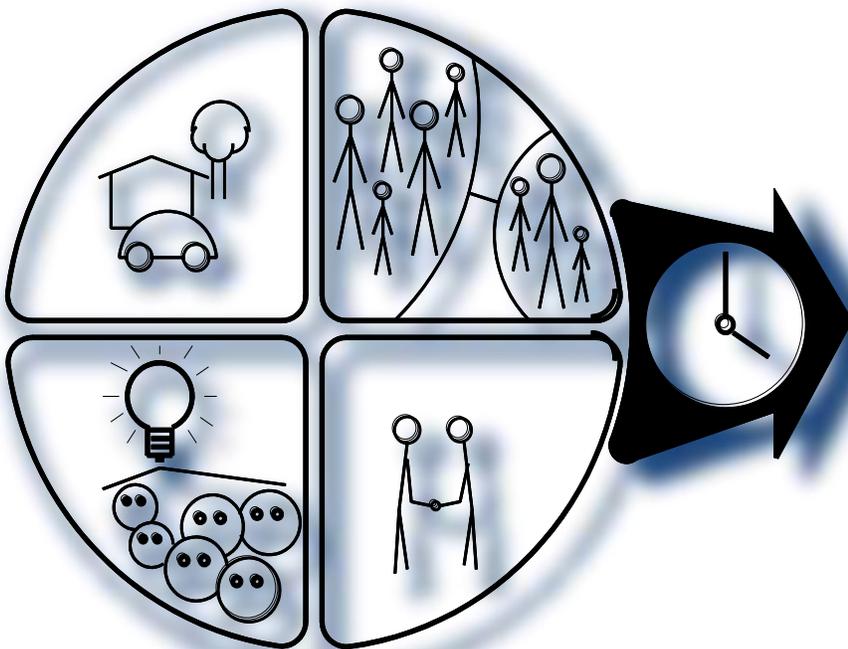


# *Introduction to Systems*

*Social Studies  
Humanities  
Science*



**Part 1**  
Thinking  
Patterns  
Relationships

Marion Brady and Howard Brady

# ***Introduction to Systems***

Originally “*Connections: Investigating Reality*”

## Part 1: Thinking, Patterns, Relationships

Version 1.0

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## To learners—Big ideas that shaped *Introduction to Systems*:

- The future will be more complicated than the present. Old solutions won't solve new problems.
- To solve problems, you need to make sense of the real world.
- In the real world, everything connects. You'll need to understand "systems."
- Because they're the creators of all arts, sciences, institutions, and ways of life, human societies are the most important systems you can study.
- Making sense of systems requires organized thought. School subjects aren't very good organizers of information.
- Thinking about ways to organize thought improves how you do it.
- For sense-making purposes, the real, everyday world is a better "textbook" than textbooks about it.
- Everything you learn should be useful, right here, right now.
- Writing makes you think. (Keep a journal.)
- Dialog makes you think. (Work with others.)
- We're not going to tell you much. We're just going to give you a series of things to do and let you teach yourself how to make more sense of reality—yourself, others, the world.



Marion Brady



Howard Brady

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## Thinking about Thinking

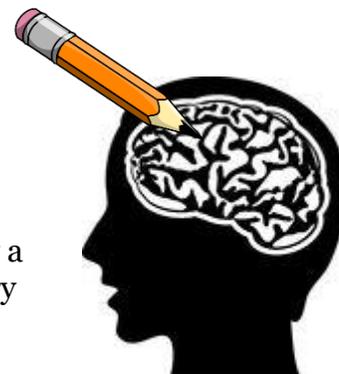
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Many people, maybe most, think you were born with a brain like blank writing paper. As you grew up, parents and others educated you by "writing" facts, advice, and other information on your brain. (The authors disagree with this theory.)

Eventually, you came to school where people assumed that this writing-on-brain process would continue, in a more-organized way, helped along by textbooks and teachers.

Your job at school has probably been rather simple—mostly a matter of "writing" secondhand information in your memory and then "reading it back" on demand. It's a game called "recalling," with frequent "playoffs" or tests to see who has stored and can retrieve the most information.

If that's how it's been for you, it may take a little while for you to get used to *Introduction to Systems*. "Recalling" isn't going to be the main game.



### Investigation: Mental Puzzles

You've been solving complicated mental puzzles all your life. That's what you're doing when you try to find the home of a new friend, fix a flashlight that isn't working, or deal with parents when they're upset at something you've done. In fact, just to get through an ordinary day, you have to solve complicated problems almost non-stop.

Here's a mental puzzle:

***On the next page are photographs of two houses. Working in small groups of three to five people, study the photos and answer these questions: (NOTE: Record answers in your journal.)***

***(a) How are they alike?***

***(b) How are they different?***

***(c) Where would you go to find houses most like one or the other of these two types?***

***(d) How might the differences in the houses affect the actions and relationships of people living in the houses? (For example, which has the "friendlier" front door?)***

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House built in the 1920s



House built in the 1960s

## Investigation: Thought Processes

When you worked on answers to the questions about the two houses, you used four different thought processes: (1) *comparing* (How are they alike?), (2) *contrasting* (How are they different?), (3) *recalling* or *remembering* (Where would you go...?), and (4) *hypothesizing* (How might the differences affect...?). These are names for four ways your mind processes information.

Other examples:

If you look out the window while talking on the phone, and describe in words what you see, you're using a mental process called *translating*—converting information from one form to another.

If you find a link between where people in your town live and the kind of pets they have, you're *correlating*, or finding relationships.

If you decide what to do on Saturday based on what's important to you, you're *valuing*.

You use other thinking (or ***cognitive***) processes besides these seven. Here's a list we use:

**Recalling, applying, inferring, hypothesizing, generalizing, categorizing, relating, comparing, contrasting, correlating, describing, abstracting, extrapolating, predicting, sequencing, integrating, synthesizing, interpreting, translating, empathizing, valuing, envisioning, imagining, intuiting**

Sometimes it's difficult to figure out what those processes are because they often overlap, or because an activity may require more than one kind of thinking.

