In this chapter, we continue to build the ideas and concepts that are necessary for you to plan and do quantitative research. To that end, we look at some examples of concepts and the operations that transform them into variables. We examine different kinds of variables and the roles that they play in research, and we conclude with a discussion and examples of research problems.

**Concepts**

We have already provided you with a working definition of concepts and constructs, terms that we use interchangeably in this text. Both refer to abstractions that have been given specific definitions. Let’s look at some examples of organizational concepts and constructs.

**Organizational Structure: Bureaucracy**

- *Hierarchy of authority* is the extent to which positions or offices are under the control and supervision of a higher office.

- *Division of labor* is the extent to which the work task is divided into specialized work.

- *Impersonality* is the degree to which an organization makes decisions on the basis of facts, unencumbered by personal bias and favoritism.
• **Formalization** is the extent to which organizational procedures are codified. There are set ways to respond to routine decisions.

• **Career perspective** is the extent to which an organization encourages employees’ commitment to the organization. There are well-known and legitimate organizational paths to promotion and success in the organization.

• **Bureaucracy** is a more complex concept that encompasses all the terms mentioned above; in fact, a classic definition of bureaucracy is the extent to which an organization has all of the above properties; that is, a bureaucracy is an organizational structure characterized by hierarchy of authority; division of labor; impersonal decision making; formal rules, regulations, and procedures; and a career perspective.

Concepts that are complex and composed of other concepts, such as bureaucracy, are sometimes distinguished by the term *construct*, which implies a concept with multiple dimensions. This is a subtle distinction and one that we will not emphasize in this book; we will continue to use *concept* and *construct* to refer to abstractions with specific definitions, regardless of complexity.

### Alienation

Alienation is a complex sociological concept defined as *the extent to which an individual rejects the common practices and conventions of a group, organization, or even society itself*. At first blush, the concept may not seem that complex to you; you simply must specify what an individual is alienated from—the group, organization, or society. But a review of the literature on alienation, especially the conceptual literature, suggests that there are multiple views or varieties of alienation. Consider the following concepts and their definitions:

• **Powerlessness** is the extent to which individuals believe that they cannot control the outcomes of their behavior.

• **Meaninglessness** is the degree to which individuals understand the events in which they are engaged; the individual is unclear on what he or she ought to believe.

• **Normlessness** is the sense in which an individual believes that socially unapproved behaviors are required to reach a certain goal.

• **Isolation** is the sense in which an individual believes that his or her valued goals are not highly valued by others in the group, organization, or society.
Self-estrangement is the extent to which a person experiences himself or herself as alien; that is, individuals are at odds with themselves.

All five of these concepts are aspects of alienation. What becomes clear is that alienation is complex, with multiple variations. We have seen that alienation can be conceptualized as a construct with at least five varieties (Hoy, 1972; Seeman, 1959).

There is no substitute for a comprehensive review of the literature to get a good fix on the idea that you are interested in studying. Students often have a sense of what they want to explore, but to understand and conceptualize the idea, extensive review is imperative. For example, the construct of alienation, as we have seen, has a rich theoretical history. At the very minimum, you would want to consult the classic works of Marx, Durkheim, Weber, and Etzioni, as well as Seeman’s synthesis.

School Climate

If you visit a dozen or so elementary schools, you will probably be struck by how different they seem. Some schools feel like prisons; others seem like efficient factories; and still others have a strong sense of community. What makes these schools feel different? Maybe it is the principals: Some are authoritarian and others are laid back. Perhaps it is the friendliness of the teachers that explains the variety. Something is just different about these elementary schools, and it does not take long to sense it. What would you call these different impressions of the school? Character, atmosphere, culture, ideology, tone, identity, and school personality or school climate are all terms you might use.

One challenge is to select the “right” set of concepts to describe the school environment. In other words, you need to conceptualize the “feel” of the school. Here again, it is important to examine the theoretical literature in order to find a useful framework to describe the idea that piques your curiosity. One might conceptualize school climate in half a dozen different ways, but I will select one perspective to illustrate the conceptualization of the atmosphere of the school. The concept of choice for me is school climate. What is school climate? How is climate defined? What are the critical aspects of school climate? You have heard the term bandied around, but if you are going to study school climate, a careful definition is an essential starting point.

We begin by viewing school climate as a multidimensional construct—that is, composed of a number of concepts. Consider the following definition:

- School climate is the “personality of the school,” defined by the leadership of the principal and the interactions of the teachers.
Let’s start with the leadership of the principal. The principal’s behavior can be examined in terms of the following three kinds of interaction or leadership patterns:

1. **Supportive** principal behavior is action that reflects basic concern for teachers, help and respect for teachers, and general openness in interactions with teachers.

