 26, 31). Each discipline's community of scholars substantially agrees on what constitutes an interesting and appropriate question to study, what constitutes legitimate evidence, and what a

satisfactory answer to the question should look like (Boon & Van Baalen, 2019; Choi & Richards, 2017).

A clarified definition of disciplinary perspective is presented here:

> **Disciplinary perspective** is a discipline's view of reality in a general sense that embraces and in turn reflects the ensemble of its defining elements that include phenomena, epistemology, assumptions, concepts, theories, and methods.

This definition of disciplinary perspective is consistent with the definition of interdisciplinary studies that emphasizes drawing on the disciplines and integrating their insights and theories to construct a more comprehensive understanding. We shall see that interdisciplinary scholars must evaluate disciplinary insights in the context of disciplinary perspective. The definition thus captures the messy reality of what occurs in actual interdisciplinary work—drawing not just on disciplinary perspectives in a general sense, but more particularly on those defining elements of disciplines (assumptions, concepts, and theories) that relate most directly to the problem being investigated.

HOW KNOWLEDGE IS TYPICALLY REFLECTED IN THE ORGANIZATION OF THE ACADEMY

Before discussing how you will use disciplinary perspectives, it is useful to understand how knowledge is typically reflected in the organization of the academy.

About Disciplines and Disciplinarity

Disciplines are intellectual communities deeply devoted to the study of a particular subject, say biology. Disciplines also involve an institutional structure of graduate (MA and PhD) programs, departmental hiring, and disciplinary journals. Disciplinary fields and interdisciplines are not truly disciplines until they have their own PhDs and hiring communities. Most academic departments typically represent a particular discipline. Clusters of related disciplines form larger administrative units called colleges, schools, or faculties such as the college of science, the school of social sciences, or the faculty of arts. In most university settings, academic departments are foundational to the institution's structure.

Disciplinary knowledge is produced in the form of books, journals, and conference presentations all of which are vetted by the disciplines. Departments and programs pass on that knowledge to the next generation through their majors, create new knowledge, and guide the careers of faculty members who do the teaching and conduct the research in

the discipline. Disciplinary departments determine the curriculum or the courses that are taught, and influence research (i.e., subject matter and method) and mode of teaching. The institutional structure of most universities thus reinforces disciplinary perspective. Those who do not reflect the perspective of their discipline will face difficulty in completing their degrees, getting hired, publishing, and gaining tenure or promotion.

The widely used term **disciplinarity** refers to the system of knowledge specialties called **disciplines**, which is little more than a century old. *Discipline* is used throughout this book as an umbrella term that also includes subdisciplines and interdisciplines, which are defined as follows:

- A **subdiscipline** is a subdivision of an existing discipline. The discipline of anthropology, for example, has developed several subdisciplines, including cultural anthropology, physical anthropology, anthropology of religion, urban anthropology, and economic anthropology. Subdisciplines have many of the characteristics of disciplines—a shared subject matter, theories, methods—but lack complete control over PhDs and hiring. They also can have quite different sets of questions, theories, and methods from the broader discipline. (Choi and Richards [2017] note that some disciplines are also characterized by an important divide between practitioners and theorists.)
- An interdiscipline literally means the space "between disciplines"—that is, between the intellectual content of two or more disciplines (Karlqvist, 1999, p. 379). An interdiscipline may begin as an interdisciplinary field, but over time, it may become like a discipline, developing its own curriculum, journals, professional associations, and most important for interdisciplinary studies, perspective. The interdisciplines of biochemistry and neuroscience, for example, emerged as interdisciplinary fields that eventually grew to become their own mainstream disciplines.

The Changing Character of Disciplines

Today's disciplines exhibit three characteristics about which you should be mindful as you study their defining elements described below.

First, disciplines are constantly evolving and taking on new elements: studying new phenomena or applying new theories or methods. This necessarily means that there is some diversity within the discipline at any point in time. But the institutional structure of disciplines ensures that there is still coherence.

Second, some disciplines are characterized by **cognitive discord**, meaning disagreement among a discipline's practitioners over the defining elements of the discipline. The American Sociological Association (ASA, n.d.), for example, states on its website, "Sociology provides

many distinctive perspectives on the world." These "distinctive perspectives" within sociology, openly acknowledged by the ASA, are reflective of sociologists having aligned themselves with various theories and schools of thought that currently inform the discipline. But in general, they apply these theories using the same methods used with old theories.

Cognitive discord also characterizes art history, a discipline experiencing divisive theoretical conflicts. Consequently, art historian Donald Preziosi (1989) says that there is no such thing as "an Olympian perspective" in the discipline, despite what might be inferred from numerous textbooks (p. xi). Indeed, some scholars go so far as to claim that a dominant perspective, as defined in interdisciplinary literature, is lacking in almost every discipline in the social sciences and humanities (Dogan & Pahre, 1989).

This raises the question of whether some disciplines, such as art history and sociology in their fragmented states, even have a general perspective on reality. The answer is yes because the very idea of a discipline as something entirely coherent, in terms of strict adherence to its defining elements (assumptions, concepts, theories, methods, etc.), is an idealization. The reality of disciplinarity, past and present, is ferment and fragmentation.[4] *Counterbalancing these centripetal forces to a large degree is an* ***intellectual center of gravity*** *that enables each discipline to maintain its identity and have a distinctive overall perspective. As long as disciplines bestow PhDs and make hiring decisions, there will be strong pressure to decide what a suitable sociologist or art historian is.*

A third characteristic of the modern disciplines is the growing practice of crossing disciplinary boundaries by disciplinarians themselves. Disciplines borrowing concepts, theories, and methods from one another, says Klein (1999), skew the picture of knowledge depicted in conventional maps of the academy. She observes, for example, how textuality, narrative, and interpretation were once thought to belong within the domain of literary studies. Now, she says, they appear across the humanities and the social sciences, including science studies, and the professions of law and psychiatry. Similarly, research on the body and on disease occurs in disciplines as varied as art history, gerontology, and biomedicine. The movement of methods and analytical approaches across disciplinary boundaries, she contends, has become an important feature of knowledge production today (p. 3). (Note that interdisciplinary scholarship encourages such borrowing and thus potentially enhances the ability of disciplines to answer disciplinary research questions.) However, these new developments do not mean the end of disciplines.

Implications for Interdisciplinary Work

Interdisciplinarians at all levels should approach disciplines not as self-contained repositories of information, but as being open to a wider range of concepts, theories, and methods that transcend their traditional boundaries. That is, researchers should not only examine the characteristic elements of relevant disciplines for insights into the problem, but also

search for information from sources that transcend disciplines such as the categories of phenomena (appearing in Table 2.3) and schools of thought (referenced in Table 2.9).

CATEGORIES OF DISCIPLINES

Table 2.1 presents a conventional classification of the disciplines that includes traditional disciplines (by no means all of them) but that excludes the applied fields and professions.[5] A discipline may be considered part of one category at one university but belong to a different category at another. History, for example, is considered a discipline within the social sciences in some institutions but part of the humanities at others. Though history has elements of both social science and humanities, this book follows the traditional taxonomy of including history in the humanities.

DISCIPLINARY PERSPECTIVES

Given how important disciplinary perspective is in the interdisciplinary research process, it is useful to sketch the perspectives of at least the most important disciplines. Students can then construct perspectives for other disciplines that they may encounter.

The disciplinary perspectives in Table 2.2 are separated into the three categories of traditional disciplines and are stated in the most general terms. These are not comprehensive

TABLE 2.1 ⬢ Categories of Disciplines

Category	Discipline
The Natural Sciences	Biology Chemistry Earth Science Mathematics Physics
The Social Sciences	Anthropology Economics Political Science Psychology Sociology
The Humanities	Art and Art History History Literature (English) Music and Music Education Philosophy Religious Studies

TABLE 2.2 ⬢ Overall Perspectives of Natural Sciences, Social Sciences, and Humanities Disciplines Stated in General Terms

Discipline	Overall Perspective
	Natural Sciences
Biology	Biology views the living physical world, including that of humans, as a highly complex and interactive whole governed by deterministic principles that explain behavior (such as genes and evolution).
Chemistry	Chemistry views the physical world as a complex interplay of distinctive properties of the elements, individually and in compounds, and their interactions. Chemistry sees larger-scale objects, organic as well as inorganic, in terms of their constituent elements and compounds.
Earth Science	Earth science views Planet Earth as a large-scale physical system that includes the four subsystems and their interactions: the lithosphere (the Earth's hard, outermost shell), the atmosphere (the mixture of gases that envelop the Earth), the hydrosphere (the subsystems that contain the Earth's water), and the biosphere (the realm of all living things, including humans).
Mathematics	Mathematics views the world through abstract quantitative creations with postulates, assumptions, axioms, and premises and explores these by proving theorems.
Physics	Physics see the world as consisting of basic physical laws that connect objects (atoms and subatomic particles, quanta) and forces (gravity, electromagnetic, strong nuclear, and weak nuclear) that often cannot be directly observed. These laws and forces establish the underlying structure of observable reality and cosmology (the form, content, organization, and evolution of the universe).
	Social Sciences
Anthropology	Cultural anthropology sees individual cultures as organic integrated wholes with their own internal logic, and culture as the set of symbols, rituals, and beliefs through which a society gives meaning to daily life. Physical anthropology views former cultures through the artifacts it uncovers.
Economics	Economics views the world as a complex of market interactions with the individual functioning as a separate, autonomous, rational entity, and perceives groups (even societies) as the sum of individuals within them.
Political Science	Political science views the world as a political arena in which individuals and groups make decisions based on the search for or exercise of power. Politics at all levels and in all cultures is viewed as a perpetual struggle over whose values and interests will prevail in setting priorities and making collective choices.
Psychology	Psychology sees human behavior as reflecting the cognitive constructs individuals develop to organize their mental activity. Psychologists also study inherent mental mechanisms, both genetic predisposition and individual differences.
Sociology	Sociology views the world as a social reality that includes the range and nature of the relationships that exist between people in any given society. Sociology is particularly interested in voices of various subcultures, analysis of institutions, and how bureaucracies and vested interests shape life.

