The Logic of Theory and Research

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I. Theories, Propositions and Concepts

What is a Theory?

A theory is a **set of general statements about how phenomena are connected**. ***Concepts*** (ideas or categories that incorporate specific events) are the flesh of a theory. ***Propositions*** (statements that assert **relationships** among concepts) are the bones of a theory. To **explain** a phenomenon (in one sense of "explain") is to show that the phenomenon (e.g., suicide) is part of a larger category (e.g., weak attachment to life) that is causally connected to other categories (e.g., detachment from social systems as a result of marital separation or death of spouse).

Theory is abstract. A theory does not assert propositions about individual things; e.g., "The more Jack rewards Jill, the more Jill likes Jack." Rather, a theory asserts **relationships among classes or families of events** (e.g., general relationships between reward patterns and interpersonal sentiments). However, a theory might be used to **deduce** hypotheses (e.g., to make predictions) about Jack and Jill.

Concepts

Concepts are usually expressed as nouns and adjectives (qualities of thingness). The "stuff" that is in a class or concept (e.g., blood pressure and body temperature--two variables that help to operationalize the concept "health") may be externally or objectively

real. However, the concept itself (e.g., "health") is conceptual; it exists as an intellectual synthesis . For example, the grey color and granite blocks of a cathedral are real; the window slits in the high walls are real; flying buttresses are real. But "gothic style" is an idea, a concept, an intellectual synthesis. "Gothic style" does not exit "out there" in the same way that bricks do. Therefore, we must make sure that the inductive process by which we **create** concepts or ideas out of the specific "stuff" that we observe is a valid process; that the definition of the concept is broad enough that it includes all of the relevant "stuff," and is narrow enough that it excludes irrelevant "stuff" (stuff belonging in another class/concept); and that the definition is stated in clear language.

Propositions

Propositions assert relationships. Relationships among what? The answer is, relationships among concepts (classes or families of specific events). Examples of propositions include the following.

1. "The larger the percentage of a country's GNP is spent on the military, the higher is its rate of infant mortality." [This is a **hypothetical** proposition asserting a **direct** relationship that operates in one direction--**unilaterally**.]

2. "The greater the strength of social networks ("strength" operationalized, for example, by the number of people in networks and how often members of a network interact with one another), the better is the health of its members." [This is a hypothetical

proposition asserting a direct relationship that could be bi-directional or reciprocal.]

3. "The stronger the social integration in a community (operationalized, for instance, by the percentage of eligible voters who vote, the percentage of families that attend some kind of church services on a regular basis, the percentage of eligible or relevant persons who attend PTA meetings, the average number of neighbors whom persons can name), the lower is the rate of suicide, alcoholism, and juvenile crime." [This is a hypothetical proposition asserting an **indirect or inverse** relationship that might be reciprocal.]

4. Paraphrased from Emile Durkheim's *Division of labor in society*: "When communal solidarity is of the "mechanical" type (i.e., based on rigid adherence to shared moral principles, categories, doctrines, or rituals), sanctions for nonconformity are likely to be repressive." [This is a **categorical proposition**; it asserts that items in one category (repressive sanctions for nonconformity) are **included** in another category (societies whose solidarity is "mechanical"). However, it might also be considered a causal-hypothetical proposition; the type of solidarity somehow causes the kind of sanction for nonconformity.]

Some theorists and researchers are easy to read because they link propositions in a logical way--one proposition leads to the next. However, many writers:

1. Scatter propositions around, and so the reader can only speculate about what the argument (the flow of logic) is.

2. Fail to state propositions in good propositional form; e.g., "The higher the military expenditures, the higher the rate of infant mortality," and "Most suicidal persons are clinically depressed."

3. Fail to state definitions in proper definitional form; e.g., "By 'aggression' is meant behavior (**genus**) that is intended to injure a living thing (**difference**)." Poor definitions leave the reader guessing what the writer means.

4. Contradict themselves, change definitions, or use vague definitions. The result is endless dispute about what the writer "really said." Or the writer is considered profound because no one knows what he or she is talking about.

Categorical and hypothetical (causal/functional) relationships
Propositions generally assert two kinds of relationships: categorical and hypothetical.

Categorical propositions. Categorical relationships are asserted by categorical propositions. Following are examples.

1. "All humans are mortal." [This categorical proposition asserts that one category is completely **within** another category.]

2. "Most suicidal persons have clinical depression." [This categorical proposition asserts that **part** of one category is **within** another category.]

3. "No form of social organization is permanent." [This proposition asserts that none of one category in in the other category.]

In summary, categorical propositions assert that all (or part) of one class is included in or is excluded from another class.

EXERCISE 1. Write and diagram categorical propositions regarding the following sets of variables: 1) things fostered by skilled teachers and achievement in students; 2) successful school reform efforts and social systems in which members do not have a shared mission; 3) adults with antisocial personalities and children who received harsh discipline.

Causal/functional propositions. Causal/functional relationships are asserted by hypothetical or causal propositions. Below are several examples.

1. "The more stressors that bear upon people during a year, the more illnesses they will have during that year."

This causal/functional hypothesis or hypothetical proposition asserts a **direct relationship** between stressors (independent variable) and illness (dependent variable); i.e., as one variable changes in one direction (up or down) the other variable changes in the same direction. Either both variables increase or both decrease.

2. "The more interpersonal support persons have for their moral principles (independent variable), the less likely they are to obey orders which prescribe what they consider immoral acts (dependent variable)."

The above causal/functional hypothesis or hypothetical proposition asserts an **inverse (or indirect)** relationship between interpersonal support and obedience. As one variable changes in one direction (up or down), the other variable changes in an opposite direction.

Hypothetical (or causal/functional) propositions assert that the existence of or a change in a dependent variable (the consequent or alleged effect) is preceded, predicted, determined, dependent or **contingent** upon the existence of or a change in an independent variable (the antecedent or alleged cause). However, there are several degrees and types of dependence or contingency. For example, independent variables may be seen as necessary conditions, sufficient conditions, intervening variables, and contributing conditions.

1. necessary condition. The existence of or a change in the dependent variable requires the existence of or a change in the independent variables. For instance:

"**If and only if** there are shared feelings of exploitation among subjects, will subjects mount resistance against rulers whom they perceive to be exploiting them."

