Introduction To Systems
Social Studies | Humanities | Science

Marion Brady and Howard Brady

Investigating American History
A Systems Approach

Investigating World History
A Systems Approach

Investigating World Cultures
A Systems Approach

Civic Systems

Systems-Based Learning

Sample Course Contents

Marion Brady and Howard Brady

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

https://www.marionbrady.com/IntroSystems/1Intro.pdf

Investigation: Planning a Spanish Town

In 1573, King Philip II of Spain issued "Ordinances for the Government of the Indies" which applied to the parts of the Western Hemisphere controlled by Spain.[1] In these ordinances, the King and his officials gave rules for designing the new towns that were being built. In this activity, you'll design your own Spanish town, following the rules.

Note: If possible, work with two to four other people on this investigation. This will give you a chance to "think out loud."

1. *Enlarge the map to a convenient size. (Freehand sketching is OK.)*

2. *Read through all the Ordinances to get a general idea of the problem before beginning your design.*

3. *Start with Ordinances 110 through 114, and decide on a size and location for the plaza. Note the scale of the map and the Ordinances' size specifications. Sketch lightly in pencil to allow for later changes.*

4. *Then:*

   - *Lay out streets* (Ordinances 115-118).

   - *Mark locations of main buildings* (119-122), *then follow the remaining Ordinances to locate other buildings and features.*
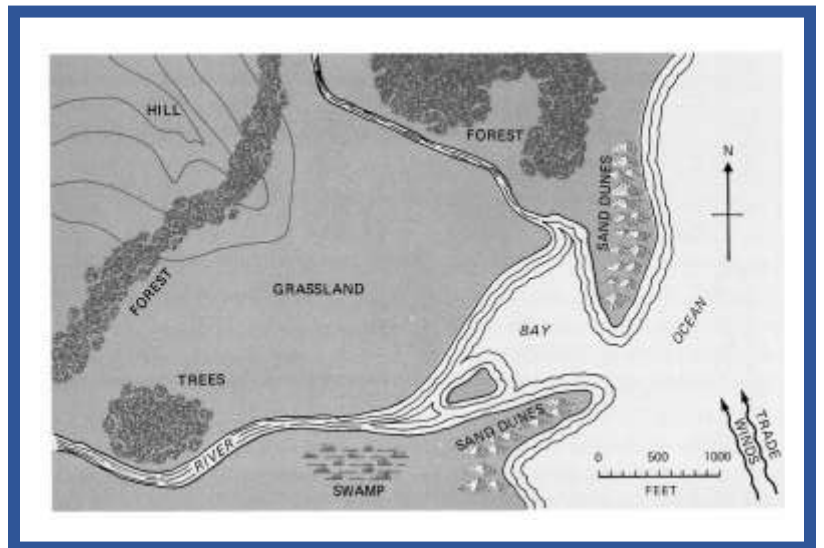
   Do all of this thoughtfully and thoroughly. Allow enough time to do a good job.

Royal Ordinance 110: When the settlers arrive at the place where the town will be built, they must make a plan for the new town. The plazas, streets, and building lots must be laid out exactly, beginning with the main plaza...

(Continued)

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[1] "Ordinances Concerning the Laying Out of New Towns," Zelia Nuttall, trans. and ed., *Hispanic-American Historical Review*, v. 4, No. 4, November 1921 (Durham, N. C.; Duke University Press.) Edited and adapted.

Royal Ordinance 111: The town must be located on ground that is not low or swampy. There must be land for farming and pasture, fuel and wood for buildings, fresh water, and a native people nearby. The town gates should open to the north wind. If the site is on the coast, the town should be a port, but do not have the sea to the south or to the west. Lagoons or swamps in where are found poisonous animals or diseased air and water should not be nearby.

Royal Ordinance 112: If the town is on the seacoast, the main plaza should be at the ship landing place. If the town lies inland, the plaza should be in the middle of the town. The plaza must be a rectangle, with the long side equal to one and one-half times the width. This is the best shape for fiestas, especially those in which horses are used.

Royal Ordinance 114: Four main streets must run from the plaza, one starting from the middle of each side. At each corner of the plaza, two streets should begin, and should line up with the sides of the plaza.