***With your group, discuss the following activities. What thought processes might each require? Identify or describe each process. (A one-word label for each thinking process isn't necessary.) Note: Many, perhaps most activities like these use more than one cognitive process.***

1. Draw a map of the area where you live.
2. Discuss which is better: cool clothes, or a smartphone?
3. In the area where you live, from what direction do winds usually blow when storms approach?
4. Many different kinds of vehicles are used to transport people. Make a list of them (bus, ...).
5. Based on your experience, describe the different ways people react to bad news.

## Investigation: Thinking In School

What kinds of thought processes are most frequently required of you in school?

- 1: Working together, make a list of six or seven quiz or test questions—any school subject, any grade level. (For example: “Columbus discovered America in the year \_\_\_\_\_.”)**
- 2: When your list is complete, analyze each question to identify the thought process or processes needed to answer it.**
- 3: Compare and contrast the thought processes used for typical school quizzes and tests with those used for the “two houses” investigation.**
- 4: Discuss, then make a list: If a game had been played by one set of rules for many, many years, then somebody abruptly changed the rules, how might players react?**
- 5: If what you do in this course (Introduction to Systems) differs from most of the school work you’ve done, how might you react? Write a generalization.**

\*\*\*\*\*

In Charles Dickens’ novel *Hard Times*, written in 1854, Dickens has the local schoolmaster, Mr. Gradgrind, say:

“Now what I want is facts. Teach the boys and girls nothing but Facts. Facts alone are wanted in life. Plant nothing else, and root out everything else. You can only form the minds of reasoning animals upon Facts; nothing else will ever be of service to them...In this life, we want nothing but Facts, sir, nothing but Facts!”

Would Gradgrind approve of the sample test questions you wrote? Why or why not? Do you think schoolwork has changed much since 1854?

What you’ll be doing in *Introduction to Systems* will be far less like what Mr. Gradgrind had in mind, and far more like the activity above in which you studied differences in two houses. Instead of using your head mostly as a place to store facts and other information to be recalled to pass a quiz or test, you’ll be solving puzzles—the same kind of puzzles you routinely solve every day. The aim won’t be to stuff your head with more and more information, but to improve your puzzle-solving ability.

## Investigation: Target Area

Making sense of “**right here, right now**”—your immediate experience—will be your most important project for the rest of your life. For a strange reason, that’s hard. We tend to ignore the too-familiar. This is what’s meant by the old saying, “a fish would be the last to discover water.”



To make the familiar “strange enough to see,” we want you to focus your attention on a “Target Area” for continuing investigation.



If you’re in a school, your Target Area is the school itself and the property it sits on. This will be your “laboratory.”

If you’re not part of a regular school, choose a familiar area—your place of worship, a large local store, or your immediate neighborhood. (Make sure your area has 50 or more people in it at least some of the time, to make it complex enough to be interesting.)

- 1: *If you wanted to describe your Target Area to someone who’d never seen it (or anything like it), what would you say? Work with others, and come up with a list of at least 20 important things in the target area that you’d need to describe and explain to that person. Record your list in your journal.***

**2: Precision requires numbers and measurement to answer questions such as: How much? How many? How far? How big? Where, exactly? Begin your investigation by collecting precise data. For example:**

What's the shape of the property? How long is each side? What's the area?

Where are the building(s)? What's their shape and size? How much of the total area do they occupy?

How many people are usually in the various spaces at various times? Males? Females?

How many groups? How big is each group?

**3: The questions in 1 and 2 are only a start; you'll need to ask and answer many more to get a really accurate picture of immediate reality. To record this information, make drawings, graphs, lists, tables, etc. (If you do this right, it'll take a lot of time. Be patient and thorough.)**

**Make your Target Area record easy to find later on. You'll be adding to it, using information from other investigations.**



<http://www.absherco.com/portfolio/education/valley-view-middle-school/>

# Investigating Patterns

Long before you started school, you learned to talk using complex sentences. How is it that you were able to do that? Not because someone had deliberately set out to teach you, but because you'd discovered the sentence-making formulas for your native language—the “master patterns” for putting together words to make sentences. You were then able to use these patterns to build absolutely original sentences by the thousands.

It's the **discovery of patterns** that leads to understanding and makes it possible to function in human society. Pattern awareness tells us what to do—how to act at a crowded drinking fountain, which spoon to pick up at a formal dinner, what to do when entering a classroom, and where to point a telescope to see a particular star at a particular time. As the days and years pass, you discover, one by one, thousands of such patterns—patterns of personality traits, patterns of wave action, patterns of historical change, patterns of growth.

## Tides

Today	High	Low	High	Low
Ponce de Leon Inlet	9:21 a.m.	3:13 a.m.	9:28 p.m.	3:47 p.m.
Cape Canaveral	8:34 a.m.	2:12 a.m.	8:41 p.m.	2:46 p.m.
Patrick AFB	8:36 a.m.	2:18 a.m.	8:43 p.m.	2:52 p.m.
Melbourne Beach	8:47 a.m.	2:30 a.m.	8:54 p.m.	3:04 p.m.
Sebastian Inlet	8:52 a.m.	2:32 a.m.	8:59 p.m.	3:06 p.m.
Vero Beach	8:44 a.m.	2:19 a.m.	8:51 p.m.	2:53 p.m.



## Investigation: Bedouin Greeting Patterns

Bedouins are nomadic, desert-dwelling Arabs in the Middle East. Their numbers are decreasing, but a few still follow tradition and live in camps. Anthropologist F. S. Vidal lived among the *Mutair* tribe of Bedouins in Saudi Arabia, and described a stranger's arrival at an encampment.<sup>1</sup>

- 1:** *Nearly everything described below is a pattern. Read the account carefully and list (in your journal) the three or more patterns you consider most important.*
- 2:** *In your journal, explain why you think the patterns you've chosen are likely to be important to the Bedouins.*

In the Bedouin camp, one of the children saw a stranger approaching on a camel. The men and children stood in front of the tents to watch him arrive. The women and older girls hurried away into the women's section.