(Continued)

TABLE 2.2 ⬢ (Continued)

Discipline	Overall Perspective
	Humanities
Art History	Art history views art in all of its forms as reflecting the culture in which it was formed and therefore providing a window into a culture. Art history can also investigate whether there are universal aesthetic tastes.
History	Historians view any historical period as a complex interplay of trends and developments leading up to it, and past events as the result of both societal forces and individual decisions.
Literature (English)	Literature believes that cultures, past and present, cannot be adequately understood without understanding and appreciating the literature produced by the culture.
Music Education	Music educators believe that a critical component of culture past and present cannot be adequately understood without understanding the music produced by the culture.
Philosophy	Philosophy relies on careful argumentation—though only rarely formal proofs of theorems—to grapple with a set of "big questions" such as What is the nature of reality? How can we understand that reality? And What is the meaning of life?
Religious Studies	Religious studies views faith and faith traditions as human attempts to understand the significance of reality and cope with its vicissitudes through beliefs in a sacred realm beyond everyday life.

Note: This **taxonomy** or systematic and orderly classification of selected disciplines and their perspectives raises the question of how students can find perspectives of disciplines, subdisciplines, and interdisciplines not included in this book. Certainly, a good place to obtain leads is this chapter, which has tables that define elements of disciplines (their epistemologies, theories, methods, etc.). Also, the chapter references standard authoritative disciplinary sources. Researchers may consult content librarians who specialize in certain disciplines. Another strategy is to ask disciplinary experts to recommend sources. This combined approach should produce aids that are authoritative and useful. The issue of finding scholarly research aids is addressed more fully in Chapter 5.

generalizations about each discipline, but central tendencies that are a matter of consensus. In later sections, we will describe individual elements (epistemology, theory, method, etc.) of each discipline's perspective.

When Disciplinary Perspectives Are Used

Disciplinary perspectives are used in two circumstances. The first is near the beginning of the research process where the focus is on identifying disciplines that are *potentially* interested in the problem. (*Note:* How to identify these disciplines is the focus of STEP 3 and the subject of Chapter 4.) Once a discipline's overall perspective on reality is known, it is relatively easy to apply the perspective to the problem. It is common to work with disciplines within a particular cluster such as the humanities, although some problems require consulting disciplinary literatures from two or more clusters. *A rule of thumb*

is to let the problem dictate which categories and disciplines within each category are most relevant to it. Identifying potentially interested disciplines early on helps to narrow the disciplinary literatures that need to be consulted when performing the full-scale literature search that STEP 4 calls for (Chapter 5).

The second is in performing STEP 5, developing adequacy in relevant disciplines (Chapter 6), and STEP 6, analyzing the problem (Chapter 7). Here it is important to note that *a discipline's perspective is not identical with the insights the discipline produces*. A discipline's experts produce insights and theories concerning a problem or class of problems. These insights and theories typically reflect the discipline's perspective. Interdisciplinarians draw on these insights and theories, analyze them (asking in particular whether the insights are biased by the disciplinary perspective), identify how they conflict, modify them by creating common ground among them, integrate them, and construct a more comprehensive understanding of the problem.

UNPACKING THE DEFINING ELEMENTS OF A DISCIPLINE'S PERSPECTIVE

Here we unpack the meaning of each element of a discipline's perspective and provide detailed tables of how these elements are associated with certain disciplines. *The tables are intended to illustrate each element and provide useful resources as you pursue your particular research topic or question. You should generally not have to acquaint yourself with each entry in each table.*

Phenomena

Phenomena are enduring aspects of human existence that are of interest to scholars and are susceptible to scholarly description and explanation. For example, individuals may differ in terms of personality, but a set of personality characteristics is always with us (Szostak, 2004, pp. 30–31).

The sorting out of distinctions between disciplines in this chapter does not imply that disciplines are static. Their character is ever changing, and their borders are elastic and porous. This reality and the absence of a logical classification of phenomena to guide the disciplines have produced two unfortunate effects. The first is that several disciplines may share a phenomenon, often unmindful of the efforts of other disciplines to comprehend it. For example, psychology and religious studies share an interest in the phenomenon of terrorism, but one rarely finds in their work references to the theories and research of the other discipline. The second effect is that the disciplines may ignore a particular phenomenon altogether. An example is the causes of economic growth, which has been a focus of economists but has not been studied by history or political science.

Interdisciplinary scholars, like their disciplinary counterparts, must identify the phenomena relevant to the research question. They can attempt this in one of two ways: approach the disciplines *serially* in hopes of locating a particular phenomenon in one or more of them, or *focus on the phenomenon itself*. Table 2.3 presents the traditional approach of first identifying relevant disciplines and searching their literatures in hopes of finding insights on a particular phenomenon. The success and speed of this search naturally depend on the researcher's familiarity with each discipline. Table 2.3 links the disciplines to illustrative phenomena of interest to them. These phenomena are linked to particular disciplines for the purpose of helping you identify which disciplines are relevant to the problem to decide which of their literatures to mine for insights.[6] The classifications provided in this table and elsewhere in this book should help advanced undergraduate and graduate students see how each discipline's perspective contributes to an overall understanding of a multifaceted problem.

TABLE 2.3 ⬢ Disciplines and Their Illustrative Phenomena

Category	Discipline	Phenomena
The Natural Sciences	Biology	Cells, genes, tissues, organs, biological systems, classifications of flora and fauna
	Chemistry	Chemical elements, molecules, compounds, chemical bonds, molecular structure, crystal structures
	Earth Science	Rocks, soils, fossils, ecosystems, tectonic plates, climate
	Mathematics	Abstract entities—numbers, equations, sets, vectors, topological spaces, geometric shapes, curves
	Physics	Atoms, subatomic particles, waves, quanta; but also stars, star clusters, galaxies, etc.
The Social Sciences	Anthropology	The origins of humanity, the dynamics of cultures worldwide
	Economics	The economy: total output (price level, unemployment, individual goods and services), income distribution, economic ideology, economic institutions (ownership, production, exchange, trade, finance, labor relations, organizations), the impact of economic policies on individuals
	Political Science	The nature and practice of systems of government and of individuals and groups pursuing power within those systems
	Psychology	The nature of human behavior as well as the internal (psychosociological) and external (environmental) factors that affect this behavior
	Sociology	The social nature of societies and of human interactions within them

Category	Discipline	Phenomena
The Humanities	Art History	Nonreproducible art—painting, sculpture, architecture, prose, poetry—and reproducible art—theater, film, photography, music, dance
	History	The people, events, and movements of human civilizations past and present
	Literature	Development and examination (i.e., both traditional literary analysis and theory as well as more contemporary culture-based contextualism and critique) of creative works of the written word
	Music Education	Development, performance, and examination (i.e., both traditional musicological analysis and theory as well as more contemporary culture-based contextualism and critique) of creative works of sound
	Philosophy	The search for wisdom through contemplation and reason using abstract thought
	Religious Studies	The phenomena of humans as religious beings and the manifestations of religious belief such as symbols, institutions, doctrines, and practices

Source: Szostak, R. (2004). *Classifying science: Phenomena, data, theory, method, practice* (pp. 26–29, 45–50). Dordrecht: Springer. With kind permission from Springer Science+Business Media.

Phenomena Classified

Until recently, only the **perspectival approach** (i.e., relying on each discipline's unique perspective on reality as presented in Table 2.2) was available to interdisciplinarians because no system of classifying all human phenomena existed. Szostak (2004) meets this need in his pioneering work that classifies phenomena about the human world. His classification approach, shown as Table 2.4, moves left to right, from the most general phenomena to the most specific. A practical benefit of his approach is that all phenomena can be linked rather easily to particular disciplines, provided that one knows the discipline's general perspective and the phenomena it typically studies.

Using Table 2.4 should facilitate linking most topics readily to one or more of the particular phenomena in the table. For example, the phenomenon of freshwater scarcity concerns the nonhuman environment. Moving from left to right, one can see multiple links to a wide array of subphenomena (center column) that may pertain to the problem. These subphenomena, in turn, provide links to other phenomena identified in the right-hand column that may be of further interest. Reading the literature pertaining to the several subphenomena may lead the researcher to broaden the investigation to include the categories of economics and politics and their respective subphenomena. In short, using Szostak's classification

TABLE 2.4 ⬢ Szostak's Categories of Phenomena About the Human World[a]

First Level	Second Level	Third Level
Genetic predisposition	Abilities	Consciousness, subconsciousness, vocalization, perception (five senses), decision making, tool making, learning, other physical attributes (movement, eating, etc.)
	Motivations	Food, clothing, shelter, safety, sex, betterment, aggression, altruism, fairness, identification with group
	Emotions	Love, anger, fear, jealousy, guilt, empathy, anxiety, fatigue, humor, joy, grief, disgust, aesthetic sense, emotional display
	Time preference	
Individual differences	Abilities • Physical abilities • Physical appearance • Energy level • Intelligences	• Speed, strength, endurance • Height, weight, symmetry • Physical, mental • Musical, spatial, mathematical, verbal, kinesthetic, interpersonal
	Personality • Emotionality (stable/moody) • Conscientiousness • Affection (selfish/agreeable) • Intellectual orientation • Other dimensions • Disorders • Sexual orientation • Interpersonal relationships	• Contentment, composure vs. anxiety, self-pity • Thoroughness, precision, foresight, organization, perseverance vs. carelessness, disorderly, frivolous • Sympathetic, appreciative, kind, generous vs. cruel, quarrelsome, fault finding • Openness, imagination, curiosity, sensitivity vs. closed-mindedness • Dominant/submissive, strong/weak, in/dependent, humor, aggression, future/present oriented, happiness • Schizophrenia, psychoticism . . . ? • View of self, others, causal relationships • Parent/child, sibling, employee/r, romance, friendship, casual acquaintance
Economy	Total output	Price level, unemployment, individual goods and services
	Income distribution	
	Economic ideology	
	Economic institutions	Ownership, production, exchange, trade, finance, labor relations, organizations
Art	Nonreproducible	Painting, sculpture, architecture, prose, poetry
	Reproducible	Theater, film, photography, music, dance

First Level	Second Level	Third Level
Politics	Political institutions	Decision-making systems, rules, organizations
	Political ideology	
	Nationalism	
	Public opinion	Issues (various)[b]
	Crime	Versus persons/property
Culture	Languages	By descent
	Religions	Providence, revelation, salvation, miracles, doctrine
	Stories	Myths, fairy tales, legends, family sagas, fables, jokes, and riddles
	Expressions of cultural values • Goals • Means • Community • Everyday norms	Rituals, dance, song, cuisine, attire, ornamentation of buildings, games • Ambition, optimism, attitudes to wealth, power, prestige, beauty, honor, recognition, love, friendship, sex, marriage, time preference, physical and psychological well-being • Honesty, ethics, righteousness, fate, work, violence, vengeance, curiosity, innovation, nature, healing • Identity, family vs. community, openness to outsiders, trust, egalitarianism, attitude to young and old, responsibility, authoritarianism, respect for individuals • Courtesy, manners, proxemics, tidiness, cleanliness, punctuality, conversational rules, locomotion rules, tipping
Social structure	Gender	
	Family types/Kinship	Nuclear, extended, single parent
	Classes (various)	Occupations (various)
	Ethnic/Racial divisions	
	Social ideology	
Technology and science	Fields (various)	Innovations (various)
	Recognizing the problem	
	Setting the stage	