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Royal Ordinance 119: If the town is on the coast, the first cathedral must be built facing the plaza, so it can be seen when arriving by sea. This building should also serve as a means of defense for the port.

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Royal Ordinance 121: The next building lots to be chosen must be for a house for the royal council, a customs house, and an arsenal. These must be near the cathedral and port so that in times of battle they will help defend each other.

The hospital for the poor and those sick with non-contagious diseases must be built near the church buildings. The hospital for those sick with contagious diseases must be built so the wind will not blow from it toward the rest of the town.

Royal Ordinance 122: The building lots for slaughterhouses, fisheries, tanneries, and other things which cause pollution must be placed so waste is not a problem.

[Ordinances omitted above are included in learner's materials, along with additional ordinances not included here. https://www.marionbrady.com/documents/AHHandbook.pdf pp. 2-6]

Record answers in your journal:

1. *What do the Ordinances suggest about Spain's main reason(s) for building towns?*
2. *King Philip II's Ordinances created towns but they also created ways of life. The most important things to be built are almost certainly described first in the Ordinances. List these parts of the town in the order they are mentioned.*
3. *For each item on your list, identify the kinds of actions that take place there.*
4. *Obviously, these actions are considered important. Why? What Spanish shared ideas (beliefs, attitudes, and assumptions) are suggested by the actions?*

[This investigation is followed by "here and now" analysis of the design of the learner's own neighborhood, town or section of a city.

The intellectual demands of analyzing and interpreting data like that in these exercises aren't trivial. Engaging learners in multifaceted activity shows a respect for them which yields dividends. In this particular activity, learners:

- Exercise language skills, since in-depth understanding of the Ordinances are required to proceed with the activity
- Translate abstractions—words—into concrete, graphic form—the town design on the map
- Visualize spatial relationships, an essential element of the process of graphic design
- Generate hypotheses (sizes required for various buildings, space requirements for pasture, etc.)
- Integrate concepts, correlating the ideas expressed in separate ordinances into an integrated whole
- Draw inferences, to determine, for example, the relative importance of the motivating ideas characteristic of Spanish colonists
- Solve mathematical problems involving scale.

That's a considerable payoff.]

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[Following: *Introduction to Systems*, Part 4, page 11. Another example of the way active learning requires complex thought, in this case to infer causal chains.]

Investigation: Stirrups and Medieval Society

Before the Middle Ages in Europe, armies of Greece and Rome mostly fought on foot. Some light cavalry (soldiers on horses) was used, and some "barbarian" horse-mounted troops fought effectively against Greek and Roman forces. However, cavalry troops became much more powerful after they adopted stirrups (which were probably invented in Asia). The change was so significant that it was one element bringing a new age to Europe.
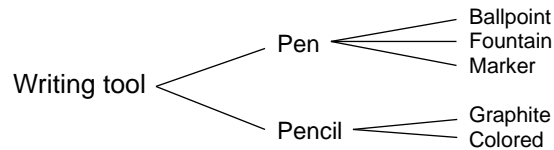
Below, in random sequence, is a list of 14 changes that followed the invention of stirrups. Rearrange the list to show as many direct cause-effect relationships as you can. (Copying the 14 items on slips of paper may make them easier to shuffle and arrange.) Show the changes in a diagram.

- Horse saddles with stirrups
- Improvements in metallurgy and metal-working skills
- Armor for men and horses
- Increase in need for grain
- Increased social class and wealth differences
- Increase in cost of fighting
- Greater stability on horseback
- Help in donning armor, mounting, care of horses
- Need for bigger, stronger horses, and more of them
- More land under cultivation
- Taxation of farmers and peasants
- Bridge construction
- More effective use of lance and battle axe
- Advances in animal husbandry and breeding

https://www.marionbrady.com/IntroSystems/4DemogrSetting.pdf

[One step in the standard sequence in each course introduces the concept of hierarchical "knowledge trees," e.g.:

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                                              Ballpoint
                              Pen  <          Fountain
                             /                Marker
        Writing tool  <
                             \                Graphite
                              Pencil  <        Colored
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...for organizing information into categories, subcategories, sub-subcategories, etc. The following investigation is typical. The categories being expanded are integral components of the "Model" for systems, the major conceptual framework for all the courses. *Civic Systems, Part 1, page 8*:]