2. **Directive** principal behavior is rigid, close, controlling supervision of teachers.

3. **Restrictive** principal behavior hinders rather than facilitates teacher work; the principal burdens teachers with reports, meetings, and busywork.

Next, consider the interaction patterns of the teachers in terms of how they relate with each other. As with the principal-teacher interactions, the following are three major patterns of teacher-teacher interactions:

1. **Collegial** behavior is teacher behavior that is open, professional, accepting, and respectful: Teachers are proud of their school and respect the professional competence of their colleagues.

2. **Intimate** behavior reflects a cohesive and strong network of social support: Teachers know each other well, socialize with each other, and are good friends.

3. **Disengaged** behavior refers to a lack of meaning and focus in teacher professional work: Teachers are simply going through the motions and are not committed to teaching.

Note that the six previous concepts describe the school in terms of principal and teacher behavior. There is one more climate concept that evolves from this perspective—a more general property of the organization—the openness of the school climate.

An open school climate is one in which the principal’s leadership is supportive, nondirective, and not restrictive. Teachers respond with a commitment to teaching and learning, close intimate social relations, and collegial relations among themselves. There is a genuine and authentic character to the open and transparent relationships in the professional activities of the school. This latter construct, school openness, is the most general and inclusive of the six earlier concepts.

To review, we started this discussion with the observation that schools give different initial impressions to observers; we sense the feel or tone of the school
even in brief visits. How do we “get a handle” on this feeling of schools? We considered a number of terms to describe the tone of the school and decided to view the atmosphere of the school from a climate perspective. We likened the school climate to the personality of an individual; that is, climate is to organization what personality is to individual. Then to illustrate further, we defined the basic elements of school climate: supportive, directive, restrictive principal behavior and collegial, intimate, and disengaged teacher behavior. Finally, we defined an open school climate in terms of these six school characteristics. The point of the exercise was to demonstrate the process of conceptualization and to identify some other concepts and constructs that we will find useful as we proceed in this text. Clearly, this is not the only perspective to view school climate; in fact, others may be more useful to you depending on just what you want to study. Furthermore, a notion of school culture, for some purposes, may provide a better view of the school’s personality. Good reviews of other perspectives on school climate and culture are found in the work of Hoy and his colleagues (Hoy & Miskel, 2008; Hoy & Sabo, 1998; Hoy, Tarter, & Kottkamp, 1991).

We now turn to two more organizational concepts and their definitions—trust and academic optimism.

**Trust**

Trust is a little like air—you don’t think about it until it is scarce or absent (Baier, 1986). Trust is fundamental to the effective functioning of all social systems, including schools and society itself; it is viewed as the “lubricant,” greasing the way for efficient operation when participants have confidence in the words and deeds of their colleagues and their leaders (Arrow, 1974).

We propose the following general definition of trust based on an extensive review of the literature (Tschannen-Moran & Hoy, 2000) and then move to trust in organizations, particularly the trust of the school faculty.

- *Trust* is an individual’s or a group’s willingness to be vulnerable to another party based on the confidence that the party is benevolent, reliable, competent, honest, and open.

This construct is complex and calls for the definition of another half a dozen concepts (Hoy & Tschannen-Moran, 1999):

- *Vulnerability* is the willingness to put oneself or one’s group at risk by trusting another individual or group.

- *Benevolence* is the confidence that one’s well-being or something one cares about will be protected by the trusted individual or group.
• **Reliability** is the extent to which one can count on another individual or group to come through with what is needed.

• **Competence** is the knowledge or skill level that the individual or group is dependent on.

• **Honesty** is the character, integrity, and authenticity of the individual or group.

• **Openness** is the extent to which relevant information is not withheld from those making themselves vulnerable.

You can see that the construct of trust like most of the concepts we have examined thus far is complex with a number of aspects: trust is vulnerability, benevolence, reliability, competence, honesty, and openness. That is, there are six concepts that constitute our working definition of trust. Are you interested in any particular aspect of trust or all the elements? What begins as a rather simple inquiry into the notion of trust quickly evolves into a set of multiple questions and concepts that need your attention and answers. Furthermore, as a student of schools, you may be interested in the collective trust of schools, that is, *faculty trust in the principal*, *faculty trust in colleagues*, or *faculty trust in students and parents*. Perhaps you are more intrigued with *parent trust* in the school, principal, or teachers. Obviously, trust has many referents. The researcher needs to decide the focus and refine the concept. Clearly, a good working definition and conceptualization of trust is critical, which again typically comes from a systematic study of the research. There is no substitute for a careful reading of the literature; relevant theory is a virtual gold mine for concepts of all kinds.