(Continued)

TABLE 2.4 ⬢ (Continued)

First Level	Second Level	Third Level
	Act of insight	
	Critical revision	
	Diffusion/Transmission	Communication, adoption
Health	Nutrition	Diverse nutritional needs
	Disease	Viral, bacterial, environmental
Population	Fertility	Fecundity, deviation from, maximum
	Mortality	Causes of death (various)
	Migration	Distance, international, temporary
	Age distribution	
Nonhuman environment	Soil	Soil types (various)
	Topography	Land forms (various)
	Climate	Climate patterns (various)
	Flora	Species (various)
	Fauna	Species (various)
	Resource availability	Various resources
	Water availability	
	Natural disasters	Flood, tornado, hurricane, earthquake, volcano
	Day and night	
	Transport infrastructure	Mode (various)
	Built environments	Offices, houses, fences, etc.
	Population density	

Source: Szostak, R. (2004). *Classifying science: Phenomena, data, theory, method, practice* (pp. 27–29). Dordrecht: Springer. With kind permission from Springer Science+Business Media.

a. Close examination of the table shows that there are only 11 categories of phenomena and relatively small sets of second-level phenomena. The third-level phenomena in the table can sometimes be further unpacked into subsidiary phenomena. Szostak says that the table was developed using a mix of deduction and induction and that thus it can be extended if/when new phenomena are discovered. Students wanting more detail can visit Szostak's Basic Concepts Classification at https://sites.google.com/a/ualberta.ca/rick-szostak/research/basic-concepts-classification-web-version-2013/the-classification-of-things-phenomena.

b. *Various* here and elsewhere in this table means that there are many subsidiary phenomena. Identifying these will require the student to consult more specialized disciplinary literatures.

approach should facilitate making connections to neighboring phenomena that may touch on the research question. Making these connections quickly not only aids the research process, as will be demonstrated in later chapters, but it also enables researchers to confirm their selection of potentially relevant disciplines. This table may appear daunting at first glance, but you need only understand its basic structure (that is, you need not and should not memorize every element) to be able to utilize it once you have a research topic in mind.

Epistemology

Epistemology is the branch of philosophy that studies how one knows what is true and how one validates truth (Sturgeon, Martin, & Grayling, 1995, p. 9). An epistemological position reflects one's views of *what* can be known about the world and *how* it can be known. Literally, an epistemology is a theory of knowledge (Marsh & Furlong, 2002, pp. 18–19). Each discipline's epistemology is its way of knowing that part of reality that it considers within its research domain (Elliott, 2002, p. 85). As we shall see, a discipline's epistemology influences (and is influenced by) the assumptions it makes and the theories and especially the methods it employs.

The **epistemic norms of a discipline** are agreements about how researchers should select their evidence or data, evaluate their experiments, and judge their theories. Philosopher of science Jane Maienschein (2000) states, "It is epistemic convictions that dictate what will count as acceptable practice and how theory and practice should work together to yield legitimate scientific knowledge" (p. 123). For example, the experimental approach (favored by the natural sciences) is based on the epistemological assumption that stresses the value of experimental control and replicability, whereas the field approach (favored by some social sciences) is based on the value of studying the "messy, muddled life-in-its-context" (p. 134).

We noted in Chapter 1 that interdisciplinary scholarship pursues a middle ground between "positivist" and "nihilist" epistemological extremes. We appreciated at that time that interdisciplinary scholarship is thus consistent with most but not quite all contemporary thinking in the philosophy of science. It is useful here to recognize that many scholars, especially in the natural sciences and economics, are still very positivist in outlook, aspiring to achieve very precise understandings that can be established beyond reasonable doubt. We can describe an attitude that falls short of stressing the possibility of absolute proof/disproof as modernist. Many scholars in the humanities tend toward a nihilistic view that objective knowledge is impossible. (*Postmodernism* is a term used to describe both nihilists and scholars who hold skeptical views of the possibilities of scholarship but stop short of nihilism.) These two epistemological perspectives have spread widely in the academy. The social sciences, in particular, although largely pursuing an epistemological middle ground, possess scholars with both positivist and nihilist outlooks (Bell 1998, Creath & Maienschein 2000; Rosenau 1992, Szostak 2007a).

It is worthwhile to briefly recognize some key contrasts in these epistemological positions:

- Is there an external reality that we can perceive, or do we "construct" reality in our minds? The middle ground here is to accept that there is an external reality but that humans are limited in their perceptive and cognitive abilities to comprehend this.
- Can we objectively understand reality or not? A middle ground here is to recognize that many biases (including disciplinary biases) can affect scholarship, but that these can be confronted through careful analysis and attempts to integrate across conflicting insights.
- Can we prove or disprove hypotheses or is scholarship a matter of opinion? A middle ground here rejects the idea of proof/disproof (beyond the realm of mathematics and logic) but accepts that scholars can amass a body of argument and evidence such that certain hypotheses are accepted.
- Is language clear or hopelessly ambiguous? A middle ground here recognizes that language is inherently ambiguous, but that humans have recourse to various strategies (including classification and interdisciplinary practices) that limit ambiguity.
- Are there empirical regularities in the world, or is this ever-changing? A middle ground here recognizes that it is challenging to identify empirical regularities precisely because all phenomena influence each other. There may be a regularity in how A affects B, but this is hard to establish because C and D also influence each of them.

We will in what follows describe the most common epistemological outlook within particular disciplines, but you should recall that there is diversity within most if not all disciplines. Students should not just rely on the epistemological perspective of the discipline, but seek to identify, if possible, where authors stand with respect to the key contrasts identified above.

NOTE TO READERS

The statements on epistemologies in Tables 2.5, 2.6, and 2.7 are not definitive but central tendencies. Any way of classifying the epistemological positions of the disciplines can be contested.[7] These tables draw heavily from disciplinary experts, with the recognition that no two scholars may give precisely the same description of their disciplines.

TABLE 2.5 ⬢ Epistemologies of the Natural Sciences

Discipline	Epistemology
Biology	Biology stresses the value of classification, observation, and experimental control. The latter is the means of identifying true causes, and therefore privileges experimental methods (because they are replicable) over all other methods of obtaining information (Magnus, 2000, p. 115).
Chemistry	Chemists use both empirics and theory (especially thermodynamics). Even more than physics, chemistry relies on lab experiments and computer simulations. Chemistry involves less fieldwork than Earth science and biology do.
Earth Science	In much of Earth science, the theory of uniformitarianism (that all geologic phenomena may be explained as the result of natural laws and processes that have not changed over time) is prominent.
Mathematics	Mathematical truths are numerical abstractions that are discovered through logic and reasoning. These truths exist independently of our ability or lack of ability to find them, and they do not change. These truths or forms of "invariance" enable us to categorize, organize, and give structure to the world. These mathematical structures—"geometric images and spaces, or the linguistic/algebraic expressions"—are "grounded on key regularities of the world or what we 'see' in the world" (Longo, 2002, p. 434).
Physics	Like all the physical sciences, physics is empirical, rational, and experimental. It seeks to discover truths or laws about two related and observable concepts—matter and energy—by acquiring objective and measurable information about them (Taffel, 1992, pp. 1, 5). It stresses experiments far more than biology or Earth science.

TABLE 2.6 ⬢ Epistemologies of the Social Sciences

Discipline	Epistemology
Anthropology	Epistemological pluralism characterizes anthropology. Empiricists hold that people learn their values and that their values are therefore relative to their culture. Both physical and cultural anthropologists embrace constructivism, which holds that human knowledge is shaped by the social and cultural context in which it is formed and is not merely a reflection of reality (Bernard, 2002, pp. 3–4).

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TABLE 2.6 ⬢ (Continued)

Discipline	Epistemology
Economics	The epistemological dominance of modernism is being challenged by postmodernism that generates a pluralistic understanding of reality. Postmodernists see reality, and the self, as fragmented. Therefore, human understanding of reality is also fragmented. Nevertheless, the beliefs of economists are still largely determined by empirical evidence in direct relation to the mathematical theories and models they use. Empiricists stress fixed definitions of words, use a deductive method, and examine a small set of variables (Dow, 2001, p. 63).
Political Science	Political science embraces a modernist epistemology. However, positivists in the discipline are trying to cast the "science" of politics in terms of finding some set of "covering laws" so strong that even a single counterexample would suffice to falsify them. But human beings, according to others in the discipline, while they are undeniably subject to certain external forces, are also in part intentional actors, capable of cognition and of acting on the basis of it. Consequently, these scholars study "belief," "purpose," "intention," and "meaning" as potentially crucial elements in explaining the political actions of humans (Goodin & Klingerman, 1996, pp. 9–10).
Psychology	The epistemology of psychology is that psychological constructs and their interrelationships can be inferred through discussion and observation and applied to treatment (clinical) or a series of experiments with slight variations (experimental). A critical ingredient of a good experiment is experimental control that seeks to eliminate extraneous factors that might affect the outcome of the study (Leary, 2004, p. 208).
Sociology	Modernist (i.e., positivist) sociology shares a modernist epistemology with the other social sciences, but this epistemology is opposed by critical social theory, a theory cluster that includes Marxism, critical theory, feminist theory, postmodernism, multiculturalism, and cultural studies. What unites these approaches in the most general sense is their assumption that knowledge is socially constructed and that knowledge exists in history that can change the course of history if properly applied (Agger, 1998, pp. 1–13).

TABLE 2.7 ⬢ Epistemologies of the Humanities

Discipline	Epistemology
Art History	Modernists determine the value of works of art by comparing them with standards of aesthetics and expertise. But practitioners of the new art history that emerged in the 1960s determine the value of works of art in relation to contestation between values of competing groups; that is, it understands them in social and cultural contexts (Harris, 2001, pp. 65, 96–97, 130–131, 162–165, 194–196, 228–232, 262–288). Postmodern critics (active from about 1970 to the present) "argue that the supposedly dispassionate old-style art historians are, consciously or not, committed to the false elitist ideas that universal aesthetic criteria exist and that only certain superior things qualify as 'art'" (Barnet, 2008, p. 260).

