1 Defining Interdisciplinary Studies

Chapter Preview

For over a century, universities and colleges throughout the world at all levels have relied on academic disciplines as platforms for imparting knowledge and generating new knowledge. Today, interdisciplinary learning at all levels is far more common as there is growing recognition that it is needed to answer complex questions, solve complex problems, and gain coherent understanding of complex issues that are increasingly beyond the ability of any single discipline to address comprehensively or resolve adequately. As Carole L. Palmer (2001) writes, "The real-world research problems that scientists address rarely arise within orderly disciplinary categories, and neither do their solutions" (p. vii).

This chapter (1) explains the meaning of interdisciplinary studies, (2) presents a definition of interdisciplinary studies, (3) explains what interdisciplinary studies is *not*, (4) discusses how the term *interdisciplinarity* is variably used today, and (5) identifies metaphors commonly associated with interdisciplinary work.

The Meaning of Interdisciplinary Studies

The meaning of interdisciplinary studies or **interdisciplinarity** continues to be contested by its practitioners and critics. But emerging from this debate are key concepts around which consensus is developing and which inform the integrated definition of interdisciplinary studies used in this book. The following discussion unpacks the meaning of these terms and, in doing so, introduces some of the theory undergirding this diverse and growing academic field.

Two Conceptions of Interdisciplinary Studies

A primary focus of the ongoing debate over the meaning of interdisciplinary studies or interdisciplinarity concerns integration. Integration literally means "to make whole." In the context of interdisciplinarity, **integration** is a process

by which ideas, data and information, methods, tools, concepts, and/or theories from two or more disciplines are synthesized, connected, or blended.

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).[1]

Integrationist interdisciplinarians, on the other hand, believe that integration should be the *goal* of interdisciplinary work because integration addresses the challenge of complexity. Integrationists point to a growing body of literature that connects integration with interdisciplinary education and research, and are concerned with developing a distinctively interdisciplinary theory-based research process and with describing how it operates (Newell, 2007a, p. 245; Vess & Linkon, 2002, p. 89). They advocate reducing the semantic evasiveness surrounding the term *interdisciplinarity* and point to research in cognitive psychology that shows that integration is both natural and achievable. This book is aligned with the integrationist understanding of interdisciplinarity.

The "Discipline" Part of Interdisciplinary Studies

Inside the academy, the term **discipline** refers to a particular branch of learning or body of knowledge such as physics, psychology, or history (Moran, 2010, p. 2). According to the American Association for Higher Education and Accreditation (AAHEA),

> Disciplines have contrasting substance and syntax . . . —ways of organizing themselves and of defining rules for making arguments and claims that others will warrant. They have different ways of talking about themselves and about the problems, topics, and issues that constitute their subject matters. (Schulman, 2002, pp. vi–vii)

Mary Taylor Huber and Sherwyn P. Morreale (2002) add that "each discipline has its own intellectual history, agreements, and disputes about subject matter and methods" and its own "community of scholars interested in teaching and learning in that field" (p. 2). Disciplines are also distinguished from one another by several factors. These include the questions disciplines ask about the world, their perspective or worldview, the set of assumptions they employ, and the methods they use to build up a body of knowledge (facts, concepts, theories) around a certain subject matter (Newell & Green, 1982, p. 25).

Academic 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. Each discipline has its own defining elements—phenomena, assumptions, epistemology, concepts, theories, and methods—that distinguish it from other disciplines.

These are the subject of Chapter 4. All of these characteristics are interrelated and are subsumed within an overall disciplinary perspective.

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 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), though many historians strive to be atheoretical. And it uses a research *method* that involves close reading and critical analysis of primary sources (i.e., letters, diaries, official documents) and secondary sources (i.e., books and articles on a topic) to present a coherent picture of past events or persons within a particular time and place.

Categories of Traditional Disciplines

There are three broad **categories of traditional disciplines**[2] (see Table 4.1 in Chapter 4):

- 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 assess human achievements and experience, and seek layers of meaning and richness of detail in written texts, artifacts, and cultural practices.

For the purposes of this book, references to *disciplines* are limited to the traditional disciplines unless otherwise noted. References to specific interdisciplines and schools of thought (e.g., feminism, Marxism) are appropriately identified.

The Fine and Performing Arts

In addition to these categories of 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 profession fields claim disciplinary status.)

The Emergence of Interdisciplines

The line between the disciplines and interdisciplinarity has begun to blur in recent years with the emergence of **interdisciplines** (further defined in Chapter 4). These are fields of study that cross traditional disciplinary boundaries and involve a wide variety of interactions ranging from informal groups of scholars to well-established research and teaching communities. Frequently cited examples of interdisciplines are neuroscience and biochemistry, though the list also includes environmental science, nanotechnology, geobiology, sustainability science and engineering, psycholinguistics, ethnomusicology, cultural studies, women's studies, urban studies, and American studies (Klein, 1990, p. 43; National Academy of Sciences, National Academy of Engineering, & Institute of Medicine, 2005, pp. 249–252). Interdisciplines differ from disciplines in terms of their origins, character, status, and level of development.[3] For example, the interdiscipline of molecular biology developed in response to breakthroughs from the discovery of the structure of DNA and the development of new technologies. Only by bringing together the skills and knowledge of a wide range of disciplinary experts—chemists, geneticists, physicists, bacteriologists, zoologists, and botanists—can many medical problems be solved (Sewell, 1989, pp. 95–96).

Evolving Constructs

The disciplines, applied fields, and interdisciplines are not rigid and unchanging but are evolving social and intellectual constructs and, as such, are time-dependent. That is, today's discipline may well have been yesterday's **subdiscipline** (further defined in Chapter 4) or branch of an existing discipline. An example is the evolution of history, which, prior to the mid–nineteenth century, played a minor role in colleges as a branch of literature but grew rapidly as an independent discipline that absorbed those aspects of politics and economics that had a past dimension (Kuklick, 1985, p. 50). Today, history is a well-entrenched professional discipline that is typically included within the humanities but also has allegiances to the social sciences.