**Academic Optimism**

The academic optimism of the school is the last concept we will briefly consider in this chapter. One of the challenges facing students of schools is to find organizational properties of schools that make a difference in the achievement of students. This task is complicated by the fact that the socioeconomic level of the school is such a powerful shaper of student performance that it overwhelms the association between other school properties and achievement; in fact, the influence of most school properties on achievement vanishes once the influence on social factors has been controlled (Hoy, Tarter, & Woolfolk Hoy, 2006b). One of the few exceptions to this finding is the concept of academic optimism, but to understand the construct, it is necessary to define three other concepts:

1. **Academic emphasis** is the extent to which a school faculty is driven by a quest for academic excellence and achievement.
2. **Collective efficacy** is the perceived collective judgment of teachers as a whole that they can organize and execute the actions required to have positive effects on students.

3. **Faculty trust in parents and students** is a collective school property that describes the extent to which the faculty is willing to make itself vulnerable to parents and students based on the confidence that these parties are benevolent, reliable, competent, honest, and open.

Optimism is an overarching construct that unites efficacy, trust, and academic emphasis because each concept contains a sense of the possible. Efficacy means that the faculty believes in itself; the faculty can make a positive difference. Trust reflects the belief that parents, teachers, and students can cooperate to improve learning; the faculty believes in its students. Finally, academic emphasis is enacted behavior prompted by these trust and efficacy beliefs. Thus, the following construct is proposed:

- **Academic optimism** is the collective belief of the faculty that it can make a difference, that students can learn, and that high academic performance can be achieved (Hoy et al., 2006a, 2006b).

For the present, we have a rich set of concepts to draw on as we proceed in this chapter. Throughout the book, we will use these concepts as well as others that we will develop as needed. You should understand that concepts and constructs are abstract terms with specific definitions. There are several kinds of definitions. All our examples thus far are theoretical, that is, conceptual and constitutive definitions. Why do we use three different terms to refer to the same thing? The answer is simple—because as you read other sources, different authors have their own preferences. For example, Kerlinger (1986) uses the word constitutive definition rather than either theoretical or conceptual definition. It does not matter: All three designations have the same meaning—definitions that explain the construct by using other concepts and words to make the meaning clear and easy to understand.

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**Variables**

What is a variable? All of us use the term as we talk to other students and professors about research. Can you give a clear definition of a variable? It may be easier said than done. First, variables are related to concepts. All the concepts that we have developed thus far can be transformed to variables. Constructs
and concepts become variables when we define them in terms of a set of operations that measure them, that is, when we provide operational definitions to match their constitutive ones. Of course, the operational definitions must capture the true meaning of the constructs, that is, be valid, and they must provide a consistent and objective measurement, that is, be reliable.

Before we offer a definition of a variable, there are three general terms you must be clear about—(1) research objects, (2) properties of the objects, and (3) values of properties (Charters, 1992). Objects are the persons, places, or things on which you do your research; the object is also called the unit of analysis. Usually, the objects of a study in educational research are people or persons (students, teachers, administrators, school board members), but they can be places such as schools or day care centers, or they can be things such as school newspaper editorials, bond elections, or curriculum programs.

Properties are the characteristics or attributes of an object. Consider the size of a dress, the height or weight of a student, or the length of a school day or school year. Clearly, properties are not the same as the objects; rather, properties describe some characteristic of the object in terms of size, color, shape, or temperature, to give just a few examples. There are many properties that we can use to describe things, and these attributes help us understand important differences and similarities among objects.

A variable is a property that takes on different values as circumstances and situations change; the value is a number that represents either the magnitude of the variable (e.g., an individual’s height) or a category of the variable (e.g., male or female). Height can be measured in inches, and the larger the number, the greater the height. On the other hand, gender is measured in terms of the categories of male (1) and female (2). Both height and gender are variables, but for height the number represents magnitude, whereas for gender the value represents a category. Variables must have at least two categories of measure; if they have only one category of measure, they are constants, not variables. Two other important facts—the values for variables must be exhaustive and mutually exclusive. Exhaustive means that each object can be assigned a value, and mutually exclusive means that each object can have one and only one value.

Let’s consider a few examples of properties (variables) of teachers (objects), some of which will be variables of magnitude (continuous or degree of variation) and others variables of category.

Height (magnitude: continuous or degree of variation—higher means taller)

Teaching level (categorical: elementary, middle, or high school)

Self-concept (magnitude: continuous—higher means stronger)

Political party (categorical: Republican, Democrat, Independent, other)
Teaching experience (magnitude: continuous—higher means longer)

Level of expertise (categorical: neophyte, advanced, master)

The list could be extended at will, but the point is that these are variables that we might use to study teachers. We could develop another list of variables for principals, superintendents, or schools; in fact, most of the concepts developed in the previous section were characteristics of schools, that is, school variables.

