

INTERDISCIPLINARY RESEARCH

PROCESS
and
Theory

4
EDITION

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LEARNING OUTCOMES

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

- Select *potentially* relevant disciplines
- Map the problem to reveal its disciplinary parts
- Reduce the number of potentially relevant disciplines to those that are *most* relevant

GUIDING QUESTIONS

How do you choose potentially relevant disciplines for your research question and then decide which are most relevant?

How and why do you map your research problem?

CHAPTER OBJECTIVES

The table of building a house for an elephant (referenced in Chapter 1) shows the importance of taking into account all relevant disciplinary perspectives when trying to solve complex problems or understand complex systems. Interdisciplinary studies tends to focus on complex problems or systems such as global warming, gun violence in inner-city neighborhoods, or the meaning of a graffiti. These problems are complex because they involve many variables that are typically studied by different disciplines.

After stating the research problem (STEP 1) and justifying an interdisciplinary approach (STEP 2), the next challenge is deciding which disciplines are *potentially* relevant to the problem and then which of these are *most* relevant (STEP 3). This chapter presents a way to quickly identify disciplines potentially relevant to the problem. It discusses the value of mapping the problem so that its constituent disciplinary parts are revealed. It then shows how to narrow the number of disciplines to those that are most relevant. Once these disciplines are identified, the full-scale literature search (STEP 4, see Chapter 5) can proceed.

4

IDENTIFYING RELEVANT DISCIPLINES

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A DRAWING ON DISCIPLINARY INSIGHTS

1. Define the problem or state the research question.
2. Justify using an interdisciplinary approach.
3. Identify relevant disciplines.
 - Select potentially relevant disciplines.
 - Map the problem to reveal its disciplinary parts.
 - Reduce the number of potentially relevant disciplines to those that are most relevant.
4. Conduct the literature search.
5. Develop adequacy in each relevant discipline.
6. Analyze the problem and evaluate each insight or theory.

SELECT POTENTIALLY RELEVANT DISCIPLINES

In selecting disciplines from which to draw insights and theories, the challenge is to decide which disciplines contribute substantially to the problem or overall pattern of behavior you wish to study. A **potentially relevant discipline** is one whose research domain includes at least one *phenomenon* involved in the problem or research question, whether or not its community of scholars has recognized the problem and published its research. Determining which disciplines are potentially relevant to the problem is a relatively straightforward process beginning with a focus on phenomena and disciplinary perspectives.

Focus on the Phenomena

Refer to Table 2.4 (Chapter 2) “Szosstak’s Categories of Phenomena About the Human World” to see which disciplines focus on the phenomena relevant to the problem, topic, or question. This table should facilitate linking most topics to one or more of the particular phenomena that may touch on the topic. Recall (or reread in Chapter 2) the example of freshwater scarcity that concerns the nonhuman environment. Then refer to Table 2.3 “Disciplines and Their Illustrative Phenomena” to link the relevant phenomena to disciplines that study them. Scan the right column to locate the phenomena that touch on the problem and then note those disciplines in the center column that study them.

Draw on Disciplinary Perspectives (in a General Sense)

Consult Table 2.2 “Overall Perspectives of Natural Sciences, Social Sciences, and Humanities Disciplines Stated in General Terms” to see if the topic as a whole is included in the phenomena studied by two or more disciplines. Ask this of each disciplinary perspective: “Does it illuminate some aspect of the problem, topic, or question?” This questioning process should help you decide which disciplines are potentially relevant to the problem and explain how each illuminates some aspect of it. However, just because the problem falls within a discipline’s perspective and research domain does not mean that the discipline’s community of scholars has addressed the problem.

Once you have identified potentially relevant disciplines, skim their literatures to see if their community of scholars have written on the topic. Those new to interdisciplinary research often start out conceiving of the problem too narrowly because of their prior exposure to a particular discipline. Stating the problem more broadly at first will make your conception of the problem more inclusive of all relevant perspectives.

Note: As mentioned in Chapter 3, the literature review (STEP 4) is a fluid step that can begin with STEP 1 and continue through later STEPS. A student may search across their library’s database for relevant works, taking note of which disciplines these represent. One challenge here, as we shall see in the next chapter, is that different disciplines often use different terminology for the same phenomenon or process.

An Example of How to Select Potentially Relevant Disciplines

Using phenomena *and* perspective approaches is illustrated in the example of a student who was interested in writing an interdisciplinary research paper on the topic of human cloning. After referencing Tables 2.4 and 2.3, the student consulted Table 2.2 on perspectives to see if the topic as a whole was included in the phenomena studied by two or more disciplines. Since it was, the student then skimmed these disciplinary literatures and found that the topic was ripe for interdisciplinary inquiry. But final confirmation had to wait until the student completed the full-scale literature search. If, however, the student had found that human cloning is embraced by the perspective of only one discipline, then the problem would likely not have merited interdisciplinary study at the undergraduate level, and the topic would have had to have been revised or abandoned.

In fact, the student discovered that no fewer than seven disciplinary perspectives embraced the topic of human cloning, as shown here in Table 4.1. The characterization of these disciplines as *potentially relevant* is based on the fact that their perspectives include some aspect of human cloning. The information in the right-hand column is

TABLE 4.1

Disciplines Potentially Relevant to the Problem of Human Cloning and How They Illuminate Some Aspect of the Full-Scale Literature Search

| Discipline, Interdiscipline, and Applied Field | How Each Illuminates Some Aspect of the Problem of Human Cloning |
|--|--|
| Biology | The biological process of human cloning and its success or failure |
| Psychology | Possible psychological impact on the donor's sense of personhood |
| Political Science | The role of the federal government |
| Philosophy | Ethical implications of cloning a human life means to be human |
| Religious Studies | Sanction in sacred writings against the creation of a form of human life |
| Law ^a | Legal rights and relationships of the cloned child to "parents" |
| Bioethics ^b | Ethical implications of the technical procedures used to clone a human, particularly in the event of failure |

^a Law is an applied field in many taxonomies.

^b Bioethics is an interdisciplinary field in many taxonomies.

derived from the more general information in Table 2.2 in Chapter 2. For example, it states in the overall perspective for biology that "when biologists venture into the world of humans, they look for physical, deterministic explanations of behavior (as genes or evolution)." It is reasonable to conclude, then, that biology is likely to be interested in human cloning *as a biological process* and to be concerned with its success or failure.

Identifying potentially relevant disciplines based on whether or not a discipline's perspective embraces the research problem is only a starting point. As noted earlier, statements of disciplinary perspectives are typically matters of scholarly consensus. For this reason, the results of the perspectival approach should be verified if a student did, by identifying phenomena that are typically of interest to *disciplines*. In this way, we might find different disciplines that investigate different parts of a complex problem.

NOTE TO READERS

There are several advantages to creating a table such as 4.1 that connects the topic to particular disciplinary perspectives. (1) It establishes whether each perspective includes the topic and how it illuminates some aspect of it. (2) It may reveal an instance of apparent overlap of perspectives. In the case of human cloning, there is obviously some overlap in perspective between bioethics and philosophy but not enough to warrant ignoring either perspective initially because each may lead to different insights. But one may very well choose to drop one perspective in the narrowing-down process if their insights turn out

to overlap too much. (3) It may prompt shifting the focus of the problem or redefining it. Instead of focusing on the problem of human cloning in general, one may wish to narrow the topic and pose a research question such as "What should be the role of government in the development of human cloning technology?" Once again, we see the iterative nature of the interdisciplinary research process [IRP] where performing one STEP may prompt the revisiting of an earlier STEP. [4] The table is a convenient resource to consult later in the research process should it be needed.