Julie Klein (1996) speaks of the "concealed reality of interdisciplinarity" where interdisciplinarity is flourishing but is not labeled as such, as in, for instance, medicine, agriculture, and oceanography. The pattern by which interdisciplinary studies operates occurs in this way: (1) Researchers detach a subject or an object from existing disciplinary frameworks; (2) they fill

gaps in knowledge from lack of attention by the disciplines; and (3) if the research attains critical mass, researchers "redraw boundaries by constituting new knowledge space and new professional roles" (pp. 36–37).

The "Inter" Part of Interdisciplinary Studies

The word *interdisciplinary* consists of two parts: *inter* and *disciplinary.* 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. So a starting point for the definition of *interdisciplinary* is between two or more fields of study (Stember, 1991, p. 4).

"Inter" Refers to Contested Space

This "in between" space is **contested space**. Most interdisciplinary study examines **contested terrain**—problems, issues, or questions that are the focus of several disciplines. For example, crime in post-9/11 Washington, D.C., is an interdisciplinary problem because it is an economic problem *and* a racial problem *and* a cultural problem. William Newell emphasizes that the test of the interdisciplinarity of a problem is not its distance from each contributing discipline but whether the problem is fundamentally multifaceted or complex (personal communication, June 30, 2004). The important point is that the *disciplines are not the focus of the interdisciplinarian's attention; the focus is the problem or issue or intellectual question that each discipline is addressing.* The disciplines are simply a means to that end.

"Inter" Refers to the Action Taken on Insights

The something "derived from two or more" fields of study is the **insights** or scholarly contributions to the clear understanding of a problem based on research. The *action taken* on these insights by interdisciplinarians is to integrate them. The **integrative process** involves creating common ground between conflicting insights into a particular problem from two or more disciplines. The integrative process is the subject of Part III of this book.

"Inter" Refers to the Result of Integration

The result of integration—and another aspect of the prefix *inter*—is *something altogether new,* distinctive, apart from, and beyond the limits of any discipline and, thus, *a cognitive advancement* or addition to knowledge. This product of the interdisciplinary enterprise is called the *more comprehensive understanding* or *more comprehensive theory,* the subject of Chapter 13. This understanding can be used for a variety of purposes, including formulating new policies, framing new research questions, and producing new artistic creations and technical products. Its being additive to knowledge, however,

does not preclude interdisciplinarity critiquing the disciplines or interrogating knowledge structures, government policies, and societal values.

Aspects of the Prefix "Inter" Summarized

Three important aspects of the prefix *inter* may be summarized as follows:

- The contested space between disciplines
- The action taken on disciplinary insights, called integration
- The result of integration that constitutes a cognitive advancement, called a more comprehensive understanding

The "Studies" Part of Interdisciplinary Studies

The word **studies** has had a long and respectable history (since the end of World War II), referring initially to geographical regions (e.g., Soviet studies) and historical eras (e.g., Renaissance studies). In recent decades, however, the term has shifted to cultural groups (including women, Hispanics, and African Americans) and also appears 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 Traditional Disciplines Are Not Referred to as "Studies"

Every established discipline has a universally recognized core of knowledge, and this core is subdivided into specific courses called a **curriculum**. The curriculum of each discipline varies from institution to institution in terms of number of courses offered and the titles of courses. Despite this variety, experts in a discipline recognize these courses as uniquely the "territory" of their discipline. The reason disciplines do not refer to themselves as history "studies" or biology "studies" is that their core of study—their curriculum—is well established and is recognized as their research and teaching domain.

This traditional arrangement, however, is being upset by the emergence of multidisciplinary studies programs such as environmental studies and urban studies, and the changing nature and expansion of disciplines. At first, many disciplinary departments simply added "environmental" to some of their course titles, while other departments contributed entire courses to a new environmental studies program, such as environmental geology, environmental psychology, or environmental law. A similar situation developed with urban studies. The problem with these and similar "studies" from an interdisciplinary perspective is that they seldom attempt to engage in integration

and, thus, have not coalesced into discrete fields that are unified by general agreement as to their conceptual definition (Klein, 1996, pp. 96–100).[4] For example, after three decades, there is still no definition of "urban" that enjoys general agreement, though most definitions include the interrelation between people and space. An exception is ecology, which, despite these difficulties, has managed to develop a broad field of its own called ecological economics (Rogers, Scaife, & Rizzo, 2005, p. 267).

Why "Studies" Is an Integral Part of Interdisciplinary Studies

Having said that multidisciplinary "studies" programs do not typically engage in integration, it is necessary to explain why the term *studies* is an integral part of interdisciplinary studies. There are two reasons for this. First, the term denotes the activity of drawing on disciplinary expertise relevant to the problem at hand. Second, the term *studies* denotes a "perceived misfit among need, experience, information, and the prevailing structure of knowledge embodied in disciplinary organization" (Caldwell, 1983, pp. 247–249). 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 studies, urban studies, sustainability studies, and cultural studies.

The Differences Between the Disciplines and Interdisciplinary Studies

There are key differences between 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 "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 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 important, a growing body of explicitly interdisciplinary research on real-world problems is emerging.
2. Have methods of acquiring knowledge and theories to order that knowledge	2. Makes use of disciplinary methods, but these are subsumed under a research process of its own that involves 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 new knowledge, more comprehensive understandings, new meanings, and cognitive advancements
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. Is largely dependent on the disciplines for its source material
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 are emerging, interdisciplinary studies still typically hires those with disciplinary PhDs.

*This column is based, in part, on Jill Vickers (1998, p. 34.)

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 in order 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). Interdisciplinarians are interested not in merely rearranging these ever-changing dots of knowledge but in *integrating* them into a new and more comprehensive understanding that is additive 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. A contrasting view is that a purely disciplinary focus sacrifices breadth, comprehensiveness, and realism for depth. An integrated view, which this book reflects, recognizes that there is a symbiosis between disciplinary and interdisciplinary research. By building on the disciplines, interdisciplinarity can then feed back new ideas and questions to the disciplines.

Newell speaks for many interdisciplinarians, arguing that interdisciplinary studies is able to achieve as much depth as do the disciplines:

> To the extent that interdisciplinary study harnesses disciplinary depth and rigor, it utilizes similar notions of depth and rigor; but to the extent that it is engaged in a different intellectual enterprise from the disciplines (especially integration), it must have some different notions of depth and rigor in addition. (personal communication, June 30, 2004)

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

This section discusses reasons for practitioners to agree on a definition, and reviews the prominent definitions of interdisciplinary studies that have emerged in recent years. A definition of interdisciplinary studies that integrates their core concepts is then presented.