All of them saw that the stranger was a Bedouin by his clothing. He wore a red checkered headcloth held by a rope around it, a long white shirt, and a dark brown cloak. Also, they knew that he must be an eastern Arab by the way he rode sitting high on the center of the camel's hump and not back over the rump as southerners do.

The stranger approached slowly from the open side of the tents, which among the *Mutair* always faces south. He did not approach in a straight line, but in a zig-zag fashion, first showing one side, then the other, coming closer all the time.

(Continued)



<http://www.bedouinadventures.com/about-us-1/our-bedouin-tribe>

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<sup>1</sup> Brady, Marion and Howard Brady, *Idea and Action in World Cultures*, Englewood Cliffs, N.J., 1977, Prentice Hall, pp 17-18. Material supplied by F. S. Vidal. © Marion Brady & Howard Brady

When he was within calling distance, he was greeted:

“The peace be upon you.” (“*Assalamu alaikum*” in Arabic)

“And upon you the peace.” (“*Wa alaikum assalaam*”)

“God willing you did not get tired.”

“It was not in vain.” (meaning “I may be tired, but it was worth it now that I can enjoy your company.”)

“Please come and rest. Make yourself at home.”

“May God be praised.”

“What is the news?”

“The news, by God’s will, is good.”

The greetings continued for some time, even after the stranger sat down with the men. Meanwhile, the boys got the coffee-making process underway. This was a small camp, and all the men were already assembled by the time the stranger dismounted. If the men had been scattered, the pounding of the coffee beans in a brass mortar (making it ring loudly) would have announced to all that a special occasion was being celebrated.

The coffee was served in tiny cups offered and accepted with the right hand. The guest was served first, followed by all the others. At these ceremonies, at least three rounds of coffee are always served. After three or more rounds, the guest will wiggle his empty cup to indicate that he wishes no more.



<https://engagingcultures.com/adventure-tours/jordan-ecotour/>

## Investigation: Greeting Patterns Here and Now

Patterns for meeting, greeting and conversation differ around the world. In Latin America, the handshake is thought of as an impersonal greeting or farewell. It's considered cold or unfriendly for two men to shake hands if they're good friends. A somewhat more friendly gesture is the left hand placed on another man's shoulder during a handshake. An intimate and warm greeting is the *doble abrazo*, in which two men embrace by placing their arms around each other's shoulders. During conversations, a Latin American man may hold the other person's arm with his hand. When Latin American men talk to each other, they often stand about 8 to 12 inches apart, measured nose to nose. To stand farther away from each other while talking seems cold and unfriendly to them.<sup>1</sup>



Photo: <http://psicologosperu.blogspot.com/2010/07/tipos-de-abrazos.html>

- 1:** *Find a location where people frequently meet and greet, and where you can overhear what they're saying. Observe, noting how greetings usually begin, how much talking each person does, their body language, tones of voice, how long most greetings take, and how greetings end. (Be careful not to offend or invade the privacy of those you're observing.)*
- 2:** *Write a description of greeting patterns you observed. Make sure your descriptions are very detailed, similar to the description of Bedouin greetings above.*
- 3:** *How do patterns differ (a) between strangers becoming acquainted, and (b) between friends? Describe how greeting patterns between two friends are affected by the amount of time since they last met.*
- 4:** *Describe what might happen during a conversation between an American and a Latin American who don't understand each other's conversation patterns. (You may wish to act this out to understand it better.)*

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<sup>1</sup> Adapted from Hall, Edward T. and William Foote Whyte, "Intercultural Communication: A Guide for Men of Action" (*Human Organization*, Vol., 19, No. 1, 1960, pp. 5-12), available at [http://spiritualityandculture.com/uploads/Intercultural\\_Communication\\_by\\_Hall.pdf](http://spiritualityandculture.com/uploads/Intercultural_Communication_by_Hall.pdf).

## Investigation: Pattern Importance

When most of the people in a group share many important cultural patterns, they form a **society**. Most of the people who live in the United States share important action patterns, so these people are part of “American Society.”

The members of a society may share many different action patterns, but not all are equally important. For example, the fact that most female members of a society wear earrings isn’t as important as the fact that most people leave their parents and set up separate homes when they become adults.

Generally, a pattern is important if (1) the pattern affects, in some way, almost everyone within the society; (2) adults model the pattern to the young and expect them to follow it; and (3) those who don’t follow the pattern are considered “odd,” or are the object of irritation, anger, or legal action.

Here’s a list of patterns followed by at least some people in American society.

***Work with your team, and use the three characteristics of an important pattern to decide which of these would be considered important. Record your results in your journal:***

1. Attending school during childhood and teenage years
2. Playing team sports
3. Being tattooed
4. Having the same last name as your father
5. Raising family food in a garden
6. Being able, some day, to choose your own husband or wife
7. Being personally clean
8. Voting in a national election
9. Using powered vehicles for transportation
10. Men opening doors for women.

## Investigation: Literary Patterns

Poetry is often more effective and easier to remember than prose because it has more patterns. “Sonnet,” “Iambic Pentameter,” and “Haiku” are words describing poem patterns.

