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1

INTRODUCING INTERDISCIPLINARY STUDIES

LEARNING OUTCOMES

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

- 1.1 Define interdisciplinary studies
- 1.2 Describe the intellectual essence of interdisciplinarity
- 1.3 Distinguish interdisciplinarity from multidisciplinary, transdisciplinarity, and integrative studies

GUIDING QUESTIONS

What is interdisciplinary studies?

What are the key characteristics of interdisciplinary studies?

How can we define interdisciplinarity and carefully distinguish it from multidisciplinary, transdisciplinarity, and integrative studies?

CHAPTER OBJECTIVES

In any university, whether physical or virtual, you will most certainly encounter the disciplines. They shape our perceptions of the world, our ability to address complexity, our understanding of others and ourselves—and usually the administrative structure of colleges and universities. Less than 200 years old in their modern form, the disciplines have come to dominate the ordering, production, and communication of knowledge. Today, however, interdisciplinarity is challenging disciplinary dominance.

This chapter introduces interdisciplinary studies as an academic field. We define interdisciplinary studies and present the intellectual essence of the field in terms of its assumptions, theories, and epistemology. We then distinguish interdisciplinarity from multidisciplinary, transdisciplinarity, and integrative studies.

DEFINING INTERDISCIPLINARY STUDIES

Interdisciplinary studies refers to a diverse and growing academic field with its own literature, curricula, community of scholars, undergraduate majors, and graduate programs. Importantly, it uses a research process designed to produce new knowledge in the form of more comprehensive understandings of complex problems. Our book focuses on this research process.

Before defining interdisciplinary studies, we unpack the meaning of its three parts: *inter*, *disciplinary*, and *studies*.

The “Inter” Part of Interdisciplinary Studies

The prefix *inter-* means “between, among, in the midst,” or “derived from two or more.” **Disciplinary** means “of or relating to a particular field of study” or specialization. Thus, a starting point for understanding the meaning of *interdisciplinary studies* is between two or more fields of study.

This “between” space is contested space—problems, issues, or questions that are the focus of several disciplines. For example, urban riots are an interdisciplinary problem because they are an economic problem *and* a racial problem *and* a public policy problem. The important point is that the *disciplines are not the focus of the interdisciplinarian’s attention; the focus is the problem, issue, or intellectual question that each discipline is addressing*. The disciplines are simply a means to that end.

The “Disciplinary” Part of Interdisciplinary Studies

Inside the academy, *discipline* refers to a particular branch of learning or body of knowledge such as physics, psychology, or history (Moran, 2010, p. 2). **Disciplines** are scholarly communities that specify which phenomena to study, advance certain central concepts and organizing theories, embrace certain methods of investigation, provide forums for sharing research and insights, and offer career paths for scholars. It is through their power over careers that disciplines are able to maintain these strong preferences: Disciplinary scholars generally gain a PhD within the discipline, are hired by a disciplinary department, and are granted tenure, promotions, and salary increases, depending in large part on how that department judges their research and teaching. An **insight** is a scholarly contribution to the understanding of a problem based on research.

Each discipline has its own defining elements—phenomena, philosophical outlook (i.e., epistemology), concepts, theories, and methods—that distinguish it from other disciplines (the subject of Chapter 2). For example, disciplines choose methods that are good at investigating their theories. All of these characteristics are interrelated and are included within a discipline’s overall disciplinary perspective on reality.

History is an example of a discipline because it meets all of the above criteria. Its knowledge domain consists of an enormous body of *facts* (everything that has been recorded in human history). It studies an equally enormous number of *concepts or ideas* (colonialism, racism, freedom, and democracy). It also generates *theories* about why things turned out the way they did (e.g., the great man theory argues that the American Civil War lasted so long and was so bloody because President Abraham Lincoln decided to issue the Emancipation Proclamation in 1862), although many historians strive to be atheoretical. Furthermore, it uses a research *method* that involves close reading and critical evaluation of primary sources (e.g., letters, diaries, and official documents) and secondary sources (e.g., books

and articles) to present a coherent picture of past events or persons within a particular time and place. **Close reading** is a method that calls for careful analysis of a text and close attention to individual words, syntax, potential biases, and the order in which sentences and ideas unfold.

Categories of Traditional Disciplines

There are three broad categories of traditional disciplines¹ (for more info, see Table 2.1 in Chapter 2):

- The natural sciences tell us what the world is made of, describe how what it is made of is structured into a complex network of interdependent systems, and explain the behavior of a given localized system.
- The social sciences seek to explain the human world and figure out how to predict and improve it.
- The humanities express human aspirations, interpret and evaluate human achievements and experience, and seek layers of meaning and richness of detail in written texts, artefacts, and cultural practices.

The Fine and Performing Arts

Among the traditional disciplines is the category of the fine and performing arts. These include art, dance, music, and theater. They rightly claim disciplinary status because their defining elements are very different from those of the humanities disciplines.

The Applied and Professional Fields

The **applied fields** also occupy a prominent place in the modern academy. These include business (and its many subfields such as finance, marketing, and management), communications (and its various subfields including advertising, speech, and journalism), criminal justice and criminology, education, engineering, law, medicine, nursing, and social work. (*Note:* Many of these applied and professional fields and schools claim disciplinary status.)

The Emergence of Interdisciplines

The line between the disciplines and interdisciplinarity has begun to blur recently with the emergence of **interdisciplines**. These are fields of study that cross traditional disciplinary boundaries and whose subject matter is taught by informal groups of scholars or by well-established research and teaching faculties. *Interdisciplines may or may not be interdisciplinary*. Frequently cited examples of interdisciplines are neuroscience, biochemistry, environmental science, ethnomusicology, cultural studies, women's studies, urban studies, American studies, and public health (National Academies, 2005, pp. 249–252). Some interdisciplines use a wide range of theories, methods, and phenomena, while others behave much like disciplines by focusing on a narrow set of these (see Fuchsman, 2012).

NOTE TO READER

The disciplines, applied fields, and interdisciplines are not rigid and unchanging but are evolving social and intellectual constructs. That is, they take on new theories, methods, and research questions over time, while shedding other theories, methods, or questions. They nevertheless maintain coherence between their theories, methods, and research questions at any point in time, and retain their control over the careers of disciplinary scholars.

The “Studies” Part of Interdisciplinary Studies

The first fields to describe themselves using the word **studies** were those focused on particular sociocultural groups (including women, Hispanics, and African Americans). The word then became common in a host of contexts in the natural sciences and social sciences. In fact, “studies” programs are proliferating in the modern academy. In some cases, even the traditional disciplines (particularly in the humanities) are renaming themselves as studies, such as English studies and literary studies (Garber, 2001, pp. 77–79).

Why “Studies” Is an Integral Part of Interdisciplinary Studies

Studies programs in general represent fundamental challenges to the existing structure of knowledge. These new arrangements share with interdisciplinary studies (as described in this book) a broad dissatisfaction with traditional knowledge structures (i.e., the disciplines) and a recognition that the kinds of complex problems facing humanity demand that new ways be found to order knowledge and bridge different approaches to its creation and communication. Today, there are programs that include a core of explicitly interdisciplinary courses, established interdisciplinary fields such as area studies (e.g., Middle Eastern studies) and materials science, and highly integrated fields such as environmental, urban, sustainability, and cultural studies.

Comparing the Disciplines and Interdisciplinary Studies

The seven main characteristics of the established disciplines are compared and contrasted with those of interdisciplinary studies in Table 1.1. There are three differences (#1, #2, and #3) and four similarities (#4, #5, #6, and #7). The differences explain why the use of the word studies in interdisciplinary studies is appropriate:

- Interdisciplinary studies does not lay claim to a universally recognized core of knowledge as, say, physics does, but rather draws on existing disciplinary knowledge, while always transcending it via integration (#1).
- Interdisciplinary studies has a research process of its own (the subject of this book) to produce knowledge but freely borrows methods from the disciplines when appropriate (#2).
- Interdisciplinary studies, like the disciplines, seeks to produce new knowledge, but unlike them, it seeks to accomplish this via the process of integration (#3).

TABLE 1.1 ■ Comparison of Established Disciplines to Interdisciplinary Studies

Established Disciplines	Interdisciplinary Studies
1. Claim a body of knowledge about certain subjects or objects	1. Claims a burgeoning professional literature of increasing sophistication, depth of analysis, breadth of coverage, and thus, utility. This literature includes subspecialties on interdisciplinary theory, program administration, curriculum design, research process, pedagogy, and assessment. Most importantly, a growing body of explicitly interdisciplinary research on real-world problems has been emerging.
2. Have methods of acquiring knowledge and theories to order that knowledge	2. Makes use of disciplinary methods, but these are subsumed under an interdisciplinary research process involving drawing on relevant disciplinary insights, concepts, theories, and methods to produce integrated knowledge
3. Seek to produce new knowledge, concepts, and theories within or related to their domains	3. Produces (via integration) new knowledge, more comprehensive understandings, new meanings, and cognitive advancements (We will define “more comprehensive understanding” and “cognitive advancement” in later chapters.)
4. Possess a recognized core of courses	4. Is beginning to form a core of explicitly interdisciplinary courses
5. Have their own community of experts	5. Is forming its own community of experts
6. Are self-contained and seek to control their respective domains as they relate to each other	6. Draws on the disciplines for material but also on an interdisciplinary literature
7. Train future experts in their discipline-specific master’s and doctoral programs	7. Is training future experts in older fields such as American studies and in newer fields such as cultural studies through its master’s and doctoral programs and undergraduate majors. Though new and explicitly interdisciplinary PhD programs have been emerging, interdisciplinary studies still often hires those with disciplinary PhDs.

Source: Adapted from Vickers, J. (1998). Unframed in open, unmapped fields: Teaching the practice of interdisciplinarity. *Arachne: An Interdisciplinary Journal of the Humanities*, 4(2), 11–42.