Reasons for Agreeing on a Definition of Interdisciplinary Studies

Critics of interdisciplinary studies frequently charge that it has no widely accepted definition. For example, writing in *The Chronicle of Higher Education,* Jeffrey N. Wasserstrom (2006) complains that interdisciplinarity has become "so fuzzy that a university's commitment to it is close to meaningless" (p. B5). For many in the academy, interdisciplinarity is whatever someone says it is.

There are five reasons why the field's practitioners and those who claim to be doing interdisciplinary work—including students—should take the definition of interdisciplinary studies seriously and seek consensus about its meaning.

1. As a maturing academic field, interdisciplinary studies needs to define itself to make the case that interdisciplinarity is, in fact, contributing something distinctive and valuable to the academy and to society at large. Developing a common conception of what interdisciplinary studies is, says Newell (2007c), will enable faculty and students "to show the ways in which they are rigorously following through on the implications of that definition" (p. 2).

2. A common definition will help the field achieve greater depth and sophistication about interdisciplinarity. Learning in most academic contexts is sequential: The subject area is introduced, its theoretical basis and approach to research is explained, and this foundational information is then applied to specific contexts in more advanced courses. The movement is from the most general to the more specific, from breadth to depth. Interdisciplinary studies courses cannot provide more depth and sophistication about interdisciplinarity if each successive course must start over again in presenting the nature of interdisciplinary studies and offer different processes. If courses in the sequence share a common definition of interdisciplinarity and a common understanding of process, then the later courses in the sequences are able to go into more depth about the nature of interdisciplinarity or address conceptual, theoretical, or methodological issues with greater sophistication. "The more explicit the earlier discussions of interdisciplinarity in the sequence," says Newell (2007c), "the more likely students are in later courses to have a clear understanding of it" (p. 3).

3. An agreed upon definition will enable meaningful assessment of student work, program effectiveness, and academic scholarship. Evaluation of student work is made more difficult (for students and instructors alike) where there is confusion about what interdisciplinarity is, what student learning outcomes should be assessed, and which outcomes are distinctive to interdisciplinary learning (Repko, 2008, p. 171). Newell (2007c) argues that where faculty have achieved consensus on a definition of interdisciplinary studies, and thus the nature of interdisciplinary work, it is possible to develop assessment instruments that measure the desired outcomes. Where there is no consensus either on a definition or on the nature of interdisciplinary work,

   > it is not possible to assess learning outcomes because there is no basis for agreement on what distinctively interdisciplinary outcomes to look for. As a result, it is effectively impossible for the faculty to provide evidence of value added through interdisciplinary education. (p. 2)

   The clarity and quality of interdisciplinary assessment has been improving since research on cognition and instruction has identified learning outcomes that are distinctive to interdisciplinary learning.[5]

4. A common conception of interdisciplinary studies will facilitate communication among faculty and students from different disciplines who are conducting interdisciplinary research and/or applying for grants. If researchers share a common working definition of interdisciplinary studies, says Newell (2007c), "they can much more easily talk with each other about common curricular and pedagogical challenges they face" and perhaps develop joint research proposals (p. 2). If students share a common conception of interdisciplinarity, and if the definition is linked to the same general interdisciplinary process for addressing any complex problem, they are more likely to creatively and habitually apply this process to any complex problem regardless of context.

5. A common definition will also increase student morale. Students in programs or courses where there are different or unspecified conceptions of interdisciplinarity will have much more difficulty explaining what their program or major or degree is than will students in programs that share a common understanding of interdisciplinarity. "Such inarticulateness," says Newell (2007c), "is mildly embarrassing when talking to Aunt Mildred at Christmas, but it has more serious consequences when interviewing with a prospective employer" (p. 2). Students are likely to be more motivated in programs and courses where faculty share a clear understanding of interdisciplinary studies and

   > where students focus on issues (especially ones they see as "relevant" to their lives or to the society in which they live, e.g., the

> right to privacy in an age of terrorism), and follow an identifiable process (e.g., examine the issue from the perspective of relevant disciplines, draw insights from them, create common ground, and construct a more comprehensive understanding) that leads to more efficacious behavior (e.g., come up with a solution that's responsive to all relevant perspectives). (p. 2)

Authoritative Definitions of Interdisciplinary Studies

Five definitions of interdisciplinary studies have gained wide recognition and express an emerging consensus among practitioners. The first is the definition advanced by Klein and Newell (1997):

> [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 or profession . . . and draws on disciplinary perspectives and integrates their insights through construction of a more comprehensive perspective. (pp. 393–394)

The National Academy of Sciences, the National Academy of Engineering, and the Institute of Medicine (hereafter referred to as the National Academies) incorporate this definition into their definition of interdisciplinary research. In *Facilitating Interdisciplinary Research* (2005), they define interdisciplinary research as

> a mode of research by teams or individuals that integrates information, data, techniques, tools, perspectives, concepts, and/or theories from two or more disciplines or bodies of specialized knowledge to advance fundamental understanding or to solve problems whose solutions are beyond the scope of a single discipline or area of research practice. (p. 26)

Research, they say, "is truly interdisciplinary when it is not just pasting two disciplines together to create one product but rather an integration or synthesis of ideas and methods" (p. 27).