***Find three short, very different poems, copy them in your journal, and identify as many patterns as possible.***

## Investigation: Patterns in the Target Area

Within the boundaries of the Target Area, there are thousands, maybe hundreds of thousands of patterns—patterns in the structure and organization of buildings, patterns in local weather, in plant and animal life, in the ways people act, in the use of time, and so on. Some are trivial, many are important. This picture shows many patterns:



<http://www.mysanantonio.com/news/education/article/Funding-shrinks-so-classes-grow-4155001.php>

- 1: Identify and list as many Target Area patterns as you can.**
- 2: From the patterns you've listed, choose two you think are important, describe them in detail, and tell why they're important.**

## Branching Out: Pattern in Music

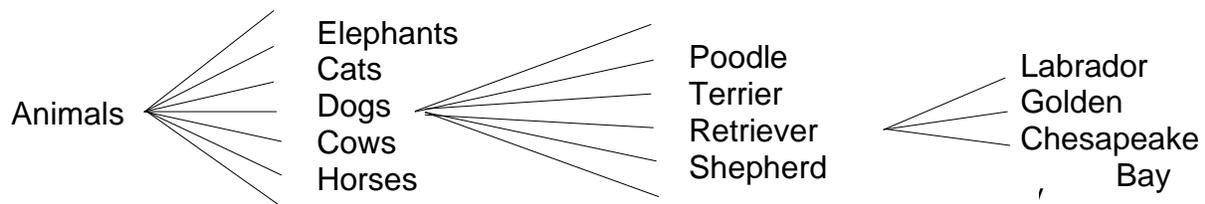
**Music:** Pattern is essential in all music. It's the difference between music and noise. **Obtain a copy of printed music, and identify the patterns. Listen to a recorded song several times and do the same thing.**

## Organizing Information: Knowledge Trees

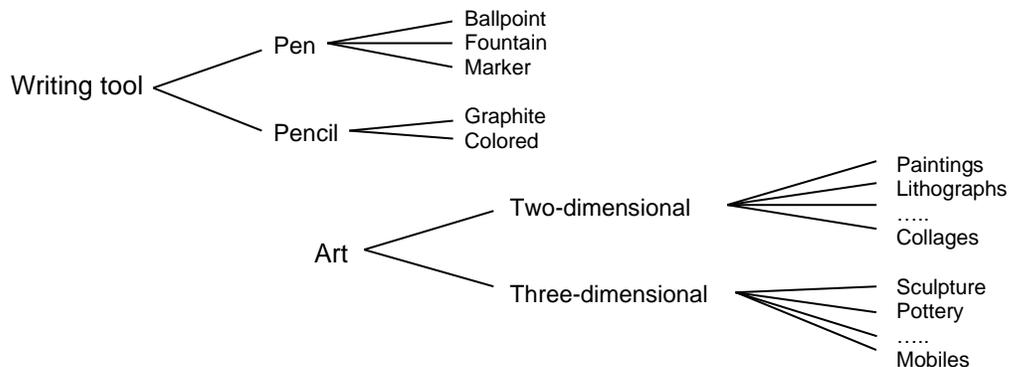
**Many of the important patterns you learned while growing up were given names or labels and became “categories.” The category labeled “animal” is used for many kinds of organisms that share the pattern of moving around. Building knowledge, you’ve been finding and refining categories since you were an infant.**

For example, one of your early ways of categorizing might have put all four-legged animals together under a single heading called “doggie.” However, you quickly moved on to a many-part system. Dogs, cats, cows, elephants, horses, and other familiar animals began to be seen as different kinds of things and were given different labels.

Your revised category system then became even more complicated. Instead of talking about dogs, you began to sub-categorize them, calling them poodles, shepherds, terriers, retrievers, and so on. Now that you’re older and know even more, you may have elaborated the dog category even further—poodles, for example, may have become “toy,” “standard,” etc. Like this:



We’ll call diagrams like this “knowledge trees.” They can be used to organize almost any kind of information. Each word in each tree is a category, and the tree shows important relationships between knowledge categories.



We live in an extremely complicated world. Knowledge trees are essential tools for sorting out and making sense of the complexity that surrounds us.

## Investigation: Developing Knowledge Trees

- 1: Choose one of the following and devise a knowledge tree to analyze and classify information about it. Work with others, if possible.**
  - Means of transport
  - Means of communication
  - Food production/distribution
  - Kinds of shelter
  - Ways of teaching and learning
  - Ways of controlling “bad” behavior
- 2: Check your work. The category words in each column should have a similar descriptive level, and “explain” the words in the previous column. The words in your final column and the category with which you started should be directly related.**
- 3: If possible, compare your work with that of others, thinking about relative strengths and weaknesses.**

## Branching Out: Insect Analysis (Biology)

You probably already know that insects have six legs (Spiders aren’t insects—they have eight legs.)

- 1: Collect several types of insects.**
- 2: Besides six legs, find as many other similarities as you can. If possible, use a magnifier or microscope.**
- 3: Based on the similarities, draw a picture (or construct a model) of a “basic” (prototypical) insect. Label the parts. If you have trouble thinking of labels, use combinations of words, like “leg section 1, closest to body.”**
- 4: Based on your analysis, make a knowledge tree for the parts of an insect.**



## Investigation: Organizing Knowledge in Commerce

Analytical categories are important because they organize information and help us deal with complexity. If a store put its products on shelves in random order, finding something would be almost impossible. Quite naturally, similar products are grouped together.

The same principle applies to information. Random facts are hard to remember, but if they're organized into categories, remembering and using them is much easier.

- 1: *Make a tree for the way products are organized in a typical supermarket.***
- 2: *Nothing's perfect. Make a short shopping list and take it to your local supermarket. If you have trouble finding an item, this may indicate a category problem. Describe the problem, and suggest a change.***
- 3: *Most stores place certain products in ways that make you notice and buy things you otherwise might not buy. Identify and describe parts of the supermarket's product display arrangement that cause you to slow down and notice or otherwise pay special attention.***



# Investigating Relationships

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As you've seen, making sense of the real world (knowledge) grows as you expand your pattern awareness and knowledge categories. There's another major source of insight into the world around you—the **discovery of relationships**. [Note: When you hear or read the word “relationships,” you may think immediately of “**human** relationships.” That isn't what we're talking about. We're concerned here with **logical** and **cause-effect** relationships. For example:

- Sunlight and plant growth are related.
- Lung cancer and smoking are related.
- Wet pavement and skidding are related.
- Economic hard times and political uncertainty are related.
- Tides relate to the moon.
- Weather relates to ocean currents.
- Suburban patterns for neighboring relate to street width.
- Rate of plant growth relates to soil characteristics.
- The welfare of a nation relates to its decisions about what to do with surplus wealth.