Why “Studies” Is Plural

“Studies” is plural because of the idea of interaction between disciplines (Klein, 1996, p. 10). Imagine the world of knowledge wherein each discipline is like a box containing thousands of dots, each dot representing a bit of knowledge discovered by an expert in that discipline. Then imagine similar boxes representing other disciplines, each filled with dots of knowledge. Scholars interested in “studies” are excited by the prospect of examining a broad issue or complex question that requires looking inside as many disciplinary boxes as necessary to

identify those dots of knowledge that have some bearing on the issue or question under investigation. “Studies” scholars, including those in interdisciplinary studies, are in the business of identifying and connecting dots of knowledge regardless of the disciplinary box in which they reside (Long, 2002, p. 14). Interdisciplinary scholars are interested not in merely rearranging these ever-changing dots of knowledge but in *integrating* them into a new and more comprehensive understanding that adds to knowledge.

Studies programs recognize that many research problems cannot easily be addressed from the confines of individual disciplines because they require the participation of many experts, each viewing the problem from its distinctive disciplinary perspective.

Critics of studies programs charge that they lack disciplinary “substance and good scholarship” (Salter & Hearn, 1996, p. 3). **Scholarship** is a contribution to knowledge that is “*public*, susceptible to *critical review and evaluation*, and accessible for *exchange and use* by other members of one’s scholarly community” (Shulman, 1998, p. 5). “Substance” and “scholarship” are typically code words for disciplinary depth-intensive focus on a discipline or **subdiscipline**. By emphasizing a narrow set of theories, methods, and phenomena, disciplines are able to carefully police whether their theories and methods are correctly applied to appropriate phenomena.

A contrasting view is that a purely disciplinary focus sacrifices breadth, comprehensiveness, and realism for depth. By focusing on a particular set of theories, methods, and research questions, disciplines inevitably ignore insights that might be gained from alternative theories or methods, or studying connections to the phenomena studied in other disciplines. An integrated view, which this book reflects, recognizes that there is a symbiosis between disciplinary and interdisciplinary research. Interdisciplinary analyses build upon and integrate disciplinary insights, while informing disciplines of the light that other theories, methods, and links to other phenomena might shed on their research questions. By articulating the nature of the interdisciplinary research process, we can encourage comparable rigor in interdisciplinary analysis, while utilizing any relevant disciplinary theories and methods.

This is not to say that a “studies” program is superior to a disciplinary one. That would be a mistake because the purpose of each is different. *Both are needed*, particularly in a world characterized by increasing complexity, conflict, and fragmentation.

A Definition of Interdisciplinary Studies

It is possible to identify key elements that practitioners agree should form the basis of an integrated definition of interdisciplinary studies:

- The focus of interdisciplinary research extends beyond a single disciplinary perspective.
- A distinctive characteristic of interdisciplinary research is that it focuses on a problem or question that is complex. (*Note:* We provide a precise definition of complexity further in text.)
- Interdisciplinary research is characterized by an identifiable process or mode of inquiry.

- Interdisciplinary research draws explicitly on specialized research performed within the disciplines.
- The disciplines provide insights about the specific substantive focus of particular interdisciplinary research projects.
- Interdisciplinary research has integration as its goal.
- The objective of the interdisciplinary research process is pragmatic: to produce a cognitive advancement in the form of a new understanding, a new product, or a new **meaning**. (*Note: The term **meaning** is important in the humanities, where it is often equated with the intent of the author or artist or the effect on the audience [Bal, 2002, p. 27].*)²

From these elements, it is possible to offer the following integrated definition of interdisciplinary studies:

Interdisciplinary studies is a process of answering a question, solving a problem, or addressing a topic that is too broad or complex to be dealt with adequately by a single discipline, and draws on the specialized research performed within the disciplines with the goal of integrating their insights to construct a more comprehensive understanding.

This definition includes four core concepts—process, disciplines, integration, and a more comprehensive understanding—which are the subjects of later chapters. Importantly, this definition has both a *what* and a *how* component. Typically, when defining an experiment, one almost unavoidably describes how to do it. Chapters 1 and 2 of this book explain the *what* part; the rest of the chapters, which deal with the interdisciplinary research process, explain the *how* part. (*Note: More detail on the historical evolution of this definition is provided in Repko, Newell, and Szostak [2012].*)

Szostak (2015b) notes that some philosophers, aware of the ambiguity of language, urge what are termed “extensional” definitions—which list examples of a thing—as a complement to (or even a substitute for) the sort of “intensional” definition above, which attempts to capture the essence of a thing in a couple of sentences. His extensional definition—which he intends as a complement to the above intensional definition—necessarily focuses on the ways in which **interdisciplinarity**, the intellectual essence of the field of interdisciplinary studies, is performed: It seeks to integrate insights from multiple disciplines after evaluating these in the context of disciplinary perspective.

Interdisciplinarity involves a set of practices: asking research questions that do not unnecessarily constrain theories, methods, or phenomena; drawing upon diverse theories and methods; drawing connections among diverse phenomena; evaluating the insights of scholars from different disciplines in the context of disciplinary perspective; and integrating the insights of those disciplinary scholars in order to achieve a holistic understanding. (Szostak, 2015b, p. 109)

Much of this book will be devoted to outlining these very practices that collectively constitute interdisciplinarity.

Politi (2019) makes a critically important point that the immense potential of interdisciplinarity to improve research, teaching, and public policy advice is currently limited by a lack of scholarly consensus about what interdisciplinarity is or how it is best pursued. This chapter provides a definition that reflects an emerging scholarly consensus, and then in the rest of the book, we will describe in detail a variety of strategies for performing interdisciplinary analysis.

THE INTELLECTUAL ESSENCE OF INTERDISCIPLINARITY

There are two dominant forms of interdisciplinarity: instrumental and critical. **Instrumental interdisciplinarity** is problem driven. It is a pragmatic approach that focuses on borrowing from disciplines, and practical problem solving in response to the external demands of society. Borrowing alone, however, is not sufficient; it must be supplemented by **integration**. For instrumental interdisciplinarity, it is indispensable to achieve as much integration as possible given the insights currently available from the contributing disciplines.

Critical interdisciplinarity questions the nature of the academy. It generally appreciates, as we have, the advantages of specialized research, but doubts that the existing structure of disciplines is the best institutional structure for pursuing specialized research. It is particularly concerned that disciplines may reflect power relations in the wider society and may thus be biased in the sorts of questions they investigate and how. Instrumental interdisciplinarity, as we shall see in later chapters, must also address disciplinary biases when evaluating disciplinary insights. Moreover, we recognized above that there can be a symbiosis between instrumental interdisciplinarity and disciplines. We can thus likewise see a complementarity between instrumental and critical interdisciplinarity (Schmidt, 2021): Instrumental interdisciplinarians will grapple with disciplinary biases and suggest ways in which disciplines might improve. Critical interdisciplinarians can warn instrumental interdisciplinarians of biases that they may encounter. Stoller (2020), emphasizes that critical interdisciplinarity can usefully guide disciplinary scholars to question why they do what they do and what their words mean.

Research on systemic and complex problems such as the environment and healthcare often reflects a combination of critique and problem-solving approaches. The integrated definition of interdisciplinary studies used in this book reflects an emerging consensus approach to the field: It is pragmatic, yet it leaves ample room for critique and interrogation of the disciplines, as well as economic, political, and social structures. This “both/and” approach is reflected in the definition of interdisciplinarity stated earlier: It refers to “answering a question, solving a problem, or addressing a topic,” so it reflects an instrumentalist approach. Yet it also refers to “integrating [disciplinary] insights and theories to construct a more comprehensive understanding.” Integrating disciplinary insights (i.e., their concepts and assumptions) or theories typically includes interrogating the disciplines. Similarly, constructing a more comprehensive understanding of a problem and communicating this understanding may involve raising philosophical and political questions or proposing transformative policies. Interdisciplinarity, then, “has developed from an idea into a complex set of claims, activities, and structures” (Klein, 1996, p. 209).

These two forms of interdisciplinarity share certain commonalities: assumptions, theories, and a commitment to **epistemological pluralism**. This refers to the diverse attitudes that disciplines have about how to know and describe reality. These commonalities constitute the intellectual essence of interdisciplinarity and provide coherence to this diverse field. We discuss them in turn in the following. (*Note: This section draws heavily from Chapter 4 of Repko, Szostak, and Buchberger [2024], *Introduction to Interdisciplinary Studies*, fourth edition.*)

Assumptions of Interdisciplinarity

All disciplines, interdisciplines, and fields of study are based on certain assumptions that provide cohesion to the field. In this regard, interdisciplinary studies is no different. There are at least four assumptions that anchor this diverse and rapidly evolving field, though the extent of agreement on each of them varies.

The Complex Reality Beyond the University Makes Interdisciplinarity Necessary

Broadly speaking, there are two categories of problems we face today—those that require a specialized disciplinary approach, and those that require a broader interdisciplinary approach. For example, a specialized disciplinary approach to the subject of freshwater scarcity could focus on depletion rates of freshwater aquifers (Earth science), the destruction of wetlands (biology), or types of pollutants (chemistry). Yet the same topic of freshwater scarcity would require an interdisciplinary approach if you wanted to learn about it as a complex whole. This would require drawing not only on these disciplines, but also on political science (to investigate existing or needed legislation), economics (to evaluate costs of stiffer environmental regulations), and interdisciplinary fields such as environmental science.

It is useful to stress here that interdisciplinary analysis almost always involves studying the relationships among phenomena studied in different disciplines, such as the effects of certain cultural attitudes on certain political processes. Scholars within disciplines pay very little attention to how the things they study interact with the objects of study in other disciplines. Interdisciplinary analysis also often employs theories and methods from multiple disciplines. As we have seen, disciplines tend to have strong preferences for the use of certain theories or methods. Furthermore, interdisciplinarity often grapples with different disciplinary definitions of key concepts.

The Specialized Research Within Disciplines Is Foundational to Interdisciplinarity

The specialized research conducted within disciplines is foundational to the unique purpose of interdisciplinarity, although critical interdisciplinarians may question the present structure and behavior of disciplines. The integrated definition of interdisciplinary studies presented earlier makes this assumption explicit: Interdisciplinary studies is a cognitive process by which individuals or groups draw on *disciplinary perspectives* and integrate *disciplinary insights and modes of thinking* to advance their understanding of a complex problem with the goal of applying it. Interdisciplinarity, particularly in its instrumental form, is not a rejection of the disciplines; it is firmly rooted in them, but offers a corrective to their dominance. We need specialization. However, we also need interdisciplinarity to broaden our understanding of complex problems. This “both/and” position is reflected, for example, in the interdisciplinary fields of health sciences and health services. It is also the position of this book and reflects the majority opinion in interdisciplinary literature.