Discipline	Epistemology
History	Modernists focus on the authenticity and appropriateness of how an event, a person, or a period is interpreted by evaluating the work in terms of its faithfulness to appropriate primary and secondary sources. "Truth," they believe, "is one, not perspectival" (Novick, 1998, p. 2). Believing that "structure" is fundamental to understanding the past, social historians focus on structure and infrastructure—on material structure, on the economy, on social and political systems—but do not eliminate the individual. More recently, some social historians have begun to employ "micro history" or the new cultural history (a blend of social history and intellectual history) as a way of studying ideological structures, mental structures (such as notions of family and community), isolated events, individuals, or actions, borrowing from anthropology the ethnographic method of "thick description," which emphasizes close observation of small details, carefully listening to every voice and every nuance of phrase (Howell & Prevenier, 2001, p. 115).
Literature	In general, modernists focus on the text and employ text-based research techniques. Newer approaches see meaning making as a relational process. The close reading of texts is being informed by background research into the context of the text, such as the circumstances surrounding its production, content, and consumption. Other newer approaches abound. For example, notions of auto/biographic writing have shifted from an idea of presenting "the truth" about someone to presenting "a truth." Oral history is viewed as a means of understanding the workings of "literary and cultural phenomena in and on people's imagination." Critical discourse analysis examines patterns in language use to uncover the workings of an ideology to see how it exerted control or how it was resisted. Quantitative researchers are using computers to calculate the frequency with which certain words appear in a text so that they can better interpret its meaning (Griffin, 2005, pp. 5–14). Deconstructionists find ambiguities in all texts.
Music Education	For modernist music educators, knowledge is often primarily technical knowledge. They assume, therefore, that empirical investigation produces verifiable and objective "knowledge" and "truth" irrespective of context. Postmodernist music educators embrace a much more pluralistic view of knowledge, viewing it as elusive, fragile, temporary, and conjectural. They assert that there are an infinite number of potentially "true" statements that can be developed about any phenomenon and that no single form of research can possibly account for the complete "truth" or reality of anything. "The goal of research, then, is continuously to seek relevant descriptions and explanations of a phenomenon based on the best and most complete knowledge we can garner about that phenomenon" (Elliott, 2002, p. 91).
Philosophy	Recently, philosophical questions about perception have become more important. For both empiricist and rationalist positions, one of the major concerns is to ascertain whether the means of getting knowledge are trustworthy. The chief concerns of epistemology in this regard are memory, judgment, introspection, reasoning, "a priori–a posteriori" distinction, and the scientific method (Sturgeon, Martin, & Grayling, 1995, pp. 9–10).

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TABLE 2.7 ⬢ (Continued)

Discipline	Epistemology
Religious Studies	Religious studies is concerned about the "assumptions and preconceptions that influence the analysis and interpretation of data, that is, the theoretical and analytical framework, even personal feelings, one brings to the task of organizing and analyzing facts" (Stone, 1998, p. 6). Though all humanities disciplines are concerned about the problem of subjectivity, few are as self-critical as religious studies (p. 7).

Epistemologies of the Natural Sciences, the Social Sciences, and the Humanities

Epistemologies of the Natural Sciences. Empiricism dominates the natural sciences.[8] Empiricism assures us that observation and experimentation make scientific explanations credible, and the predictive power of its theories is ever-increasing (Rosenberg, 2000, p. 146). However, the epistemologies of the sciences make scientific approaches inadequate for addressing value issues (Kelly, 1996, p. 95).

Epistemologies of the Social Sciences. The disciplines in the social or human sciences, more so than in the natural sciences, tend to embrace more than one epistemology, as shown in Table 2.6. For example, reflecting the growing postmodernist criticism of positivism's empiricism and value neutrality, most social scientists now agree that knowledge in their disciplines is generated by the "continual interplay of personal experience, values, theories, hypotheses, and logical models, as well as empirical evidence generated by a variety of methodological approaches" (Calhoun, 2002, p. 373).

Epistemologies of the Humanities. The humanities, even more so than the social sciences, embrace epistemological pluralism as shown in Table 2.7. This development is explained by the rise of the "new generalism" or "critical humanities" (feminism, critical theory, postcolonial studies, cultural studies, gender studies, postmodernism, poststructuralism, deconstructionism, etc.), which is discussed in greater detail below. The humanities prize diversity of perspective, values, and ways of knowing.

The Interdisciplinary Position on These Approaches

Interdisciplinarity seeks to avoid both the extremes of modernist optimism and postmodernist pessimism: If we doubt that enhanced understanding is possible, then there is no use in doing interdisciplinary research. But if we doubt the importance of perspective,

then interdisciplinarity is unnecessary. Interdisciplinarians should respect diverse epistemologies, but should not think that "anything goes" (Szostak, 2007a).

Good interdisciplinary work requires a strong degree of **epistemological self-reflexivity** (Klein, 1996, p. 214). This is awareness of how epistemological choices tend to influence one's selection of research methods that, in turn, influence research outcomes (Bell, 1998, p. 101). Accordingly, interdisciplinarians should take care that their embrace of certain assumptions, epistemologies, theories, methods, and political views do not bias the research process and thus skew the resulting understanding.

As noted above, interdisciplinary researchers should be wary of certain epistemological attitudes but should otherwise be respectful of all epistemologies. As elsewhere in this book where a both/and approach (that is, seeing value in alternative approaches rather than choosing one over the other) is recommended, interdisciplinary scholars are guided to integrate the best of both epistemologies rather than limit themselves to one. Interdisciplinary analysis is possible as long as we back away from the most extreme postmodern arguments (as most postmodernists themselves do) and desirable as long as we back away from extreme modernist assumptions.

Assumptions

From each discipline's epistemology (and ethics, etc.) flows a set of assumptions that tend to characterize research in that discipline. An assumption is something taken for granted, a supposition. **Assumptions** are the principles that underlie the discipline as a whole and its overall perspective on reality. As the term implies, these principles are accepted as the truths upon which the discipline's theories, concepts, methods, and curriculum are based. Stated another way, it is the interplay of assumptions and empirical evidence that shapes a discipline's theories, concepts, and insights.

Grasping the underlying assumptions of a discipline as a whole provides important clues to the assumptions underlying its particular insights and theories. Assumptions underlying specific insights are important to the integrative part of the interdisciplinary process that calls for identifying *possible* sources of conflict between insights. If conflicts between sets of insights or theories exist, one can then work to modify the conflict(s) by creating common ground (STEP 8). There are two kinds of assumptions: "basic" assumptions that scientists across disciplinary clusters typically make, and more focused or "hallmark" assumptions that are made by scientists working in a particular cluster of disciplines.

Basic Assumptions

The particular *combination* of assumptions is unique to each discipline, but disciplines can share assumptions. The assumptions in Tables 2.8, 2.9, and 2.10 are not comprehensive generalizations, but central tendencies and, thus, can be challenged by disciplinarians who might prefer different representational selections. The purpose in presenting these tables is twofold: (1) to help researchers decide which disciplines are relevant to the problem so

that their literatures can be mined for insights and (2) to identify assumptions that will be useful in performing later STEPS, particularly STEP 8.

Hallmark Assumptions of the Natural Sciences. The *hallmark assumptions* made by those working in the natural sciences are two. The first is that scientists can transcend their cultural experience and make definitive measurements of phenomena (things). The second is that "there are no supernatural or other a priori properties of nature that cannot potentially be measured" (Maurer, 2004, pp. 19–20).[9] This assumption is reflected to varying degrees in the characterizations of disciplinary assumptions underlying the natural sciences noted in Table 2.8. (*Note:* The sources cited in this and in following tables are good starting points for further reading.)

TABLE 2.8 ⬢ Assumptions of Disciplines in the Natural Sciences

Discipline	Assumptions
Biology	Biologists assume that the hypothetico-deductive approach (i.e., deductive reasoning used to derive explanations or predictions from laws or theories) is superior to description of pattern and inductive reasoning (Quinn & Keough, 2002, p. 2).
Chemistry	The function of the whole is reducible to the properties of its constituent elements and compounds and their interactions. "All living organisms share certain chemical, molecular, and structural features, interact according to well-defined principles, and follow the same rules with regard to inheritance and evolution" (Donald, 2002, p. 111).
Earth Science	The principle of uniformitarianism leads geologists to assume that the present is the key to understanding the past. Earth processes have not significantly changed during the several billion years that Earth has been a dynamic planet similar in many ways to the other planets constituting the solar system.
Mathematics	Assumptions (or axioms) in mathematics form the starting point for logical proofs of its theorems. They constitute the "if" part of a statement: "If A, then B." The consequences of the assumptions are found through logical reasoning, which leads the mathematician to discover the conclusion, "then B" (B. Shipman, personal communication, April 2005).
Physics	Logical empiricism assumes the existence of a finite set of laws that governs the behavior of the universe and that there is an objective method for discovering these truths. Natural realism, by contrast, assumes (1) that the universe works in a law-like manner, though the nature of the universe may be extremely complex and much of it may even be unfathomable; and (2) "scientists can build models that approximate nature sufficiently to allow further progress in understanding particular phenomena" (Maurer, 2004, p. 21). This atomistic approach to knowledge further assumes that separate parts together constitute physical reality, that these separate parts are lawfully and precisely related, and that physics events can be predicted.

Source: Adapted from Gerring, J. (2001). *Social science methodology: A critical framework*. Boston: Cambridge University Press. AND Stoker, G., & Marsh, D. (2002). Introduction. In D. Marsh & G. Stoker (Eds.), *Theory and methods in political science* (2nd ed., pp. 1 -16). New York: Palgrave Macmillan. AND Elliott, D. J. (2002). Philosophical perspectives on research. In R. Colwell & C. Richardson (Eds.), *The new handbook of research on music teaching and learning* (pp. 85–102). Oxford: Oxford University Press.

Hallmark Assumptions of the Social Sciences. The social sciences are grounded in essentially the same set of basic assumptions that characterize the natural sciences (Frankfort-Nachmias & Nachmias, 2008, p. 5). Assumptions in the social sciences are closely related to the research methods, theories, and schools of thought embraced by members of each discipline's community of scholars. For example, a popular textbook on behavioral research methods (psychology, communication, human development, education, marketing, social work, and the like) states the assumption underlying the scientific approach and systematic empiricism as these methods are applied to the behavioral sciences: "Data obtained through systematic empiricism allow researchers to draw more confident conclusions than they can draw from casual observation alone" (Leary, 2004, p. 9). Modernists share a "grizzled confidence" in such ideas as "progress" and "knowledge" grounded in empirical and replicable data (Cullenberg, Amariglio, & Ruccio, 2001, p. 3). This modernist assumption is present, to varying degrees, in many of the social science disciplines but is being challenged by postmodern notions. Both sets of assumptions—modern and postmodern—are noted in Table 2.9.