MAP THE PROBLEM TO REVEAL ITS DISCIPLINARY PARTS

Mapping may well assist in identifying relevant disciplines. After selecting the disciplines potentially relevant to the research question, you need to identify the constituent parts of the problem, understand how these relate to each other and to the problem as a whole, and view the problem *as a system*. Using systems thinking to map the problem facilitates this understanding.¹

The map may reveal a gap in your understanding of the problem or establish that you are placing too much emphasis on a few disciplinary components at the expense of other equally important components. Whereas the disciplinarian is often satisfied to focus on a single part or on a few "neighboring" parts of the problem, the interdisciplinarian is concerned with achieving an interdisciplinary understanding of the problem *as a whole*.

Maps profitable to interdisciplinary work include the system map, the research map, the concept or principle map, and the theory map. Mapping the problem may occur as early as STEP 1, but should occur before conducting the full-scale literature search (STEP 4).

Once you see the problem as a complex whole, you can then shorten the list of disciplines to those that are essential before conducting the full-scale literature search. The results of the search should confirm the completeness and accuracy of the map.

Systems Thinking and the System Map

Part II of the IRP is designed to help you deconstruct the problem and understand it in all of its complexity. An important and useful tool to accomplish this is to cultivate systems thinking. Systems thinking, defined in Chapter 3, helps us understand the relationship between a whole and its parts. Systems thinking involves not just visualizing interrelationships, but also thinking in terms of positive and negative feedback loops, spotting patterns in the behavior of the whole at a point in time and over time. Systems thinking adds a powerful dimension to interdisciplinary research, integration and problem solving.²

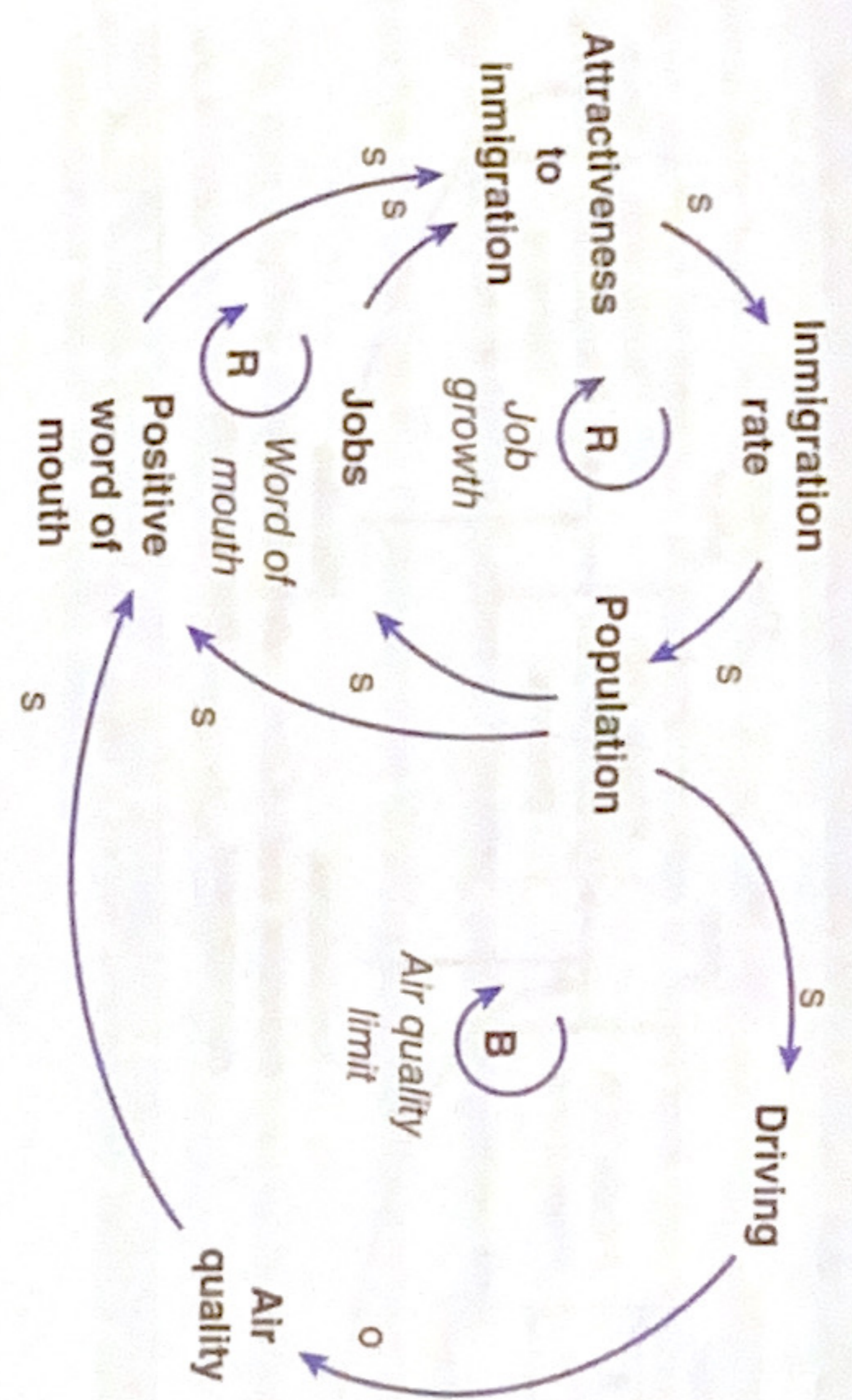
Although systems thinking is typically associated with the quantitatively oriented fields of engineering, operations management, computer science, and environmental science, it increasingly is being applied to a widening range of qualitatively oriented problems such as the actions of emergency workers at the World Trade Center on September 11, 2001.

A primary analytical tool of systems thinking is the **system map**, a visual that shows all the parts of the system (complex problem) and illustrates the causal relationships among them (that is, which phenomena influence which others). Such a map helps the researcher to visualize the system as a complex whole. Generally, each part of the complex problem is studied by a different discipline. Constructing the system map will help reveal disciplinary parts of the problem that were not initially obvious (Newell, 2007a, p. 246). The mapping exercise is iterative: You should sketch the system near the outset but likely will add important elements or clarifications as the research progresses.

Systems maps have two key elements: the *phenomena* relevant to a complex problem, and *arrows* that indicate visually how these influence each other. (Note: Students should appreciate that these maps can be built up slowly by reflecting upon [and later, reading about] the elements of the complex problem [see Repko, Szostak, & Buchberger, 2020, pp. 173–178].) Two types of system maps of particular interest to researchers are causal loop diagrams and stock and flow diagrams. These diagrams facilitate our understanding of the inner workings of a system by visualizing the behavior that occurs in the system, as well as the likely outcome(s) that the system will produce.

For example, to understand why communities experience traffic congestion on a road system just after it has been expanded requires an understanding of the relationship between the key actors in the system. Figure 4.1 shows a causal loop diagram that illustrates how individuals select driving routes and the relationships between population, driving, air quality, and word-of-mouth communication.

FIGURE 4.1 Causal Loop Diagram



Source: Mathews, L. G., & Jones, A. (2008). Using systems thinking to improve interdisciplinary learning outcomes. *Issues in Integrative Studies*, 26, 73–104, 77.