2. sufficient condition. The independent variable is not asserted to be a necessary condition; it is expected that **other** independent variables **also** can have the asserted effect on the dependent variable. However, the independent variable is asserted to be sufficient to effect a change in the dependent variable. For example:

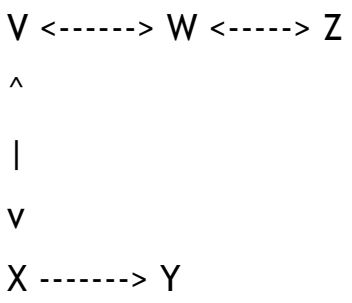
"**Whenever** there are shared feelings of exploitation among subjects, they will mount resistance against the rulers whom they perceive to be exploiting them."

Generally, no one factor is likely to be sufficient. Instead, a set of necessary conditions (e.g., shared feelings of exploitation plus an opposition ideology plus opposition leaders plus opportunities to mount resistance) is usually asserted to make up a sufficient condition. This set of independent variables may operate in a sequence or in a configuration, as shown.

Independent variables in a sequence:

If V, then W; if W then X; if X, then Y; if Y, then Z (final dependent variable)

Independent variables in a configuration:



3. intervening variable. Some variables are neither necessary nor sufficient. Rather, they **stand between** main independent variable(s) and the dependent variable(s). W, X, and Y, above, are intervening variables--i.e., intervening between the distal effects of V on Z. For example, it is generally true that the larger the dose of cold virus, the greater the likelihood that people will catch a cold. However, the

relationship between viral dose (independent variable) and the probability of catching cold (dependent variable) is influenced by a third variable--namely, the strength of the immune system. In other words, viruses produce colds but generally **only if** the immune system is weak enough. In a causal model of these relationships, the strength of the immune system is a gatekeeper standing between viruses and colds, as shown.

Viral dose -------> [If Weak Immune System] --> Likelihood of Cold
Main Independent --> Intervening Variable -----> Main Dependent Variable
Variable

It is seldom easy to determine if a variable is an intervening variable. We must compare situations in which the alleged independent variable exists, but the possible intervening variable **sometimes exists and sometimes does not exist**. For example, participants in an experiment get different doses of cold virus. Some receive a large dose; some a moderate dose; and some a small dose. Seventy-five percent of those receiving a large dose shortly caught a cold; half receiving a moderate dose caught a cold; and only ten percent receiving a small dose caught a cold. In other words, **the larger the dose of virus, the higher the probability of a cold (empirical generalization)**. But suppose we also measured the strength of each person's immune system. Let us **statistically remove** from the sample (take out of the data) all persons with a strong immune system, and then re-analyze the data only with persons having a **weak** immune system. Now we find that ninety-five percent of the people receiving a

large dose got a cold (it was only seventy-five percent when those with a strong immune system were in the high-dose group); seventy percent of those receiving a moderate dose got a cold (it was fifty percent before those with a strong immune system were taken out of the sample); and thirty percent of those receiving a small dose of virus got a cold (it was only ten percent when persons with a strong immune system were in the sample).

The findings show that **the strength of the immune system makes a difference in whether people get a cold.** By itself a weak immune system is **not** sufficient to cause a cold; one still needs a dose of virus. Nor is a weak immune system a necessary condition for catching a cold, because some people with a strong immune system still do catch a cold. (It could be that even strong immune systems are overwhelmed by certain strains of cold virus.) Therefore, the correct empirical generalization seems to be this--The larger the dose of cold viruses (and to the extent that the immune system is weak), the greater the likelihood of catching a cold.

4. contributing condition. A contributing condition affects the amount, type, or speed of change that can be effected by the main independent and intervening variables. For instance, whether people get sick depends upon the size of the viral dose (the main independent variable) and the strength of the immune system (intervening variable). But how long people remain sick may have little to do with dose and immune system. Rather, it may be a function of personality traits (such as healthy-mindedness), diet and rest during the illness, pressure to return to work, or rewards for acting sick.

Here is another example of a contributing condition. When subjects in an authoritarian social system collectively realize that the costs of submission far outweigh the rewards they receive in exchange, the likelihood of resistance to rulers increases. But **what kind** of resistance will subjects mount? Will it be private grumbling, peaceful demonstrations, work stoppages, or violence? The kind of resistance may be a function of the amount of violence rulers have used against subjects. Thus, rulers' use of violence may contribute to the form of resistance, but it may not affect the likelihood of resistance. How do we determine the causal function of independent variables (i.e., as necessary, sufficient, intervening, or contributing)? The answer is that we construct a tentative (hypothetical) causal model, and conduct research to test the model.

Direction of causal/functional relationships. Causal/functional propositions generally assert a causal "flow" or "path" among the variables. These paths are as follows.

1. Unilateral. Unilateral relationships are **in one direction only**. That is, change in an independent variable (necessary condition, sufficient condition, intervening variable, or contributing condition) effects a change in the dependent variable, but the change in the dependent variable does not then affect the independent variable. For example, something about social class (degree of frustration? models of violence?) affects the rate of homicide in each social class, but the rate of homicide does not cause social class.

2. Bilateral or reciprocal. A bilateral relationship is **two-way**. Change in X engenders change in Y; the change in Y then effects a

further change in X. This reciprocal (back-and-forth) relationship is called a **feedback loop**. Feedback loops are of several kinds. One kind is a **positive** feedback loop. In a positive feedback loop, each increase (or decrease) in one set of variables effects a further increase (or a further decrease) in the other set of variables. That is, each set either amplifies or dampens the other set in the same direction. For example, in a "heated argument," the behavior of one person fosters an increase in the "heat" of the other person's behavior, which fosters even more "heat" in the first person's behavior, which produces still more "heat" in the other's behavior, until some limit is reached. Or, as one person withdraws in a relationship, the other person may withdraw some, which results in the first person withdrawing more than before, which results in the other person withdrawing even more than before, until a **limit** is reached (separation).

Another kind of reciprocal influencing is a **negative feedback loop**. In a negative feedback loop, change in one set of variables effects an increase, say, in the other set of variables. The increase in the second set then results in a **dampening** or a decrease in the level of the first set. For instance, the heat that comes from a furnace raises the temperature of the room until the temperature is high enough to shut off the furnace. Or, an increase in the rate of crime in a city produces an increase in the number of police in the city, which results in a decrease in the rate of crime. Of course, the decrease in the rate of crime may result in a decrease in the number of police, which then results in another increase in the rate of crime, and another cycle begins. This would be an example of **oscillation**.