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   • Kinds of shelter
• Means of communication   • Ways of teaching and learning
• Food production/distribution   • Ways of controlling "bad" behavior

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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.**

[Incidentally, this activity, like most of the activities in SBL, illustrates one of the fundamental limitations of standardized tests. Learners can organize each category in many different "correct" ways. Some ways will be better than others, but there is no "right" answer. Evaluation of each learner's (or work group's) knowledge tree quality may be done by any insightful teacher, but not by a machine-scored examination.]

https://www.marionbrady.com/Civics/01HereNow.pdf

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[The next page shows, in simplified graphic form, the "Model" that is used in all courses to analyze and organize information from both primary sources and reality. Elements of the Model were introduced in activities that preceded this page. Each of the five elements of the Model—Setting, Demographics, Action Patterns, Shared Ideas (worldview), and the systemic relationships that create Change as time passes, is elaborated and expanded in many different contexts by subsequent units of study.

We believe this Model replicates the way learners intuitively organize learning by creating mental "stories," stories constructed using the natural, universal analytical categories of the Model.]

The Human Systems Model

You now have the main elements of a Model for investigating any human system or organized human group.
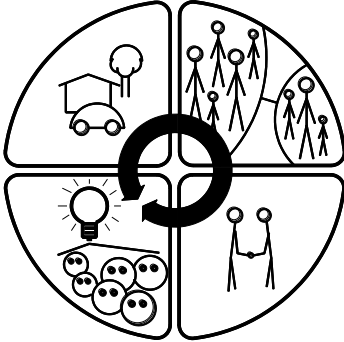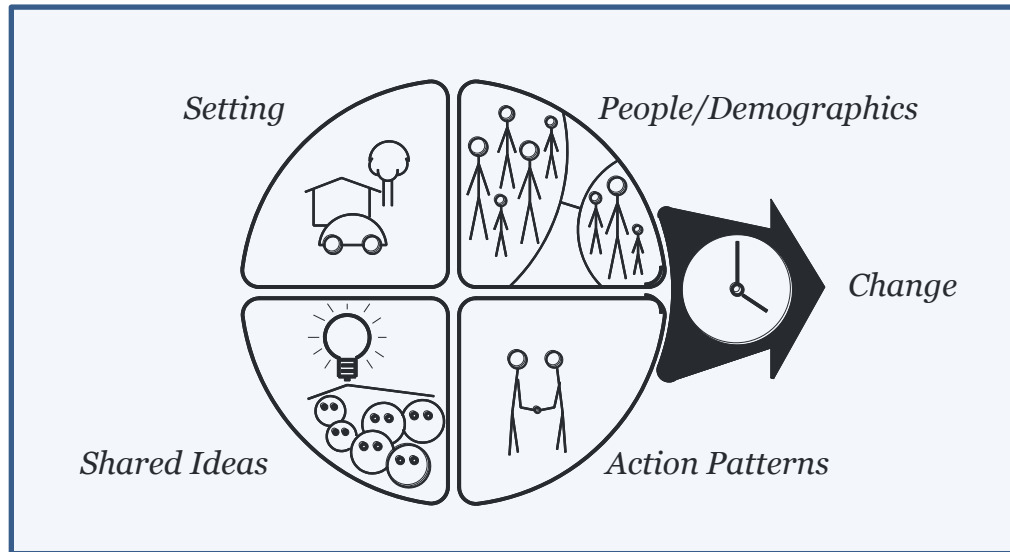
A reminder: Human systems, like all systems, are integrated. Every part relates directly or indirectly to every other part, and a change in any part will cause changes elsewhere. Population increases or decreases, for example, will probably change patterns for work, for obtaining and distributing food, for housing. These, in turn, will cause changes in Settings and in ideas about human relationships. Such changes may occur too slowly to be noticed, so understanding them requires a look at information over time—history.

https://www.marionbrady.com/IntroSystems/2AnalyzingSystems.pdf

Investigation: Target Area Setting

Understanding your Target Area more completely will require more data about its Setting. ***With your work group, choose one of the following, investigate and prepare a report on your findings.***