A third definition is offered by Diana Rhoten, Veronica Boix Mansilla, Marc Chun, and Julie T. Klein (2006) in *Interdisciplinary Education at Liberal Arts Institutions*. They define interdisciplinary education as

> a mode of curriculum design and instruction in which individual faculty or teams identify, evaluate, and integrate information, data, techniques, tools, perspectives, concepts, or theories from two or more disciplines or bodies of knowledge to advance students' capacity to understand issues, address problems, and create new approaches and solutions that extend beyond the scope of a single discipline or area of instruction. (p. 3)

A fourth definition is put forth by Veronica Boix Mansilla (2005) in "Assessing Student Work at Disciplinary Crossroads." She is particularly concerned with the product of interdisciplinary work: the "interdisciplinary understanding." Interdisciplinarity, she says, is

> the capacity to integrate knowledge and modes of thinking drawn from two or more disciplines to produce a *cognitive advancement*—for example, explaining a phenomenon, solving a problem, creating a product, or raising a new question—in ways that would have been unlikely through single disciplinary means [italics added]. (p. 16)

Finally, William Newell (2007a) in "Decision Making in Interdisciplinary Studies" offers a fifth definition of interdisciplinary studies (which is a refinement of the 1997 definition). It is, he says,

> a two-part process: it draws critically on disciplinary perspectives, and it integrates their insights into a more comprehensive understanding . . . of an existing complex phenomenon [or into] the creation of a new complex phenomenon. (p. 248)

From these definitions, it is possible to identify key elements that they share and that can form the basis of an integrated definition.

An Integrated Definition of Interdisciplinary Studies

These five authoritative definitions share the following common elements:

- Interdisciplinary research has a particular substantive focus.
- 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.
- Interdisciplinary research is characterized by an identifiable process or mode of inquiry.
- Interdisciplinary research draws explicitly on the disciplines.
- The disciplines provide insights about the specific substantive focus of interdisciplinary research.
- 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 [Bal, 2002, p. 27].)[6]

From these definitions, it is possible to offer this 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 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. It is worth noting that this is a "what" definition. Definitions also have a "how" component. For example, when defining an experiment, one almost unavoidably describes how to do one. Since this book is advancing the interdisciplinary research process as an essential component of interdisciplinary studies, the rest of the book can be seen as fleshing out the "how" part of a definition of the field.

Here it is useful to explain the difference between a *disciplinary insight* and an *interdisciplinary insight,* as these terms are used in the discussion that follows. A **disciplinary insight** is an expert's view on a particular problem that is based on research. An **interdisciplinary insight** is produced when the interdisciplinary research process (or some version of it) is used to create an integrated and purposeful result. As used in this book, insights refer to scholarship produced by disciplinary experts, unless otherwise stated.

What Interdisciplinary Studies Is Not

The integrated definition of interdisciplinary studies is further clarified by explaining what it is not.

Interdisciplinary Studies Is Not Multidisciplinary Studies

Regrettably, those who are uninformed and outside the field typically misunderstand the terms *interdisciplinarity* and *multidisciplinarity* as being synonymous and, consequently, have caused much confusion. **Multidisciplinarity** refers to the placing side by side of insights from two or more disciplines. 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 makes no 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 hard 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).

Two Metaphors

Two metaphors effectively illustrate the essential difference between multidisciplinary studies and interdisciplinary studies: the fruit salad and the smoothie.

The Bowl of Fruit Multidisciplinary studies can be compared to a bowl of fruit containing a variety of fruits, each fruit representing a discipline and being in close proximity to the others. The number of fruits used and the proportions of each in the bowl may not be based on anything more than visual appeal.

The Smoothie This is not so with interdisciplinary studies, however, which Moti Nissani (1995) compares to a "smoothie." The smoothie is "finely blended so that the distinctive flavor of each [fruit] is no longer recognizable, yielding instead the delectable experience of the smoothie" (p. 125). The metaphor of the smoothie, while limited, illustrates four essential characteristics of interdisciplinary studies:

- The selection of fruits (i.e., the disciplines and their insights) is not random but purposeful with the end product clearly in view.
- The blending of fruits (i.e., the process of integration) changes the contribution of each fruit (i.e., disciplinary insight) (Newell, 1998, p. 548).
- The smoothie (i.e., the result of integration), compared to the ingredients used, is something new.
- The activity involved in creating the smoothie (i.e., the interdisciplinary research process) is limited in time and space to the research problem.

The Fable of the Elephant House

Lawrence Wheeler's instructive fable of building a house for an elephant 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 (i.e., monistic) perspective of their

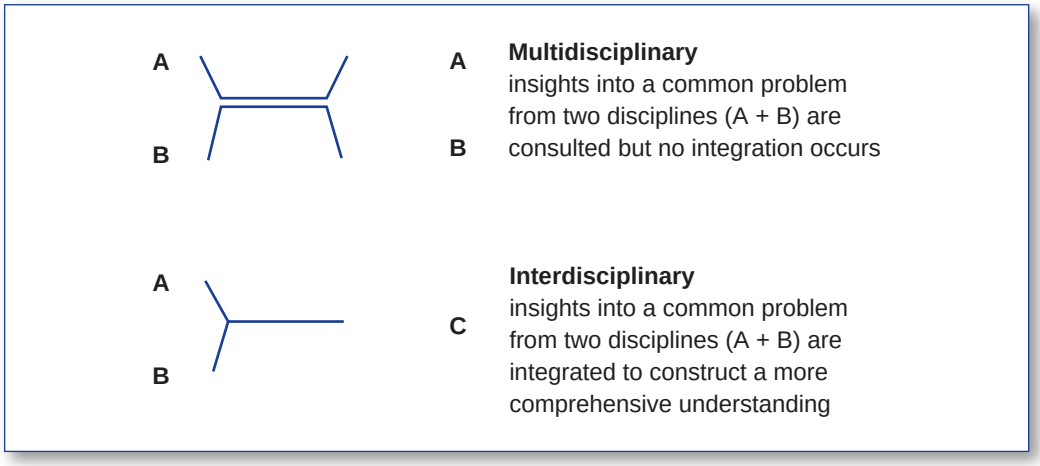
specialty and fail to take into account the perspectives of other relevant disciplines, professions, or interested parties (in this case, the elephant).

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 separate disciplinary data, concepts, theories, and methods to produce an interdisciplinary understanding of a complex problem or intellectual question (Klein & Newell, 1997, p. 393).

Multidisciplinarity and interdisciplinarity have this in common: They seek to overcome disciplinary monism. However, they do this in different ways. Multidisciplinarity means limiting activity to merely appreciating different disciplinary perspectives. But 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, states 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 1.1 shows the difference between multidisciplinarity and interdisciplinarity:

Figure 1.1 Difference Between Multidisciplinary and Interdisciplinary



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

Interdisciplinary Studies Is Not Transdisciplinary Studies

The contrast between interdisciplinary studies and transdisciplinary studies lies in their differing approaches to the disciplines. Interdisciplinary studies relies *primarily* on the disciplines for their perspectives, insights, concepts, theories, data, and methods in the process of integrating their theories and insights, and constructing a more comprehensive understanding of a *particular* problem, not a class of similar problems. However, interdisciplinary studies uses an overarching research process (the subject of Chapter 3) that subsumes disciplinary methods. While interdisciplinarity focuses on integrating across disciplines, the field is open to voices (i.e., stakeholder views) from beyond the academy.