3. Dialectical. A dialectical relationship involves reciprocal influencing, but with one more feature. As each set of variables influences the other set, the quantitative changes eventually yield a change in the **quality, type, or state of each variable, and also perhaps in the nature of the relationship.** One more degree of heat lost, and water becomes ice. For instance, if parents accidentally reward their young children for throwing tantrums and hitting, the children will perform these behaviors more often. The parents then try harder to stop the problematic behaviors in ways that, again, reward these behaviors. At some point, **quantitative changes in the children's behaviors result in a qualitative shift** in the way the children are perceived. They are no longer seen as normal children who perform problematic behavior too often; they are seen as children with a conduct disorder. At the same time, the parents no longer see themselves as regular parents, but as guards or victims. Finally, as the nature of each person's participation in the relationship changes, the nature of the relationship itself changes; e.g., from sweet children and loving parents (a complementary relationship) to an adversarial relationship (a symmetrical relationship).

4. Configurations, networks, and ecological systems. Social systems contain many interrelationships among many variables (features). To make matters more complicated, many interrelationships are reciprocal and/or dialectical. Indeed, a system may be so complex that it is hard to determine which variables and relationships are more important in fostering certain outcomes. In fact, if we study some relationships in isolation from the system in which they ordinarily

occur, the results may not reflect how things usually are but only how they appear in a contrived situation.

Proximity. Some causal/functional relationships are **"proximal."** That is, there is little time lag or few intervening variables between the main independent variable and the main dependent variable. Other causal/functional relationships are **"remote" (distal)**. Sometimes, remote causes are considered **predisposing** factors and proximal causes are considered **precipitating** factors. However, these terms are vague with respect to the degree of dependence. For instance, if early childhood experiences are considered remote causes of adult emotional difficulties, are those childhood experiences necessary conditions, sufficient conditions, contributing, or intervening?

EXERCISE 2. Assert propositions that illustrate the following: necessary conditions, sufficient conditions, intervening variables, contributing conditions, direct relationships, indirect (inverse) relationships, proximal relationships, distal relationships, unilateral relationships, reciprocal relationships, dialectical relationships, and configuations. Label all propositions. Note that one proposition may assert several features of relationships.

Levels of analysis

Phenomena exist on several levels of analysis (levels or units of social organization). Generally, the units of analysis, from microscopic to macroscopic, include the following.

1. individual actions.
2. dyads; e.g., interaction patterns between two persons.

3. small group; e.g., family, team, or work group with division of labor, communication network, hierarchies of prestige, authority and power.
4. gatherings; e.g,, a party, sports event, audience, rally, or mob.
5. formal organization; e.g., a store, a school, a hospital, a political party--with all of the features listed above.
6. social institution; e.g., economic, family, political, military, religious.
7. community, with all of the features listed above.
8. society.
9. inter-societal relations.

It is important to identify the level or unit of analysis being examined because the **whole** (the more encompassing unit) has characteristics that the **parts** (the constituent or lower level units) do not have. Therefore, concepts and generalizations that apply to one level of social organization **may not apply** to the other levels. Below are two examples of a failure to see that what applies to one level may not apply to another.

1. "An automobile engine is heavy; therefore all of its parts are heavy."

2. "Seventy-five percent of the voters in a community voted Republican in an election. Therefore, each voter was seventy-five percent likely to vote Republican."

Obviously, some parts of a heavy engine are light. Also, most people in the election were in fact one-hundred percent likely to vote

Republican and most of the rest were one-hundred percent likely not to. To erroneously attribute to the "parts" (a lower level) a characteristic of the whole (a higher level) is called the **ecological fallacy or the fallacy of division**. Sometimes, committing the ecological fallacy is not only erroneous; it is also absurd. For instance, the concept "family" has division of labor as one of its attributes. But no individual "has" a division of labor! Division of labor is a concept that applies not to individuals but to the organization of individuals' contributions to the overall work in a social system (the larger whole).

On the other hand, we commit the **fallacy of composition** when we erroneously attribute to the whole a characteristic of the parts. For example:

1. "Each part of a sewing machine motor is light. Therefore, the motor as a whole is light."

2. "All of the members of 2nd platoon, Delta Company, are cowardly. Therefore the platoon as a whole is cowardly.

Again, the above two conclusions are illogical and may be false. As individuals, members of a platoon may be cowardly. But as part of a platoon (with leaders, roles to play, and ways to support one another), the platoon as a whole may act in an heroic way even if all of the members are shaking in their boots. The patterns of organization in the larger social form or whole also help to explain how ordinarily people can participate in genocidal movements.

Sometimes, it is not erroneous to use concepts relevent to "lower" levels to describe "higher" levels. For instance, we could count how often each individual in a family rewards other members. After adding the individual scores (Billy rewarded others 5 times, Mary rewarded others 8 times, Sam rewarded others 2 times, and Sally rewarded others once), we could say, " As a family, members reward one another at a rate of sixteen per day." **The rate of family rewarding is a feature of the family organization.** Similarly, we could count the number of people who are mugged each year in a city (a phenomenon at the level of individuals), and then calculate the mugging rate (e.g., 150 muggings/10,000 population). This rate is a feature of the larger unit of organization (the city). Here is a question. After we calculate the mugging rate of 150/10,000 (a characteristic of the city), can we say that each individual's chances of being mugged are 150/10,000?

II. INTELLECTUAL STYLES

According to William James (in *Pragmatism*), there are two main intellectual styles, or ways of making sense of the world--empiricism and rationalism. Each style is regarded by many believers as the only road to the truth. This helps to explain feuds, misunderstandings, and persecutions in philosophy, science, religion and politics. Each style begins and ends in a different place, and uses a different form of logic (inductive vs deductive) to get there. Let us examine each style in detail. Perhaps we can find a way to combine them when we are thinking about, studying, and working to improve organizations.

A. Empiricism and Induction

Empiricism is represented by the methods of Aristotle and David

Hume. For empiricists, one solid bit of data provided by the senses is worth a bucket of unsubstantiated ideas (e.g., hypotheses). Therefore, empirical research and theorizing often have the following features.