RHRN
Project

- ***Sunlight affects the building or buildings in your Target Area. Identify places where the sun's effect is greatest. Make measurements to find how the sun's angle is changing from day to day (e.g. length of the flagpole's shadow at the same time each day). Explain this change with diagrams. Measure the effects of the sun's heat and light on the building interior.***

- ***Precipitation—rain, maybe snow—falls on your Target Area. How much? When? (Check local statistics.) Where, specifically, does the water go when it runs off? (Describe its route to the nearest river.) How contaminated is the water that comes off the building roof? Off the parking lot? What are the contaminants? Find out if they're harmful in some way.***

- ***Your Target Area uses energy—electricity, and perhaps natural gas or other fuel. Find out how much is used, what it costs, how efficiently it's used, what the by-products are (e.g. carbon dioxide from burning fuel). Identify the source of electricity, and find out how it is produced.***

- ***Identify the different kinds and amounts of waste produced in the Target Area. Where does it go? How is it processed? How much is recycled? Where will it be when you're 60 years old?***

- ***Other possible investigations of Target Area Settings: foot and vehicle traffic studies, air quality, etc. Make sure that whatever you investigate has important effects on the main Target Area system.***

https://www.marionbrady.com/cultures/03Setting.pdf

[Note that active learning activities break down the artificial boundaries between disciplines and courses. This one links science, math, social studies, history, etc.]

[The Model is a natural and logical organizer growing out of the way the human brain processes information. *Introduction to Systems*, Part 2, page 15:]

Investigation: How Universal Is Our Human Systems Model?

News reporters know that to tell a story, they must answer the five "W" questions:

Who? What? When? Where? Why?

Note that these questions "fit" logically with the main categories of the Model.

1:   *Match each of the five "W" questions with its corresponding Model category.*

2:   *Test the Model by reviewing the "who, where, what, when and why" of human affairs in several sources—news stories similar to the one shown here, an incident described in a history book, an elderly person's recollection, an incident in your school, etc. In your journal, paste in news clippings or copies of other printed accounts, or write information from verbal accounts, then draw circles around the information that answers each of the "W" questions, and indicate which question is answered.*

Note: The question "Why?" sometimes isn't answered in news stories, either because the answer is obvious, or because the reporter doesn't know the answer.

3:   *For each story, identify possible systemic relationships between the components.*

4:   *Dramas and plays model reality but use different words for major categories. What are they?*

https://www.marionbrady.com/IntroSystems/2AnalyzingSystems.pdf

Fire severely damages local dentist office

TITUSVILLE — A dentist office sustained extensive damage after a Thursday night fire in Titusville, Fire Departments officials said.

Fire crews got a call at 6:11 p.m. for the fire at Christie Dental of Titusville in the 600 block of Country Club Drive, Battalion Chief Greg Sutton said. Crews saw smoke coming from the windows of the business when they arrived on the scene.

Crews extinguished the fire in 30 minutes and no injuries are reported. But the dentist office sustained extensive smoke damage throughout the building and is uninhabitable.

The cause of the fire is under investigation and the State Fire Marshal's office has been contacted, Sutton said.

Investigation: A Change in Shared Ideas

If you were able to ask either ancient Egyptians or Mesopotamians about their beliefs about life, their answer would probably be something like this:

"The skies tell the truth about all things. Each day the sun is born, travels across the sky, dies in the west and journeys into the underworld, to be born again the next morning.

"The moon, likewise, journeys from this world to the underworld, except she changes her appearance from night to night, sometimes showing her whole face, then gradually hiding it until she disappears, then she reappears again.

"The stars show us the passage of a year. Every spring, the same stars rise in the east, but these are different from the stars that rise in any other season. The stars show us when the river will rise and bring new life.

"Just like the sun, moon and stars, seeds must go into the ground and die before they can sprout and grow into new plants.

"People are the same. They are born like the morning sun, live their lives, then die and travel to the underworld.

"Some years the river rises more, some years less, but the world is much the same as it has always been since the creating god caused it to form."