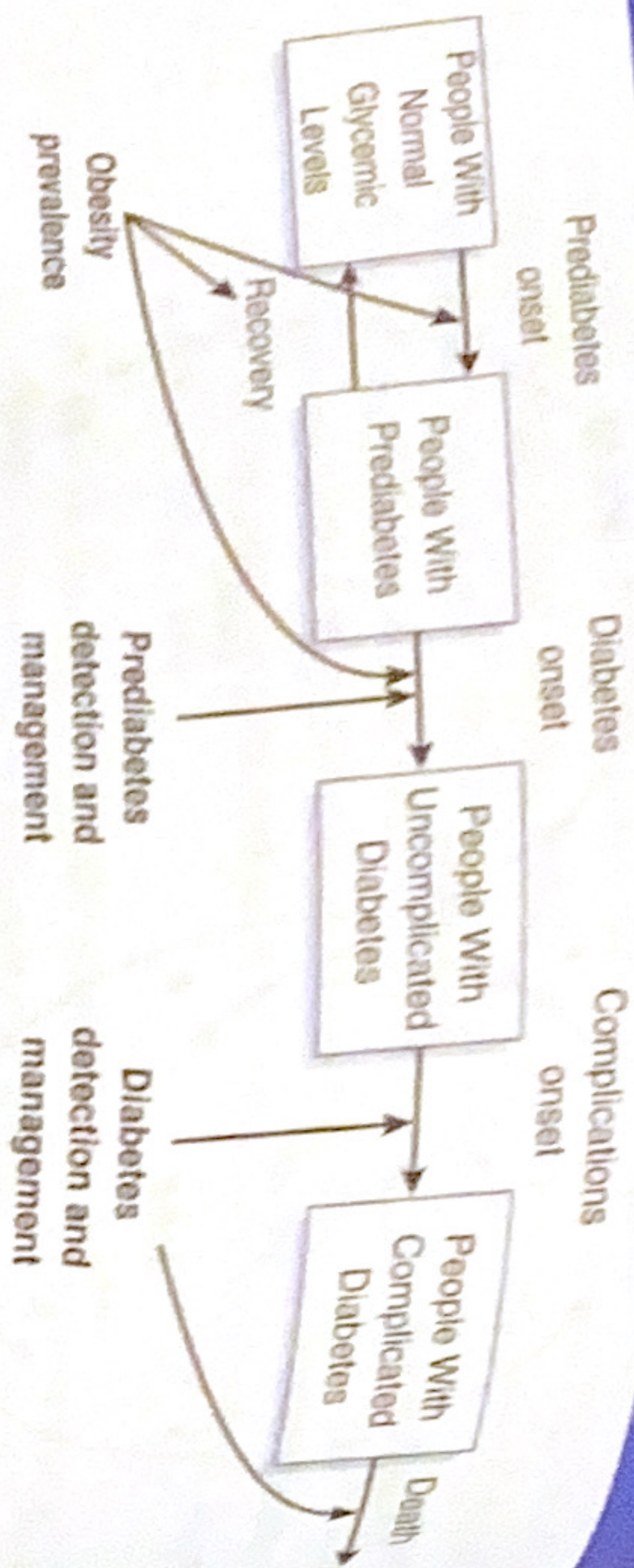
Specifically, Figure 4.1 shows how population affects vehicle traffic in a region that in turn affects air quality negatively.

Leah Greden Mathews and Andrew Jones (2008) explain the subscripts:

The subscripts *s* and *o* on the relationship arrows in a causal loop diagram show whether the two phenomena are moving in the same or opposite direction. Reduced air quality tends to negatively impact public perceptions of a region's livability, which, in turn, has the effect of reducing or even reversing population growth. This type of offsetting relationship is said to be a "balancing loop," and is labeled with a B (for balancing). There are other factors that serve to reinforce the population trend simultaneously which are labeled with an R (for reinforcing) in the causal loop diagram. As population grows, positive word of mouth can also grow as people express enthusiasm about the region to their friends and relatives. The positive "buzz" can lead to "in-migration" which reinforces population growth. (p. 77)

In addition to breaking down a problem into its constituent parts, the causal loop diagram helps identify which parts of the system are likely to be addressed by different disciplines, subdisciplines, and interdisciplinary. For example, the disciplines interested in the relationship between a region's road system and its air quality include biology, economics (the study of transportation), and political science (government agencies at the local,

FIGURE 4.2 Stock and Flow Diagram Showing the Population-Level Flows of People Through Stages of Diabetes, With the Public Health Interventions



Source: Mathews, L. G., & Jones, A. (2008). Using systems thinking to improve interdisciplinary outcomes. *Issues in Integrative Studies*, 26, 73-104, 79.

state, and federal levels responsible for monitoring air quality), as well as the interdisciplinary field of environmental science. Knowing the key parts of a system and understanding how they relate to each other and to the problem as a whole enables the researcher to undertake the full-scale literature search with greater focus and efficiency.

Szosrak (2017b) recognized that disciplines often posit “balancing loops” among the phenomena they study such that there is some tendency toward stability in the systems they examine. Phenomena studied in other disciplines often serve to destabilize these systems (as when changes in weather or consumer tastes destabilize a market studied by economists). Disciplinary scholars may wish to ignore these destabilizing influences, and may thus be resistant to interdisciplinary understandings. Students performing interdisciplinary research should be ready to question whether subsystems are as stable as disciplinary scholars may assert.

Figure 4.2 shows a stock and flow diagram that helps the researcher visualize the flows and accumulations (stocks) in the complex system of diabetes incidence. The usefulness of this diagram is that it makes distinctions between people’s physiological condition relative to Type 2 diabetes within a given population.

Mathews and Jones (2008) explain the boxes:

Each of the boxes represents stocks or accumulations of numbers of people with various diabetic conditions. The arrows represent flows or relationships between the stocks. The flow mapped in Figure 4.2 shows the flow of people through various stages of diabetes. For example, a fraction of *People with Normal Glycemic*

Levels will experience prediabetes onset and become part of the population of *People with Diabetes*. Some of these individuals will recover and return to the category of *People with Normal Glycemic Levels*. There is a reverse flow depicted between these two stocks. However, some *People with Prediabetes* will experience diabetes onset and become part of the accumulation of *People with Uncomplicated Diabetes*. (p. 78)

Benefits to Students of Using Systems Thinking and the System Map

There are five practical benefits to using systems thinking and drawing a system map:

- The map clarifies what part of the problem different authors or disciplines are addressing. Sometimes it will seem that authors or disciplines are disagreeing when in fact they are simply investigating different phenomena or relationships within the broader problem.
- Even if a project is limited to only two or three disciplines, and thus the entire system cannot be engaged, one still needs to understand which parts of the system each discipline illuminates. Researchers may discover that relationships are first thought to be of secondary importance are of primary importance.
- Drawing a system map and locating the disciplines on it that one believes are relevant enables the researcher to more easily identify other relevant disciplines that may have been overlooked earlier.
- Drawing a system map helps the researcher understand not only how the system operates the way it does but also *why* the system behaves the way it does. For example, simply knowing *how* coal contributes to acid rain does not explain *why* coal was chosen over other materials to fuel electric utilities to begin with. One should be as concerned with knowing the *why* of the problem as knowing the *how* (Motes, Bahr, Atha-Weldon, & Dansereau, 2003, pp. 240–242).
- A system map can reveal the existence of a system that did not initially seem to be a system. Systems include not only physical phenomena such as roads or climate, but also cultural phenomena such as faith traditions and gender roles. A map may illustrate, for example, how cultural values support (or not) particular political institutions or practices.