TABLE 2.9 ⬢ Assumptions of Disciplines in the Social Sciences

Discipline	Assumptions
Anthropology	Cultural relativism (the notion that people's ideas about what is good and beautiful are shaped by their culture) assumes that systems of knowledge possessed by different cultures are "incommensurable" (i.e., not comparable and not transferable) (Whitaker, 1996, p. 480). Cultural relativism has been the driving ethic of anthropology for generations, but it is being challenged by feminists, postcolonialists, and advocates for other marginalized groups on the grounds that relativism supports the repressive status quo in other cultures (Bernard, 2002, p. 73).[a]
Economics	Modernist approaches predominate. Modernist economists assume that the same dominant human motivation (rational self-interest) transcends national and cultural boundaries, in the past as in the present. Also, they assume that both usefulness and value are implicit in rational choices (on which they prefer to focus) under conditions of scarcity. Postmodernists assume that all things, including economic motivation and behavior, are intimately bound up with the situatedness (i.e., the cultural, political, and technological context) of those engaged in these activities and thus are not generalizable (Cullenberg et al., 2001, p. 19).
Political Science	Political science has been influenced primarily by history, but more recently, it is being influenced by theories from sociology, economics, and psychology. Consequently, its assumptions reflect whichever discipline and theory it is drawing from at the moment. Modernists assume rationality: "Human beings, while they are undeniably subject to certain causal forces, are . . . in part intentional actors, capable of cognition and acting on the basis of it" (Goodin & Klingerman, 1996, pp. 9–10). Behavioralists (who are also modernists) assume that political science can become a science capable of prediction and explanation (Somit & Tanenhaus, 1967, pp. 177–178). Proponents of the scientific method of research assume that empirical and quantitative, rather than normative and qualitative, analysis is the most effective way of knowing political reality (Manheim, Rich, Willnat, & Brians, 2006, pp. 2–3).

(Continued)

TABLE 2.9 ⬢ (Continued)

Discipline	Assumptions
Psychology	Psychologists assume that "data obtained through systematic empiricism allow researchers to draw more confident conclusions than they can draw from casual observation alone" (Leary, 2004, p. 9). Generalizations about larger populations may be inferred from representative sample populations. Psychologists also assume that group behavior can be reduced to individuals and their interactions and that humans organize their mental life through psychological constructs.
Sociology	Assumptions vary widely in this discipline. Empiricists assume an independent social reality exists that can be perceived and measured through gathering of data. Critics of modernism assume that our perceptions of social reality are filtered through a web of assumptions, cultural influences, and value-laden vocabularies, that individual human behavior is socially constructed, with rationality and autonomy playing modest roles at best; groups, institutions, and especially society have an existence independent of the individuals in them. People, they assume, are motivated primarily by the desire for social status (Alvesson, 2002, pp. 2–3).

a. Cultural relativism does not equate to ethical relativism (that all ethical systems are equally good since they are all cultural products), as Merrilee Salmon (1997) makes clear. Note that incommensurability, if true, would render interdisciplinarity infeasible.

Hallmark Assumptions of the Humanities. The humanities are grounded in a set of assumptions that differ greatly from those of the sciences. Over the course of the twentieth century and especially in recent decades, the older assumption of unified knowledge and culture has given way to a pluralistic and even conflicted set of assumptions. Klein (2010) lumps these new assumptions under the heading "the new generalism." This is not a unified paradigm, she explains, but "a cross-fertilizing synergism in the form of shared methods, concepts, and theories about language, culture, and history" (p. 30). The keywords of this new paradigm are *plurality* and *heterogeneity* (replacing *unity* and *universality*), and *interrogation* and *intervention* (supplanting *synthesis* and *holism*). The **new humanities**, she says, "interrogates the dominant structure of knowledge and education with the aim of transforming them" with the "explicit intent of deconstructing disciplinary knowledge and boundaries" (p. 30). This trend, Klein asserts, is especially apparent in cultural studies, women's and ethnic studies, and literary studies, where "the epistemological and political are inseparable" (p. 30).

> As humanities disciplines moved away from older paradigms of historical empiricism and positivist philology [the study of literature and the disciplines associated with literature], increasing attention was paid to contexts of aesthetic works and responses of readers, viewers, and listeners. The concept of culture was also expanded from a narrow focus on elite forms to a broader anthropological notion, and once discrete objects were reimagined as forces that circulate in a network of forms and actions. (Klein, 2010, p. 30)

TABLE 2.10 ⬢ Assumptions of Disciplines in the Humanities

Discipline	Assumptions
Art History	Modernists assume that the intrinsic value of the object is primary. Radical art historians—for example, Marxist, feminist, psychoanalytical, and poststructuralist—"share a broad historical materialism" of outlook: that all social institutions, such as education, politics, and the media, are exploitative and that "exploitation extends to social relations, based, for instance, on factors of gender, race, and sexual preference" (Harris, 2001, p. 264). In general, these critics assume that intrinsic values remain primary, but understanding the social context completes one's grasp of the work (p. 264).[a]
History	Modernist (positivist and historicist) historical scholarship rests on the idea that objectivity in historical research is possible and preferred (Iggers, 1997, p. 9). In general, social history (e.g., Marxian socioeconomic history, the Braudelian method, women's history, African-American history, and ethnic history) assumes that those whom traditional history writing had ignored (the poor, the working class, women, homosexuals, minorities, the sick) played an important but unappreciated role in historical change (Howell & Prevenier, 2001, p. 113).
Literature	Literature (broadly defined) or "texts" are assumed to be a lens for understanding life in a culture and an instrument that can be used to understand human experience in all of its complexity. Texts "encompass the continuous substance of all human signifying activities" (Marshall, 1992, p. 162). Another assumption is that these texts are "alien" to the reader, meaning that "something in the text or in our distance from it in time and place makes it obscure." The interpreter's task is to make the text "speak" by "reading" the text using extremely complex skills so as to give the text "meaning." *Meaning* is "an intricate and historically situated social process" that occurs between the interpreter and the audience (i.e., reader) that neither fully controls (Marshall, 1992, pp. 159, 165–166).
Music Education	Modernists assume that empirical investigation produces verifiable and objective "knowledge" (i.e., in the sense of infallible theories, laws, or general statements) and "truth" that is context free. Postpositivists (interpretivists, critical theory advocates, gender studies scholars, and postmodernists) deny the possibility of objectivity because human values are always present in human minds (Elliott, 2002, p. 99).
Philosophy	There are two schools of thought about how to get knowledge. Rationalists assume that the chief route to knowledge is the exercise of systematic reasoning and "looking at the scaffolding of our thought and doing conceptual engineering" (Blackburn, 1999, p. 4). The model for rationalists is mathematics and logic. Empiricists assume that the chief route to knowledge is perception (i.e., using the five senses of sight, smell, hearing, taste, and touch and the extension of these using technologies such as the microscope and telescope). The model for empiricists is any of the natural sciences where observation and experiment are the principal means of inquiry (Sturgeon, Martin, & Grayling, 1995, p. 9).
Religious Studies	Religious studies often queries faith, and the history of religions focuses on understanding humans as religious beings. One key assumption of the discipline is that there is something inherently unique about religion, and those who study it must do so without reducing its essence to something other than itself, as sociologists and psychologists tend to do. A related assumption is that even though religion is freighted with human emotion, objectivity is possible (Stone, 1998, p. 5).

a. Marxists assume that class struggle is the primary engine of historical development in capitalist society and that other forms of exploitation are either a product of the basic antagonism of class or peripheral to it. Feminists assume connections and causal links between patriarchal dominance within the society as a whole and its art. Psychoanalytic art historians assume that a full understanding of "the subject" requires inquiry into the complex nature of the embodied human psyche and its conscious and unconscious outworkings (Harris, 2001, pp. 262, 264, 195).

These keywords and trends provide important clues to the assumptions of humanities disciplines. Table 2.10 identifies the assumptions of modernism alongside the assumptions of the "new generalism."

NOTE TO READERS

Assumptions often play an important role in the process of creating common ground among conflicting disciplinary concepts and theories. Chapters 10 and 11 explain how to modify the assumptions underlying concepts and theories to prepare them for integration. For example, in examining theories explaining the causes of suicide terrorism, students in a class whose topic was terrorism found that an important assumption underlying scholarly insights from psychology and political science is that the behavior of the terrorists is rational (as defined by both disciplines), not irrational as many in the class had initially supposed.

Concepts

A **concept** is a symbol expressed in language that represents a phenomenon or an abstract idea generalized from particular instances (Novak, 1998, p. 21; Wallace & Wolf, 2006, pp. 4–5). For example, chairs come in various shapes and sizes, but once a child acquires the concept *chair,* that child will always refer to anything that has legs and a seat as a chair (Novak, 1998, p. 21).

Although *concept* is a key term used throughout this book, we do not provide examples of concepts favored by each discipline here for two reasons. First, the term lacks clarity as it relates to other terms such as *phenomena, causal link, theory,* and *method*. Szostak (2004) finds that many concepts can be defined in terms of phenomena, causal links (that is, relationships between phenomena), theory, or method. Some concepts, such as culture, are clearly phenomena. Others, such as oppression, are results of phenomena—in this instance, political decision making. Still others, such as revolution, globalization, and immigration, describe processes of change within or between phenomena (p. 41). But most of these can best be understood as illustrating features of causal links—for example, the link between art and human appreciation (pp. 42–43). It is thus best to deal with concepts when discussing phenomena, theories, and methods. Moreover, the same phenomenon (or concept more generally) might be called by different names in different disciplines.

In addition to the difficulty of differentiating concepts from phenomena and causal links is the more formidable challenge of dealing with the huge number of concepts that each discipline has generated. Perhaps this is why so few scholars have attempted exhaustive surveys of scholarly concepts in particular disciplines, let alone across entire disciplinary categories.

For this reason, this book makes no attempt to associate particular concepts with particular disciplines. Researchers will certainly encounter what are purported to be concepts and should consult Szostak's classification of phenomena presented earlier in this chapter to see whether the concept is, in fact, a phenomenon. If not, the interdisciplinarian should investigate whether the concept is or could be carefully defined in terms of causal links, theory, or method.