Transdisciplinary studies takes a very different approach to the disciplines. One variant calls for creating "a total system of knowledge" that is completely "beyond disciplines" (Nicolescu, 2007, p. 1). Quantum physicist Basarab Nicolescu (2007) is promoting the unification of the scientific and the sacred to achieve "unity of knowledge together with the unity of our being" (p. 1). For example, he sees transdisciplinarity aiding holistic health practitioners who are "seeking to promote the understanding of illness as something arising from the interwoven fabric—body, plus mind, plus spirit—that constitutes the whole human being" (p. 1).

The other variant of transdisciplinarity calls for "trans-sector problem solving" where the focus of study is a mega problem or grand theme such as "the city" or "ecological sustainability." Such mega and complex problems require collaboration among a hybrid mix of actors from different disciplines, professions, *and sectors of society* (Klein, 2003, pp. 12, 19).[7] In the United States, reports Klein (2010), transdisciplinarity is conceptualized as a form of "transcendent interdisciplinary research" (p. 24); the transdisciplinary team science movement is "fostering new theoretical frameworks for understanding social, economic, political, environmental, and institutional factors in health and well-being" (p. 24).

The Differences Between Multidisciplinarity, Interdisciplinarity, and Transdisciplinarity Summarized

- Multidisciplinarity studies a topic from the perspective of several disciplines at one time but makes no attempt to integrate their insights. Multidisciplinary approaches tend to be dominated by the method and theory preferred by the home discipline.
- Interdisciplinarity (as defined in this book) studies a complex problem (including mega ones) 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** concerns that which is at once *between* the disciplines, *across* different disciplines, and *beyond* all disciplines. Its goal is (a) the understanding of the present world, of which one of the imperatives is the unity of knowledge, and (b) the solution of mega and complex problems by drawing on and seeking to integrate disciplinary *and stakeholder views* on the basis of some overarching theory.

The Premise of Interdisciplinary Studies

A major **premise of interdisciplinary studies** is that the disciplines (including interdisciplines) themselves are the necessary preconditions for and foundations of interdisciplinarity.[8] This premise is implicit both in the definition of interdisciplinary studies offered earlier and, as already noted, in the very concept of interdisciplinarity itself. "Precondition" means prerequisite; it also connotes preparation. The disciplines, despite their limitations, are appropriate starting points for doing interdisciplinary research. They have, after all, produced the knowledge that is foundational to advances in education, medicine, engineering, technology, culture, government, and economics.

Furthermore, to ignore the disciplines and the wealth of knowledge that they have generated would severely constrain the interdisciplinarian's ability to research almost any conceivable topic. "Foundation" means the basis upon which something stands, like a house standing on a foundation. The disciplines are foundational to interdisciplinary research because they provide the perspectives, epistemologies, assumptions, theories, concepts, and methods that inform our ability as humans to understand our world. Even with the many shortcomings of the disciplines, interdisciplinarians still need to take them seriously and learn as much as they can from them.

Competing Impulses Behind the Term *Interdisciplinarity*

Interdisciplinarians have differing views on the role of the disciplines. There are, writes Moran (2010), two "competing impulses" behind the term *interdisciplinarity* (p. 13). On one hand, there is the search for a wide-ranging, total knowledge; on the other hand, there is a more radical questioning of the nature of knowledge and our attempts to organize and communicate it. In this sense, says Moran, interdisciplinarity "interlocks with concerns of epistemology—the study of knowledge—and tends to be centered around problems and questions that cannot be addressed or solved within the existing disciplines" (pp. 13–14).

These two differing impulses have implications for the meaning of interdisciplinarity. As Geoffrey Bennington (1999) points out, *inter* is an ambiguous prefix that can mean "forming a communication between" or "joining together." Indeed, the term *interdisciplinarity* is slippery: "It can suggest forging connections across the disciplines; but it can also mean establishing a

kind of undisciplined space in the interstices between disciplines, or even attempting to transcend disciplinary boundaries altogether" (p. 104). This ambiguity of interdisciplinarity, says Moran (2010), is a major reason why some critics have come up with other terms, such as *post-disciplinary*, *anti-disciplinary*, and *transdisciplinary*. These terms that are often loosely defined and used interchangeably suggest that being interdisciplinary is not quite enough and that there is another intellectual level where disciplinary divisions can be subverted or even erased (p. 14).

The integrated definition of interdisciplinary studies set out earlier assumes "the existence and relative resilience of disciplines as modes of thought and institutional practices" (Moran, 2010, p. 15). This book agrees with Moran and other practitioners who view interdisciplinarity as complementary to the disciplines. The disciplines and the knowledge they produce in terms of insights, theories, concepts, and methods make interdisciplinary studies possible. This book explores how we can profitably use the disciplines, interdisciplines, and schools of thought to produce new understandings.

How the Term *Interdisciplinarity* Is Variably Used Today

Klein (2005a) cautions that not all interdisciplinarities are the same. "Disagreements about definition," she says, "reflect differing views of the purpose of research and education, the role of disciplines, and the role of critique" (p. 55).

Forms of Interdisciplinarity

There are two dominant forms of interdisciplinarity: instrumental interdisciplinarity and critical interdisciplinarity. **Instrumental interdisciplinarity** is problem-driven. It is a pragmatic approach that focuses on research, borrowing, and practical problem solving in response to the external demands of society. However, borrowing alone is not sufficient for instrumental interdisciplinarity but 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 is society driven. It "interrogates the dominant structure of knowledge and education with the aim of transforming them, while raising epistemological and political questions of value and purpose" (Klein, 2010, p. 30). This focus is silent in instrumental interdisciplinarity. Critical interdisciplinarians fault the instrumentalists (also known as pragmatists) for merely combining existing disciplinary approaches without advocating their transformation. Rather than building bridges across academic units for practical problem-solving purposes, critical interdisciplinarians seek to transform and dismantle the boundary between the literary and the political,

treat cultural objects relationally, and advocate inclusion of low culture (Klein, 2005a, pp. 57–58).