Note: The system map will prove to have further advantages in later STEPS. Researchers can reflect on what theories or methods might best illustrate different relationships among phenomena (useful when evaluating disciplinary research or when graduate students or scholars plan their own research). And a map like this can

spark inspiration regarding how to leverage disciplinary insights. If the result of asking a question to a social problem, the map may indicate which disciplines' relationships it is best to act upon. It may be necessary to act simultaneously on many domains of a complex problem.

The Similarity of Systems Thinking to Problem-Based and Inquiry-Based Learning

Systems thinking is similar to problem-based learning and inquiry-based learning. They use a "scaffolding strategy" to help students move progressively toward understanding while assuming increasing responsibility over the learning process. The strategy helps to break up the problem into its discrete parts (as the IPB does) and move in step-like fashion toward understanding it as a whole (Mathews & Jones, in p. 80). The systems methodology of learning and conducting research is summarized in Figure 4.3.

FIGURE 4.3 ■ **Systems Thinking Methodology**

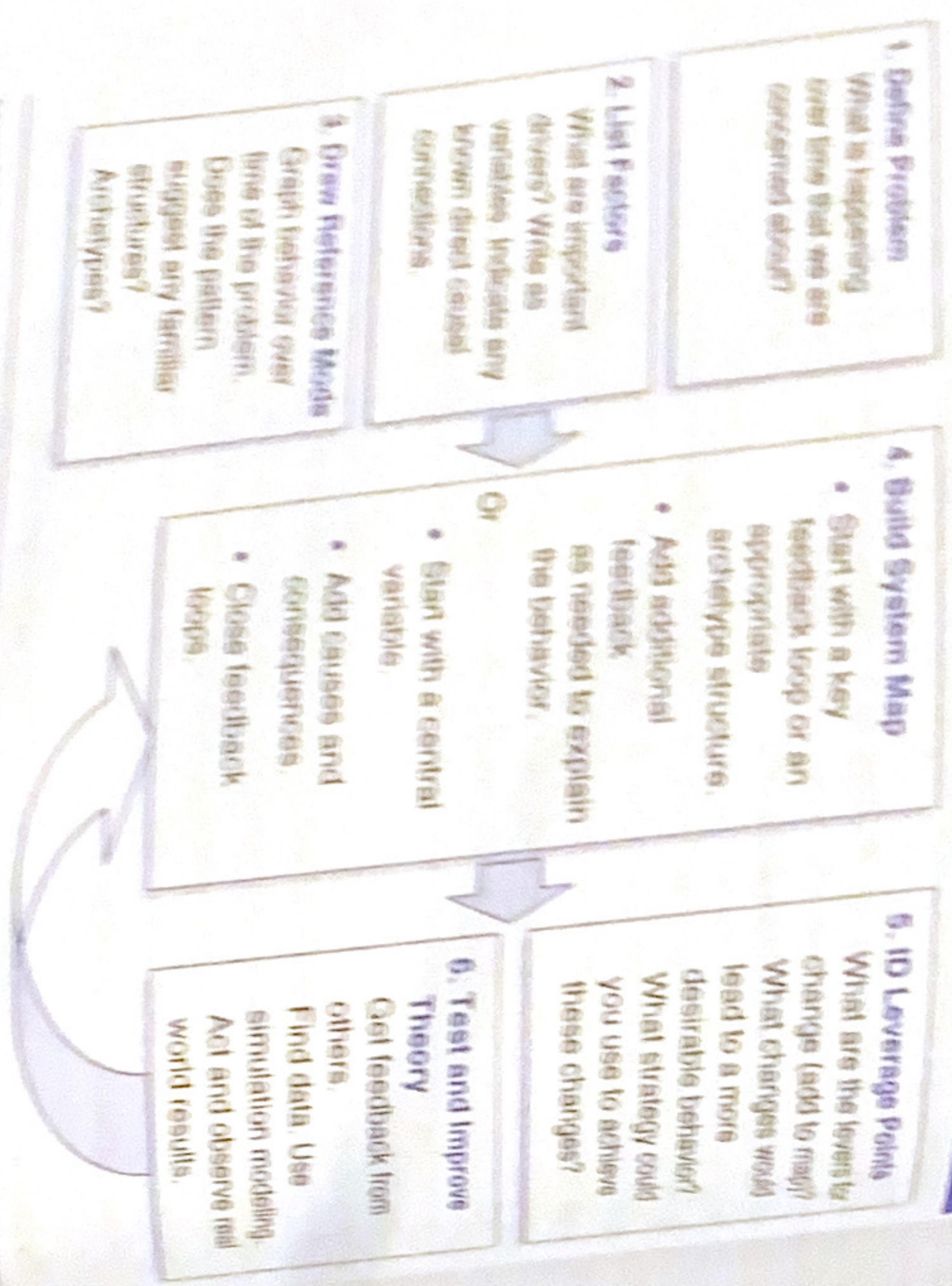


Figure 4.3 Mathews, L. B., & Jones, A. (2008). Using systems thinking to improve interdisciplinary outcomes. *Issues in Integrative Health*, 3(3), 40-41.

How Systems Thinking Promotes Interdisciplinary Learning and Facilitates the Research Process

Using systems thinking and system mapping promotes at least four skills appropriate to interdisciplinary learning and research: perspective taking, nonlinear thinking, holistic thinking, and critical thinking.

Perspective taking, as noted in Chapter 2, involves examining a problem from the standpoint of the interested disciplines and identifying the differences between them. Students have to employ perspective taking when asked to identify the potentially relevant disciplines to a problem. For example, in an interdisciplinary course on land use, students were asked to assume the role of an individual experiencing poor air quality who sets about collecting data to present to appropriate local, state, and federal agencies.

Systems thinking, as well as system mapping, fosters nonlinear thinking by looking for nonlinear relationships among the phenomena or actors in a system. Where they occur, a small change in one part of the system may lead to big changes elsewhere in the system—what Mathews and Jones (2008) refer to as “leverage points” (p. 80). These nonlinear relationships can be visualized as causal loops. Causal loops include balancing loops—also known as negative feedback loops (where phenomena are in an offsetting relationship)—and reinforcing loops—also known as positive feedback loops (where phenomena are moving in the same direction).¹

Systems thinking and system mapping promote holistic or comprehensive thinking by asking students to view system parts in relationship to the system as a whole. Comprehensive thinking is required because students must (1) identify a problem, (2) break it down into its constituent parts (so that they connect parts to particular disciplines), (3) identify the causal factors that are important contributors to the problem, and (4) show how these factors relate to each other and to the problem as a whole. “Once students understand the dynamics of the system, they can identify and test hypotheses about where and when to intervene in the system. This will enable them to later propose solutions to the problem” (Mathews & Jones, 2008, p. 78).

Systems thinking also promotes critical thinking by requiring students to examine their assumptions and base their conclusions on evidence. That is, they must ask whether scholarly insights into each relationship on their map is supported by adequate argument and evidence. While all disciplines lay claim to critical thinking, such thinking is freighted with added meaning for interdisciplinary students who must examine assumptions (their own as well as those of the disciplines in which they are working) and evaluate and reconcile the conflicting claims of disciplinary experts (Mathews & Jones, 2008, p. 81).