The Disciplines by Themselves Are Inadequate to Address Complexity Comprehensively

Disciplinary inadequacy is the view that the disciplines by themselves are inadequate to address complex problems. This inadequacy stems from several factors:

- The disciplines lack breadth of perspective.
- The disciplines are unwilling to assume responsibility for offering broad-based and comprehensive solutions to complex societal problems.
- The disciplines possess an unreasonable certainty that they provide all that is needed to make sense of the modern world.
- The disciplines do not have the cognitive or methodological tools to make sense of complex reality and provide us with a complete picture.
- Integrative strategies are needed to combine the best elements of disciplinary insights into a more comprehensive understanding.

Underlying the assumption of disciplinary inadequacy is the judgment that disciplinary approaches are “partial” and “biased.” They are partial in that a discipline views a particular problem through the lens of its own unique and narrow perspective. Economists, for instance, are skeptical of research from other disciplines because they value their own theories and methods, and they tend to ignore insights generated by alternate theories and methods (Pieters & Baumgartner, 2002). Disciplinary approaches are biased in that they are interested in only those concepts, theories, and methods that the discipline embraces, while rejecting different concepts, theories, and methods preferred by other disciplines. For example, although power is a concept relevant to virtually all the social sciences, each discipline has its own definition of power, and each definition is undergirded by certain assumptions, methods, and so forth that are unique to it. To gain a more balanced and comprehensive understanding of power as it relates to a problem, we must first understand how each discipline understands the concept of power before attempting to create common ground between these varied and conflicting notions.

Disciplinary inadequacy as applied to the health sciences is the subject of a study by Terpstra, Best, Abrams, and Moor (2010). Their conclusion is summarized in Box 1.1.

BOX 1.1: INTERDISCIPLINARY HEALTH SCIENCES

Over the last century, there have been many lessons learned in the health field. A key lesson is that health is a complex phenomenon and the underlying causal pathways for disease and illness are more than just biological. . . . Health is a phenomenon deeply rooted within a social system, and health outcomes result from a dynamic interplay between factors across the lifetime, originating from the cellular level, to the socio-political level. . . . As such, efforts to improve health must consider the multifactorial nature of the problem

and integrate appropriate knowledge across disciplines and levels of analysis. . . . Health research has implicated a myriad of factors involved in HIV prevention. . . . Unfortunately, incidence rates continue to rise because the knowledge is not being applied in the unified manner necessary to address the complexity of the problem. . . .

Unfortunately, the majority of health research is conducted for the sake of science, and not for the sake of dissemination and implementation. Knowledge created for science's sake tends to be discipline specific and reductionist, producing results that are not easily applied to inform practice and policy decisions. The reality is that health and health service challenges cannot be handled well by any single discipline or social sector, and the traditional reductionist approach to science does not work well for the majority of health service problems. Disciplinary knowledge and levels of analysis are intertwined in health service problems, and as such, application requires integrative theoretical models and knowledge. As stated by Rosenfeld (1992), "to achieve the level of conceptual and practical progress needed to improve human health, collaborative research must transcend individual disciplinary perspectives and develop a new process of collaboration" (Terpstra et al., 2010, p. 1344).

Source: Terpstra, J. L., Best, A., Abrams, D., & Moor, G. (2010). Interdisciplinary health sciences and health systems. In Julie Thompson Klein & Carl Mitcham (eds.), *The Oxford Handbook of Interdisciplinarity*. OUP, Oxford.

Interdisciplinarity Is Able to Integrate Insights From Relevant Disciplines

It is feasible to integrate insights concerning a complex problem from relevant disciplines. This bold assumption is based not on wishful thinking, but on a carefully constructed process to achieve integration that instrumental interdisciplinarians have developed and applied successfully recently.

Theories of Interdisciplinary Studies

Theory refers to a generalized scholarly explanation about some aspect of the natural or human world, how it works, and how specific facts are related, that is supported by data and research (Bailis, 2001, p. 39; Calhoun, 2002, p. 482). An example is the "broken windows theory of crime," which communicates the idea that seemingly trivial acts of disorder such as a broken window in a vacant house tend to trigger more serious crime in the neighborhood.

Every discipline embraces certain theories that provide its intellectual core and give it coherence. This is also true for interdisciplinary studies that draws on a body of theory to justify using an interdisciplinary approach and inform the research process. This body of theory includes theories on complexity, perspective taking, common ground, and integration.

Complexity

As noted previously, interdisciplinary analysis almost always addresses interactions among phenomena studied in different disciplines. Such interactions receive little attention from disciplinary scholars. Moreover, the challenges or problems investigated by interdisciplinary scholars or

students tend to involve interactions among *many* phenomena within some sort of system. The interdisciplinary researcher should further appreciate that all of these phenomena also interact with yet other phenomena. This is what we mean in this book by **complexity**. **Interdisciplinary complexity theory** states that interdisciplinary study is necessitated when the problem or question is multifaceted and functions as a “system.” This complexity has many implications for interdisciplinary analysis: We need to integrate insights from multiple disciplines; this will often in turn involve integrating theories and drawing on multiple methods; there will often be gaps in understanding because disciplines pay little attention to cross-disciplinary linkages; there will be other cases of conflict because each discipline stresses its phenomena and theories in generating insights. Much of this book is devoted to grappling with challenges rooted in complexity.

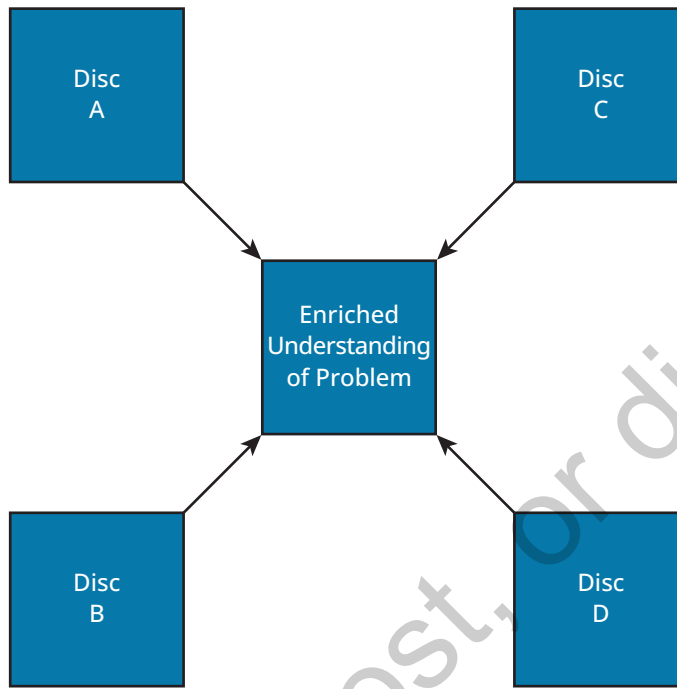
Interdisciplinary complexity theory also addresses the special case of the humanities and the arts. These disciplines are more concerned with behavior that is idiosyncratic, unique, and personal. The common practice in these disciplines is to practice **contextualization**. This is the practice of placing “a text, or author, or work of art into context, to understand it in part through an examination of its historical, geographical, intellectual, or artistic location” (Newell, 2001, p. 4). *As complexity theory is concerned with the behavior of complex phenomena, and as contexts are themselves complex, the theory also provides a rationale for the interdisciplinary study of texts, artistic creations, and individuals that are unique and complex.*

Perspective Taking

Perspective taking is viewing a particular issue, problem, object, behavior, or phenomenon from a particular standpoint other than your own. As applied to interdisciplinary studies, **perspective taking** *involves analyzing the problem from the standpoint or perspective of each interested discipline and identifying their commonalities and differences.*

As developed by cognitive psychologists, perspective taking theory makes five important claims critical to your ability to engage in interdisciplinary work and function successfully in the contemporary world:

1. *Perspective taking reduces the human tendency to negatively stereotype individuals and groups* (Galinsky & Moskowitz, 2000). Assuming the position of the stereotyped individual, either virtually or actually (as John Howard Griffin did in *Black Like Me*), reverses your perspective. Holding a negative stereotype of an individual or group that is the object of study will certainly skew the interdisciplinary study and fatally compromise the resulting understanding. Stereotyping is inconsistent with good interdisciplinary practice. (Perspective-taking is thus also an important skill for democratic citizenship; Nussbaum, 2018; Stoller, 2020)
2. *Perspective taking facilitates our ability to assemble new sets of potential solutions to a given problem* (Galinsky & Moskowitz, 2000; Halpern, 1996, pp. 1, 21). Here the old adage “there is wisdom in a multitude of counselors” applies: Examining the insights from the perspective of each interested discipline, even though they conflict, enriches your understanding of the problem and enables you to make creative connections (see Figure 1.1).

FIGURE 1.1 ■ Making Creative Connections

Source: Allen F. Repko

3. *Perspective taking heightens our awareness that we are biased in the direction of our own knowledge, whether it comes from our life experience or prior academic training.* In psychology, false-consensus bias is a cognitive bias whereby individuals tend to overestimate the extent to which their beliefs or opinions are typical of those of others (Fussell & Kraus, 1991; 1992). For example, after seeing a film, viewers who believe the film was excellent will tend to overestimate the percentage of people who thought that the film was excellent. The implication for interdisciplinary work is that we need to be aware of our biases, including disciplinary biases (which may have developed after majoring in a particular discipline), so that these do not prejudice (consciously or unconsciously) our analysis of the problem under study (Repko et al., 2020).
4. *Perspective taking invites us to engage in role taking* (Martin, Thomas, Charles, Epitropaki, & McNamara, 2005, p. 141). There are three role-taking aspects of perspective taking, each of which is pertinent to interdisciplinary work:
 - *Accurately perceive how others see and understand the world.* This involves seeing ourselves as role takers much as those in the theater arts do as they assume the role of a character in a play. To engage in the interdisciplinary research process, we must consciously assume the role, if only briefly, of a disciplinary expert and view the problem through the expert's eyes. This role-taking ability is particularly important

for those engaged in non-Western cultural studies, race and ethnic studies, urban studies, women's studies, sexuality studies, and other programs that emphasize difference.