These distinctions between instrumental and critical interdisciplinarity are not absolute or unbridgeable. Research on systemic and complex problems such as the environment and health care 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 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. But it also refers to "integrating [disciplinary] insights and theories to construct a more comprehensive understanding." Integrating disciplinary insights (e.g., their concepts and assumptions) or theories typically includes interrogating the disciplines. Similarly, constructing a more comprehensive understanding of a problem (STEP 9) and communicating this understanding (STEP 10) may involve raising epistemological and political questions or proposing transformative policies (see Chapter 3). Interdisciplinarity, then, "has developed from an idea into a complex set of claims, activities, and structures" (Klein, 1996, p. 209). Identification of some of the more important of these follows.

Interdisciplinarity Is Used to Describe Work

The work of interdisciplinary studies has three aspects.

The Work of Integrating Knowledge

According to Veronica Boix Mansilla and Howard Gardner (2003), the principal work of interdisciplinary studies is the integration of knowledge and modes of thinking from two or more disciplines. "Integration," they say, is the "blend[ing] into a functioning or unified whole" (p. 1). The **integration of knowledge**, then, means identifying and blending knowledge from relevant disciplines to produce an interdisciplinary understanding of a particular problem or intellectual question. This understanding is limited in time and to a particular context and would not be possible by relying solely on a single disciplinary approach. For example, a single disciplinary perspective cannot adequately explain the complex phenomenon of terrorism, much less craft a comprehensive solution to it. Understanding terrorism in an interdisciplinary sense calls for drawing on insights and theories from history, political science, cultural anthropology, sociology, law, economics, religious studies, and psychology and integrating these to produce a more comprehensive understanding of it. By drawing on multiple disciplines, says Boix Mansilla (2002), interdisciplinary study "advances our understanding [by explaining complex

phenomena, crafting comprehensive solutions, and raising new questions] in ways that would have not been possible through single disciplinary means" (p. 7). The work of integrating knowledge is also about practical problem solving (Boix Mansilla & Gardner, 2003, p. 2).[9]

Interdisciplinary work often leads to the formation of new fields and new interdisciplines. Examples of the growing variety of such fields include ecology; environmental sciences; leadership studies; behavioral economics; resource management; landscape development; industrial ecology; medical ecology; human ecology; social ecology; public health; cancer research; biotechnology; sociology of knowledge; discourse studies; science, technology, and society studies; future studies; conflict studies; cultural studies; media studies; communication studies; information sciences; cybernetics; computer sciences; systems sciences; and knowledge management (Klein, 2003, p. 16).

The Work of Recognizing and Confronting Differences

Interdisciplinarity recognizes and confronts differences, looks for common ground despite those differences, and seeks to produce an understanding that takes those differences into account. "The reality," says Klein (1996),

> is that differences matter. Even if negotiated and mediated, differences do not go away—they continue to create "noise." Misunderstandings, animosities, and competitions cannot be mitigated or glossed over. They must be taken seriously as attempts are made to spell out differences and their possible consequences. Interdisciplinarity . . . does not trust that everything will work out if everyone will just sit down and talk to each other. (p. 221)

The differences that Klein and others say that interdisciplinary studies must recognize and confront include differences over values such as political agendas, cultural traditions, and religious animosities. Klein's straightforward statement is a realistic assessment of the human condition as it is, not as it ought to be. Interdisciplinarity embraces reality. An example of a topic reflecting the reality of political and cultural differences is a study of education for democratic citizenship, which uses political liberalism and civic republicanism to critique each one's assumption and expose each one's overreliance on rights or duties.

Interdisciplinarity Is Used to Describe a Research Process

The interdisciplinary research process (IRP) is the "how" part of the definition of interdisciplinarity. Interdisciplinarity refers to the *process* used to study a complex problem/issue/question, not to the problem/issue/question itself. Chapter 3 introduces the model of this process. As noted in the integrated definition of interdisciplinary studies, the goal, purpose, or result of the research process is to construct *a more comprehensive understanding*

(see Chapter 13). This is an umbrella term that refers to a product, policy, technology, poem, or artistic production. A core component of the IRP is integration, the subject of Part III.

Each interdisciplinary research project involves drawing on a different combination of disciplines, insights, and theories because knowledge and problems are contextual and contingent. One practitioner expresses it this way: For interdisciplinarians, the "definition of intellectuality shifts from absolute answers and solutions to tentativeness and reflexivity" (Klein, 1996, p. 214). Chapter 2 discusses the kind of thinking that interdisciplinary studies students should cultivate and ideally exhibit.

Interdisciplinarity Is Used to Describe the Kind of Knowledge Produced

Boix Mansilla, Miller, and Gardner (2000) are concerned with the kind of knowledge that interdisciplinary studies produces. Individuals demonstrate **disciplinary understanding**, they say, "when they use knowledge and modes of thinking in disciplines such as history, science, or the arts, to create products, solve problems, and offer explanations that echo the work of disciplinary experts" (pp. 17–18). By contrast, individuals demonstrate **interdisciplinary understanding** "when they integrate knowledge and modes of thinking from two or more disciplines in order to create products, solve problems, and offer explanations, in ways that would not have been possible through single disciplinary means" (pp. 17–18).

Interdisciplinarity Is Used to Describe Change in Knowledge Production

Knowledge production refers to scholarly research published in the form of peer-reviewed articles and books. The discussion about interdisciplinarity is a dialogue about innovation—that is, *change*—in the means of knowledge production. Disciplinary researchers traditionally are trained to produce knowledge differently than are interdisciplinarians. Interdisciplinarians borrow from the disciplines and integrate this information to produce new understandings and meanings.[10] This activity, which goes against the grain of what many disciplinary researchers have been taught to do and to protect, is needed because knowledge is increasingly interdisciplinary and boundary crossing is commonplace.

Metaphors Commonly Used for Interdisciplinary Work

A **metaphor** is a figure of speech in which a word or phrase, a story, or a picture is likened to the idea that one is attempting to communicate, as shown in the metaphor of the smoothie and the fable of the elephant house.