The Research Map

The research map helps those new to interdisciplinary research visualize the research process from beginning to end. While creating a research map may at first appear as a diversion from the more important business of “getting on” with the project, experience shows that investing time in constructing the research map—formulating the problem and identifying its various components—increases efficiency in performing subsequent STEPS of the IRP. The sample research map shown in Figure 4.4, reveals key components of the research map.

- It states the purpose of the research.
- It identifies what disciplines are potentially relevant.
- It states the perspective of each discipline on the problem.
- It identifies the assumptions of each discipline.
- It identifies nondisciplinary sources or interpretations.

Note: Students in some courses may be encouraged to consider nondisciplinary sources. For example, in a course with an environmental focus, it might be useful to learn what farmers or other local people think about a particular environmental challenge. This may prove more helpful than evaluating disciplinary insights because there may be no detailed consensus to draw upon. Nevertheless, local insights may be quite distinct from those of any scholarly discipline.

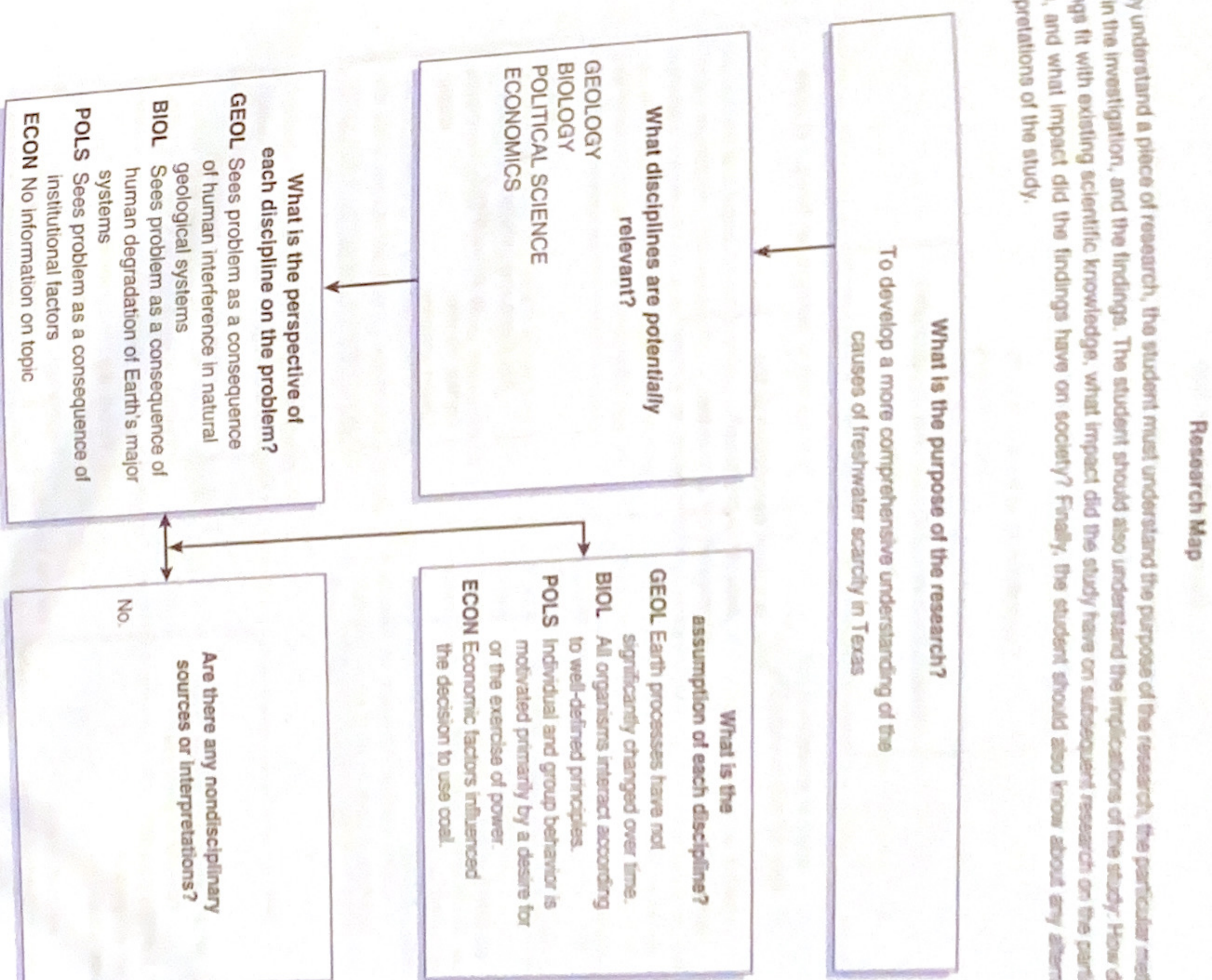
The Concept or Principle Map

More advanced students working with more complex or larger-scale problems can benefit from using concept or principle maps. The concept or principle map organizes information about the problem showing meaningful relationships between the parts of the problem that requires thinking through all the parts of the problem and anticipating how these behave or function, as shown in Figure 4.5.

The Theory Map

The theory map describes a theory’s supporting evidence and importance, and compares it to other theories. In the following chapters, we shall see that theories are important in most of the professional work and student projects used to illustrate aspects of the interdisciplinary research process. For example, a student investigating the causes of freshwater scarcity in Texas discovered that the insights from each of the relevant disciplines are couched in terms of theories that are well known within that discipline. If one or more disciplinary theories are involved in an inquiry, you must develop adequacy in each theory and in each discipline that produced it. We will discuss theory in more detail in STEP 5 (Chapter 6). Preliminary to developing adequacy, however, is mapping the problem. The theory map on Piaget’s theory of cognitive development shown in Figure 4.6 can easily be modified to focus on additional aspects of any theory.