- *View a situation broadly from multiple perspectives* (Martin et al., 2005, p. 141). The implications for interdisciplinary process are obvious: We must not limit our inquiries to only those disciplines with which we are familiar or to those expert views with which we agree.
 - *“Perceive the other’s perspective in depth and have a full understanding of the other’s perspective”* (Martin et al., 2005, p. 141, italics in original). In interdisciplinary work, *depth* and *full understanding* refer to disciplinary depth. We will see in later chapters that interdisciplinary scholars can achieve the necessary level of understanding of disciplinary insights if they appreciate disciplinary perspective. This holds special significance for those in the humanities and fine and performing arts, where the ability to understand and even assume or appropriate the identity of another is a critical skill.
5. *Perspective taking involves holistic thinking.* **Holistic thinking** is the ability to understand how ideas and information from relevant disciplines relate to each other and to the problem (Bailis, 2002, pp. 4–5). Holistic thinking differs from perspective taking in this important respect: Perspective taking is the ability to understand how each discipline would typically view the problem, whereas holistic thinking is the ability to see the whole problem in terms of its constituent disciplinary parts. In holistic thinking, the focus is on the relationships of parts to the whole and on the differences between and similarities to other parts. The object of holistic thinking is to view the problem inclusively in a larger context rather than under controlled or restrictive conditions favored by disciplinary specialists. However, “larger context” does not mean the most encompassing context possible. One actually wants the narrowest context possible that still encompasses everything needed to address the problem as a whole. Holistic thinking allows for seeing characteristics of a problem that are not apparent when studying it in disciplinary isolation. For example, an interdisciplinary study of community art, usually seen as separate from urban economic development, may show how the community benefits socially, culturally, and economically (i.e., holistically) from various kinds of art. The goal or the product of holistic thinking is a more comprehensive understanding of the problem (discussed in the following). Overcoming monodisciplinarity, which focuses on a single academic discipline, involves deciding that other disciplines—their perspectives, epistemologies, assumptions, theories, and methods—are worth considering when studying a particular problem. Indeed, interdisciplinarians eventually come to value and seek other perspectives.

Recent neurological research suggests that training in perspective-taking causes different neural pathways to be engaged when we are solving problems. It appears that this makes our decision-making more creative. For this reason, along with the others, many businesses have introduced perspective-taking training for managers (Platt, 2021).

Common Ground

Although *common ground* does not appear in the definition of interdisciplinary studies presented earlier, it is implicit in the concept of integration. The interdisciplinary concept of common ground comes from cognitive psychology's theories of common ground and the emerging field of cognitive interdisciplinarity. These theories are introduced here and are discussed more fully in Chapters 8 and 11.

Noted cognitive psychologist Herbert H. Clark (1996) defines common ground in social terms as the knowledge, beliefs, and suppositions that each person has to establish with another person to interact with that person (pp. 12, 116).

Cognitive psychologist Rainer Bromme (2000) applies Clark's theory of common ground to communication between disciplines. Whether developing a collaborative language for interdisciplinary research teams or integrating conflicting insights, the theory of cognitive interdisciplinarity calls for discovering or creating the "common ground integrator" by which conflicting assumptions, theories, concepts, values, or principles can be integrated.

Working independently of Clark and Bromme, William H. Newell (2001) was the first interdisciplinarian to define common ground in interdisciplinary terms. According to Newell, common ground involves using various *techniques* to modify or reinterpret disciplinary elements (p. 20).

Newell's definition contains three ideas consistent with those of Clark and Bromme:

1. Common ground is something that the interdisciplinarian must create or discover.
2. Creating or discovering common ground involves modifying or reinterpreting disciplinary elements (i.e., concepts, assumptions, or theories) that conflict.
3. Modifying these elements to reduce the conflict between them involves using various strategies. (*Note:* These strategies are the subject of later chapters.)

Newell's particular contribution to understanding common ground is that it is what makes integration of disciplinary insights possible. In effect, Newell has illuminated the mysterious "black box" of interdisciplinary integration so that we can readily perceive how to create common ground and thus achieve integration.

A definition of common ground that integrates Newell's definition with the formulations of Clark and Bromme is as follows: **Common ground** is the shared basis that exists between conflicting disciplinary insights or theories and makes integration possible (Repko, 2012, pp. 56–57).

Integration

Integration is a process by which concepts, assumptions, or theories are modified to reconcile insights regarding the same problem from two or more disciplines. The purpose of interdisciplinary studies is not to choose one disciplinary concept, assumption, or theory over another, but to produce an even better understanding of the problem by integrating the best elements of competing concepts, assumptions, or theories. A primary focus of the debate over the meaning of interdisciplinary studies or interdisciplinarity concerns integration, which literally means "to make whole."

Practitioners are divided concerning the role of integration. **Generalist interdisciplinarians** understand interdisciplinarity loosely to mean "any form of dialog or interaction between

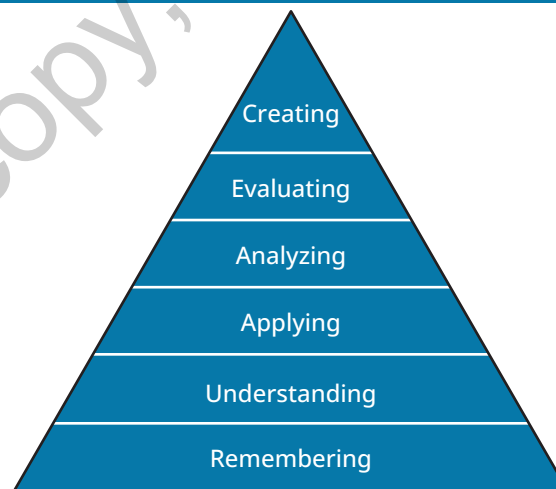
two or more disciplines,” while minimizing, obscuring, or rejecting altogether the role of integration (Moran, 2010, p. 14).³

Integrationist interdisciplinarians, on the other hand, believe that integration should be the *goal* of interdisciplinary work because integration addresses the challenge of complexity. Integrationists, pointing to a growing body of literature that connects integration with interdisciplinary education and research, are concerned with developing a distinctively interdisciplinary research process and describing how it operates (Newell, 2007a, p. 245; Vess & Linkon, 2002, p. 89). They advocate reducing the confusion about the meaning of *interdisciplinarity* and point to research in cognitive psychology that shows that the human brain is designed to process information integratively. *This book is aligned with the integrationist understanding of interdisciplinarity.*

The core of the **integrationist position** is that integration is achievable and that researchers should strive for the greatest degree of integration possible given the problem under study and the disciplinary insights at their disposal. Importantly, integrationists point to recent theories supportive of integration advanced by cognitive psychologists, curriculum specialists, teacher educators, and researchers. Moreover, they point to the increasing amount of interdisciplinary work characterized by integration.

The idea for interdisciplinary integration is grounded in Bloom’s classic taxonomy of levels of intellectual behavior that are involved in learning. Drawing on theories on learning and cognitive development, an interdisciplinary team of researchers and educators updated Bloom’s taxonomy in 2000. The team identified six levels within the cognitive domain, with simple recognition or recall of facts at the lowest level through increasingly more complex and abstract mental levels, leading ultimately to the highest order ability—creating—as shown in Figure 1.2.

FIGURE 1.2 ■ Updated Bloom’s Taxonomy of Levels of Intellectual Behavior



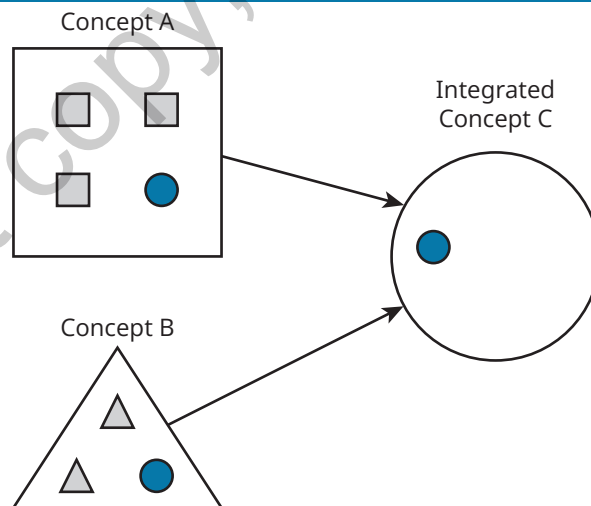
Source: Anderson, L. W., Krathwohl, D. R., Airasian, P. W., Cruikshank, K. A., Mayer, R. E., Pintrich, P. R., . . . & Wittrock, M. C. (2001). *A taxonomy for learning, teaching, and assessing: A revision of Bloom's Taxonomy of Educational Objectives* (p. 28). New York: Longman. Reprinted by permission of Pearson Education, Inc. New York, NY.

The significance of this taxonomy for interdisciplinary studies is that it elevates the cognitive abilities of creating and integrating to the highest level of knowledge. **Creating** involves putting elements together—integrating them—to produce something that is new and useful. As noted earlier, integration is the distinguishing feature of interdisciplinary studies and is at the core of the interdisciplinary research process. You will find at many points in this book that the literatures on creativity and on the interdisciplinary research process intersect, students learning how to do interdisciplinary research will expand their creative capabilities more generally.

Interdisciplinary integration finds additional support in the work of linguists George Lakoff and Gilles Fauconnier, and cultural anthropologist Mark Turner. Lakoff (1987) introduced the **theory of conceptual integration** to explain the innate human ability to create new meaning by blending concepts and creating new ones (p. 335). Fauconnier (1994) deepened our understanding of integration by explaining how our brain takes parts of two separate concepts and integrates them into a third concept that contains some properties (but not all) of both original concepts. For example, the nickname “Iron Lady,” referring to former British prime minister Margaret Thatcher, represents a conceptual integration of the concept iron, a metal used in construction because of its strength, with the concept lady, a woman who holds political rank. The implicit claim of the metaphor is that Margaret Thatcher acted *as if* she were made of iron (p. xxiii). Conceptual blending is possible because certain commonalities exist in the two original concepts that provide the basis for the new integrated concept. This third concept is different from either of the two original concepts. Figure 1.3 depicts this process.

Turner (2001) extends the theory of conceptual integration still further by arguing that we cannot fully appreciate a concept without understanding its cultural or historical context (p. 17).