General Features of Empiricism

First, empiricism is **inductive**. One begins by collecting (e.g., observing and recording) specific events or incidents (e.g., individual actions and social activities). Next, one looks for connections among these specific events. Through a process of **induction or "intellectual synthesis,"** one gradually creates a larger picture of the phenomenon of interest. The picture consists of two sorts of general statements: 1) the identification and definition of **"empirical concepts"** (i.e., certain events are now seen as members of larger types or categories), and 2) **"empirical generalizations"** (propositions) about relationships among the empirical concepts.

A second feature of empiricism is that it tends to be **descriptive and idiographic**. This means that the researcher or theorist is not so much interested in testing general propositions or hypotheses (e.g., answering the question "Why?" or answering the question "Is it true that...?"). Instead, he or she is interested in discovering how members in a particular setting accomplish social life as a seamless, dynamic process. Let us examine empiricism as a method in more detail.

Steps in Empirical (Inductive) Research and Theorizing

The inductive (empirical) style is a process of **discovery**--in contrast to the deductive, rationalist style, which is typically part of a process of verification and testing. It begins with observations of specific

events or incidents and then moves to the development of general conceptions of how things are organized. The researcher scans a dark landscape and discovers particular things, then types of things, and then relationships among types of things. The inductive process can be described by the following sequence.

1. Begin with observations. These observations are guided by: a) an interest or question (e.g., "How do teachers become attached to a school?"), and b) basic concepts or guidelines (e.g., "Keep in mind that social events have an objective, subjective, and intersubjective side."). For example, in answering the question, "How do teachers become attached to a school?" we would look for events that may be examples of attachment. Later we determine the conditions in which these events ("attachment") seem to occur vs do not occur, and are stronger vs weaker. Notice that I said "may be examples." This is because we do not yet have a definition of attachment. Therefore, we cannot say that the identified events are to be seen as examples of attachment. In step 2, however, we create a defintion.

2. Examine the identified events and discover how some events share certain features. After identifying common features, group the events . The group is a category and may be called an **"empirical concept."** In other words, the empirical concept is like a "family." The similarities among the events are "family resemblances." (See Ludwig Wittgenstein's *Philosophical investigations*.) Next, develop an **"empirical definition"** for the concept/family. For example, guided by an interest in teachers' attachment to schools, we collect hundreds of events ("doings") through interviews, observations, and teachers'

journals. Events that appear to have something in common include: 1) staying late after school to prepare the next days' classes; 2) spending time at home most evenings evaluating one's performance; 3) telephoning colleagues to discuss ways to improve the curriculum; and 4) reading how to involve families in school programs. How do these events resemble one another; what do they have in common? They all involve behavior above and beyond the stipulations in a teacher's contract; they all contain or reveal an emotional connection or commitment to a school, the craft of teaching, or to students. In other words, **they might be seen as examples of (members of the category or family) "attachment."**

However, consider the following events: 1) calling in sick when one is not sick; 2) leaving school soon after the final bell rings; 3) frequently looking forward to the end of each week and school year; and 4) watching TV rather than thinking about the next days' teaching. What do these have in common, and in what ways do they differ from examples of "attachment"? These latter items involve behavior that avoids or escapes teaching and a school; they suggest disconnection from or disaffection for a school, profession, and/or students. In other words, they could be seen as examples of (members of the contrasting category) "alienation." Reviewing examples of attachment vs alienation we now develop **empirical definitions** for these two empirical concepts.

EXERCISE 3. Complete the following definition. "Attachment is a (state the genus or larger category)

that involves (state the common features)

3. Continue collecting events and incidents---at different times, in different places, and with different persons. This enables us to fill in, and to determine the limits of, the empirical concepts. For example, in what other ways might teachers reveal attachment vs alienation? In what ways does alienation in teachers differ from alienation in students, administrators, specialists, and families? Based on new information, we may revise earlier definitions to include the newly discovered features of alienation and attachment. For example, additional interviews reveal that some teachers imagine how their school might change, have positive feelings for the subjects they teach, and have negative feelings about lazy colleagues. Recall that the examples of attachment in #2 above were actions. These new items are images and feelings. Can we revise the earlier definition of attachment to include these?

EXERCISE 4. Complete the revised definition of attachment.
"Attachment is a (state the genus)

that involves (state the common features)

Sometimes, however, we create categories and definitions that are too broad; they lump together events that differ in important ways. For example, alligators and concrete walls could be put in the category of "things with rough surfaces." But alligators and concrete walls are different in so many ways (living vs not living; organic vs inorganic; growing vs constructed) that putting them in the same category--and in one category only--obscures these differences. Therefore, instead of creating more-inclusive definitions of alienation and attachment (as we did above), we might develop **typologies**; i.e.,

a set of different kinds of attachment and alienation. In other words, **we divide the original (too large) concept into several smaller ones**. Note that there are many possible typologies of the same set of things. It depends on the dimensions along which we are making distinctions between the things. For example, there can be separate typologies of fruits along the dimensions of size, shape, color, sweetness, nutritional content, whether they come singly or in bunches, etc. We have to **select dimensions relevant to our interests or questions**.

EXERCISE 5. Create three typologies of fruits using the above-noted dimensions. Notice how items that go together in one typology do not go together in another typology.

Fruits, based on... Fruits, based on... Fruits, based on...

EXERCISE 6. List dimensions along which we can create typologies of organizations.

1.

2.

3.

4.

5.

Now create typologies of organizations using two of the dimensions.

Organizations, based on... Organizations, based on...

EXERCISE 7. List at least three dimensions along which we can categorize examples of (create typologies of) attachment or alienation.

1.

2.

3.

Now create a typology using one the dimensions.

Types of Attachment, Along the Dimension of...

1. e.g., (relevant behaviors)

2. e.g.,

3. e.g.,

4. e.g.,

4. Create empirical generalizations (propositions) that summarize what we have discovered so far. That is, we move to a higher level of generality. We can assert empirical generalizations about many things; for example: a) quantitative features of a social system; b) simple (e.g., two-variable) causal or functional relationships; c) sequences; d) configurations; and e) more general categories and relationships. Let us examine each kind of empirical generalization.

a. Propositions about quantitative features of a social system. Examples include the following. (1) How often do instances of attachment vs alienation occur? For example, how many sick days per semester do teachers take? (2) What percentage of teachers could be considered strongly attached, moderately attached, or strongly unattached? (3) How much time per day do teachers spend trying to improve their teaching?