Metaphors help us visualize an unfamiliar concept (Lakoff & Johnson, 1980, p. ix). They are important to interdisciplinary work and thinking in two ways: (1) They communicate to disciplinarians the nature of interdisciplinary work in an overall sense, and (2) they model the result of a specific research project. Commonly used metaphors descriptive of interdisciplinary work in general include "boundary crossing," "bridge building," "mapping," and "bilingualism."

The Metaphor of Boundary Crossing

Boundary crossing is the process of moving across knowledge formations for the purpose of achieving an enlarged understanding. Boundaries between knowledge units—academic disciplines—are in a continuous, though imperceptibly slow, process of breaking down and reformulating. Indeed, boundary crossing with respect to knowledge production has become the defining characteristic of our age (Klein, 1996, p. 1).

Boundaries exist in many forms, including political, social, economic, religious, and ethnic. Surrounded by boundaries, we are mostly unaware of their existence until we find one blocking our progress. Boundary-related topics include the boundaries between science, religion, and humanist ethics concerning embryonic stem cell research and human cloning; the boundaries between religion, politics, and education concerning appropriate apparel; and the boundaries between politics, business (management), and sociology (race) concerning governmental (at all levels) responses to natural disasters such as Hurricane Katrina and the Haitian earthquake.

Less known but no less important are the boundaries between academic disciplines, or, as Klein (1996) calls them, "specialist domains." "Boundary," she says, "has become a new keyword in discussions of knowledge" (p. 1). Words related to *boundary* include *turf*, *territory*, and *domain*.

The metaphor of boundary crossing is useful to interdisciplinarians because it calls attention to the ways that disciplines have historically staked out their differences, claims, and activities and have built institutional structures to define and protect their knowledge practices (Klein, 1996, p. 1). But *boundary* can also be descriptive of something that is artificial and needlessly obstructive. This is the sense that Steve Fuller (1993) ascribes to the metaphor when he calls disciplinary boundaries "artificial barriers to the transaction of knowledge claims. Such boundaries are necessary evils that become more evil the more they are perceived as necessary" (p. 36).

There are at least two problems, though, with the boundary metaphor. First, it conveys the incorrect notion of a static line or space that fails to acknowledge changes within a discipline or overlapping aims and activities among disciplines. Also, territorial metaphors fail to describe adequately the role of language between disciplines (Lyon, 1992, p. 682). Few boundaries or languages remain fixed—at least not for very long. This is certainly true in the academy.

Reasons for crossing boundaries are several and are discussed in later chapters. For interdisciplinarians, the primary reason for crossing boundaries is to develop a more comprehensive understanding of a problem that would not otherwise be possible by examining it from the perspective of a single discipline.

The Metaphor of Bridge Building

The metaphor of **bridge building** connotes the borrowing of tools and methods from disciplines (Squires, 1975, pp. 42–47). There are two attractions to this metaphor. The first is the idea of showing how interdisciplinary activity, like the spun cables suspended from the piers of the Golden Gate Bridge and firmly anchored in the bedrock on either shore, is something that takes place between two disciplines. The second attraction is the idea that interdisciplinary studies has an applied orientation. Possible bridge building topics include explorations of how environmentalists can work with business and government to sustain the environment while meeting the economic development needs of the indigenous society, and how better communication and understanding can be developed between hostile racial, religious, and other groups.

There is, however, a problem with using bridge building to describe interdisciplinary studies, the interdisciplinary research process, and integration: "Bridge builders do not tend to engage in critical reflection on problem choice, the epistemology of the disciplines being used, or the logic of disciplinary structure" (Klein, 1996, pp. 10–11). In other words, this metaphor suggests that interdisciplinary study is less concerned with the knowledge, perspectives, concepts, assumptions, theories, and methods of those disciplines relevant to the problem or question under investigation than with the construction of a theory (i.e., cable) that would connect the disciplines.

The Metaphor of Mapping

Mapping or mapmaking is a metaphor based on the idea that the carving up of knowledge space is like the practice of cartography or mapmaking. Mapping involves using a "combinational" or integrative method to map or display information that is gathered from a variety of sources (Szostak, 2004, p. 143). European cartographers produced a system of mapping geographical and political space by lines of longitude and latitude forming territorial quadrangles that symbolically represented the world. These divisions were further subdivided into smaller units and, in turn, into still smaller units. In the absence of global positioning systems, inaccuracies abounded and disputes inevitably arose over who owned what sliver of territory (Stoddard, 1991, p. 6).

The classic illustration of this errant approach to mapping was the 1884 partitioning of Africa. Someone has calculated that of the colonial borders that dissected the continent and its peoples, fully 30% were arbitrary (Stoddard, 1991, p. 6). The remapping of the Earth's surface in our own day is occurring at the same time we are remapping knowledge.

Mapping a problem—breaking it down into its component parts and seeing how these parts behave and relate to one another—is an important strategy used by disciplinarians and interdisciplinarians to analyze complex problems. Mapping a problem such as spousal battery or environmental pollution, for example, is likely to require the researcher to seek insights from several disciplines to explain its causes. Chapter 5 introduces various ways to map a problem.

The usefulness of the metaphor of mapping or remapping is that it reveals new interdisciplinary fields and the extent of border crossing between disciplines (Klein, 1996, p. 3). The weakness of this metaphor, however, is that it compares knowledge (which is fluid) to land (which is more stable). Another weakness is that maps necessarily emphasize some aspects over others, and thereby constrain thought and even mislead at times. Szostak (2004) notes that "maps may represent the concerns and interests of the powerful, as when black population centers were ignored on maps of South Africa" (pp. 143–144).