FIGURE 1.3 ■ Integrating Two Separate Concepts to Create a Third Concept



Source: Allen F. Repko

Accordingly, concepts (discussed in depth in Chapter 10) should be analyzed in the context and theoretical framework of the disciplines from which they come.

From the previous discussion, it is possible to construct a definition of integration as follows:

Integration is the cognitive process of critically evaluating disciplinary insights and creating common ground among them to construct a more comprehensive understanding. The new understanding is the product or result of the integrative process.

In this book, we will limit our use of the word “integration” to describe the integration of insights, as in the definition above. Readers should be aware that some interdisciplinary scholars apply the word “integratio” to many activities, including integrating methods and the perspectives of members of interdisciplinary research teams (e.g., Keestra, Uilhoorn, & Zandveld, 2022). We would stress that integrating insights is the *goal* of interdisciplinary research while employing mixed methods and encouraging mutual understanding within research teams are among the many strategies for achieving that goal. We prefer not to dilute the meaning of “integration” by applying it to other activities that can be described with alternative terminology.

Epistemology of Interdisciplinary Studies

Epistemology involves questions such as “What can we know?” and “How can we know it?” Of the many ways that disciplinarity contrasts with interdisciplinarity, none is greater than their starkly different approaches regarding epistemology. Each disciplinary perspective involves a set of epistemological attitudes. Interdisciplinarity necessarily involves respecting these various epistemologies.

Some disciplines, especially in the natural sciences (but also economics to a considerable extent), believe that scholars can employ quantitative methods (notably experiments, statistical analysis, and mathematical modelling) to achieve very precise understandings of the phenomena that they investigate. Other disciplines, especially in the humanities, believe that scholarly understandings are always subjective to some degree and that the qualitative methods they employ (interviews, close reading of texts, surveys) cannot generate very precise understandings. Some scholars in these disciplines have come to doubt that any sort of objective understanding is possible: They see scholarship as only a game in which we argue for positions that we find congenial. (Note that all of these disciplines choose an epistemological outlook that reflects the nature of their favored methods. As noted, disciplinary perspectives are internally consistent.)

Interdisciplinarity steers a path between two extremes. On the one hand, it rejects a positivist belief that scholarship advances by proving or disproving hypotheses. Philosophers of science now appreciate that it is always possible to interpret any research finding in multiple ways. On the other hand, interdisciplinary research must reject an alternative nihilistic belief that we are not able at all to advance human understanding through research. The middle-ground position, recommended by most but not all philosophers of science, is that scholarly understanding advances through careful amassing of evidence and argument. In the case of interdisciplinarity,

we evaluate disciplinary insights, with a general expectation that these will be imperfect but contain some kernel of truth. We then seek a more comprehensive understanding that best fits our collective perception of the world (Szostak, 2007a). The interdisciplinary view that disciplinary insights are partial matches with contemporary philosophical understanding of epistemology (Welch, 2011).

Interdisciplinary can practice epistemological pluralism, in which they respect the different epistemologies pursued in different disciplines (Welch, 2011). They can recognize that some disciplines may be too confident in their insights, and others perhaps too hesitant to reach firm conclusions. They can employ the interdisciplinary techniques of evaluation that we will outline in later chapters to critique insights from any discipline.

Note that epistemological pluralism supports a blend of instrumental and critical interdisciplinarity, as was advocated above: We are free to both draw upon and critique disciplinary insights and perspectives. Note also that our interdisciplinary epistemological outlook is in turn grounded in an interdisciplinary ontology: our philosophical understanding of how the world works (as forcefully advocated by Bhaskar, Danermark, & Price, 2016). It is because the phenomena studied in one discipline interact in complex ways with the phenomena studied in other disciplines that we need interdisciplinary analysis to integrate across insights, which can only be partial (see Henry, 2018).

DISTINGUISHING INTERDISCIPLINARITY FROM MULTIDISCIPLINARITY, TRANSDISCIPLINARITY, AND INTEGRATIVE STUDIES

Through articulating the nature of the interdisciplinary research process in later chapters, we can encourage rigor in interdisciplinary analysis. We have carefully defined and described interdisciplinary studies above to set the stage for discussion of that process. We can prevent unnecessary confusion with other terminology you may come across by carefully distinguishing interdisciplinarity from multidisciplinary, transdisciplinarity, and integrative studies.

Interdisciplinary Studies Is Not Multidisciplinary Studies

Some who are outside the field mistakenly believe that *interdisciplinarity* and *multidisciplinary* are synonymous. They are not. **Multidisciplinarity** refers to the placing of insights from two or more disciplines side by side. For example, this approach may be used in a course that invites instructors from different disciplines to present their perspectives on the course topic in serial fashion but does not attempt to integrate the insights produced by these perspectives. “Here the relationship between the disciplines is merely one of proximity,” explains Joe Moran (2010); “there is no real integration between them” (p. 14). Merely bringing insights from different disciplines together in some way but failing to engage in the additional work of integration is **multidisciplinary studies**, not interdisciplinary studies. **Multidisciplinary research** “involves more than a single discipline in which each discipline makes a *separate* contribution [italics added]” (National Academies, 2005, p. 27).

Note that multidisciplinary research is still valuable in setting the stage for interdisciplinary research (and in some simple cases, where one discipline explains how A affects B, and another how B affects C, multidisciplinary analysis alone may give us an understanding of how A indirectly affects C; see Mennes 2020). Multidisciplinary teaching programs usefully expose students to multiple disciplinary perspectives and insights. Yet students can easily be frustrated if provided no guidance on how to evaluate and integrate disciplinary insights. We strongly encourage multidisciplinary teaching programs (which often advertise themselves as interdisciplinary) to become interdisciplinary by teaching interdisciplinary strategies.

Lawrence Wheeler's instructive fable of building a house for an elephant (Wheeler & Miller, 1970) illustrates a typical multidisciplinary approach to solving a complex problem:

Once upon a time a planning group was formed to design a house for an elephant. On the committee were an architect, an interior designer, an engineer, a sociologist, and a psychologist. The elephant was highly educated too . . . but he was not on the committee.

The five professionals met and elected the architect as their chairman. His firm was paying the engineer's salary, and the consulting fees of the other experts, which, of course, made him the natural leader of the group.

At their *fourth* meeting they agreed it was time to get at the essentials of their problem. The architect asked just two things: "How much money can the elephant spend?" and "What does the site look like?"

The engineer said that precast concrete was the ideal material for elephant houses, especially as his firm had a new computer just begging for a stress problem to run.

The psychologist and the sociologist whispered together and then one of them said, "How many elephants are going to live in this house? . . . It turned out that *one* elephant was a psychological problem but *two* or more were a sociological matter. The group finally agreed that though *one* elephant was buying the house, he might eventually marry and raise a family. Each consultant could, therefore, take a legitimate interest in the problem.

The interior designer asked, "What do elephants do when they're at home?"

"They lean against things," said the engineer. "We'll need strong walls."

"They eat a lot," said the psychologist. "You'll want a big dining room . . . and they like the color green."

"As a sociological matter," said the sociologist, "I can tell you that they mate standing up. You'll need high ceilings."

So they built the elephant a house. It had precast concrete walls, high ceilings, and a large dining area. It was painted green to remind him of the jungle. And it was completed for only 15% over the original estimate.

The elephant moved in. He always ate outdoors, so he used the dining room for a library . . . but it wasn't very cozy.

He never leaned against anything, because he had lived in circus tents for years, and knew that walls fall down when you lean on them.

The girl he married *hated* green, and so did he. They were *very* urban elephants.

And the sociologist was wrong too. . . . They didn't stand up. So the high ceilings merely produced echoes that greatly annoyed the elephants. They moved out in less than six months! (Wheeler & Miller, 1970, n.p.)

This fable shows how disciplinary experts usually approach a complex task: They perceive it from the narrow perspective of their specialty and fail to take into account the perspectives of other relevant disciplines, professions, or interested parties (in this case, the elephant).

This story also illustrates how a multidisciplinary approach to understanding a problem merely juxtaposes disciplinary perspectives. The disciplines speak with separate voices on a problem of mutual interest. However, the disciplinary status quo is not questioned, and the distinctive elements of each discipline retain their original identity. In contrast, interdisciplinarity consciously integrates disciplinary insights to produce a more comprehensive understanding of a complex problem or intellectual question.

Multidisciplinary and interdisciplinarity have the following in common: They seek to overcome the narrowness of disciplines. However, they do this in different ways. Multidisciplinary means limiting activity to merely appreciating different disciplinary perspectives. Interdisciplinarity means being more inclusive of what disciplinary theories, concepts, and methods are appropriate to a problem. It also means being open to alternative methods of inquiry, using different disciplinary tools, and carefully estimating the degree of usefulness of one tool versus another to shed light on the problem (Nikitina, 2005, pp. 413–414).

Research is truly interdisciplinary, according to the National Academies (2005), “when it is not just pasting two disciplines together to create one product but rather is an integration and synthesis of ideas and methods” (p. 27). Figure 1.4 shows the difference between multidisciplinary and interdisciplinarity.

FIGURE 1.4 ■ Difference Between Multidisciplinary and Interdisciplinarity



- A Multidisciplinary**
Insights into a common problem from two disciplines (A + B) are consulted, but no integration occurs.



- B Interdisciplinary**
Insights into a common problem from two disciplines (A + B) are integrated to construct a more comprehensive understanding.

Source: National Academy of Sciences, National Academy of Engineering, & Institute of Medicine. (2005). *Facilitating interdisciplinary research* (p. 29). Washington, DC: National Academies Press.

Interdisciplinary Studies Is Not Transdisciplinary Studies

Complementary to interdisciplinarity, **transdisciplinarity** involves the integration also of *insights generated outside the academy*, a team approach to research, the active involvement of nonacademic participants in research design, and a case study approach. For example, if investigating environmental degradation in a particular area, transdisciplinary scholars would seek insights from local people on both the causes and potential solutions of environmental challenges (Bergmann et al., 2012, van Wehrden et al., 2019). Whereas an interdisciplinary scholar might tackle the general problem of economic development, a transdisciplinary scholar would more likely focus on development challenges in a particular locality.