EXERCISE 8. List at least two more quantifiable features of alienation or attachment.

1.

2.

3.

b. Propositions about simple (e.g., two-variable) causal or functional relationships. To assert a causal or a functional relationship is to state that one variable or set of variables (dependent variables) follows, changes as a consequence of, or somehow depends upon another variable or set of variables (independent variables, as antecedent and concurrent conditions, predictors, or causes). For example, we may discover that alienation and attachment occur under certain antecedent and concurrent conditions and not under other conditions; or that alienation and attachment occur in certain forms, frequencies, and strengths under certain conditions. These "causal" conditions might include the subject matter that teachers teach, the

size of classes, the amount and quality of positive supervision, and skill at teaching.

EXERCISE 9. List at least two more conditions that might predict or "govern" attachment vs alienation.

1.

2.

Also, we may discover certain consequences of strong vs weak attachment. For example, (1) As teachers' attachment weakens, perfomance in the classroom weakens. (Can you make a case for this assertion in the sequence regarding teacher burn-out in c., below?) (2) As teachers' attachment increases, the solidarity of the group increases.

EXERCISE 10. List at least two more examples of the consequences of strengthening or weakening attachment vs alienation.

1.

2.

3.

Following are more examples of empirical generalizations that assert (in propositional form) causal or functional relationships.

(1) "The greater the complexity of a task, the more the division of labor will be specialized." ["Complexity of tasks" (the independent

variable) may be a sufficient condition for the "degree of specialization" (the dependent variable).]

2) "Empowerment decreases alienation, but only if teachers want to be empowered." ["Wanting empowerment" would be an intervening variable.]

(3) "Punishment produces a faster decrease in the rate of a behavior if person's have opportunities to perform alternate behavior." ["Opportunities to perform alternate behavior" would be a contributing condition.]

Caution! The idea of causation used in natural sciences (i.e., independent [antecedent] variables are something like forces that make dependent [consequent] variables change), is probably not appropriate to human activities. For instance, regarding #1 above, the complexity of a task is not a force that makes managers and workers divide jobs into smaller work units which are then performed by separate workers. In a human system, the complexity of a task is a feature of the work environment that (given a certain degree of specialization) affects the quality and rate of production, and therefore the feelings (e.g., fatigue, job satisfaction) of managers and workers, who then think of ways to improve the situation. Increasing specialization is not a mechanical effect; it is an adaptive choice. In summary, asserting a causal or functional relationship between two variables in a social system implies merely that change in one variable somehow depends upon or is fostered by prior change in another variable. The "somehow" includes all of the perceptions, feelings, evaluations, planning, and decision-making done by individuals and

groups; i.e., the subjective and intersubjective sides of a social system.

In other words, relationships between the independent and dependent variables are neither magical nor mechanical; they are produced by the practical activities of members. Therefore, it seems that even "simple" (e.g., two-variable) "causal" or functional relationships are actually more complex.

EXERCISE 11. List at least two more empirically-discovered causal relationships in social systems. Suggest how change in dependent variables is the ongoing result of members' practical activities.

1.

2.

As stated, causal or functional relationships usually involve more than two variables. Unless these are added to our depiction of relationships, efforts to improve a social system may fail, and we will not know why. In summary, we need to consider more complex interrelationships, such as sequences and configurations.

c. Propositions about sequences, temporal relationships, or steps in a process. Following are examples.

(1) "There are five stages of teacher burn-out: (a) strain (an empirical concept); (a) decreased competence of performance; (c) pessimism; (d) alienation; and (f) disengagement."

(2) "There are four stages in the practice of special education: (a) assessment; (b) program planning; (c) instruction; and (d) program evaluation."

(3) "One of the first difficulties that parents of children with disabilities may encounter is distancing reactions (an empirical concept) from relatives, strangers, and even professionals. Later, families may isolate themselves from relatives, neighbors, and community activities."

(4) "There are three phases in behavior therapy applied to phobias: (a) clients describe problems and goals; (b) therapists and clients discuss ways to change behavior; and (c) clients suggest changes for themselves."

EXERCISE 12. List the stages in at least two more empirically-discovered sequences in schools.

d. Propositions about configurations. A configuration is a system of interrelationships among many variables (classes of events). These interrelationships may be seen as happening at one point in time [in cross-section] or through time [longitudinally]). Examples of configurations include the following.

(1) stable channels of communication in a decision making process (e.g., portrayed as a cross-section at any point in time by interconnected lines).

(2) a person's or a group's network of social support (a changing assembly of individuals and groups which provide emotional and

financial support, advice, and hands-on help). We could depict interconnections among persons and groups at any point in time; and we could depict changes in these interconnections through time.

(3) changes in competencies (e.g., communication, locomotion, activities of daily living) and in the relationships among competencies in a person's behavioral repertoire over the course of psychosocial development.

EXERCISE 13. List and/or diagram at least two examples of configurations.

All of the asserted relationships above (causal/functional, sequences, and configurations) are simplifications. Hopefully, they may be useful simplifications--suggesting types of events and connections to consider. However, actual relationships involve the consciousness (perception, feelings, classification, reflection, justification, critique, etc.) and praxis (will, energy, choice, action) of persons and groups. In summary, neither an analysis of a school nor plans for improving a school are adequate unless we consider objective, subjective, and intersubjective features.

EXERCISE 14. Compare and contrast the following causal/functional relationships, sequences and configurations.

1. Building a house of cards vs the collapsing of a house of cards.

2. Instituting comprehensive school reform vs the "collapsing" of a school reform effort.

3. Following written steps in a recipe vs "following" one's "practical (tacit) knowledge" of the steps in a recipe.

4. Stages of psychotherapy vs stages of teacher burn-out.

5. Patterns of communication and decision making in a team meeting vs a school system's organizational chart depicting relations of power and authority among units and offices.

e. Propositions about more general categories and relationships. We can use raw data (events), empirical concepts (categories of events), and empirical generalizations regarding relationships to create more general formulations. For example, the research of Emile Durkheim (in *Suicide*) led him to the following empirical generalizations:

(1) The more members of a religious "confession" share beliefs and practices, the lower their rates of suicide; and

(2) The suicide rate in a society decreases when it is at war.