We might note here that some disciplines strive for very precise definitions of key concepts (e.g., mass and energy in physics), while other disciplines allow diffuse interpretations (there are over a thousand distinct definitions of culture, for example). Humanities scholar Mieke Bal (2002) agrees that concepts "need to be explicit, clear, and defined." She notes, however, that in interdisciplinary humanities, concepts "are neither fixed nor unambiguous" (pp. 5, 22, 23).

Theory

The root meaning of the word *theory* is "looking at or viewing, contemplating or speculating." There are two kinds of theory: scientific theory (about the world), which corresponds to the root meaning of theory just noted, and various types of philosophical theory (epistemological, ethical, etc.), which were dealt with in the section on epistemology. Confusion sometimes arises by the fact that some theories such as feminism or Marxism or literary theory operate as both scientific theory and philosophical theory: They make not only epistemological arguments, but also arguments about the world.

The Importance of Theory to Interdisciplinary Work

Interdisciplinarians need a basic understanding of theory, both scientific and philosophical, for four practical reasons. First, as Janet Donald (2002) emphasizes, for students to work in a discipline, they "must have the vocabulary and the *theory* of the field" because "each discipline requires a different mindset [italics added]" (p. 2).

Second, more than ever before, theory dominates the scholarly discourse within the disciplines and often drives the questions asked, the phenomena investigated, and the insights produced. Klein (1999) notes the increasingly common practice of disciplines borrowing theories and methods from other disciplines and, in some cases, making the borrowed theory or method their own (p. 3).

Third, since these theories explain particular or local phenomena, they provide many of the disciplinary "insights" into a particular problem, and it is these insights that students need to integrate to produce an interdisciplinary understanding of the problem.

Fourth, students need to develop a basic understanding of theory because of the interrelationship between theory and disciplinary research methods. In his discussion of how to do interdisciplinarity, Szostak (2002) emphasizes the importance of ascertaining "what theories and methods are particularly relevant to the research question. In the conduct

of interdisciplinary work," he says, "there are complementarities such that borrowing a theory from one discipline will encourage use of its methods, study of its phenomena, and engagement with its worldview" (p. 106). As with phenomena, he cautions researchers to not ignore theories and methods that may shed some lesser light on the question.[10] He also cautions not to blindly accept the evidence for a theory from the methods preferred by that discipline. Disciplines choose methods that make their theories look good. It is that sort of synergy that makes disciplinary perspective so powerful (See Box 2.1).

NOTE TO READERS

Understanding each theory, even in general terms, will enable researchers to approach many topics with greater sophistication and depth of insight. Explanation of precisely how theory may actually be used in interdisciplinary work is reserved for later chapters, where we will discuss working with theories.

BOX 2.1

Szostak (2017b) noted that most disciplines posit some sort of stability among the phenomena that they investigate. This stability can be challenged by interactions with the phenomena studied by other disciplines, as when changes in consumer tastes or weather patterns shock the market prices studied by economists. Though disciplinary scholars may know that the systems they study are not always stable, they may nevertheless focus on theorizing stability and thus be hostile to interdisciplinary explanations of instability. Economists, for example, have rejected arguments that technological shocks may have been important in causing the Great Depression because they prefer to focus on interactions among economic variables that generally produce greater stability in economic outcomes. Scholarship as a whole needs to understand both stability and instability (why the Great Depression happened, but also why such calamities are rare) and may thus benefit from a symbiotic relationship between disciplinary and interdisciplinary research.

Method

Method concerns how one conducts research, analyzes data or evidence, tests theories, and creates new knowledge (Rosenau, 1992, p. 116).[11] Methods are ways to obtain evidence of how some aspect of the natural or human world functions (Szostak, 2004, pp. 99–100).

Each discipline tends to devote considerable attention to discussing the method(s) it uses, and it does this by requiring students majoring in the discipline to take a research methods course. The reason is simple: The methods a discipline favors reflect its epistemology and are well suited to investigating its favored theories. Interdisciplinarians should be particularly aware of this linkage between a discipline's methods and theories: There may be other methods that would shed less favorable light on the discipline's theories than the method(s) favored by that discipline.

The Importance of Disciplinary Methods to Interdisciplinary Work

The interest of interdisciplinarians in disciplinary methods and the kind of knowledge required of them varies considerably depending on how they work with methods. Those interdisciplinarians conducting basic research have to decide when and whether to use quantitative or qualitative methods, or both. Though the furor over this difference is dying down, disciplinary researchers remain divided about which approach is preferable. Interdisciplinarians engaged in basic research should be open to both approaches. The **quantitative approach**, such as the number of molecules and the size of the ozone layer, emphasizes that evidence can be expressed numerically over a specified time frame. The **qualitative approach** focuses on evidence that cannot easily be quantified, such as cultural mannerisms and personal impressions of a musical composition. In reality, the quantitative or qualitative distinction is becoming increasingly blurred. For example, theories in natural science that focus on nonintentional agents—such as the germ theory of disease or cell theory—are inherently qualitative. Scholars employing qualitative methods often quantify by using words such as *most* rather than percentages (Szostak, 2004, p. 111).

There has for some decades been a large and growing literature on "mixed methods research" or "multimethod research." This literature has stressed for the most part the value of mixing quantitative and qualitative methods. This sometimes means utilizing both simultaneously: One might both statistically analyze and do close readings of interview transcripts. It sometimes means using different methods in sequence: One might use the results of statistical analysis to suggest questions for a focus group. There is a large overlap between the mixed methods literature and the literature on interdisciplinarity (Szostak, 2015a, pp. 128–143).

Just as researchers must have at least a general knowledge of the theories informing the disciplines relevant to the problem, so too must they have a working knowledge of the methods used by these same disciplines. Interdisciplinary programs whose courses cross only a few disciplinary boundaries naturally emphasize only a few methods. Interdisciplinary programs or courses that take interdisciplinarity itself as a focus tend toward a much broader coverage of methods, though this coverage is far from exhaustive. The latter kind of program clearly demands that students read widely in the disciplinary literature

TABLE 2.11 ⬢ Key Quantitative and Qualitative Methods

Approach	Methods
Quantitative	Experiments
	Surveys
	Statistical analysis
	Mathematical modeling
	Classification
	Mapmaking
	Examination of physical traces
	Careful examination of physical objects (as when geologists study rocks)
Qualitative	Participant observation
	Interview
	Textual analysis
	Hermeneutics
	Intuition/experience
	Textual analysis

Source: Adapted from Szostak, R. (2004). *Classifying science: Phenomena, data, theory, method, practice.* Dordrecht: Springer.

to develop at least a general understanding of all the standard methods. Fortunately, the number of these is relatively small. Table 2.11 lists commonly used quantitative and qualitative methods. Analysis of the strengths and weaknesses of each method is reserved for Chapter 6.

Research Methods Associated With Disciplines

Tables 2.11, 2.12, and 2.13 associate particular disciplinary categories with particular methods. The methods associated with each category are not definitive and are stated in the most general terms. Any statement of disciplinary practices can be contested on the ground that it disguises the pluralistic and even conflicted nature of disciplinary practice. The following descriptions are written in awareness of the possible criticisms. The purpose of these tables is to help researchers decide which research method(s) are appropriate to the problem, or topic.

TABLE 2.12 ⬢ Research Methods Associated With the Natural Sciences

Discipline	Methods
Biology	The epistemological debate between the naturalist or field position and the experimental or laboratory position is also about which methods (i.e., lab or field) produce "good science" (Creath & Maienschein, 2000, p. 134). Laboratory (i.e., experimental design and data analysis) methods extract life from its natural ecological setting and examine specimens under controlled conditions using electron microscopy and positron-emission tomography (PET) to produce visual images of the structure of systems (Bechtel, 2000, p. 139). Systems ecologists and developmental biologists insist on studying life in its living, functioning, active form using "philosophical, sociological, anthropological, and cognitive explanatory schemata" (Holmes, 2000, p. 169). Biologists increasingly appreciate that the scientific method must take into consideration ethical limits to experimentation.
Chemistry	Chemistry differs from the other sciences by attempting to develop new materials using the foundational principles discovered and developed by chemistry via experiments. "Understanding the properties of a substance and the changes it undergoes leads to the central theme in chemistry: macroscopic properties and behavior, those we can see, are the results of submicroscopic properties and behavior that we cannot see" (Silberberg, 2006, p. 5). Experiments are the dominant method in chemistry.
Earth Science	Like physics and chemistry, Earth science relies on a variety of quantitative methods of displaying and analyzing data, including statistics, geographic information systems (GIS), computer modeling, X-ray diffraction and florescence, mass spectronomy, emission and absorption spectronomy, gravity and magnetic resonance, acoustic (seismic) wave propagation (reflection and refraction), remote sensing using the electromagnetic spectrum, and well logging techniques that include sonic, electrical resistivity, and neutron absorption. Increasingly, however, geologists are relying more on fieldwork because processes taking place in geologic time cannot be replicated (J. Wickham, personal communication, August 2006).
Mathematics	Mathematics is totally abstracted from the empirical world, though other disciplines that are empirical apply mathematics. The worlds mathematicians create are rational simply because rationality is a requirement mathematicians impose on themselves. Mathematics uses proven theorems about the properties (e.g., consistency, transitivity, completeness) of the abstract realities they create.
Physics	Like chemistry, physics takes objects apart to study their constituent parts (atoms and subatomic particles, quanta) to see how they are related; but unlike chemistry, it also studies overall characteristics such as mass, velocity, conductivity, and heat of evaporation. The methods of physics are split into theoretical and experimental. "Theoretical" physicists solve problems using mathematical modeling rather than experimentation. Experimental physicists use experiments and computers to measure and quantify objects and phenomena and to test and verify or falsify the theories produced by the theoretical physicists (Donald, 2002, pp. 32–33). In physics, the hypothesis often takes the form of a causal mechanism or a mathematical relation. Cosmology, the branch of physics that studies the origins and development of the universe, must generally rely on astronomical observation as its method.