FIGURE 4.4 ■ Research Map

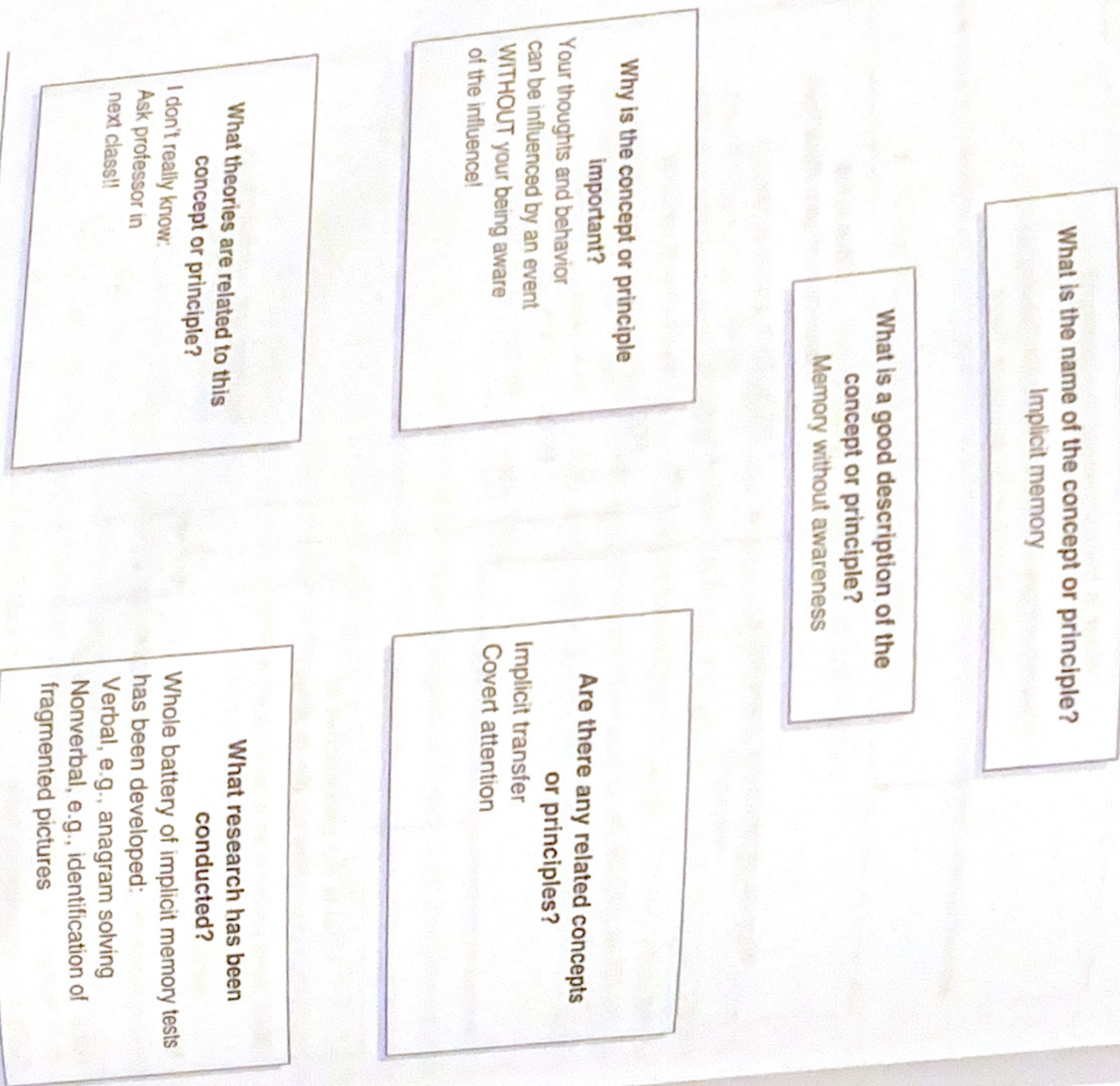


Source: Adapted from Motes, M. A., Bahr, G. S., Atha-Weldon, C., & Dansereau, D. F. (2003). Academic guide maps for learning psychology. *Teaching of Psychology*, 30(3), 240-242.

FIGURE 4.5 ■ Concept or Principle Map

Concept or Principle Map

Concepts and principles are ubiquitous in science. To fully understand a concept or principle, the student must be able to describe it and must also know how the concept or principle fits with existing theories and what research has been conducted on the concept or principle. Additionally, the student should know how and why the concept or principle is important to science and society, as well as to any related concepts or principles.

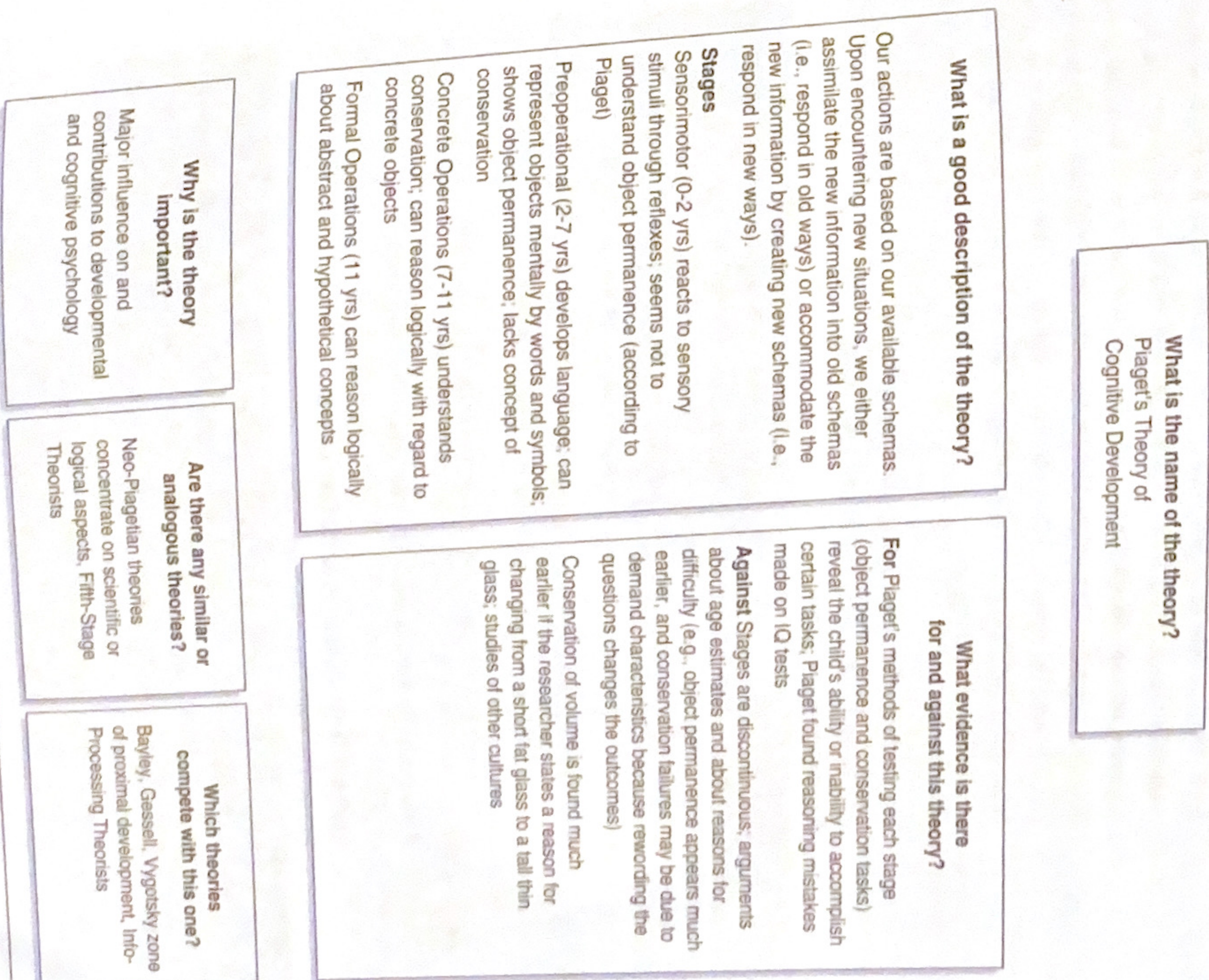


Source: Adapted from Motes, M. A., Bahr, G. S., Atha-Weldon, C., & Dansereau, D. F. (2003). Academic guide maps for learning psychology. *Teaching of Psychology, 30*(3), 240-242.

FIGURE 4.6 ■ Theory Map

Theory Map

To fully appreciate a scientific theory, the student should be able to describe the theory, know evidence for and against the theory, know why the theory is important, and know whether there are any similar and competing theories.



Source: Adapted from Motes, M. A., Bahr, G. S., Atha-Weldon, C., & Dansereau, D. F. (2003). Academic guide maps for learning psychology. *Teaching of Psychology, 30*(3), 240-242.