The Metaphor of Bilingualism

Bilingualism is a popular, but inappropriate, metaphor for interdisciplinary work that implies *mastery* of or *proficiency* in two complete languages. Its attraction is that it compares disciplines to foreign languages. For many, developing proficiency in a foreign language is as difficult and time-consuming as developing proficiency in a new discipline. There are two problems with this metaphor. The first is that it assumes that one cannot work in a new discipline without first mastering it. This is not the case. The numerous examples of professional and student work presented in this book (especially Chapter 7) demonstrate that what is required for interdisciplinary work is *adequacy* in relevant disciplines, not mastery of them. This applies both to members of research teams and to individual researchers. The minimal condition for interdisciplinary work (i.e., adequacy) for members of a team of experts from different disciplines, says Klein (1996), must be "communicative competence" (p. 220). The second problem is that a bilingual person speaks in either one language or the other, rather than drawing different insights from each language and then integrating them. Bilingualism involves either/or thinking whereas interdisciplinary studies use both/and thinking.

Reflections on These Metaphors

Lest you feel that you must find just the right metaphor to express visually what you are attempting to do, accept Klein's conclusion that "interdisciplinary

activities cannot be depicted in a single image" (Klein, 1996, p. 19).[11] Interdisciplinarians are able to communicate the concept of interdisciplinarity to disciplinarians more effectively when they are mindful of the aspect of interdisciplinarity that each of these metaphors illuminates while being aware of each one's limitations.

Chapter Summary

Interdisciplinary studies and interdisciplinarity are evolving dynamic concepts that are now mainstream in the academy. Still, many disciplinarians use the terms *multidisciplinarity* and *interdisciplinarity* interchangeably and are unaware of the role of integration and of the goal of the interdisciplinary enterprise. This chapter has defined these terms, explained the differences between the disciplines and interdisciplinary studies, examined how interdisciplinarity differs from multidisciplinarity and transdisciplinarity, and identified the ways that interdisciplinarity is variably used today. Lastly, this chapter has identified strengths and weaknesses of various metaphors descriptive of interdisciplinary studies.

Chapter 2 identifies the drivers of interdisciplinary learning and research, presents the etymology of interdisciplinarity, examines the interdisciplinary critique of the disciplines, traces the origins of interdisciplinarity, and describes the interdisciplinary approach to learning and research.

Notes

1. Some generalists such as Moran see the terms *interdisciplinarity* and *integration* as synonymous with *teamwork* as in team teaching and cross-disciplinary communication on research projects (J. R. Davis, 1995, p. 44; Klein, 2005b, p. 23; Lattuca, 2001, p. 12). Other generalists such as Lisa Lattuca (2001) prefer to distinguish between types of interdisciplinarity by focusing primarily on the kinds of questions asked rather than on integration (p. 80). Still other generalists such as Donald G. Richards (1996) go so far as to reject any definition of interdisciplinary studies that "necessarily places priority emphasis on the realization of synthesis [or integration] in the literal sense" (p. 114).

2. For the limited purposes of this book, I am using traditional lists of major disciplines rather than the much fuller contemporary taxonomies.

3. See Klein (1996, pp. 78–84) for a detailed discussion of these differences.

4. However, some argue that some fields of studies have achieved this state.

5. Allen F. Repko (2008) identifies four cognitive abilities that the literature on cognition and instruction suggest are hallmarks of interdisciplinary learning, and shows how these abilities may be expressed in the language of assessment and evaluated on both the course and program levels.

6. In the humanities, students are required to choose a definition of meaning: artist intent, audience reaction, and so on. However, Rick Szostak (2004) argues that the interdisciplinary conception of "meaning" should urge students to embrace all

possible definitions and the causal links they imply. Students "could still choose to specialize with respect to one of these (or not) without needing to assume the others away" (p. 44).

7. For a thorough discussion of the strengths and limitations of transdisciplinarity, see Somerville and Rapport (Eds.) (2000), *Transdisciplinarity: Recreating Integrated Knowledge,* particularly the chapters by Klein and Newell. In the 1990s, reports Klein (2010), transdisciplinarity began appearing more often in the humanities as a label for critical evaluation of knowledge formations. For example, in women's and gender studies, Dölling and Hark (2000) associated transdisciplinarity with critical evaluation of terms, concepts, and methods that cross disciplinary boundaries (pp. 1196–1197).

8. However, as Klein (2005a) notes, interdisciplinarity can no longer be regarded as a single kind of activity framed against a stable disciplinary system (p. 69).

9. They talk about a variety of forms of interdisciplinary work. In their work in total, though, they emphasize epistemic goals that are contingent upon "practical" contexts.

10. Klein (1990) notes, however, that "there are no standards for excellence in borrowing" (p. 94).

11. More recently, Klein (2000a) concludes that "territorial metaphors may be obsolete" and suggests that organic metaphors, such as boundary crossing, that highlight connection may be more useful because "knowledge production is no longer strictly within disciplinary boundaries" (pp. 8–9).

Exercises

Defining for Clarity

1.1 You saw in this chapter the importance of defining the controversial and misunderstood term *interdisciplinary studies* in order to reveal its true meaning. Does the integrated definition fully capture the several aspects of interdisciplinarity advanced by the five authoritative definitions? If not, how might it be improved? Can you think of another controversial or misunderstood term whose true meaning could be clarified by studying its definition?

Claimed and Not Claimed

1.2 This chapter compared and contrasted the field of interdisciplinary studies with the traditional disciplines. What characteristics of interdisciplinary studies are most unlike the characteristics of the disciplines? Why is the field of interdisciplinary studies unlikely to become a discipline?

Reasons for Agreeing

1.3 This chapter presented several reasons for agreeing on a definition of interdisciplinary studies. Which of these would be of greatest interest

to (a) university administrators, (b) scholars in traditional disciplines, (c) your family, and (d) employers or prospective employers?

What and How

1.4 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. What is the "how" component of this definition?

Metaphors

1.5 Metaphors help us visualize complex ideas or concepts. The metaphors of the bowl of fruit and the smoothie help us to visualize two complex concepts, multidisciplinarity and interdisciplinarity, that are mistakenly used interchangeably. Can you think of another metaphor for each of these terms?

Building Houses for Elephants

1.6 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.

1.7 Is there a transdisciplinary aspect to the elephant house project? If so, what is it, or what should it be?

Complementary

1.8 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?

More Metaphors

1.9 Of the metaphors commonly used to describe interdisciplinary work (excluding that of the smoothie), which is the most helpful to instrumental interdisciplinarity, and which is most helpful to critical interdisciplinarity?

Reflection

1.10 How has this chapter broadened and/or clarified your understanding of interdisciplinary studies as an academic field?