None of these elements contradict the practice of interdisciplinarity, which can also involve insights, case studies, team research, and drawing on life experience and expertise outside the academy. We might think of transdisciplinarity as “interdisciplinarity plus,” where additional constraints (noted above) are placed on the transdisciplinary researcher.

NOTE TO READERS

This book focuses on interdisciplinarity. However, we will have occasion to discuss team research. Some of the numerous examples of interdisciplinary analysis provided in what follows qualify as case studies. Moreover, some of these examples do indeed draw on insights generated beyond the academy.

Interdisciplinary Studies and Integrative Studies

Integrative studies is often used in the contemporary academy to indicate something more than just integrating insights from different disciplines. **Integrative studies** seeks to integrate various elements of student experience such as coursework and residential life (Hughes, Muñoz, & Tanner, 2015).

While integrative studies and interdisciplinarity do not share the same boundaries, they do share important points of overlap. They both stress integration. Indeed, integrative studies makes a point that should be stressed here: Integration, perhaps the most important step in the interdisciplinary research process, is called for in all aspects of our lives. The integrative skills that interdisciplinary students will master are useful more generally in life. These students will be well suited to the needs of employers for workers that can integrate diverse bits of information into a coherent strategy. They will be better prepared not only for the world of work, but also to participate as members of their community in facing today's complex challenges.⁴

The Differences Between Multidisciplinarity, Interdisciplinarity, Transdisciplinarity, and Integrative Studies Summarized

- Multidisciplinarity studies a topic from the perspective of several disciplines at one time but does not attempt to integrate their insights.

- Interdisciplinarity studies a complex problem by drawing on disciplinary insights (and sometimes stakeholder views) and integrating them. By employing a research process that subsumes the methods of the relevant disciplines, interdisciplinary work does not privilege any particular disciplinary method or theory.
- Transdisciplinarity is best understood as a type of interdisciplinarity that stresses team research, a case study approach, and especially integrating not just across disciplines but beyond the academy.
- Integrative studies seeks to integrate various elements of student experience such as coursework and residential life.

CHAPTER SUMMARY

Interdisciplinary studies and interdisciplinarity are evolving and dynamic concepts that are now mainstream in the academy. This chapter focused on the meaning of each term, unpacking the field's essence in terms of its assumptions, theories, and epistemology. It examined various conceptions of interdisciplinarity including generalist, integrationist, critical, and instrumental. It also discussed how interdisciplinarity differs from multidisciplinary, transdisciplinarity, and integrative studies.

Chapter 2 introduces the disciplines and their perspectives, describes how knowledge is typically reflected in the organization of the academy, and presents an in-depth discussion of disciplinary perspective.

EXERCISES

Defining for Clarity

- 1.1 In this chapter, you saw the importance of defining the controversial and misunderstood term *interdisciplinary studies* to reveal its true meaning. Can you think of another controversial or misunderstood term whose true meaning could be clarified by studying its definition in a similar manner?

What and How

- 1.2 Definitions of some terms contain both a *what* and a *how* component. This is true of the integrated definition of interdisciplinary studies that appears in this chapter. Identify which part of the definition is the *what*, and which is the *how*.

Dominant Forms

- 1.3 Which form of interdisciplinarity, instrumental or critical, would most likely yield a more comprehensive understanding of why newly arrived immigrants typically resist (at least initially) assimilating into the majority culture?

Assumptions

- 1.4 Is the assumption that the complex reality beyond the university makes interdisciplinarity necessary justified? If so, why? If not, why not?
- 1.5 This chapter has argued that interdisciplinarity should be viewed as complementary to the disciplines rather than as a threat to them. In your view, what is the most compelling argument that can be made for a “both/and” rather than an “either/or” position?
- 1.6 Why should a person’s life experience be considered less or more valid than a disciplinary insight published in a scholarly journal?
- 1.7 Identify a health issue or a health service challenge that could benefit from an interdisciplinary approach.

Complexity

- 1.8 In interdisciplinary work, why must the object of study be complex?

Perspective Taking

- 1.9 Explain the relationship between perspective taking and holistic thinking.

Integration

- 1.10 Explain why creating is so closely associated with interdisciplinary studies.

Epistemology

- 1.11 Explain why epistemological pluralism is considered a key component of interdisciplinarity.

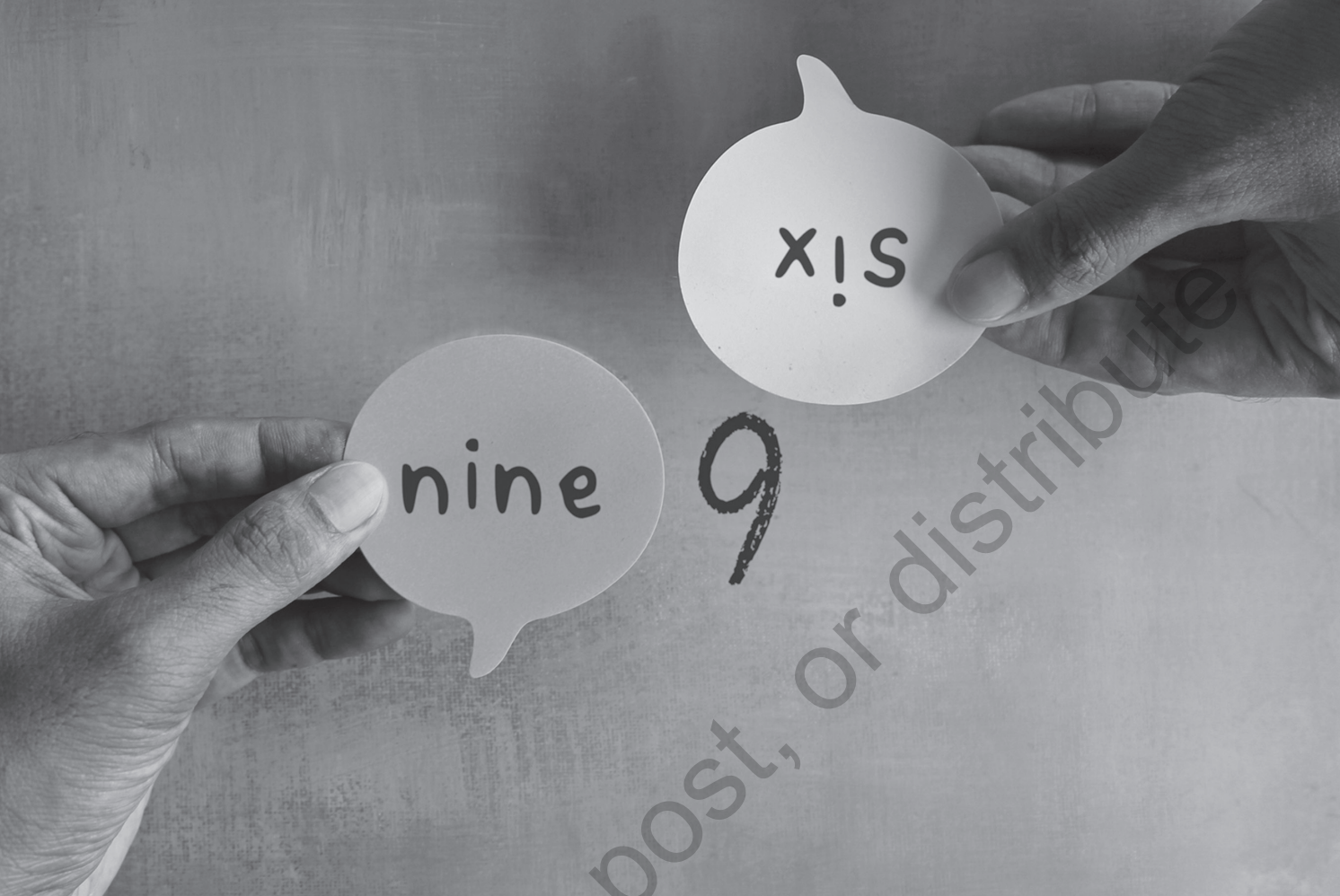
Inventory

- 1.12 Examine your university’s undergraduate and/or graduate curriculum to determine how much interdisciplinary activity exists on campus.
- 1.13 How might your institution’s general education curriculum be made more interdisciplinary?

Building Houses for Elephants

- 1.14 The fable of the elephant house is instructive to those who are engaging in a complex enterprise such as building a house. Think of another complex enterprise that is planned or already under way in your community and apply the lessons of the elephant house to it.
- 1.15 Is there a transdisciplinary aspect to the elephant house project? If so, what is it, or if not, what should it be?

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2

INTRODUCING THE DISCIPLINES AND THEIR PERSPECTIVES

LEARNING OUTCOMES

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

- 2.1** Explain the concept of disciplinary perspective
- 2.2** Describe how disciplinary knowledge is typically reflected in the organization of the academy
- 2.3** Identify discipline categories
- 2.4** Explain how to use disciplinary perspective
- 2.5** 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 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, 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. Raymond C. Miller was the first to assert that disciplines have distinct perspectives or worldviews that are pertinent to interdisciplinary understanding and stated that perspective should be "the primary means of distinguishing one discipline from another" (1982, 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. It tends to think that its phenomena are of particular importance in the world. 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.

The following are the **defining elements of a discipline's perspective**:

- The phenomena it studies
- Its epistemology or rules about what constitutes evidence
- 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)

The important point to stress about disciplinary perspective is that these elements cohere. Disciplines choose methods that are good at investigating their favored theories and study phenomena amenable to these theories and methods. Economics for much of the twentieth century emphasized rational choice theory: that is, that individuals made decisions rationally. This meant that economists need not observe the decision-making process. If we know an individual's goals (and we can usually assume that they want to maximize income or minimize costs) and the choices they face, we know what they will do. Economists thus employed mathematical models and statistical analysis almost exclusively and focused their attention on variables that could be quantified, whereas sociologists, who pursued theories of cultural influences or peer pressure, resorted to interviews, surveys, and observation, to understand why people acted as they did. It was only when a minority of economists began doing experiments (and these regularly showed that individuals did not make decisions rationally) that the discipline as a whole became more flexible regarding the rationality assumption. This example highlights

the synergy between theory, method, and subject matter. It also shows that disciplines evolve through time but that such synergies remain important. We can note further that the pursuit of both statistical analysis and experiments tends to be associated with epistemological beliefs that objective and precise understandings of the world are possible. This belief in precision was reflected in the discipline's tendency to provide very precise definitions of key terminology, whereas there are literally hundreds of competing definitions of terms such as *culture* in other social sciences.