REDUCE THE NUMBER OF POTENTIALLY RELEVANT DISCIPLINES TO THOSE THAT ARE MOST RELEVANT

Once you have selected the disciplines generally relevant to the problem, you can decide which of these are most relevant. Conduct a cursory search of the literature of all potentially relevant disciplines to identify the disciplines most relevant to the problem. The most relevant disciplines are those disciplines, often three or four, that are most directly connected to the problem, have produced the most important research on it, and have advanced the most compelling theories to explain it. These disciplines, or parts of them, will provide information about the problem that is essential to developing a comprehensive understanding of it.

Three Questions to Ask to Distinguish Between Potentially Relevant and Most Relevant Disciplines

To identify the most relevant disciplines, ask three questions of each discipline you selected as potentially relevant to the problem:

- Is the problem a central focus for the discipline's perspective? Is it (or key components of it) a part of the subject matter of the discipline?
- Has it produced a body of research (i.e., insights and supporting evidence) on the problem of such significance that it cannot be ignored?
- Has it generated one or more theories to explain the problem?

Answer these questions as you conduct the cursory literature search.

Applying These Questions to the Disciplines Potentially Relevant to Various Topics

Question 1: Does the discipline have a well-defined perspective on the problem? At this early phase of the research process, you should be able to explain how each discipline's overall perspective illuminates the problem or some facet of it. One way to do this (and perhaps gain new insights into the problem) is to restate each perspective in terms of an overarching question about the problem as shown in Tables 4.2, 4.3, 4.4, and 4.5. Complete this table as you do cursory reading in each discipline's literature.

Question 2: Has the discipline produced a body of research (i.e., insights and supporting evidence) on the problem of such significance that it cannot be ignored? Here, the focus is on the

TABLE 4.2 • Disciplines and How They Illuminate Some Aspect of the Problem of Human Cloning (Before the Full-Scale Literature Search)

| Discipline, Interdiscipline, and Applied Field | Perspective Stated in Terms of an Overarching Question Asked About Human Cloning |
|--|---|
| Biology | What are the scientific consequences of human cloning? |
| Psychology | How will the discovery of being cloned affect the cloned person psychologically and the perceptions of others who know (or think about) the person? |
| Political Science | What should be the role of government concerning this issue? |
| Philosophy | How will human cloning affect humanity, and what it means to be human? |
| Religious Studies | Does the science of human cloning conform to sacred writings and, more particularly, to the notion of what it means to be human? |
| Law | What are the legal implications of human cloning, and what are the rights of those who are participants in human cloning experiments? |
| Bioethics | What are the ethical implications of the technology used in human cloning? |

TABLE 4.3 • Disciplines and How They Illuminate Some Aspect of the Columbia River Ecosystem

| Discipline | Perspective Stated in Terms of an Overarching Question Asked About the Columbia River Ecosystem |
|-------------------|---|
| Biology | What are the consequences of the dam system to native salmon populations? |
| Economics | What are the economic benefits and liabilities of the dam system on the people living in the region? |
| Earth Science | What are the implications of the dams on the region's hydrological system? |
| History | What does the damming of the Columbia River system tell us about the nation's confidence at this period of history? |
| Political Science | What should be the role of government at all levels concerning the future of the dam system? |

TABLE 4.4 • Disciplines and How They Illuminate Some Aspect of Occupational Sex Discrimination (OSD)

| Discipline and School of Thought | Perspective Stated in Terms of an Overarching Question Asked About Occupational Sex Discrimination |
|----------------------------------|--|
| Economics | What is the economic motivation for OSD? |
| History | What is the historical context that would help explain OSD? |

TABLE 4.4 ● (Continued)
Perspective Stated in Terms of an Overarching Question Asked About Occupational Sex Discrimination

| | |
|----------------------------------|--|
| Discipline and School of Thought | Perspective Stated in Terms of an Overarching Question Asked About Occupational Sex Discrimination |
| Sociology | How is OSD a reflection of broader social relationships in society? |
| Psychology | How does the behavior of the perpetrators and victims of OSD reflect the psychological constructs individuals develop to make sense of their situations? |
| Marxism | How is OSD a necessary act of preserving capitalism? |

TABLE 4.5 ● **Disciplines and How They Illuminate Some Aspect of a Graffiti (i.e., a Wall Writing)**

| Discipline and Subdiscipline | Perspective Stated in Terms of an Overarching Question Asked About the Graffiti |
|------------------------------|---|
| Anthropology (Cultural) | Is the graffiti an expression of contemporary "popular" Dutch culture? |
| Art History | Is the graffiti merely illustrative of the text about it? |
| Linguistics (Narratology) | What does the graffiti represent? |
| Philosophy (Epistemology) | What does the graffiti suggest is real and unreal? |
| Literature | What can the graffiti be compared to in Dutch poetry? |
| Psychology | Is the graffiti a text of psychic mourning for love lost? |

Note: Cultural anthropology, narratology, and epistemology are subdisciplines.

significance of each discipline's published research. Since the goal of any interdisciplinary research effort is to achieve the most comprehensive understanding of the problem possible, it is advisable to include those disciplines producing important insights into the problem, whether the number of insights is one or several. In the example of human cloning, the disciplines include biology, psychology, political science, philosophy, religion, law, and bioethics.

Course requirements generally determine how many disciplines and how much reading in their literatures students can reasonably be expected to handle. Some students may need to limit the number of disciplines used to only three or four, based on the comparative importance of their insights. Ways to evaluate the importance of insights include

- seeing how often the insight is cited by other writers,
- consulting disciplinary experts, and
- noting the date of publication.

The last factor is particularly important when dealing with time-sensitive issues involving, for instance, rapidly evolving reproductive technologies. You should focus on research that is published in peer-reviewed journals, by university presses, and by academic presses. There is an abundance of material on the Internet, some of which is peer reviewed but much of which is not. Your instructor will provide guidelines on how to evaluate information that is not peer reviewed. (*Note:* These guidelines are discussed in Repko et al. [2020].)

When determining the relative importance of a discipline and its insights, you should not be influenced by the *quantity* of a discipline's research on the problem. If a discipline has just begun to address the problem, or if the problem is of recent origin, then it is not uncommon to find that its experts have published only one or a few insights. But those few may be extremely important because they are based on the latest research and may advance an important theory. A single treatment of the problem by a leading scholar in a discipline may impact the discussion in such a forceful way that one cannot ignore it. In this event, the next question may prove particularly important.

Question 3: Has the discipline generated one or more theories to explain the problem? Theories about the causes or consequences (real or possible) of a problem should be part of developing adequacy in each relevant discipline (STEP 5; see Chapter 6) and may be among the possible sources of conflict between disciplinary insights (STEP 7; see Chapter 9). Whether or not theories are involved can be answered only by conducting a full-scale literature search.

NOTE TO READERS

Advanced undergraduates and some graduate students who labor under time and other constraints must somehow reduce the number of potentially relevant disciplines to those that are the most relevant to the problem, and do so quickly and in a way that does not compromise the integrity of the end product. More senior scholars acting as solo interdisciplinarians conducting solo research have considerably more latitude in

identifying relevant disciplines and their insights and theories. Reducing the number of disciplines is not as necessary for them as it is for graduate and undergraduate students who are expected to not overlook any important insight or theory. Interdisciplinary research is a process where the necessarily incomplete research of one scholar is built upon by others. No research is ever completely comprehensive. The process of narrowing

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may occur also in collaborative research, where interdisciplinary teams conducting basic research are limited by their budget or by the availability of researchers from particular disciplines. Identifying the most relevant disciplines may involve revisiting the formulation of the research question (STEP 1) and undertaking the full-scale literature search (STEP 4).