TABLE 2.13 ⬢ Research Methods Associated With the Social Sciences

Discipline	Methods
Anthropology	Anthropology uses a wide variety of scientific and interpretive techniques to reconstruct the past including experiments, sampling, cultural immersion, fieldwork, interviewing (unstructured and semistructured), structured interviewing (questionnaires and cultural domain analysis), scales and scaling, participant observation, field notes, direct and indirect observation, thick description, analysis of human interaction, language, archaeology, and biology (Bernard, 2002). The most common method in cultural anthropology has long been detailed field observation, though this has changed in recent decades. Physical anthropology relies on the examination of the results of archaeological excavation.
Economics	Modernist methods include mathematical modeling and statistical analysis. What is distinctive about most economic datasets is that they are generated for other purposes (e.g., governmental policy) and often do not directly measure the variables of interest to economists, so economists end up working with inferential indicators more than direct measurements. Mainstream economics, however, is experiencing some degree of methodological fragmentation by postmodernists who oppose the reduction of human behavior and motives to a single purpose: individual gain. Concluding that "an overarching methodology is rendered impossible by the fragmented nature of discourse-based knowledge," postmodernism denies the role of methodology altogether. Recently, a corrective "synthetic" approach has adopted a pluralistic approach to methodology, holding that the methodology of each economic school of thought should be analyzed critically on its own terms (Dow, 2001, pp. 66–67).
Political Science	Political science does not have a single big methodological device all its own, the way that many disciplines do. Rather, "political science as a discipline is defined by its substantive concerns, by its fixation on 'politics' in all its myriad forms" (Goodin & Klingerman, 1996, p. 7). More specifically, practitioners describe governments and examine ideas, normative doctrines, and proposals for social action (Hyneman, 1959, p. 28). Political scientists rely heavily on mathematical modeling and statistical testing. A method distinctive to political science is polling data on voter behavior. Like other social sciences, political science believes that "research should be theory oriented and theory directed," and that "findings [should be] based upon quantifiable data" (Somit & Tanenhaus, 1967, p. 178).
Psychology	There are two primary types of research: basic research to understand psychological processes, the primary goal of which is to increase knowledge, and applied research to find solutions for certain problems such as employee morale. Experiments are commonly employed, especially in basic research. Other applied researchers conduct evaluation research to assess the effects of social or institutional programs on behavior (Leary, 2004, p. 4).

Discipline	Methods
Sociology	The intellectual labor of sociology, not unlike other disciplines, is divided among theorists, methodologists, and researchers who use surveys, interviews, and observation. The effect of this cognitive separation in sociology is "that theorists do not deal with the relationship of theory to evidence" and, thus, to method (Alford, 1998, pp. 11–12). Methodologists are usually divided into quantitative and qualitative specialties. "Quants" are further divided between applied and theoretical statisticians. "Quals" are divided into ethno methodologists, symbolic interactionists, grounded theorists, historical methodologists, and ethnographers, each having its own specialized terminology and research techniques. Researchers analyze the substantive problems defined as part of the discipline's subfields of criminology, demography, social stratification, political sociology, the family, education, and the sociology of organizations (Alford, 1998, pp. 1, 11). Though sociology has been long dominated by modernist approaches to research, this is being seriously challenged by methodologies inspired by the humanities that are qualitative (i.e., meaning-based), constructionist, interpretative, narrative, and contextualized (situated in power, race, and gender). Qualitative research methods do not rely heavily on mathematical and statistical analysis but "study people in their natural setting and attempt to make sense of phenomena in terms of the meanings that people bring to them" (Dorsten & Hotchkiss, 2005, p. 147).

Source: Adapted from Szostak, R. (2004). *Classifying science: Phenomena, data, theory, method, practice*. Dordrecht: Springer.

Methods of the Natural Sciences. All the natural sciences use what is often called the "scientific method."[12] Interdisciplinarians should be aware that there are more than a dozen scientific methods used in the scholarly enterprise (see "Methods" in Table 2.11). The phrase *scientific method* can loosely be understood to mean careful, quantitative, hypothesis-driven research, but often is interpreted to recognize only experimental research.

The **scientific method**, defined narrowly, has four steps: (1) observation and description of phenomena and processes; (2) formulation of a hypothesis to explain the phenomena; (3) use of the hypothesis to predict the existence of other phenomena, or to predict quantitatively the result of new observations; and (4) execution of properly performed experiments to test those hypotheses or predictions. The scientific method is based on beliefs in empiricism (whether the observation is direct or indirect), quantifiability (including precision in measurement),[13] replicability or reproducibility, and free exchange of information (so that others can test or attempt to replicate or reproduce).

The scientific method assumes that there is a single explanation of how phenomena that appear to be separate entities are intrinsically unified (Donald, 2002, p. 32). Similarly, the assumption underlying interdisciplinarity is that conflicting disciplinary insights into a complex problem can be intrinsically unified by modifying

or creating an underlying common ground concept, assumption, or theory. This assumption is unlike the assumption underlying the "scientific method," however, in that the resulting disciplinary general "law" is applicable to all similar phenomena, whereas the resulting interdisciplinary understanding is "local" and limited to the problem at hand.

Not all the sciences use the scientific method in the same way. The physical sciences, such as physics and chemistry, use experiments to gather numerical data from which relationships are identified and conclusions are drawn. Yet geologists and cosmologists can generally not employ experiments and thus rely instead on careful observation of physical objects. Among the differences that Table 2.12 addresses are what each discipline considers to be data and how each gathers and processes data. For example, chemistry's approach to research is quite similar to that of the other physical sciences, such as physics and Earth science, in that it seeks to measure and describe observed phenomena.

Methods of the Social Sciences. The social sciences use modernist scientific techniques, such as mathematical models and statistical analysis of empirical data, in conducting much of their research. The more descriptive social sciences, such as anthropology, may use qualitative methods that involve gathering information by making visual observations or interviewing and using "thick (that is, detailed) description" to record this information.

But modernist and quantitative approaches have lost force in recent decades largely because of developments in the philosophy of science and the rise of postmodernism. It is in methodology that postmodernism is having its greatest impact on the social sciences and the humanities by "deflating the confidence previously held in the capacity to identify best practice" (Dow, 2001, p. 66). Today, says H. Russell Bernard (2002), "the differences *within* anthropology and sociology with regard to methods are more important than the differences *between* those disciplines" (p. 3). Consequently, the description of methods in Table 2.13 reflects both modernist and postmodernist approaches.

Methods of the Humanities. Researchers working in the humanities draw on fields of scholarship in which different beliefs hold. Table 2.14 shows that the humanities rarely insist on quantifying observations. Part of the challenge of interdisciplinary integration (introduced in Chapter 8) is reducing conflict between insights by modifying their concepts and/or assumptions. Once these insights are prepared for integration, constructing a more comprehensive understanding is possible. Whereas the natural and social sciences leave the integration of knowledge out of the scientific method altogether and the humanities leave it up to the reader, viewer, or listener to integrate knowledge, interdisciplinary studies strives to achieve integration. The scholarly enterprise needs both specialized and integrative research.

TABLE 2.14 ⬢ Research Methods Associated With the Humanities

Discipline	Methods
Art History	Modernist art historians examine art objects in terms of the artists' mastery of appropriate technique, their structure and meaning within particular historical, political, psychological, or cultural contexts. Formalist analysis of a work of art, for example, considers primarily the aesthetic effects created by the component parts of the design, while iconography studies focuses on content rather than form. Two methodological reactions against formalism are Marxism, which studies the economic and social context of art, and feminism, which is predicated on the idea that gender is an essential component to understanding art. Biographical and autobiographical methods rely on texts (if they exist) and approach works of art in relation to the artist's life and personality. Semiotics, a recent methodological approach derived from linguistics, philosophy of language, and literary criticism, assumes that cultures and cultural expressions such as language, art, music, and film are composed of "signs" and that each sign has a meaning beyond, and only beyond, its literal self (Bal & Bryson, 1991, p. 174). Other approaches include deconstruction, which assigns meaning according to contexts that themselves are continually in flux, and the complex psychoanalytic method that deals primarily with unconscious significance of works of art (Adams, 1996). Postmodern critics, who see the artist as deeply implicated in society, "reject formal analysis and tend to discuss artworks not as beautiful objects produced by unique sensibilities but as works that exemplify society's culture, especially its politics" (Barnet, 2008, p. 260).
History	Historians engage in research that involves identification of primary source material from the past in the form of documents, records, letters, interviews, oral history, archaeology, and so forth, or secondary sources. They also practice critical analysis involving interpretation of historical documents and forming these into a picture of past events or the quality of human life within a particular time and place. To write good history, historians need a combination of well-reasoned arguments based on solid evidence combined with objectivity and interpretive scrutiny. In the twentieth century, the narrative, event-oriented history characteristic of nineteenth-century professional historiography gave way to "various kinds of social science–oriented history spanning the methodological and ideological spectrum from quantitative sociological and economic approaches and the structuralism of the Annales School to Marxist class analysis" (Iggers, 1997, p. 3). As applied to history, postmodernists question whether there are objects of historical research accessible to clearly defined methods of inquiry, asserting that every historical work is a literary work because historical narratives are verbal fictions, the contents of which are more invented than found (pp. 8–10).
Literature (English)	Research methods emphasize the centrality of texts and include auto/biographical, oral history, critical discourse analysis (i.e., analyzing patterns in language) for exploring visual signs (e.g., illuminations of manuscripts, graphic novels, photographs), computer-aided discourse analysis, ethnography (concerns cultural and social practices), quantitative analysis (i.e., how numbers are used as interpretive tools and as a means of calculating the frequency with which certain words occur and the contexts in which they are set), textual analysis that sees meaning making as a relational process (which relies on other research methods such as feminist and deconstructionist ones), interviewing living authors, and creative writing (which must be accompanied by a theoretical piece of writing) (Griffin, 2005, pp. 1–14). Literary theories are also approaches to literature and include New Criticism (that insists on the preeminence of the text itself and its literary properties), psychoanalytic criticism, reader-response criticism, structuralism, deconstructionist criticism, Marxist criticism, feminist criticism, Bakhtinian criticism, Foucaultian criticism, and multicultural criticism that takes seriously the cultural perspectives of minorities (Bressler, 2003).