From these, Durkheim theorized that the empirical relationships are part of a more general relationship: The more strongly integrated a group is, the more strongly its members are attached to the group and the more strongly they will be attached to life.

Another kind of general formulation is an hypothesis that what we discovered in a sample: 1) applies to a larger circle of people and their activities, or 2) enables us to predict what will happen if independent variables change. For example:

"Alienation and attachment are functionally related to social conditions. Therefore, altering certain of these social conditions ought to foster a decrease in alienation and an increase in attachment. These conditions might include increasing the amount of positive contact with principals, increasing peer assistance, and increasing teacher empowerment over decisions regarding curriculum and instruction."

B. Rationalism and Deduction

The second intellectual style is rationalism, represented by the work of Plato and Thomas Hobbes. For rationalists, one plausible theoretical proposition is worth a silo of "mere" facts. Rationalists want to believe that the world is orderly--describable, predictable, explainable, and perhaps even governed by laws. Therefore, work in the rationalist (theory first) style generally has the following features.

General Features of Rationalism

First, rationalism tends to be **deductive**. We begin by asserting hypotheses (propositions about general relationships). [Note that this is where the empirical-inductive process ended.] Then we deduce what we expect to find in a particular case. In other words, we deduce things that are expected to be examples of (particulars contained in) the general categories hypothesized about. [In other words, deduction is like unpacking the concepts.]

Next, we might **test the hypothesis** by collecting evidence (particulars) that will either support or falsify the hypothesis. Second rationalism is often explanatory and nomothetic. This means that the researcher or theorist regards observed patterns as important not

because they reveal how people (idiographically) create and sustain social life, but because the patterns (nomothetically) signify, symbolize, or document more universal, enduring, and general patterns (ideas, truths, laws). [See the allegory of the cave in Plato's *Republic*; Book VII, 514.]

Steps in Rationalist (Deductive) Research and Theorizing

The rationalist-deductive style of research and theorizing can begin where the inductive style ends. The deductive researcher or theorist could treat the inductive researcher's empirical generalizations or theoretical propositions as hypotheses to test. Therefore, deductive work is not so much a process of discovery as it is a process of **verifying, testing, or trying to falsify** what one thinks has been discovered. For example, will the empirical generalizations stated earlier hold up in other settings. Would the same "causal" variables and stages of teacher alienation be found in small, medium and large schools; public vs parochial schools; highly centralized vs decentralized schools? In summary, deductive work begins with generals (propositions stated as hypotheses about what one expects to find) and moves to specifics (observations of the things hypothesized about). The following diagram depicts the operations in deductive research.

a. Assert conceptual hypothesis:

Conceptual variable X --------> Conceptual variable Y
(Conceptual definition of X) (Conceptual definition of Y)

b. Deduce operational definitions of X definition of Y

Conceptual variable X --------> Conceptual variable Y

|

V

Operational definition of X---> Operational definition of Y

c. Assert operational hypotheses:

Operational variables (examples of) X-----> Operational variables (examples of) Y

d. Collect data on the operationalized variables.

e. Interpret findings as supporting vs falsifying the hypothesized relationships among the operational and conceptual variables.

Now let us examine the steps in more detail.

1. **We begin with hypotheses (general theoretical propositions)**. For example, "Vulnerability regarding social place (position or status) in a social system (Y, dependent variable) is an inverse (indirect) function of the extent to which other members validate a person's claims to social place (X, independent variable)." Or, "The more (often, genuinely, intensely) other members validate a person's claims to a social place, the less vulnerable regarding social place a person will be."

Notice that this hypothetical proposition asserts a causal relationship not between particular events, but between classes (families, categories) of events (vulnerability, validation of claims). These categories are called "concepts" or "conceptual variables." They are

called "variables" because each varies; that is, there can be more or less vulnerability regarding place, and there can be more or less validation of claims to a place. The hypothesis is called a **"conceptual hypothesis."** If we were asserting an hypothesis about very particular events (e.g., what Jill will do when Jack proposes marriage), that would be an "empirical hypothesis."

2. **We develop conceptual definitions for each of the concepts (conceptual variables).** We use the ***method of genus and difference*** in creating definitions. First we state the genus (larger category) of which the phenomenon is a member. Then we state some of the specific features of the things that we are defining, to distinguish them from other things that are also in the larger category. For example:

"Vulnerability regarding place in a social system is an **experience** (genus) involving: a) fear of loss of opportunities to participate, b) fear of no longer being treated with respect and sensitivity, c) fear of no longer being regarded by others as the person that one wants to see oneself as being, or d) fear of being removed from the social system." (a.-d. indicate the difference between vulnerability regarding social place vs vulnerability regarding other things, such as illness.)

"Validation of claims to a place in a social system consists of **actions** of other members (genus) which communicate, or which can be interpreted as communicating, other members' evaluations of the person as being: a) like them, b) competent, and c) valuable." (a.-c. indicate the **difference** between validation of claims to a place vs claims to, say, being owed money.)

It is important to understand that **the above conceptual definitions are not true.** This is because concepts, such as vulnerability and validation, are not objects. We cannot check our definition of vulnerability (or our idea of it) against vulnerability itself, in the same way that we can compare our definition of "chair" against tangible chairs. In summary, **stating a conceptual definition is not the same as stating a fact**. A conceptual definition is like a search light; it points out certain aspects of the world. Instead of being true or false, conceptual definitions are better or worse, more useful or less useful search lights. They may be too narrow (i.e., exclude what ought to be considered vulnerability, for instance) or too broad (i.e., include what ought not to be considered vulnerability); and they may be more or less precisely worded.

Notice that **conceptual definitions are abstract.** For example, what is meant by "fear of loss of opportunities to participate"? What is "fear"? What is an "opportunity to participate"? Therefore, although conceptual definitions aim our attention at what might be meant by "fear of loss of opportunities to participate," **we need to be more specific**, as shown in 3., below.

3. Using conceptual definitions as a guide, **we derive or deduce operational definitions**. Following is an example.

"Vulnerability regarding place in a social system means (is signified or manifested by) tension and anxious thoughts (such as "They do not like me," "They do not want me here," and "They will think I'm a failure.") when a person is about to perform or has already performed actions that other members may see as commentary on a person's fitness

(e.g., how well one speaks, how one looks, or how well one does a job)."