Recall from Chapter 2 that there is a tradeoff between manageability and creativity at this STEP. Graduate students and scholars may wish to keep an eye on disciplines that seem only tangentially related to the problem precisely because these disciplines may have a novel

contribution to make. Any researcher that does not face really tight time constraints may find that they gain valuable and novel insights by looking further afield.

With respect especially to Questions 2 and 3, it is important to remember that particular disciplines may only have insights or theories relevant to just a subset of the relationships involved in your research problem as you have mapped this above. One of the purposes of mapping is indeed to guide you in identifying most relevant disciplines. You should make sure that you include a discipline that addresses each relationship that you want to address in your research.

Applying These Questions to the Problem of Human Cloning

Reading the literature on the problem of human cloning with these questions in mind heightened student awareness of not only the amount of disciplinary activity among the relevant disciplines, but also the *differing* insights produced by these disciplines. By asking these three questions of each relevant discipline, the student was able to reduce the former list of seven to five disciplines that were *most* relevant to the problem of human cloning. These are listed here along with an explanation for their selection:

- **Biology:** The cursory literature search found that more biologists are writing about human cloning than are scholars from any other discipline. This is understandable because human cloning is itself a biological procedure. Students also found that biologists are advancing some of the most important theories on human cloning and are expressing the greatest diversity of opinion on this issue.
- **Bioethics:** Essays written by bioethicists contain important bridging concepts and methods. The essays may appear to be similar to those written by philosophers but differ from them in one important respect: They are science based.
- **Philosophy:** Though essays written by philosophers appear to overlap those written by bioethicists, there are important differences. For one thing, the essays are not science based, but are grounded in humanistic ethics, thus offering a perspective that contrasts sharply with that of bioethicists on this issue. For another, philosophers tend to exclude important bridging concepts and methods that bioethicists tend to include.

- **Religious Studies:** Religion and the world's major faith traditions are among the most powerful influences in our society today. This explains, for example, why U.S. congressional hearings on "hot button" social issues such as human cloning typically include taking testimony from representatives of the major faith traditions. Therefore, including the perspective of religion seemed appropriate given the amount of attention religious studies scholars have devoted to this issue, the popular interest in their views, and the need to understand value systems that are faith based rather than empirically based.
- **Law:** Though the amount of legal scholarship on the issue is far smaller than that from the other disciplines, law offers insights that approach the issue from a unique perspective and is therefore pertinent.

In the end, course constraints required limiting the number of disciplines to three. The decision to consider biology, philosophy (i.e., humanistic ethics), and religion as "most" relevant to the problem of human cloning was made based on the criteria already noted. Whether these criteria or others are used to differentiate between disciplines that initially appear to be relevant and those that are in fact most relevant, the essential thing is to develop some means by which to identify and justify the disciplines ultimately used and make this decision-making process explicit. Later STEPS in the IRP will validate whether the disciplines selected are in fact the most relevant.

Chapter Summary

STEP 3 of the interdisciplinary research process involves taking three actions: (1) selecting disciplines that are potentially relevant to the problem because it falls within their research domains, (2) mapping the problem to identify its various disciplinary parts, and (3) reducing the number of disciplines to those that are most relevant. Students are well advised to think through the problem and use both the phenomena and perspective approaches to identify disciplines potentially relevant to the problem. The STEP of identifying relevant disciplines requires, among other things, that students have a clear understanding of the overall behavioral pattern of the problem they are studying. Students are urged to map the problem to reveal its disciplinary parts and causal linkages. Perceiving linkages and cause-and-effect relationships necessary to deal with complex problems is not possible using a traditional single-discipline approach.

It is in dealing with complex real-world problems that the interdisciplinary research process proves its analytical power and demonstrates its unmatched ability to construct a more comprehensive understanding. A simple research map, for example, can help students new to interdisciplinary research visualize the process from beginning to end. More advanced students working with more complex problems can benefit from using

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concept, theory, and system maps to break down the problem into its constituent parts and see how the parts relate to the whole. By asking the three prescribed questions of each potentially relevant discipline, students should have little difficulty in identifying those that are most relevant. This process serves three practical purposes: (1) it deepens the student's understanding of the problem, (2) it may reveal the need to refine or restate the research question, and (3) it will make the full-scale literature search more productive.

Notes

1. The mental representation of the internal organization of a problem or system may be expressed in a text format or depicted by a visual-spatial technique called concept or knowledge mapping (Czuchry & Dansereau, 1996, pp. 91-96). The knowledge map is composed mainly of nodes of various shapes, sizes, and colors with meaningful links that are labeled to designate the relationships among the nodes. Succinct statements are incorporated in each node, and the links are identified by a letter abbreviation. The links may indicate characteristics, components, consequences, direction of action, outcomes, predictions, subsets, or subtopics; therefore, a legend is included to explain the meaning of the labels for the links. The spatial arrangements of the nodes on the map may be hierarchical, radial (spider), chain, flowchart, or even multidimensional; some map designers have positioned the nodes as trees, ladders, bridges, rockets, or other symbolic shapes for the theme of the map. The most significant purpose of the map's configuration is to depict relationships among the various aspects of the concepts in each node; consequently, the nodes may also be arranged to designate inclusions, exclusions, overlapping concepts, or chronological sequences (C. Atha-Weldon, personal communication, March 2005). Szostak (2004) speaks of mapping the causal links among relevant phenomena to show which phenomena are implicated in a particular research question and how they are related. The researcher might even map which theories are implicated along different links. A useful base from which to sketch such a map when doing work in the social sciences or humanities is his list of phenomena that appears in Chapter 2 as Table 2.4. Table 2.3 is useful in identifying natural science phenomena.
2. Machiel Keestra (2012) presents an example of a particular application of systems thinking. He initiates a promising discussion of the advantages of focusing on mechanisms whereby scholars can engage in intervention, stimulation, or activation experiments with components or operations of individual mechanisms, and look for consequences on that level in a way they usually cannot when testing theories about humans.
3. "When one finds nonlinear relationships, they are normally in reinforcing (i.e., positive feedback) loops, not balancing loops. But not all reinforcing/positive feedback loops involve a nonlinear relationship. Positive feedback loops may merely reinforce or strengthen a relationship (in which case no nonlinear relationship may be involved), but some of them can produce new (not just enhanced) outcomes because the intensified relationship has reached a tipping point (what complex theorists call a bifurcation point) or threshold (in which case a nonlinear relationship is probably involved)" (William H. Newell, personal communication, January 8, 2011).

Exercises

Potentially Relevant Disciplines

- 4.1 Identify disciplines potentially interested in the following questions:
- Should the international space station continue to be funded?
 - Should the prison camp for alleged terrorists at Guantánamo Bay be closed?
 - Should novels with racially pejorative words be used in literature courses in public schools?

Think Systems

- 4.2 Systems thinking promotes interdisciplinary learning and facilitates the interdisciplinary research process. Create a system map to describe the effects of a factory closure on a local economy.

Mapping

- 4.3 This chapter has argued that you should map the problem as part of the process of identifying relevant disciplines. Identify the kind of map that would best aid your understanding of each of the following problems, and explain:
- The causes of homelessness
 - Why couples divorce
 - How to create a new business

Getting Perspective on the Problem

- 4.4 Use the examples presented in Tables 4.2 through 4.5 to show how the disciplines and their perspectives can illuminate aspects of the problem of teens dropping out of high school.