Conceptual Analysis

Links to previous studies

Explanation, rationale, theory, point of view

Questions, hypotheses, models

Design

| Subjects | Situations | Treatment | Observation or measurement | Basis for sensing attributes or changes | Procedure |

Analysis

Conclusion

Link to next study
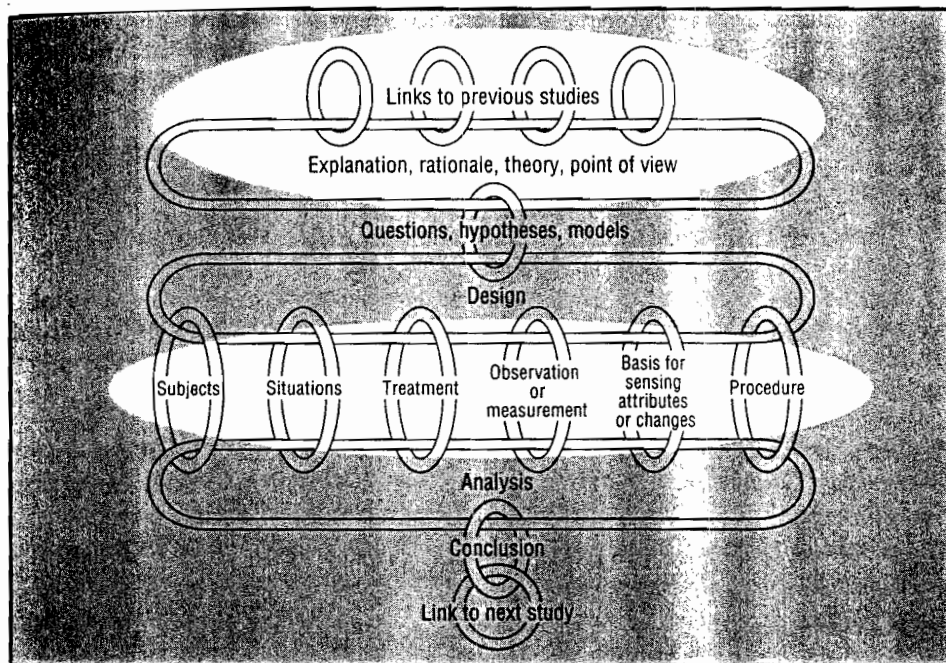
Krathwohl, D.R. (1993).
*Methods of educational and social
science research: An integrated approach.
New York: Longman.*

Some physical features of the world—like pencil, clock, clouds, thunder, and dog—have direct referents we can see and touch; they stand out almost begging for names. Other features—like joy, sadness, intelligence, and role—have no direct physical referent. They have to be *cut out*, as it were. These covert aspects of experience are named by the constructs of science.

After May Brodbeck

The gift of humanity is . . . that, unlike animals, we form concepts. . . . Man constantly invents ideas to express what seems to him to lie behind the appearances of nature. . . . In this sense, science is as much a play of imagination as poetry is. . . .

Man has outdistanced the other animals because he has not one but two languages: a thinking language for manipulating concepts inside his head as well as a speaking language (such as animals have) for communicating with others. A scientific discovery is searched for, a law is first guessed at . . . in the thinking language. But the exposition of science is not an account of . . . discovery . . . [;] its aim is to display the discovery definitively . . . so that everyone can then reason about it unequivocally.

Jacob Bronowski, The Identity of Man

OVERVIEW

Conceptual analysis is a process of defining constructs that is helpful both in problem formulation and in translating those constructs into measures, observations, or treatments.[1] It contributes to those links in the chain of reasoning by strengthening the credibility of the explanation and facilitating translation of the construct into the design. It is also a model for validating measures, as we shall see in chapter 11.

CHAPTER CONTENTS

INTRODUCTION

Central to comprehending a problem is understanding the exact meaning of the words that describe it—that is, learning the rules for using those terms correctly and precisely. **Conceptual analysis** helps us to understand those rules. Though called conceptual analysis, this process is particularly useful in analyzing constructs (abstract nouns that cannot be directly sensed) to find the precise way in which we use common terms in a given problem context. It is less useful with highly technical terms with agreed-on specific definitions. Conceptual analysis can facilitate organization of the literature search by illuminating the nature of a problem and its relationship to the network of concepts in which it is embedded.

Devised by philosophers, the conceptual analysis process is already used informally in science. By describing and illustrating it, this chapter calls attention to it and makes it available for use. We will encounter its parallel in construct validity in chapter 11, on measurement. As with all such techniques, how well it works depends on combining creativity with judgment.

Concepts and Constructs in the Social and Behavioral Sciences

Concepts and constructs are a prime feature of the social and behavioral sciences. The review of the literature on a problem marvelously fills our heads with such terms. Sometimes there emerges a clear image of the meaning of each. But that is the exception, because in our fields, such terms are not used with notable consistency. Let's clarify what we mean by concepts and constructs and emphasize the fact that conceptual analysis is particularly useful with constructs.

Let us consider *concept*, the broader term. Concepts are the terms that we use in our thinking language to refer to the things around us. For example, in our thinking language, the concept of clock, though perhaps learned with reference to a particular clock in our parents' bedroom, applies to any clock, whether it resembles our parents' clock or not. It can be a different color, size, or shape. As the quotation with which the chapter begins indicates, *pencil, clock, clouds, thunder, dog,* and the like are all concepts that have physical referents, that cry out for names.