For individual humans, for whole societies and civilizations, in every field of study, a search for insight is, more than anything else, a search for possible and probable relationships.

This isn't new for you—you've been finding relationships since you were an infant. You discovered a relationship between crying when you were hungry or uncomfortable, and receiving attention from a parent.

## Investigation: A Closer Look at Relationships

**1:** *Below are parts of relationship statements. Discuss these with others, then, in your journal, fill in the blanks with what seem to you to be useful hypotheses:*

Teen-age suicide is related to \_\_\_\_\_.

Claustrophobia can be caused by \_\_\_\_\_.

\_\_\_\_\_ is related to free time.

Neighborhoods are peaceful when \_\_\_\_\_.

\_\_\_\_\_ is affected by color.

Violent behavior is related to \_\_\_\_\_.

\_\_\_\_\_ is related to family birth order.

If job stress is high, then \_\_\_\_\_.

**2:** *Do you feel safer in some places than others? Explain how personal feelings of security and comfort (or insecurity and discomfort) might relate to each of these:*

- (a) Neighborhood design
- (b) Home environment
- (c) How classrooms are organized
- (d) How schools are organized and operate

## Investigation: Geographic Relationships

**1:** *Identify and list what you believe are the ten or twelve most important cities on earth.*

**2:** *Check the geography where each of the cities is located, and identify similarities (patterns) in their locations. List the geographic characteristics probably related to city formation and growth.*

**3:** *Find other locations with similar geographic conditions to those where important cities are located. Almost always, a city will be located there, but many of these cities are smaller and less important. Identify possible reasons why.*

## Investigation: Relationships in Public Issues

Below is a list of the states in the United States and their 2019 violent crime rates,<sup>1</sup> expressed as total crimes per 100,000 people. The list is arranged in series, with Maine having the lowest rate.

***On a map of the United States, identify the locations of the 10 lowest crime states, and the locations of the 10 highest-crime states. Why do you think the crime rates differ?***

Maine	115.2	New York	358.6
New Hampshire	152.5	Indiana	370.8
Connecticut	183.6	North Carolina	371.8
Vermont	202.2	Florida	378.4
New Jersey	206.9	Colorado	381.0
Virginia	208.0	South Dakota	399.0
Kentucky	217.1	Montana	404.9
Wyoming	217.4	Illinois	406.9
Rhode Island	221.1	Kansas	410.8
Idaho	223.8	Texas	418.9
Utah	235.6	Delaware	422.6
Minnesota	236.4	Oklahoma	431.8
Iowa	266.6	Michigan	437.4
Mississippi	277.9	California	441.2
Oregon	284.4	Maryland	454.1
North Dakota	284.6	Arizona	455.3
Hawaii	285.5	Nevada	493.8
Wisconsin	293.2	Missouri	495.0
Ohio	293.2	Alabama	510.8
Washington	293.9	South Carolina	511.3
Nebraska	300.9	Louisiana	549.3
Pennsylvania	306.4	Arkansas	584.6
West Virginia	316.6	Tennessee	595.2
Massachusetts	327.6	New Mexico	832.2
Georgia	340.7	Alaska	867.1

Note: The causes of crime are complex, and some crimes are never reported, so don't show up in statistics. Crimes totaled in the table are *reported* murder, forcible rape, robbery, and aggravated assault.

<sup>1</sup>[FBI — Table 4](#)

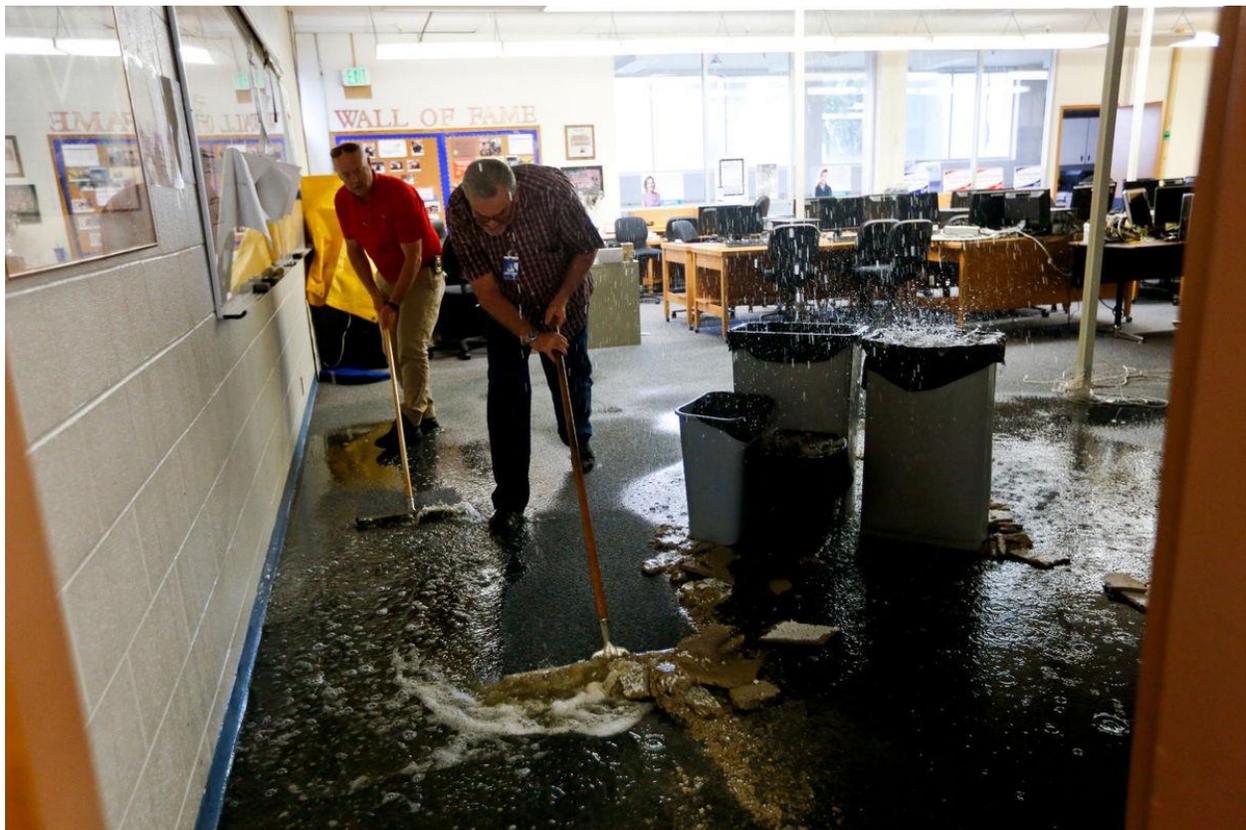
## Investigation: Relationships in the Target Area