According to the recorded traditions of the Israelites, about 1850 BCE a tribal leader named Avram (also called Abram in many translations), originally from Ur but living in Harran in Mesopotamia, had the following experience:[2]

God said to Avram, "Leave your country, your relatives, and your father's house. Go to a country that I will show you. I will make you into a great nation and bless you, making your name honored. Those who bless you I will bless, those who curse you I will damn, and every clan on earth will pray to be blessed like you."

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[God] took Avram outside and said, "Look up to the sky and try to count the stars. That's how many descendants you will have."

Read the description of the Shared Idea category "Time" on Page 1, then decide how a fundamental idea expressed in the account about Avram differs from the views of Egyptians and Mesopotamians (top box). Which view is more like those shared by most people you know? Record your conclusions. https://www.marionbrady.com/worldhist/06AncientIsrael.pdf

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[2] Genesis 12:1-3, 15:5. (Paraphrased from various translations)

Investigation: Incremental Change

To survive and prosper, a society must adapt to change. However, demographic and environmental changes often occur so slowly they aren't noticed. Or, if people *do* notice, the changes seem to be so gradual they can safely be ignored.

Here are examples of incremental changes in Setting. Which, if any, apply to your society? What are possible long-term consequences of the changes? Choose one and make a flow chart.

- Gradual loss of topsoil
- Long-term lowering of underground water tables
- Gradual increases in the length of the growing season and maximum temperatures.

Add other possible changes to this list, and make flow charts.

https://www.marionbrady.com/IntroSystems/5DynamicsChange.pdf

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Rethinking Education's Main Assumptions

In his 1916 Presidential Address to the Mathematical Association of England, Alfred North Whitehead had harsh words for the education establishment. "The second-handedness of the learned world," he said, "is the secret of its mediocrity."

Not surprisingly, more than a century has passed and nothing has changed. Textbooks, teacher talk and technology continue to deliver secondhand information organized by the core curriculum adopted in 1893. Standardized tests monitor the amount learners can keep in short-term memory long enough to make it appear the system is working.

It's not. Our children and our children's children are going to face problems from the accelerating rate of technological, environmental, demographic, cognitive, economic, political and social change that are complex beyond present ability to imagine. Their survival will hinge on their ability to cope, and the conceptual stew of the misnamed core curriculum won't provide it.

Since nobody yet knows what will need to be known, schooling's primary emphasis must shift from transmitting existing knowledge, to teaching the young how to create new knowledge.

That's what Systems-Based Learning (SBL) is designed to do. It assumes (1) that the organization of information is critically important, (2) that the optimum organizers of information aren't the core subjects but the thought processes that infants bring with them to life and develop to sophisticated levels long before reaching school age, (3) that new knowledge is created by the ability to infer, hypothesize, generalize, synthesize, imagine, predict, extrapolate, estimate, and dozens of other thought processes and the countless combinations of thought processes that make humanness and civilized life

possible, (4), that learner firsthand experience and non-traditional uses of traditional content of school subjects can be used to create experiences that require learners to use a full range of thought processes, and (5) that the kind of thinking that emerges from those experiences is far too complex and idiosyncratic to be evaluated by standardized tests.

We believe (1) that the middle school level is the optimum time to formally begin SBL instructional activities, (2) that because all knowledge is systemically integrated, a single, more efficient block of time each day should be devoted to academics, (3) that learning is optimized when small groups are supervised by roving teams of teachers with different areas of expertise, (4) that learners should have another daily block of time to pursue a matter of personal choice, and (5) that the so-called "frill" subjects are not frills and deserve a third block of dedicated time, as should daily physical activity.

Note: System-Based learning, recognizing the problem of bureaucratic rigidity, offers SBL-related instructional materials for four courses already taught at the middle and high school level. However, because SBL subsumes and systemically integrates all present and future fields of knowledge, we'd like to see the artificial, arbitrary walls separating specialized studies eliminated, especially at the middle school level.

All course materials are free to educators (including homeschooling parents) for use with their own learners.

Courses and other free professional support materials are at www.marionbrady.com.

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Originally titled *What's Worth Teaching? Selecting, Organizing, and Integrating Knowledge, and* published by SUNY Press as part of their Philosophy of Education Series, the relatively brief and jargon-free book linked below may also be downloaded without cost or other obligation.

https://www.marionbrady.com/documents/WWL.pdf