"Validation" of claims to a place in a social system consists of actions of other members, such as praising versus insulting a person, offering versus not offering opportunities to take part in everyday tasks, protecting versus not protecting a person from pain and deprivation, paying attention versus ignoring a person when he or she speaks."

Operationalized as specific examples, "vulnerability" and "validation" are now **"operational variables"** or "operational concepts." Notice that the above two operational definitions were **derived** from the conceptual definitions. If the conceptual definitions are like circles of light that shine on portions of a dark landscape, the operational definitions state what is inside the circles of light. However, the operational definitions given above must be made larger and more precise. What is meant by "anxious thoughts"? Also, "vulnerability" implies more than the three "anxious thoughts" stated. What are "praising" and "protecting"?

EXERCISE 15. Using the conceptual definition of "validation" in #2 above, and the partial operational definition of "validation" in #3 above, develop a revised operational definition that contains enough precise examples to "cover" the concept.

4. Next, **we restate the original conceptual hypothesis as an operational hypothesis.** We have transformed the concepts in our original conceptual hypothesis into events that we can observe. Now we state that we expect to find a relationship between the

operationalized variables. Following is an example of an operational hypotheses.

"The more often people receive insults (such as 'We don't like you' or 'Your clothes are ugly'); the less often people are protected from pain and deprivation (for example, are made to wait a long time before they receive care in an emergency room); and the less they are given the chance to participate (e.g., to have a conversation), then the more persons will experience tension and will engage in anxious thinking before, during, and after they interact with other persons."

5. Next, **we test the operational hypothesis (and by inference the conceptual hypothesis from which it was derived).** We do this by observing the operational variables (described above) to determine whether they are associated as hypothesized. For example, we might conduct an **experiment** in which participants in one experimental condition receive much validation while participants in another condition receive little. At the same time, we measure participants' tension and anxiety about their place in the experimentally-created social system.

Or, we might conduct a **survey**, using interviews or questionnaires that ask people about their experiences of validation and vulnerability (as we have operationalized them). Some questions ask how often persons have received praise versus insults, how sensitively they feel others have treated them, and how much tension they feel about the way they look and act. Or we might do **field research** similar to the inductive work described earlier, and **observe** how people treat one

another and at how vulnerable people seem to be under different conditions of validation.

6. **We use methods of inductive inference to see whether the two sets of variables are connected as hypothesized.** For example, even if vulnerability is high when validation is low (as predicted), the degree of vulnerability could be the result of something else, such as poor health, childhood experiences, or even errors in measurements. Several forms of inductive reasoning (described later) enable us to separate causal/functional relationships from coincidental relationships.

7. **If findings agree with our prediction (from the operational hypothesis), we tentatively accept the conceptual hypothesis from which the operational hypothesis was deduced.** For example, if persons in the experimental condition involving a lot of validation experienced less vulnerability than persons in the condition involving a lot of **in**validation, then the theoretical proposition (conceptual hypothesis) about the general relationship between vulnerability in a social system and validation of place in the social system has withstood the test; at least it is not false (this time).

To strengthen the proposition, we would test it in other places (i.e., **replicate** the research). However, if the findings do not support the operational hypothesis, we check our measurements, redefine the variables, determine whether the hypothesis applies better in other situations, or reject the hypothesis as false and admit that the theoretical proposition is not as general as we thought.

Some individuals and research teams confine themselves to one or the other style of work--inductive or deductive. However, it is possible to use them both, in a **cycle**. In fact, researchers and theorists who combine both styles of work have done the most powerful work. For instance, we might begin with inductive work. Then we use the deductive style to test propositions about relationships we discovered in the inductive work. The deductive work might suggest the need to do further inductive work to discover how general the findings are or why certain hypotheses were not supported. Then another round begins.

Drawing Causal Inferences

Whether it is inductive theorizing and research (looking for empirical relationships) or deductive theorizing and research (testing hypotheses), we are likely to assert causal/functional propositions (i.e., to make causal inferences). However, as David Hume shows in *A treatise of human nature*, we cannot see causation directly. We only **infer** causal connection. Somehow, we feel more comfortable with the proposition "X causes Y" when the inference is drawn under certain evidentiary conditions, which are as follows: 1) evidence that the alleged cause preceded the alleged effect ("temporal priority"); 2) empirical evidence that the alleged cause and effect occur together ("contiguity"); 3) logical evidence that ties them together ("constant conjunction"); and 4) evidence that alternative explanations are implausible. Let us examine each of these criteria.

Alleged Cause Precedes Alleged Effect. Consider the following assertion. "An increase in teachers' authority to make curricular

decisions (independent variable) fosters an increase in teachers' attachment to their school." This proposition (it could be an empirical generalization from research) seems plausible **only** if there is evidence that teachers' authority to make curricular decisions **preceded** an increase in teachers' attachment to their school. Evidence of temporal priority might be supplied by observation, experimental control, and/or commonsense reasoning (e.g., it is not likely that a house burned down and then someone smoked in bed).

Empirical Evidence of Association. The inference that an increase in teachers' authority to make curricular decisions fosters an increase in teachers' attachment to their school, is more compelling if we have data showing that these two variables **changed in close succession** (V->Y: a proximal relationship) or in a sequence of variables that changed in close succession (V->W->X->Y: a distal relationship), and in the order asserted. Similarly, we can conclude that a family training program produced beneficial effects only if we have evidence of change in families and evidence that family members attended meetings, understood what was presented during meetings, and read and understood materials.

Evidence Provided by Inductive Logic. Logical evidence is obtained by designing research, analyzing data, and interpreting findings such that we can apply one or more of John Stuart Mill's methods of inductive inference, as described in his *A system of logic*. These methods include: concomitant variation, agreement, difference, joint agreement and difference, and residues.

1. The method of concomitant variation. If two variables are changing with respect to one another (e.g., both are increasing, both are decreasing, or one is increasing and the other is decreasing) while everything else remains at about the same level, then we have logical evidence that one variable is a cause or an effect of the other (or they are both being changed by a third variable.)