Kinds of Variables

There are a number of ways to classify variables. Our treatment here is to identify several of the more important and useful distinctions. We begin by classifying variables by type of variation.

Categorical and Continuous Variables

We have already alluded to this distinction in the list of variables above. When the variations of the variable are associated with specific categories, we will refer to them as categorical variables. Charters (1992) calls these in-kind variables because the variation represents different kinds of categories. Such variables usually do not fall along any continuum of measurement; in fact, the variation is simply a matter of identifying a property as having two or more distinct categories—for example, sick or healthy. The following are a few illustrations of categorical variables, that is, variations in kind, followed by a specification of the categories.

Leadership style: statesman, task-oriented, social, passive

Career orientation: place bound, career bound

Mobility pattern: upwardly mobile, ambivalent, indifferent

Locus of control: internal, external

Learning style: visual, verbal

Remember, there must be at least two distinct categories. The name of the variable does not necessarily give you a clue to the kind of variable. When dealing with a categorical variable, the categories and the implicated values should be clearly stated.

Variables that vary by magnitude along an ordered continuum are called continuous variables. The numbers or values indicate the magnitude of the
variable, that is, the value represents how far along a given dimension the actual object lies; the larger the number, the further out on the dimension. The numbers are not merely names for categories. Continuous variables are also called in-degree variables (Charters, 1992) because the number is a quantitative measure of degree. The name of the property often provides a clue: level, length, index, quotient, size, height—all suggest a quantitative measure such that the property varies in degree along a given continuum. Consider a few illustrations:

Age: the larger the number, the older the individual

Class size: the larger the number, the larger the class

Salary: the larger the number, the higher the salary

IQ: the larger the number, the more intelligent

Experience: the larger the number, the more experienced

All the above variables suggest continuous measurement from low to high. Sometimes, the name, however, is misleading. We assume that age is a continuous variable, and theoretically, it is, but some researchers measure it as a categorical variable by grouping respondents, for example, into three categories—young, middle-aged, and mature. Why? Although respondents may be reluctant to give their exact age on a questionnaire, they may be willing to place themselves into one of a few broad and clearly defined categories. Some people are vain, and others are suspicious that the research may try to identify them and their responses. The only way to be certain of the kind of variable is to examine its operational measure.

**Independent and Dependent Variables**

Another way, perhaps the most common way, to classify a variable is in terms of its function. An independent variable is the presumed causal variable in a relationship, and the dependent variable is the presumed effect variable (Kerlinger, 1986). The key word in these definitions is presumed, because in social and behavioral research we can never be sure that a given variable causes another to change. We presume or theorize that it does, but we cannot be certain. We predict from the independent to the dependent variable: The independent is the antecedent, and the dependent is the consequent. In the statement “If \( x \), then \( y \),” \( x \) is the independent variable and \( y \) is the dependent variable. A similar convention exists in mathematics: The \( x \) variable is the independent variable, and the \( y \) variable is the dependent variable—for example, when you graph a function.
Consider this statement from psychology: “Frustration (x) leads to aggression (y).” The presumed cause is frustration, and the presumed consequence is aggression; thus, frustration is the independent and aggression is the dependent variable. In some relations, it is clear which is the independent variable, but in others it is not. In examining the relation between experience and pupil-control orientation, the independent variable is clearly experience because pupil-control orientation cannot cause any variation in experience. Similarly, in a study of intelligence and achievement, it is more likely that intelligence influences achievement rather than the other way around. There are many relationships in the social and behavioral sciences, however, in which the causation flows both ways; that is, the independent variable affects the dependent variable, but then the dependent variable influences the independent variable. This is an example of reciprocal causation because the causal connection flows both ways. For example, the personal characteristics of an individual influence behavior, but behavior in turn influences personal attributes, a case of reciprocal causation. The distinction between independent and dependent variables is useful if not always exact.

**Measured and Manipulated Variables**

All the variables that we have given and illustrated thus far are measured variables—variables that are defined by operations that are measured. We use some tool to measure the value of the variable—a scale for weight, a test for achievement, or a questionnaire for more abstract properties. Measured variables are straightforward. Find the right tool and measure them.

A manipulated variable is a variable that has been directly controlled by the researcher in an experiment. Consider the concept of leadership. A measured variable of leadership is the score on a descriptive questionnaire on which subordinates describe leader behavior. Note that the behavior has already happened.