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TABLE 2.14 ⬢ (Continued)

Discipline	Methods
Music Education	Music education research is multimethod. Positivist scholars use expertise (i.e., mastery of techniques involved in the production of works of art) and criticism (i.e., interpretation of compositions in terms of their aesthetic qualities, techniques employed, and their meaning within specific historical, political, psychological, or cultural contexts). However, the basic trend in music education research methods is on interpretivist forms of inquiry (i.e., phenomenology, action research, ethnography, narrative inquiry that focuses on human actions, beliefs, values, motivations, and attitudes), critical theory (that stresses that teaching and learning are deeply related to social practices and injustices), feminist or gender studies (that argues that gender issues are implicit in all research methods and interpretations, although most in the field reject the idea of a distinctly feminist research methodology), and postmodernism (that rejects the idea of "methods" altogether and holds that there are no rules of procedure that must be followed and no "right" procedures of investigation, though it does embrace introspection, individualized interpretation, and deconstruction) (Elliott, 2002, pp. 85–96).
Philosophy	The method of philosophy is the making and the questioning of distinctions (a distinction is a difference displayed). Philosophy explains by distinguishing between concepts, as for example, how responsible action is to be distinguished from the irresponsible (Sokolowski, 1998, p. 1). Philosophers use a variety of techniques to examine a written composition including dialectic, syllogism and logic, contemplation, linguistic/symbolic analysis, argument and debate, and also thought experiments.
Religious Studies	Scholars of religion employ a variety of research and analytical methods that cut across disciplinary lines when examining religious phenomena, religious actions, religious groups, and religious ideas. The methods used by researchers are largely dictated by the questions they ask and the issues they seek to explore. The common ground among scholars of religion is their efforts to describe and explain religious phenomena as an aspect of human culture and experience and do this by engaging in self-reflection, self-criticism, self-censorship, and self-control (Stone, 1998, pp. 6–8).

NOTE TO READERS

Undergraduate interdisciplinarians are highly unlikely to apply disciplinary methods themselves. Their challenge is to critically analyze, interpret, and apply insights produced by disciplinarians wielding those methods. Graduate students and even more senior scholars acting as solo interdisciplinarians may still not apply disciplinary methods themselves other than to identify and examine linkages among the insights of contributing disciplines. However, they would apply disciplinary methods if, as part of their integrative work, they choose to conduct their own basic research. Interdisciplinary teams may well employ such methods as they conduct basic research.

Chapter Summary

This chapter provides information that is foundational to interdisciplinary practice and critical to developing adequacy in contributing disciplines (STEP 5; see Chapter 6) and evaluating their insights (STEP 6; see Chapter 7). It explains the role of the disciplines and defines disciplinary perspective to mean a discipline's worldview as well as its defining elements (i.e., phenomena, epistemology, assumptions, concepts, theory, and method). How perspective is used depends on what STEPS are being performed. The chapter also provides two ways of beginning interdisciplinary inquiry. One is Szostak's classification approach that involves linking the topic to the appropriate phenomena. The virtue of this approach is that it enables researchers to identify more readily neighboring phenomena that may otherwise be overlooked but may well be relevant to the problem. Researchers, then, can broaden their investigation without focusing, at least initially, on particular disciplines. The other, the traditional perspectival approach, involves linking the problem to those disciplines whose perspectives embrace it. Researchers can profitably use both approaches to identify disciplines relevant to the problem and then delve deeply into their scholarship, thus countering the occasional criticism that interdisciplinary studies is shallow and lacks rigor. Using both approaches shows that interdisciplinary analysis can be systematic and cumulative.

Armed with this basic knowledge of the disciplines, their perspectives, and their defining elements, students are now able to identify the disciplines relevant to the problem. Making this decision is STEP 3, the subject of Chapter 4.

Notes

1. "Most disciplines tend to think that what they study is the most important part of reality (that is, their worldview isn't just about what they study but [is about] its role in the larger whole)" (Rick Szostak, personal communication, January 11, 2011).
2. Early on, interdisciplinarians such as Newell and Green (1982) opted for a narrow definition: "Disciplines are distinguished from one another by the questions they ask about the world, by their perspectives or world view, by the set of assumptions they employ, and by the methods which they use to build up a body of knowledge (facts, concepts, theories) around a certain subject matter" (p. 24). According to this definition, "perspective" is but one of four primary disciplinary elements and is co-equal with the questions that the disciplines ask about the world, the set of assumptions they employ, and the methods they use to build up a body of knowledge (facts, concepts, theories).
3. Newell (1992) argues that "perspective" should be defined in broader terms, even suggesting that it is the source of all other disciplinary elements. He refers to "perspective" as that "from which those concepts, theories, methods, and facts emerge" (p. 213). He adds, "The interdisciplinary researcher must understand how the relevant concepts, theories, and methods underlying each-discipline's perspective are operationalized" (1998, p. 545). Janet Donald (2002) apparently agrees, emphasizing that "to understand a field of study [i.e., a discipline], students must learn its perspectives and processes of inquiry" (pp. xii–xiii). By "perspective," she means a discipline's epistemology,

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vocabulary, theory, and methods or processes of inquiry (pp. 2, 8). Jill Vickers (1998) states interdisciplinarians "must accept that the different disciplines have different cognitive maps" (p. 17). For Hugh Petrie (1976), reliable borrowing from the disciplines requires that the interdisciplinarian know quite a lot about the "cognitive and perceptual apparatus utilized" (p. 35).

4. Rogers, Scaife, and Rizzo (2005) explain that much of this discord within disciplines "may owe more to internal political agendas than we would like [to admit]" (p. 268). The reason why scholarly disciplines do not become inert and settled, explains Marjorie Garber (2001), is "the disciplinary libido," meaning the ways in which disciplines seek to differentiate themselves from each other while at the same time desiring to become "its nearest neighbor, whether at the edges of the Academy (the professional wants to become an amateur and vice versa), among the disciplines (each covets its neighbor's insights), or within the disciplines (each one attempts to create a new language specific to its objects, but longs for a universal language understood by all)" (p. ix).
5. Among the applied fields and professions, Geertz (1983) includes education, communications, criminal justice, management, law, and engineering (p. 7). Elsewhere, Geertz (2000) characterizes these broad categories as "rather baggy" because of their indeterminacy (p. 156). Mary Taylor Huber and Sherwyn P. Morreale (2002) use the term *disciplinary domains*, referring to the humanities, the social sciences, and the sciences (p. 8). The use of the term *core disciplines* implies a hierarchy of knowledge that many would contest (Salter & Hearn, 1996, p. 6).
6. Members of various disciplines will likely find the descriptions of their respective disciplines not comprehensive enough. But experience using these descriptions in interdisciplinary classrooms validates their intended purpose: to point the student to those disciplines that are potentially relevant to the problem. Once these are identified, the student should then consult each discipline's research aids, many of which are cited in tables in this chapter. These include handbooks, companions, journals, and bibliographies to validate the relevance of each discipline to the problem.
7. For example, Alan Bryman (2004) states, "There is no agreement on the epistemological basis of the natural sciences" (p. 439). Competing epistemological values in biology, for example, are fueling the debate over how much can be learned in the laboratory versus how much can be learned in the field—in other words, what constitutes "good science." Admittedly, there is some overlap between assumptions, epistemology, and preferred method in the tables.
8. Empiricism has come under fire from postmodernists, particularly from feminist philosophers of science who identify a role for value judgments in science and advocate tolerance and willingness to encourage a variety of approaches and multiple judgments of significance to the same scientific problem (Rosenberg, 2000, p. 183).
9. R. N. Giere (1999) calls this philosophical approach "naturalistic realism" and states that it is closest to the actual mindset that most scientists take.
10. Polkinghorne (1996) says that philosophers of science, if not practicing scientists, now accept that scientific methods can neither prove nor disprove any theory (or even any narrow hypothesis). Nevertheless, the application of scientific methods to theories provides scientists with invaluable, if imperfect, evidence with which they can judge whether a theory is in accord with reality (pp. 18–19).

11. Szostak (2004), in *Classifying Science: Phenomena, Data, Theory, Method, Practice*, is careful to distinguish methods "from techniques or tools, such as experimental design or instrumentation, or particular statistical packages" (p. 100). Tools and techniques and so on are a subset of methods.
12. Alexander Taffel (1992) states, "The combination of activities in which scientists engage to achieve the understanding they seek is sometimes called the scientific method. There is however no single method of science, but rather a variety of activities in which scientists use different combinations of these to solve difficult problems. Scientific activities include recognizing and defining problems, observing, measuring, experimenting, making hypotheses and theories, and communicating with other scientists" (p. 5).
13. Modern science relies heavily on statistical methods in the testing of hypotheses (Rosenberg, 2000, p. 112). Taper and Lele (2004) discuss the two schools of statistical thought, frequentist and Bayesian, and how these approaches impact quantitative statements. "There cannot be such a thing as quantification of support for a single hypothesis," they argue. Scientific evidence "is necessarily comparative," meaning that "one needs to specify two hypotheses to compare, and data may support one hypothesis more than the other" (p. 527).

Exercises

About Disciplinary Perspective

2.1 This chapter has said that a discipline's perspective is like a lens through which it views reality.

Identify three relevant disciplinary perspectives and describe how they might view each of the following:

- Offshore drilling for oil and gas
- Urban sprawl (e.g., building subdivisions and shopping centers on farmland)
- Income inequality
- Border security

How Knowledge Is Typically Reflected in the Organization of the Academy

2.2 How is knowledge reflected in the organization of your university? Where do the applied fields such as hospitality, architecture, etc., fit into the organization?

Disciplinary Perspective

2.3 How does juxtaposing different or even conflicting perspectives aid one's understanding of a complex problem, event, or behavior?

Phenomena

2.4 Disciplines, we have said, often share interest in the same phenomenon. Which disciplines would likely share an interest in these phenomena?

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- Extreme drought in sub-Saharan Africa
- The Israeli–Palestinian conflict
- A performance of Shakespeare's *Hamlet*

2.5 Using Szostak's "Categories of Phenomena About the Human World" (see Table 2.4), identify subphenomena that are likely connected to these problems, topics, or issues:

- Gang violence
- The disintegration of the Ross Ice Shelf in Antarctica
- Student debt

Epistemological Approaches

2.6 What are the logical limits of postmodernist epistemology?

2.7 Describe the strengths and weaknesses of *modernist* and *postmodernist* epistemology when each tries to explain the rise of religious fundamentalism in the Middle East?

Assumptions

2.8 What might be the assumptions of these researchers:

- Those working in the natural sciences about the cause of increasing volcanic activity in Indonesia?
- Those working in the social sciences about the cause of population decline in the developed nations of the world?
- Those working in the humanities and influenced by "the new generalism" about the meaning (in a general sense) of violent lyrics in some genres of music?

Quantitative and/or Qualitative

2.9 Here are research topics that might be addressed by either quantitative or qualitative methods. For each one, describe how you would conduct either a quantitative study or a qualitative study, and explain which approach would most likely lead to a more comprehensive understanding of the topic:

- Policing in urban high-crime neighborhoods
- High unemployment among 18- to 24-year-olds