Disciplinary perspective, then, is much more than just the sum of theory, method, epistemology, phenomena, and concepts. These elements are mutually reinforcing and jointly provide a way of looking at the world. 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 (Choi & Richards, 2017).

It is worth stressing that different disciplines, especially in the humanities and social science, where there are many more methods in use than in natural science, will often have perspectives that differ in multiple ways. The efforts of a sociologist to understand peer pressure by interviewing or observing can seem bizarre to a rational choice economist: The sociologist is employing questionable methods to study a questionable theory about phenomena the economist thinks are unimportant. The sociologist can be equally suspicious of the economist's research. By shaping the way scholars think, disciplinary perspective serves as a powerful barrier to interdisciplinary communication. To pursue interdisciplinarity, we need to understand what disciplinary perspective is and how its elements are mutually reinforcing.

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, 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 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, contains 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. Nevertheless, 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 that "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. Generally, though, they apply these theories using the same methods used with old theories. Note also that sociology studies a broad diversity of phenomena—culture, social structure (societal divisions by gender, ethnicity, class, and more), population dynamics, and crime—phenomena that are not more closely related to each other than they are to the economy or politics, phenomena addressed in other disciplines (Szostak 2023). Sociologists have naturally developed quite different theories to address these quite different phenomena.

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.¹ *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. As Klein (1999) pointed out decades ago, disciplines borrowing concepts, theories, and methods from one another skew the picture of knowledge depicted in conventional maps of the academy. She observed, for example, how

textuality, narrative, and interpretation were once thought to belong within the domain of literary studies. They now 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 (p. 3). (Note that interdisciplinary scholarship encourages such borrowing and thus potentially enhances the ability of disciplines to answer disciplinary research questions.) However, these developments do not mean the end of disciplines.

Implications for Interdisciplinary Work

Interdisciplinary scholars 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 (see Table 2.3).

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.² 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.

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

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 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.

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 the 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 artefacts 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. [As noted above, economics has deviated from especially strict adherence to rationality recently.]

Discipline	Overall Perspective
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. [Recall from above that sociology studies a diverse body of phenomena. It is thus particularly difficult to identify central tendencies.]
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	In North America, music departments tend to combine the teaching of musical performance (which tends to be taught outside universities in conservatories in Europe) and the teaching of theories about music. Much attention is paid to how music performance is best taught. Music is seen as an important component of a community's culture, but also reflecting common aesthetics. A wide range of theories and methods are applied to the study of music.
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.). In addition, 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.

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 highlight 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. Interdisciplinary scholars draw on these insights and theories, analyze them (asking in particular whether disciplinary perspective biases the insights), 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 or relationship altogether. An example

is the causes of economic growth, which has been a focus of economists but has not been studied much 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.³ 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, ideology, public opinion
	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—culture, social structure (gender, ethnicity, class, etc.), crime, population

(Continued)

TABLE 2.3 ■ Disciplines and Their Illustrative Phenomena (Continued)

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

Alternatively, the interdisciplinary scholar can start by identifying relevant phenomena and then seek to identify the disciplines that study these. Table 2.4 captures the key phenomena addressed across the social sciences and humanities. The table can be read from left to right, with more general phenomena on the left and more specific phenomena on the right. A practical benefit of this 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 this classification 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 2.4 ■ Phenomena Studied in the Social Sciences and Humanities^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 <ul style="list-style-type: none"> Physical abilities Physical appearance Energy level Intelligences 	<ul style="list-style-type: none"> Speed, strength, endurance Height, weight, symmetry Physical, mental Musical, spatial, mathematical, verbal, kinesthetic, interpersonal
	Personality <ul style="list-style-type: none"> Emotionality (stable/moody) Conscientiousness Affection (selfish/agreeable) Intellectual orientation Other dimensions Disorders Sexual orientation Interpersonal relationships 	<ul style="list-style-type: none"> 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

(Continued)

TABLE 2.4 ■ Phenomena Studied in the Social Sciences and Humanities^a
(Continued)

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	Rituals, dance, song, cuisine, attire, ornamentation of buildings, games
	<ul style="list-style-type: none"> • Goals • Means • Community • Everyday norms 	<ul style="list-style-type: none"> • 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	
	Act of insight	
	Critical revision	
	Diffusion/Transmission	Communication, adoption

First Level	Second Level	Third Level
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. The table was developed using a mix of deduction and induction and thus 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.

table may appear daunting at first glance, but you need only understand its basic structure (i.e., you need not and should not memorize every element) to be able to utilize it once you have a research topic in mind.

The phenomena studied in natural science can be classified in a similar manner. We can start with the basic waves and particles that are the essence of physical reality. There are then the elements and compounds of elements that comprise chemical reality. The elements are well

organized by the periodic table (with allowance for different isotopes). Compounds can best be represented by the elements they combine. Rocks (and minerals and soil types) reflect their chemical composition. Biological entities (including genes, cells, and organs) are even more complex combinations of chemicals. They in turn combine to produce the huge variety of flora and fauna that characterize the world. Two other categories of phenomena studied in the natural sciences are cosmological objects and mathematical concepts (the latter are not really natural science phenomena, but departments of scholars studying these are generally found in natural science colleges or faculties). We do not provide a tidy table here because scholars have identified huge numbers of (especially) chemical compounds and species of flora and fauna. (Students needing to engage with more precise natural phenomena than those mentioned here can consult Szostak's Basic Concepts Classification at <https://sites.google.com/a/ualberta.ca/rick-szostak/Basic-Concepts-Classification/the-classification-of-things-phenomena>.)

We should note that it is far easier to move between phenomena and disciplines in natural science than in the social sciences and humanities. Natural science disciplines tend to reflect different orders of complexity. Physicists study waves and particles. Chemists study elements and compounds. Biologists study biological entities. Geologists study rocks. One deviation from this logical division is that physicists also study cosmological objects, as do astronomers, who are generally housed in physics departments. Biology is sometimes divided into a host of disciplines such as zoology, the study of fauna.

Epistemology

Epistemology is the branch of philosophy that studies how one knows what is true and how one validates truth. 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 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 to recognize here 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 (Rosenau 1992, Szostak 2007a).

It is worthwhile to recognize briefly 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? 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. (One key difference between natural science and social science is that natural scientists are usually better able to study interactions among a small number of phenomena in isolation and are thus better able to establish empirical regularities.)

We will describe in what follows 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 below are not definitive but central tendencies. Any way of classifying the epistemological positions of the disciplines can be contested.

Epistemologies of the Natural Sciences

Natural scientists believe for the most part believe that they are investigating enduring causal regularities, which they can identify empirically. They are confident in their abilities to observe the world accurately, precisely, and objectively. Physicists thus seek to understand how and why waves and particles interact always and everywhere. Likewise, chemists seek to understand how and why certain chemicals will always behave or interact under particular well-specified conditions (temperature, pressure, etc.). Biologists employ evolutionary theory to comprehend the evolution of all species. They seek general understandings of how genes, organs, and other biological entities operate. Geologists generally pursue uniformitarianism, a belief that geological formations are the result of natural laws and processes that have not changed over time. Note that in all cases, this epistemological outlook encourages (and reflects) the use of methods that allow precise (generally quantitative) results to be obtained, and theories that are highly generalizable (i.e., the same theory can be applied widely). Quantum theory in physics, thermodynamics in chemistry, and theories of tectonic plates in geology can each be employed widely.

We might stress a further element of natural science epistemology: a belief that we can study different causal relations in isolation. We can then build up a broader understanding of how the world works piece by piece. This epistemological belief reflects the reality that natural scientists can often isolate a couple of phenomena for study, such as in looking at how two chemicals react. There are nevertheless situations in which natural scientists need to study complex systems of interaction. This is the general case in social science.

Mathematics is a special case. As noted elsewhere, it is housed in the natural sciences in most universities (likely because of the quantitative nature of most natural sciences) but does not actually study the natural world. Rather, mathematics, like philosophy, involves making reasoned statements that build on preceding understandings. Mathematicians believe that they can continue to add to our understandings of mathematical processes by applying logic and careful reasoning.

Epistemologies of the Social Sciences

Robinson, Gonnerman, and O'Rourke (2019) find that social scientists are on average much less confident than natural scientists that an unbiased science is possible. The social sciences exhibit much greater epistemological diversity than do the natural scientists. Some social scientists, especially in economics, believe that they are seeking to identify enduring causal regularities. Other social scientists doubt that objective, enduring understandings are possible. As with natural scientists, epistemological attitudes are reflected in theories and methods. (Most) Economists thus emphasize quantitative methods such as mathematical modeling and statistical analysis. Though increasingly questioned, the highly generalizable rational choice theory is still widely applied in the discipline. Alternatively, cultural anthropologists often take a constructivist epistemological attitude (i.e., a belief that we construct our external reality), and then theorize that human understandings and behaviors are shaped by the cultural context in which we operate.⁴

Some political scientists and sociologists believe that they are pursuing the identification of empirical regularities, but others think this is impossible due to the unpredictability

of individual behavior, or the ways in which we construct reality. There are also concerns that language is too ambiguous for us collectively to achieve consensus about the causes of complex social processes. Consequently, both disciplines are characterized by theoretical and methodological diversity. Psychology seeks through experiments to identify general tendencies in human behavior. Yet psychologists are naturally well aware of individual diversity (experiments may at times serve to identify such differences). Observational research, especially in clinical settings, seeks to understand how different types of people behave in certain circumstances (classification of personality traits, psychological disorders, etc. has thus always been important in the discipline).

Epistemologies of the Humanities

The humanities, even more so than the social sciences embrace epistemological pluralism. This development is characterized and explained by the rise of the “new generalism” or “critical humanities” (feminism, critical theory, postcolonial studies, cultural studies, gender studies, postmodernism, poststructuralism, deconstructionism, etc.). All of these approaches are suspicious of previous scholarship, and stress subjectivity. The humanities prize diversity of perspective, values, and ways of knowing.