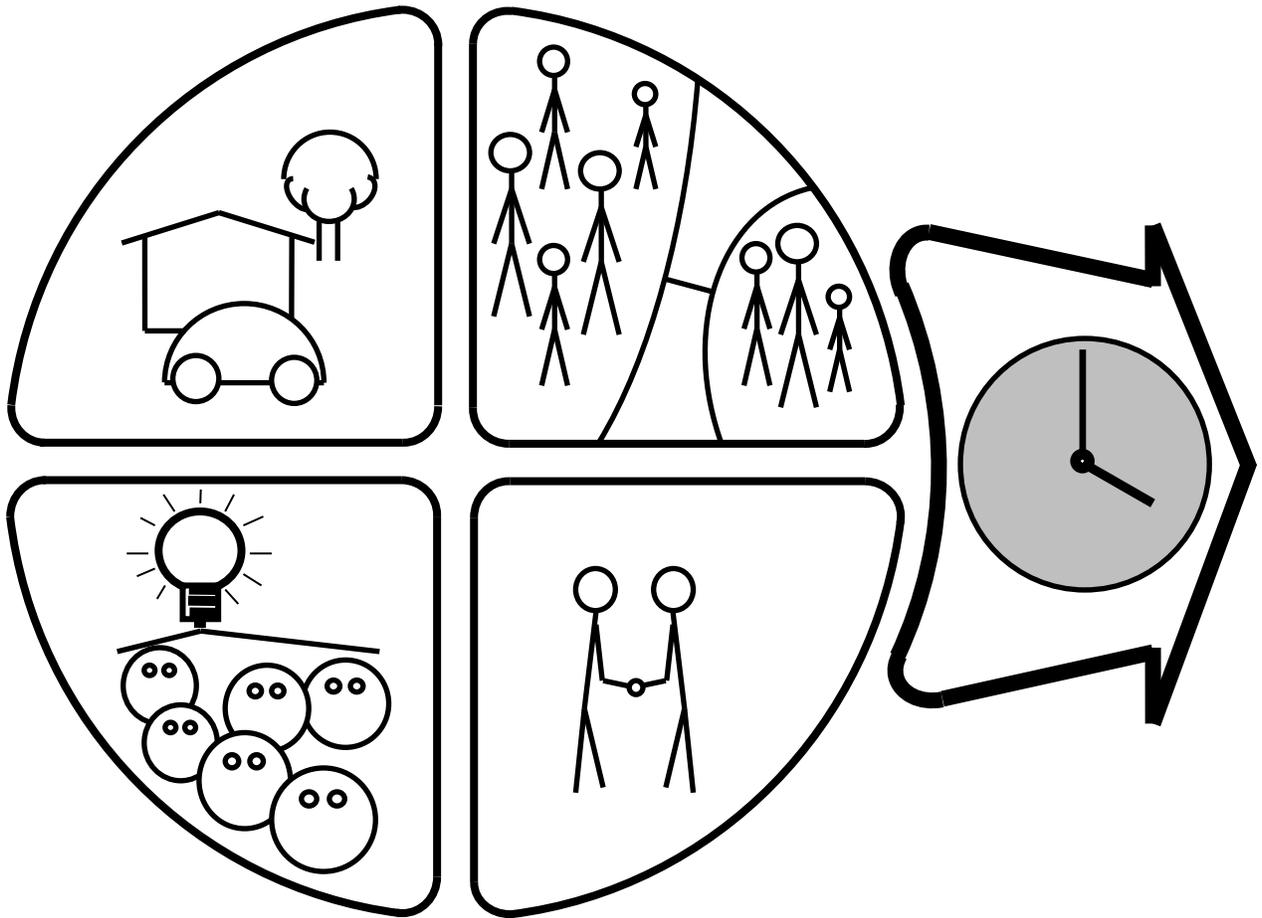
The information about your Target Area you've collected so far is the beginning point for this investigation. Using that information, think about some possible relationships between parts of the Target Area you've identified (or will identify).



For example, is there a relationship between the orientation of different parts of a building and use of electricity? Between sound levels and locations? Is the level of dust in the air different in different parts of the Target Area? If so, why? Where and why do people congregate? Where is the most maintenance necessary? Why? Is any part of the Target area creating problems or deteriorating excessively? Identify reasons.

- 1: List at least five possible relationships between parts of your Target Area.**
- 2: If you identify problems, suggest possible solutions. If possible, identify those responsible, and do what you can to improve the situation.**





## For Teacher/Mentor:

The rationale for *Introduction to systems (IS)*, and general procedures recommended for the course are described in the “Overview for Teachers and Mentors.” <http://www.marionbrady.com/IntroSystems/oTeacher-MentorOverview.pdf>.