A manipulated variable of leadership is one that is controlled by the researcher. For example, a study may be designed in which the researcher hires actors to play different roles for various groups. In one group, the leader behaves according to an autocratic script; in another group, the leader follows a democratic script; and in the third group, the leader maintains no control or influence in the group. In the design of this experiment, leadership is manipulated and defined as autocratic, democratic, or laissez-faire—three leadership styles (Lewin, Lippitt, & White, 1939). In this case, the variable is a manipulated categorical variable. Manipulated variables are categorical because they are the manipulations of groups in an experiment. For example, in the experiment with three leadership styles, there is only one variable, leadership style, with three categories or variations—autocratic, democratic, or laissez faire. Thus, we have illustrated the difference between a measured and a manipulated variable.
In sum, manipulated variables are the exclusive domain of experimental research. Measured variables are the properties of objects in both experimental and nonexperimental research. Virtually all the variables in nonexperimental research are measured; however, in experimental research, only the dependent variable is measured. In other words, the independent variable is manipulated and its effect measured in the dependent variable. In the end, what researchers are trying to do is to explain the variability, or variance, in the dependent variable by manipulating some independent variable or set of independent variables.

**Mediating and Moderating Variables**

One other distinction in types of variables should be briefly addressed—mediator versus moderator variables. A *moderating variable* is one that affects the direction and/or strength of the relation between an independent and a dependent variable. That is, in a correlational analysis framework, a moderator changes the basic relation between the independent and dependent variables. For example, in Fielder’s leadership theory, he demonstrates that the “favorableness of the group setting” moderates the relationship between leadership and effectiveness. When the group situation is only favorable, then there is a positive correlation between a human relations style of leadership and group effectiveness, but when the situation is either very favorable or very unfavorable, then there is a negative relation between human relations leadership and effectiveness (Fiedler, 1967).

In contrast, a *mediating variable* (sometimes called an *intervening variable*) explains the relationship between the independent and dependent variables; it does not change the relation, it explains it. For example, the presence of a teacher aide enhances student achievement; that is, having a teacher aide is positively related to higher student achievement. Why? How? What explains the relationship between having an aide and increased student achievement? The degree of individual attention explains the relation between having a teacher aide and student achievement; hence, degree of individual attention is a mediating variable between the two variables.

In sum, a moderating variable influences the strength of a relation between two other variables, whereas a mediating variable explains the relation between those variables. For example, consider the relation between socioeconomic status (SES) and frequency of breast self-exams (BSE). Age might be a moderating variable because the relation is likely strong for older women and less strong or nonexistent for younger women. Education, however, might be a mediating variable that explains why there is a relation between SES and BSE. Remove the effect of education, and the relation between SES and BSE disappears (Baron & Kenny, 1986). There are other useful distinctions in variables, but we can stop here and add when appropriate.
We now turn to transforming concepts and constructs into variables. Researchers cannot do quantitative empirical research without converting their concepts into variables. Theoretical definitions are not sufficient; operational definitions are required. We must change our ideas into concepts and our concepts into variables. An operational definition explicates the variable as a set of specific operations that are measured or manipulated.

In the previous section, we gave many examples of variables that were relatively easy to measure—for example, age, experience, gender, height, weight, political party, and school level. Let’s look at some operational measures for more abstract concepts, those defined theoretically in the beginning of this chapter. Although every one of these terms can be measured (operationalized), we illustrate with only a few. A good exercise for you: Find operational definitions for some of the other concepts.

In education, scales are measured using pencil and paper questionnaires to operationalize many of our concepts. Let’s begin with school climate. There are a number of different ways to measure school climate (e.g., see www.waynehoy.com), but we will illustrate the OCDQ-RE, a questionnaire designed to tap the climate of elementary schools. The OCDQ-RE is a 42-item questionnaire that is administered to the teachers of the school. The items are then grouped into subgroups that define the six elements of school climate—supportive, directive, and restrictive principal behavior and collegial, intimate, and disengaged behavior. The first three concepts define the leader behavior of the principal (principal-teacher interactions), and the last three describe the teacher-teacher interactions. Once all six elements of climate are measured, then it is possible to determine the extent to which the school climate is open or closed.

Consider the concept of supportive principal behavior. First, we provide the theoretical definition of the concept and then the operational measure of the variable.

- **Concept** (theoretical definition): **Supportive principal behavior** is action that reflects basic concern for teachers, help and respect for teachers, and a general openness and support in interactions with teachers.

- **Variable** (operational definition): **Supportive principal behavior** is operationalized by the following set of items from the OCDQ-RE.