Those humanities disciplines that study art, such as art history, music, or literature, debate to what degree works of art reflect and speak to a common human aesthetic taste versus a particular cultural context. In theorizing and exploring the former, one might easily believe that certain empirical regularities might be identified. In exploring the cultural context, though, understandings are likely to be less generalizable and perhaps also less precise and objective. These humanities disciplines have tended toward the latter sort of epistemological attitude, but with important exceptions. (An integrative approach might accept that both aesthetic and cultural forces are at work, and explore how these interact. This might require a flexible epistemology that embraces both generalizable and more particular understandings.) With respect to objectivity, these disciplines, like the rest of the humanities, have become more skeptical that we can identify objective understandings most/all scholars accept.

Philosophy is generally housed administratively in the humanities, but is quite different from other humanities disciplines. Like mathematics, philosophy has generally been characterized by a belief that we can enhance our philosophical understanding through the accretion of careful, reasoned argument. In recent decades, though, many philosophers have become skeptical that we can build toward one shared philosophical understanding. Rather, they argue that there will always be a diversity of philosophical viewpoints on most issues of philosophical concern. Since epistemology is one of these areas, there has been a blossoming of epistemological theories that outline the limitations to human perception and cognition that work to limit the pursuit of objective understandings.

Historians are often guided by a belief that each historical event is unique. They have tended, then, to describe unique confluences of processes and personalities. Yet this has not prevented numerous attempts to establish historical regularities by comparing across time and place. (As with the study of art above, an integrative approach might embrace both: There may well be historical regularities that we should seek to identify, while still appreciating that how

such regularities interact with each other and with unique personalities will mean that each historical time and place is still unique.) Historians once hoped that by the careful examination of historical sources, we could achieve an objective understanding of what happened in history and why. As in philosophy, many contemporary historians are skeptical that we can ever achieve an objective consensus. While all historians still stress the close reading of historical texts, some seek to identify commonalities while others stress the diversity of opinions within these texts. Historians have long debated whether they should be informed by theories developed in other disciplines; there is an understandable concern that such theories might bias the interpretation of historical documents. Those interested in historical regularities have been more open to borrowing theories than have those stressing the uniqueness of each event.

Religious studies has in recent decades embraced epistemological skepticism of the possibility of objective understandings. Yet the field is still motivated by a belief that it is possible to study religions without either reifying or denigrating religious belief. Scholars in the field often distinguish themselves both from theologians and from some sociologists who are critical of religion in general.

Across the humanities, the emergence of more skeptical epistemological attitudes has been closely associated with new types of theories. We might make special note of theories such as deconstructionism that have stressed the ambiguity of both words and texts; such theories have spread from literary studies across the humanities and into some social sciences. Furthermore, the concern that power relations within the wider society have biased previous scholarship encourages theories that stress exploitative relationships. Historians worry in particular that subservient groups leave fewer written records than dominant groups, and thus conjecture that the importance of such groups in history has been underappreciated.

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. Yet if we doubt the importance of perspective, then interdisciplinarity is unnecessary. Interdisciplinary scholars should respect diverse epistemologies, but should not imagine that “anything goes” (Szostak, 2007a).⁵

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, interdisciplinary scholars 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 previously, 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 (i.e., seeing value in alternative approaches rather than choosing one over the other) is recommended, interdisciplinary scholars are guided to integrate the best of different epistemologies rather than limit themselves to one. Interdisciplinary analysis is possible as

long as we back away from extreme postmodern arguments (as most postmodernists themselves do) and desirable as long as we back away from extreme modernist assumptions.

Concepts

A **concept** is a symbol expressed in language that represents a phenomenon or an abstract idea generalized from particular instances (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 (i.e., 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). 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 these reasons, this book does not 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). Diphthoorn, Leyh, Knittel, Huysmans, and Van Goch (2023) argue that the fact that concepts take on different meanings as they move across disciplines is an invitation to interdisciplinary analysis: We can analyse and attempt to integrate across these different meanings. Diphthoorn and Leyh (2023) describe a podcast series that looks at dozens of concepts, how these are employed in different disciplines, and how common ground might be achieved. We will indeed discuss a strategy for integrating across differences in meaning, redefinition, in Chapter 10.

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 addressed 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

Interdisciplinary 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, as 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 not to ignore theories and methods that may shed some lesser light on the question. 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).

Elsewhere in this chapter, we have provided tables of the phenomena studied by scholars and the methods employed by scholars. We were also able to discuss the most important differences in epistemological outlook. For both concepts and theories, it is not possible to provide a comprehensive survey simply because there are so many different concepts and theories employed across the scholarly enterprise. We will, however, identify some key types of theory in Chapter 7. Students and scholars can usefully ask what types of theory are most appropriate to their research question: They will often find that multiple theory types are necessary to address a complex research question.

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: STABILITY, INSTABILITY, AND INTERDISCIPLINARITY

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 among the phenomena they normally study 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.⁶ 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. Interdisciplinary scholars 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 interdisciplinary scholars in disciplinary methods and the kind of knowledge required of them varies considerably depending on how they work with methods. Those interdisciplinary

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. Interdisciplinary 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 been for some decades 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, although this coverage is far from exhaustive. The latter kind of program clearly demands that students read widely in the disciplinary literature to develop at least a general understanding of all the standard methods. Fortunately, the number of these is relatively small. Table 2.5 lists commonly used quantitative and qualitative methods. Analysis of the strengths and weaknesses of each method is reserved for Chapter 6.

TABLE 2.5 ■ 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)

Approach	Methods
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.

Research Methods Associated With Disciplines

Tables 2.6, 2.7, and 2.8 associate particular disciplinary categories with particular methods. The methods associated with each category are not definitive and are stated in the most general terms.

TABLE 2.6 ■ Research Methods Associated With the Natural Sciences

As noted above, the methods employed in the natural sciences tend to be quantitative. They also tend to be deductive. That is, they involve the testing of hypotheses (though researchers may develop these hypotheses inductively by observing the world, they stress the deductive elements of their research).

Discipline	Methods
Biology	Biologists stress experimentation (like other natural scientists), but there is also important research that observes organisms in natural settings (biologists debate the relative value of experiment versus observation). There is also, of course, a long and important tradition of classifying species. An earlier tradition of classifying according to observed similarities is being replaced by an emphasis on classifying in terms of genetic inheritance.
Chemistry	Experiments are the dominant method in chemistry.
Earth Science	Earth science also uses experiments, but often relies on observations of the natural world. Technologies such as X-ray diffraction and mass spectrometry are employed. Mathematical modelling and physical modelling (of, say, landslides) are employed, as is statistical analysis.
Mathematics	Mathematics is totally abstracted from the empirical world, though other empirical disciplines 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	As the name suggests, experimental physicists stress experiments. Theoretical physicists instead pursue mathematical modelling. Cosmology, the branch of physics that studies the origins and development of the universe, must generally rely on astronomical observation as its method.

TABLE 2.7 ■ Research Methods Associated With the Social Sciences

Discipline	Methods
Anthropology	The most common method in cultural anthropology has long been detailed field observation, although this has changed in recent decades. Cultural anthropologists now apply field research methods to technologically advanced societies as well as traditional societies. Observation is often supplemented (sometimes replaced) by interviews, and resort to linguistic, biological, or archaeological analysis. Physical anthropology relies on the examination of the results of archaeological excavation.
Economics	Economists have long stressed mathematical modelling and statistical analysis (econometrics). In recent decades, an important minority of economists has pursued experiments. Economists rarely perform surveys, though survey results are more often included within statistical analyses.
Political Science	Political science is methodologically diverse. Mathematical modelling and statistical analysis are common. So also are surveys, especially of public opinion. Observation and textual analysis (of laws and debates) are also important. Some questions (like the sources of democracy) require the use of historical methods.
Psychology	Experiments are the most common method by far. Yet observation is employed both in clinical settings and in social psychology. Classification (of personality types, psychological disorders, and much more) has also been important.
Sociology	Sociology is a rare discipline in which both quantitative and qualitative methods are widely pursued. Surveys have long been common, and survey results are often examined statistically. Yet interviews and observation have long also been common. More recently, methods of textual analysis have been imported from the humanities.

TABLE 2.8 ■ Research Methods Associated With the Humanities

Discipline	Methods
Art History	Art history usually involves the careful analysis of visual texts: paintings, sculptures, etc. Intuition may be employed in analyzing the effects a work has on its audience. Yet art historians also examine written texts to understand the artist's motivation and to place works of art within a cultural and historical context.
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. While textual analysis is thus the dominant method, interviews, examination of physical objects, and statistical analysis are all pursued at times.
Literature (English)	Textual analysis is the dominant method, but there are diverse techniques for doing so. There is some quantitative analysis of, say, word frequency in texts.

Discipline	Methods
Music Education	Works of music are studied in broadly similar ways to works of art (above), with scholars relying on hearing rather than sight. Music programs in North America focus much attention on how best to teach music, which involves carefully observing interactions between teacher and student.
Philosophy	Philosophy does not study the world as other disciplines do (usually, philosophy of science is often grounded in an appreciation of how science proceeds in practice). It pursues logical argument. This generally involves the close reading of preceding philosophical texts.
Religious Studies	Textual analysis is the most common method. Intuition is utilized in discussing religious experience. Observation can also be important here.

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.

Methods of the Natural Sciences. All the natural sciences use what is often called the “scientific method.” Interdisciplinary scholars should be aware that there are more than a dozen scientific methods used in the scholarly enterprise (see “Methods” in Table 2.5). 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), 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 2.6 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.

Modernist and quantitative approaches have lost force in recent decades largely because of developments in the philosophy of science and the rise of postmodernism. This process is most visible in sociology and least visible in economics. Consequently, the description of methods in Table 2.7 reflects both modernist and postmodernist approaches.

Methods of the Humanities. Table 2.8 shows that the humanities rarely insist on quantifying observations.

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. However, graduate students and scholars 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. We will discuss in later chapters how researchers might usefully employ multiple methods in their 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, 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 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.

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, and so forth, 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** As we have said, disciplines often share interest in the same phenomenon. Which disciplines would likely share an interest in the phenomena implicated in these possible research areas?
- Extreme drought in sub-Saharan Africa
 - The Israeli–Palestinian conflict
 - A performance of Shakespeare's *Hamlet*
- 2.5** Using Table 2.4 (Phenomena Studied in the Social Sciences and Humanities), 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.

Quantitative and/or Qualitative

- 2.8 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