We’ve included a wide range of investigations. Not every investigation needs to be done by every learner. In some situations, you may choose to skip an investigation, or assign some work groups one investigation, other groups another, to be worked on simultaneously. The only criterion is thorough grasp of the concepts and skills by every learner before moving on.

The time required to complete Part 1 will vary over a wide range from class to class, but is certain to require several weeks. With active learning, scheduling must be open-ended.<sup>1</sup>

### ***Investigation: Mental Puzzles***

The transition from conventional narrative textbook-based learning to active learning may be difficult for some students—particularly the ones that coped with passive learning effectively. We’ve heard students ask, “Why don’t you just tell us what you want us to know?” Learners resist these investigative activities primarily because they are unlike the “read and recall game” they’ve come to expect to play in school.

Mindy Nathan, principal of an alternative school in Bloomfield, Michigan, wrote to us:

“...My kids LIKE and PREFER the surface requests of conventional test questions that don't demand thought. It's like a relief to them. Crossing the barrier – the chasm that exists in their preference for ease and rote response, and the deeper, meatier, cognitive processes – is a gigantic challenge...I am dealing with kids at the end of their frustration level, who have never experienced (or haven't recognized?) true joy in learning.”

The activities point out to students that they constantly engage in “higher order” thought processes, and that doing so isn't more difficult than memory work, just different, and far more useful.

For poorly-motivated learners, the emphasis on “here and now” application of that which is being learned has been helpful with other course material we’ve developed, and we believe it’s an essential part of this course.

The “comparing houses” investigation introduces, subtly, a major idea that will be developed more thoroughly later: Important relationships between habitat or setting and human behavior.

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<sup>1</sup> We’d appreciate feedback from users on this (or any) subject.

### ***Investigation: Thought Processes***

This involves the next level of abstraction—thinking about different kinds of thinking, which may be difficult for learners working individually. Working in small groups or teams should meet with considerably greater success. If necessary, consider posing additional situations that are easier to classify:

What’s the name of the (principal, librarian, mayor, etc.): (*Recalling*)

Arrange these ten books in alphabetical order by the author’s last name. (*Sequencing, classifying*)

Which of these (books, etc.) is bigger? (*Comparing*)

Describe today’s sky appearance in words. (*Translating*)

What are the differences between these two scissors? (*Contrasting*)

Identify the verbs in the following sentences. (*Applying criteria*)

Here’s a weight tied on the end of a string. If I let it hang, and start it swinging back and forth, then leave it alone, what happens? Why? (*Analysis, hypothesizing*)

How could you solve the problem of homelessness in your town? (*This one could involve many processes.*)

And finally:

If a team is assigned a major problem to solve, which thought process is most important? (*Of course, they’re all important.*)

Note that learner responses may differ from those we’ve suggested, and not be incorrect. Differences in opinion about abstractions such as these are likely.

### ***Investigation: Thinking in School***

This activity should help solidify the idea that the expected kinds of activity within *Introduction to Systems* may differ significantly from other courses they’ve had.

### ***Investigation: Target Area***

This is a major activity—a foundation for much that follows. Its relationship to the study of systems may not be immediately apparent, but it’s a necessary step to study of the “here and now” aspects of social and physical systems that come later. An understanding of a group’s *Setting* is an important element of system analysis, and is dealt with in depth later in the course, but begins here.

Properly done, even this first target area investigation can have huge educational impact. Kids will be learning active-mode investigation, measurement procedures, the importance of accuracy, and an attitude that whenever possible they should gather firsthand information for themselves, rather than trust secondhand information. We suggest you read the description of one master teacher that had a group of alternative-school learners focus on this task:

<http://www.marionbrady.com/IntroSystems/DrWilliamWebb-Testimonial.pdf>

For materials you'll need 50- or 100-foot measuring tapes (or go metric with 10 or 25 meter tapes). Other materials or tools may also be needed—large protractors, 11 x 17 inch (or A2) or larger paper, some kind of level, etc.

You may choose to limit the area to be measured and mapped to something less than the entire school campus, particularly if the area is complex, as Dr. Webb did with his class. Or, alternatively, if the campus is complex, different work groups may be assigned different areas to measure and plot.

Some ingenuity may be needed if the target area space involves corners at angles other than 90 degrees, as in the example cited by Dr. Webb. Let the kids figure it out themselves.

Learner autonomy is essential to making this and other investigations effective, so teachers or mentors should refrain from jumping in with answers or opinions. One essential message that should be communicated to learners is that mistakes are a necessary part of real learning, and making mistakes is OK, no big deal, no real block to classroom success. Multiple teams working on this will almost certainly end up with different results, at least slightly, and discussion of the differences should be part of the process.

We've counseled patience for the learners. Teachers and mentors must be patient as well. This activity will certainly take several days, but they're well spent. The deskwork portion—creating the plan view of the target area and formatting the associated data—could be spread out over some time, with work on this activity interspersed with the investigations that follow.

### ***Investigation: Bedouin Greeting Patterns***

The problem learners may have with this data piece would be in generalizing beyond the specifics of the described patterns. A major generalization based on the stranger's approach patterns is, "act in ways to ensure a peaceful reception." The coffee ceremony complex of patterns are set up to "establish and maintain friendly relationships." If the greeting customs are followed precisely, the stranger and the men of the camp will develop a feeling for each other's personality and character—the significant reason for every greeting ceremony in every society.

### ***Investigation: Greeting Patterns Here and Now***

We agree with Alfie Kohn<sup>1</sup> that homework, by and large, has little or no effect on achievement and often has negative effects that far outweigh any potential benefits.

However, a kid that comes home and says, "My teacher says that for homework I have to go to the mall<sup>2</sup> on Saturday" is unlikely to view the experience negatively.