DIRECTIONS: Please indicate the extent to which each statement describes your school. 1 = Rarely OCCURS 2 = Sometimes OCCURS 3 = Often OCCURS 4 = Frequently OCCURS

The principal goes out of his/her way to help teachers ..................... 1 2 3 4

The principal uses constructive criticism .................................... 1 2 3 4
The principal explains his/her reasons for criticism to teachers ............ 1 2 3 4
The principal listens to and accepts teachers’ suggestions ..................1 2 3 4
The principal looks out for the personal welfare of the teachers .......... 1 2 3 4
The principal treats teachers as equals .................................1 2 3 4
The principal compliments teachers ..................................1 2 3 4
The principal is easy to understand .....................................1 2 3 4
The principal goes out of his/her way to show appreciation to teachers . 1 2 3 4

Now look at a definition of another dimension of elementary school climate.

- **Concept** (theoretical definition): *Collegial teacher behavior is behavior that is open, professional, accepting, and respectful; teachers are proud of their school and respect the professional competence of their colleagues.*

- **Variable** (operational definition): *Collegial teacher behavior* is operationalized by the following set of items from the OCDQ-RE.

DIRECTIONS: Please indicate the extent to which each statement describes your school.
1 = Rarely OCCURS 2 = Sometimes OCCURS 3 = Often OCCURS 4 = Frequently OCCURS

Teachers accomplish their work with vim, vigor, and pleasure ............. 1 2 3 4
*Teachers leave school immediately after school is over ....................1 2 3 4
Most teachers here accept the faults of their colleagues ................... 1 2 3 4
Teachers help and support each other ....................................1 2 3 4
Teachers are proud of their school ......................................1 2 3 4
*Teachers socialize together in small, select groups ........................1 2 3 4
Teachers respect the professional competence of their colleagues ......... 1 2 3 4
*Scored in reverse

As you know from our earlier discussion of school climate, there are four other aspects, each with an operational definition. In actual research, teachers in the school respond to the items, the items are scored, and then each individual dimension score is averaged to obtain the school score on that aspect of climate. The items of the OCDQ are called 4-point **Likert items**, items that indicate the degree to which the respondent agrees with the statement or the
extent to which it occurs. Although the climate measure is composed of 4-point Likert items, Likert items can have 5-, 6-, or 7-point responses. To get a more complete understanding of these operational variables, go to www.waynekhoyst.com and administer one of the climate measures to your school and score it according to the directions supplied.

Let’s review. We use the term theoretical definition to refer to a conceptual definition; the concept is defined in terms of words. But the concept must be transformed into a variable to do research. For example, supportive principal behavior is operationalized as a set of Likert items on which the teacher describes the extent to which principal behaviors occur: rarely occurs, sometimes occurs, often occurs, and very frequently occurs. The items are summed to get an individual score on each dimension (supportive, directive, and restrictive principal behavior and collegial, intimate, disengaged teacher behavior), and then the scores for each dimension are averaged to get a school score on the variables; the higher the score, the more of the property. In the case of the OCDQ-RE, an openness index is calculated by combining all the dimensional scores on the instrument to indicate the extent to which the school climate is open. One final point: All the variables measured by the OCDQ-RE have been tested and refined to demonstrate that the variables are reliable and valid: They measure consistently what they are supposed to measure. In fact, all the variables that we describe in this chapter are valid and reliable.

Of course, not all concepts are operationalized by a set of Likert items. For example, consider hierarchy of authority.

- **Concept** (theoretical definition): Hierarchy of authority is the extent to which a position is under the control and supervision of a higher office.

- **Variable** (operational definition): Hierarchy of authority is the number of supervisory levels in the chain of command.

Note the difference between the theoretical definition and the operational one. The distinction demonstrates the conversion of a concept to a variable. This particular operational definition is direct, objective, and relatively easy to apply to most school organizations.

We end this section on operationalizing concepts by examining the concepts of academic emphasis, collective efficacy, and faculty trust in teachers and parents.

- **Concept** (theoretical definition): Academic emphasis is the extent to which a school faculty is driven by a quest for high academic excellence and achievement.

- **Variable** (operational definition): Academic emphasis is operationalized by the following set of items (see www.waynekhoyst.com).
Directions: Please indicate the extent to which each statement describes your school.
1 = Rarely OCCURS 2 = Sometimes OCCURS 3 = Often OCCURS 4 = Frequently OCCURS

The school sets high standards for academic success ...........................................1 2 3 4
Students respect others who get good grades ......................................................1 2 3 4
Students in this school can achieve the goals that are set for them ...............1 2 3 4
Students seek extra work so they can get good grades ...............................1 2 3 4
Students try hard to improve on previous work ..............................................1 2 3 4
Teachers in this school believe that their students have
the ability to achieve academically .................................................................1 2 3 4
Academic achievement is recognized and acknowledged by the school ......1 2 3 4
The learning environment is orderly and serious ............................................1 2 3 4

- **Concept** (theoretical definition): Collective efficacy is the perceived collective judgment that teachers as a whole can organize and execute the actions required to have positive effects on students.