For instance, an experiment was conducted in a class of 20 elementary school children to identify what affects the rate of children's aggression. During the first experimental period (A1 or Baseline), the teacher was asked to go about her business and handle the children's aggression (operationally defined as hitting, kicking, insulting, etc.) in her usual way. Prior observation showed that her usual way involved staring at the "offender," reminding the offender of the rules, telling the offender to stop, or even giving the offender an enjoyable activity to "distract him" or "settle him down."

In the next experimental period (B1), the teacher was coached to ignore aggression and, instead, to comfort and reinforce other children who were engaging in nonaggressive behavior at that time.

In the third experimental period (A2), called a "reversal," the teacher was asked to do what she used to do during A1 (which, again, meant that she tried to stop aggresssion). And during the final period (B2), she was asked to go back to ignoring aggression and reinforcing nonaggression.

Let's say that we graph the number of aggressive acts per day. Suppose we find that when the children received a lot of teacher

contact following aggression (A1 and A2), the rate of aggression was high, and when the amount of teacher contact following aggression decreased (B1 and B2), the rate of aggression decreased. Since nothing else in the classroom was changing along with changes in the teacher's responses to aggression, it is plausible to infer that changes in the teacher's responses somehow caused changes in the children's rate of aggression. [Note that it would be important to try to determine how the teacher and the children made sense of what was happening--the subjective and intersubjective sides of the social system.]

2. The method of agreement. Imagine that we study twenty failed school reform efforts. Each school and each reform effort was a **different configuration** of variables (e.g., school size, socioeconomic status of school, location, teacher-student ratio, speed of reform). Despite these differences, however, **all of the schools and failed reform efforts had one thing in common**--staff did not fully understand and were not fully committed to the mission or the reform plans. Since nothing else in the schools and plans was common across the schools, it is reasonable to infer that **the way in which they "agreed" (i.e., were the same) was the cause of the failed reform efforts.**

3. The method of difference. Mill's method of difference is the form of inductive logic used in the typical pre-test, post-test, experimental-group, control-group study. Let us say that we have a pool of 50 families whom we randomly assign to two comparison groups. One group receives written materials, ten weekly group meetings, and

weekly home visits aimed to improve family interaction and home teaching. The second group receives written materials only. We compare pre-test and post-test scores on the quality of family interaction and home teaching. Families in the first group have significantly larger pre-post-test differences. What can we infer? Since we **randomly assigned** families to the two groups, any personal and family differences that might have accounted for improvement or lack of improvement (e.g., religion, support network, expectations of success, initial teaching skill) **had an equal chance of being in each group**. Therefore, we can assume that the groups were fairly similar on these extraneous factors. (Of course, we could also measure those factors that we think are important and see how similar the two groups actually are.) **Since the only other systematic difference between the two groups (which we know about) was group meetings and home visits, it seems likely that these two features of the training made the difference in the amounts of improvement.**

4. The joint method of agreement and difference. This method combines the methods of agreement and difference. Let us take the above research on family training one step farther. We compared pre-post-test scores of families in the two groups which systematically differed only on whether they received written materials or received materials, meetings, and home visits. We used the method of difference to infer that the meetings and home visits accounted for the difference in improvement. Now imagine that, in addition, we obtain a large sample of families who **differ in many ways** (income, ethnicity, education, etc.). In each family we examine the quality of family interaction and teaching (dependent variables). We also

examine whether each family reads materials on interaction and teaching (e.g., books, magazines), is part of some kind of group in which family interaction and teaching are discussed, or receives any in-home assistance or support (e.g., from relatives or other families) (independent variables). If we find that families who attend family-oriented meetings and receive home assistance also have higher quality family interaction and teaching, then we have logical evidence through the method of agreement that these variables make a difference. In summary, **the combined use of the methods of agreement and difference provides compelling evidence.**

5. The method of residues. Imagine a situation in which some phenomenon (Y) might be explained by four factors. We may be able plausibly to infer the one that is the cause through a **process of elimination**. If we know that factor 1 is a cause of Q, factor 2 is a cause of R, and factor 3 is a cause of S, then factor 4, the only one left, is likely to be the cause of Y. As Sherlock Holmes used to tell Dr. Watson, when you eliminate all of the other possible explanations, the one that remains, improbable though it may seem, must be the correct explanation.

Ruling Out Rival Hypotheses

Let us say we have satisfied the first three criteria for drawing a plausible and compelling causal inference. 1) We have evidence that the alleged causes preceded the alleged effects; 2) We have empirical evidence (data) that the two variables changed, and in the way that was asserted; and 3) We have used Mill's methods to provide logical

evidence of a causal connection. Now we must show that **rival explanations are implausible**.

Consider the inference that children's rate of aggression changed as a function of change in teacher's responses to aggression vs nonaggression. Surely it is possible that **other** variables caused some or all of the change in children's behavior. We must identify as many of these **extraneous** variables as we can and see if they provide plausible "rival" explanations. Below are some possibilities.

1. There were changes in some children's diets during the experiment (e.g., less sugar and less food additives). [Our data show that there were no such changes.]

2. There were changes in some children's participation in sports after school. Increased exercise calmed the children. [Our data show that only two children increased their amount of exercise. This could not have accounted for more than a small amount of change in the rate of aggression for the class.]

3. Maturation accounted for change in aggression and nonaggression. [It is unlikely that the children matured in the B1 period, regressed in the A2 period, and matured again in the B2 period--all coincidental with changes in the behavior of the teacher.]

4. During the A1 and A2 periods (when rates of aggression were high), the children were given harder tasks. Frustration was the cause of their aggression. [Our data show that the tasks were the same across all four periods.]

5. Some children were put on medication during the experiment. This caused a decrease in aggression. [Our data show that four children were put on medication during the experiment. However, two of these children were on medication during the A1 period (when the rate of aggression was high), and all four of the children were on medication during the A2 (reversal) phase, when aggression rose again. If we cannot say that medication decreased aggression during the A1 and A2 periods, it is unreasonable to think that medication worked during the B1 and B2 periods.]

6. The children's rates of behavior were really the same across the four experimental periods.The apparent changes were the result of measurement error or bias. [In fact, observers were trained to high levels of reliability before the experiment began. Their reliability was checked periodically during the experiment and was high. Moreover, observers were "blind" to the experimental periods and did not know what the hypotheses were.

By showing that rival explanations are either false or implausible, it is likely that our explanation is correct.