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<sup>1</sup> See <http://www.alfiekohn.org/article/rethinking-homework/>

<sup>2</sup> Or the closest airport reception area for incoming flights, for example.

Some discussion of observation procedures should be done in advance. Stress one major caution—**sensitivity for the privacy of those being observed**. Learners observing people in public places must make their observations seem casual and unremarkable; note-taking (or making discreet long-distance cellphone photos or videos) should be done in ways that won't be noticed by those being observed.

### ***Investigation: Pattern Importance***

### ***Investigation: Literary Patterns***

These are straightforward activities that should present few problems for learners.

### ***Investigation: Patterns in the Target Area***

There may be a tendency, at this point, for learners to look only for human behavioral patterns. Although this is our primary focus, other non-human patterns (e.g. room arrangement, location of safety equipment, patterns of heating or airflow, time patterns of bells, etc.) should also be noted, because ultimately they affect human patterns.

#### **Some additional pattern questions:**

What patterns do students follow while waiting to enter a closed door? What patterns are followed while eating lunch? What behavior patterns are associated with good news (e.g. unexpected free time)? Bad news (e.g. an unexpected test)? What greeting patterns are followed at various times and places in the target area? What patterns are associated with various levels of noise generated by students? Which patterns differ between males and females? Who runs the school? What do they do? Who makes which decisions? Should they or somebody else be making those decisions? Why? Who makes the formal rules? Who enforces the rules? What happens if some people think a rule is unfair?

The exercise of sorting patterns by importance, from the previous investigation, may be applied here as well.

### ***Branching Out Activities***

These *optional* activities are suggested for learners with special interests—music, art, science, etc.—who are willing to do extra work. Often, they can form bridges between this course and more conventional course content.

### ***Investigation: Developing Knowledge Trees***

A possible problem in this and many other *IS* investigations may be the conventional assumption by learners that there's only one right answer. That's rarely the case in this course (and in real life). Even if they start with the same category, the trees that learners will generate will differ significantly. Evaluating conceptual trees should be based on whether categories at each level of the hierarchy are reasonably parallel, and whether they follow the criteria listed in Step 2 of the investigation.

If the knowledge trees are generated by teams, some way of presenting their work to the whole class for discussion will be helpful. Questions such as, “What are the strong points of this tree?” “Are bigger trees better than smaller ones?” “Is anything important left out?” “How are these two categories in this group different?” “Which tree is most useful?” may be helpful. Check the trees in advance, and ensure that criticism (by you or learners) won’t result in hurt feelings. Treat displayed trees as “works in progress, subject to change.”

Note that the starting categories for these trees are important parts of the general systems Model that will be introduced later in the Unit.

### ***Investigation: Organizing Knowledge in Commerce***

This investigation will help drive home the necessity of rational organization in many areas of life. Of course, the focus may be changed to another kind of store if needed for simple access—a “big box” store, and even the urban corner *bodega* or the local convenience store needs to have its wares grouped into similar categories to be successful.

### **Investigating Relationships**

Knowledge and understanding generally grow not by amassing facts but by linking together aspects of reality not previously thought to be related. Finding relationships, then, is central to learning.

### ***Investigation: A Closer Look at Relationships***

As we said earlier, there’s usually no single right answer to the puzzles that make up *IS*. That’s true with this activity, as well. After work groups have come up with answers, whole-class discussion could compare them to select those answers with the greatest merit (rated by “usefulness”).

### ***Investigation: Geographic Relationships***

Major cities are generally deep-water seaports in places with reasonable climate, conducive to development and industry and creation of a commercial hub. The amount of commerce accessible from the major city is probably the greatest determinant of its size.

This somewhat-optional activity is a chance to introduce some conventional world geography. If course expectations require some emphasis on such topics, learners could prepare detailed reports on various major world cities and their overall characteristics, with appropriate graphics for illustration.

### ***Investigation: Relationships in Public Issues***

Let the work groups struggle with this for a while. Plotting the locations of the low-crime and high-crime states, the obvious first correlation is with location, which suggests a possible relationship to climate. Perhaps people are less likely to commit crimes in cold weather. Alaska, however, is a high-crime state, confusing the issue.

Poverty rates (see Wikipedia's List of U.S. states by poverty rate) match crime rates fairly well, but again Alaska, with low poverty, is an outlier that doesn't fit the pattern. (However, Alaska's state-distributed funds to residents from oil and gas exports reduce poverty, but don't change poverty's culture.) We've not found an explanation, but believe the high Alaska crime rate may be at least partially due to a kind of leftover "wild west" culture in the state. Also, in some locations, the sparse population may make some people feel they're not being observed by those around them, thus are more likely to commit crimes.

**Probably the best lesson here is that not all questions have easy-to-find answers.**

### ***Investigation: Relationships in the Target Area***

One key to maintaining learner interest in a project is making sure all feel they have some reasonable control over the learning process. Autonomy is closely associated with effective learning, and this investigation provides opportunities for kids to choose the direction of their investigation, and potentially take action that could make a significant difference in their environment.

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**Jerome Bruner** (1915-2016) Essay, "**The Act of Discovery**," in his 1962 collection *On Knowing: Essays for the Left Hand*

"Bruner illustrates those attitudes with what is perhaps the most insightful lens on problem-solving ever crafted — the English philosopher Thomas Dewar Weldon's distinction between difficulties, puzzles, and problems. Bruner synthesizes:

We solve a problem or make a discovery when we impose a puzzle form on a difficulty to convert it into a problem that can be solved in such a way that it gets us where we want to be. That is to say, we recast the difficulty into a form that we know how to work with — then we work it. Much of what we speak of as discovery consists of knowing how to impose a workable kind of form on various kinds of difficulties. A small but crucial part of discovery of the highest order is to invent and develop effective models or "puzzle forms." It is in this area that the truly powerful mind shines."