- **Variable** (operational definition) is operationalized by the following set of items (see www.waynekhoy.com).

Directions: Please indicate the extent to which each statement is true of your school along a continuum from Strongly Disagree (1) to Strongly Agree (6).

Teachers in this school are able to get through to the most difficult students .................................................................1 2 3 4 5 6
Teachers here are confident they will be able to motivate their students .................................................................1 2 3 4 5 6
*If a child doesn't want to learn teachers here give up ............................................1 2 3 4 5 6
*Teachers here don't have the skills needed to produce meaningful learning .............................1 2 3 4 5 6
Teachers in this school believe that every child can learn ............................................1 2 3 4 5 6
These students come to school ready to learn .................................................................1 2 3 4 5 6
Home life provides so many advantages that students here are bound to learn .................................................................1 2 3 4 5 6
• Concept (theoretical definition): Faculty trust in parents and students is the school faculty’s willingness to be vulnerable to parents and students based on the confidence that they are benevolent, reliable, competent, honest, and open.

• Variable (operational definition): Faculty trust in parents and teachers is operationalized by the following set of items (see www.waynekhoy.com).

Directions: Please indicate the extent to which each statement is true of your school along a continuum from Strongly Disagree (1) to Strongly Agree (6).

Teachers in this school trust their students. ......................... 1 2 3 4 5 6
Teachers in this school trust the parents. ......................... 1 2 3 4 5 6
Students in this school care about each other. .................. 1 2 3 4 5 6
Parents in this school are reliable in their commitments. .... 1 2 3 4 5 6
Students in this school can be counted on to do their work. 1 2 3 4 5 6
Teachers can count on parental support. ......................... 1 2 3 4 5 6
Teachers here believe that students are competent learners. 1 2 3 4 5 6
Teachers think that most of the parents do a good job. ......... 1 2 3 4 5 6
Teachers can believe what parents tell them. ..................... 1 2 3 4 5 6
*Students here are secretive. ......................... 1 2 3 4 5 6

*Scored in reverse
Finally, consider the following construct:

- **Concept** (theoretical definition): *Academic optimism* is the collective belief of the faculty that it can make a difference, that students can learn, and that high academic performance can be achieved.

- **Variable** (operational definition): *Academic optimism* is operationalized by combining the scores of academic emphasis, collective efficacy, and faculty trust in parents and students.

**RESEARCH PROBLEMS**

Insomnia is a frequent problem among older citizens. In common parlance, a problem is a difficulty that causes discomfort or worry. This general definition conveys the nature of a problem, but it is insufficient for scientific purposes. We need a more specific delineation that suggests how researchers can address the issue. In science, a research problem is a query about the relationship between two or more variables. It foreshadows the research and is an important element of any research proposal (see “Elements of a Proposal,” Appendix A). Note that the statement of the problem is a question in need of an answer.

Let’s consider a few research problems from psychology and teaching:

1. Does massive reinforcement improve reading achievement?
2. Does student frustration lead to student aggression?
3. Does teacher optimism promote student optimism?
4. Does student optimism lead to higher levels of classroom performance?
5. Do specific goals improve mathematics achievement?

All these are possible research problems because they all are questions; they inquire about the relation between two variables; and the questions all lend themselves to empirical testing. In other words, a good research problem meets three criteria:

1. The problem is a question.
2. The question is about the relation among variables.
3. The relationship is capable of empirical testing.
Now let’s develop some research questions with the concepts we have examined in this chapter. Consider the following:

1. Is bureaucratic structure in schools related to teacher alienation?
2. Is organizational climate related to teacher alienation?

Both these meet the general criteria of a research problem: They are questions about the relationships between variables, and the questions seem capable of empirical testing. But both are general questions that could be developed and specified. For example, what is there about bureaucratic structure that may promote alienation? Furthermore, what kind of alienation would it produce? What aspect of bureaucracy is the culprit? We could narrow and specify the question by asking, “Does hierarchy of authority promote a sense of powerlessness among teachers?” Furthermore, if we are familiar with the conceptualizations of structure and alienation that we outlined earlier, we could develop a rather extensive set of questions, about 25 research questions or so—for example, “Is hierarchy of authority related to meaninglessness, to normlessness, to isolation, and to self-estrangement?” We could generate a similar list of questions about division of labor, impersonality, formalization, and career orientation. As the researcher grapples with these questions and tries to formulate answers, the analysis inevitably undergoes change and refinement. We ask ourselves what elements of structure promote alienation and what kind of alienation? What elements of structure are unrelated to alienation? Which particular kinds of alienation? What is more important in creating alienation—the amount or the kind of structure? In sum, the general question about structure and alienation leads to a host of more specific questions about the relationships among the elements of each construct.

The second research problem about school climate and alienation also has many possibilities. These are rich constructs with much potential. See how many specific research problems you can generate from this second general question. Are these questions worth answering? Why? The process of generating fascinating research questions depends on a number of factors including your imagination, your knowledge, and your scholarship. There is no substitute for a rigorous review of the literature (see Appendix A) as you try to formulate and conceptualize your research problem. Build on the work of other theorists and scholars—stand on their shoulders. Read, read, and read. Once you get some rich conceptual frameworks, you will find it easy and enjoyable to create interesting research questions. Given the conceptualizations of just a few constructs at the beginning of this chapter, consider what you can do with the following general questions:

1. Is there a relationship between school climate and school structure?
2. Is there a relationship between trust and alienation?
3. Is there a relationship between school climate and trust?
4. Is there a relationship between school climate and academic optimism?
5. Is there a relationship between structure and trust?
6. Is there a relationship between structure and academic optimism?

How many more general queries can you generate with these concepts? Furthermore, these general questions suggest a myriad other related and more specific issues. What is the object of your analysis? Teachers? Students? Administrators? The list of possibilities goes on. We have just begun. Add the concept of school achievement, and the possibilities escalate. Add student self-concept, and the options continue to mount, and on and on. Build conceptual capital as you take classes in education, administration, psychology, and sociology. Keep a concept notebook to record fascinating constructs and their meanings. Fill your mind as well as your notebook with concepts. Then as you begin to ask questions about their relationships, you will be amazed by the research possibilities.

Students ask, “How do I find good research questions?” My answer is, “Observe, read, and take notes.” Look for patterns of behavior and try to explain them. Search for fascinating constructs and theoretical perspectives. Use abstractions to shape your questions and answers. Read theoretically rich articles. Collect ideas and concepts, and ask how the ideas and concepts apply to schools. Good theory generates good research. So don’t avoid the theoretical; embrace it, and apply it to the problems of practice. The application of theory to practice involves some practice itself, but it is a skill that can be learned and a habit to be cultivated. It may take you a while to figure out how to use the ideas of theory to develop important research questions, but the effort is worth the reward. A major purpose of this text is to help you along this journey of discovery.

**Summary**

To understand research, it is imperative to comprehend the nature of concepts, constructs, variables, and research problems.

- **Concepts, constructs, and variables** are terms that are often used interchangeably, yet there are some subtle differences among them.
- Concepts are general abstractions that have specific definitions.
- Constructs are concepts, but they typically are more complex ones with multiple dimensions.
• Concepts and constructs are the stuff of theory; they are abstractions that are used to explain relations and general patterns of behavior.

• Variables are concepts that have operational measures.

• Variables are the properties of the object being studied; they are symbols that take on at least two numerical values.

• For some variables, the value represents a category such as male or female, but for other variables, such as weight, the number represents the magnitude or degree of the variable along a continuum.

• There are many kinds of variables, but the most common distinction is between independent variables (the presumed causes) and dependent variables (the presumed effects).

• A research problem is a question about the relation of two or more variables, which frames a quantitative study.

• Ultimately, the researcher’s challenge is to explain what causes the dependent variable to change (see “Elements of a Proposal,” Appendix A).

Check Your Understanding

1. What is the difference between a concept and a construct? Give a specific example of each. Define each in words. Can you define them as a set of operations?

2. Make up an operational definition for each of the following terms:
   A. reinforcement
   B. mathematical ability
   C. underachievement
   D. discipline
   E. organizational conflict
   F. administrative hierarchy
   G. classroom atmosphere

3. Provide an example of a concept that can be measured either as a categorical variable or as a continuous variable. How many categories does the variable have, and what are they?

4. Define teaching style first as a categorical variable and then as a continuous variable. Next define teaching style as an experimental variable and then as a measured variable.
5. What is the difference between a mediating and a moderating variable? Give an example of each.

6. Below are research problems from education. Study them and then construct a hypothesis for each.
   A. Does teacher feedback provide improvement in student performance?
   B. Does school climate influence student achievement?
   C. Do administrator beliefs influence teacher performance?
   D. Is direct teaching more effective than indirect teaching?
   E. Does socioeconomic status of students influence attitudes toward school?

7. Discuss the possibility of testing each of the following hypotheses.
   A. Progressive supervisors evaluate teachers more positively than do traditional supervisors.
   B. Teachers with high self-efficacy have students with higher self-efficacy than teachers with low self-efficacy.
   C. The greater the cohesiveness of a faculty, the greater the faculty influence on teachers.
   D. Role conflict among teachers is a function of the bureaucratic structure of the school.

### Key Terms

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