Constructs are concepts, too, but whereas we have a mental image of a clock, constructs are terms that have no direct physical referent—*joy, sadness, intelligence, role.* Constructs refer to such characteristics as a person's internal state, capacities, or tendencies to act that we cannot directly sense: anxiety, spatial aptitude, racial bias. To return to the chapter's initial quotation again, they must be cut out, as it were. We must *infer* their presence from behaviors and other consequences that result from their existence. We cannot directly see, touch, smell, or hear them, only their outcomes.

Some psychologists, most notably Skinner (1957), have constructed a theory of verbal behavior development without using constructs or making such inferences. They confine their terms strictly to observable referents and

their results. Although they have had some success, for most of us constructs are remarkably useful terms. Indeed, many would say they are essential; we would be lost without them. But when a construct is fuzzy, when its meaning differs markedly from person to person or instance to instance, when we use the same term in different ways, then it can be a source of difficulty and misunderstanding. A conceptual analysis of constructs removes the "fuzz" and clarifies how the term is being used. This permits clearer communication of our research and eases translation of the constructs from our thinking language into consequences that can be directly sensed in situations, actions, and results. This is necessary if we are to use constructs in our empirical research.

Use of Conceptual Analysis in the Chain of Reasoning

Clarification of terms is useful at a variety of places in the chain of reasoning. Clearly, it can be useful in the literature survey and the development of the rationale and explanation by distinguishing various ways in which the same term is being used. Besides being useful in the top links of the chain, conceptual analysis may help define the essential characteristics of a treatment, situation, population, or concept to be measured and observed, therefore having the potential to help clarify the design.

Sometimes clarification of terms can markedly facilitate the development of a field. For example, an early reading of the literature would have found the term *anxiety*, a construct that refers to uncomfortable feelings of apprehension. A conceptual analysis of the ways in which *anxiety* was used in the literature before a distinction was developed in instrumentation would have shown that the term was being used in two senses. In one, it referred to the syndrome caused by stressful situations, what was later called *state anxiety*. In the other, it referred to a more or less chronic feeling or mood, later referred to as *trait anxiety*. Although these two meanings were later distinguished in instrumentation, a conceptual analysis might have untangled them and led to earlier instrument construction.

THE PROCESS OF CONCEPTUAL ANALYSIS

Though only rarely do we engage in such formal pursuit of the meanings of terms, informally we do many of the same things, and the process is not complex. Basically, conceptual analysis involves a series of steps to help us generate ideas about the defining characteristics of a construct. These conditions are the necessary and sufficient conditions under which the term applies. **Necessary conditions** are those that must be present for the term to apply. **Sufficient conditions** are those that when present are sufficient to distinguish examples from nonexamples. Having found a set of sufficient conditions, we then test each characteristic to determine whether it really is *necessary* for the term to apply. Next we check whether we have found all the defining characteristics, that is, whether the set is *sufficient* to distinguish examples completely

from nonexamples of the construct. If not, we seek the missing characteristics. Ideally, we find all the sufficient characteristics for the term. We hope that they constitute all the necessary (defining) characteristics as well. Let us look at the steps in more detail.

Step 1: Find Examples of the Construct

The first step is to examine many examples of the way we use the term describing the construct in question and make some guesses or hypotheses about its defining characteristics. These are the characteristics without which the term would not be applicable. Consider the term *desk*. A desk should have a surface on which to write, draw, or type; this is a defining characteristic; we cannot envision a desk without such a surface. But must we be able to sit down and place our legs under it? Is this a defining characteristic? No, it is not; though now rare, stand-up desks were once very popular and still are with some individuals.

Consider what it means for a person to be "creative."[2] We are concerned with creativity as a goal in school, in research, in business, in a wide variety of situations. We all have an idea in our head about what it means to be creative, and we could undoubtedly distinguish individuals whom we consider creative from those we consider not so. But creativity is not something we directly see, touch, or smell; it is a construct. To determine the defining characteristics of creativity, we must consider a number of cases of it. Thinking of certain categories of cases helps us find the central "territory" of a construct and its boundaries. Here are some examples of categories:

- **Model cases** are perfectly clear and unquestioned examples of the construct; they define the central territory; they contain the defining characteristics.
- **Contrary cases** are clearly outside that territory and help determine the boundaries. They lack one or more, if not all, of the essential defining characteristics.
- **Borderline cases** help determine the boundaries more exactly by finding those cases where it is difficult to determine whether they are examples of the construct or not.
- **Related cases** are a bit further out. They are almost, but not quite, the same as the term being analyzed. They also help establish the boundary.
- **Invented cases** give the imagination free play to see what cases might belong even though they aren't real. They attempt to make obvious "the simple regularities and conditions of our world that remain unnoticed because they are so taken for granted" (Green, 1971, p. 211).[3]

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2. I am indebted to Emily Robertson for significant parts of this example.
3. Notice that sampling is involved. We are drawing from a population of examples of the concept for the conceptual analysis. How to sample them? We could argue that in the absence of a sampling frame or an enumeration of all the population's examples, we are using a convenience sample—those cases that come to mind. But we do better than that because we seek certain

These do not exhaust the possible categories of examples (nor will they all necessarily be useful in any given instance), but they make the point that numerous and varied examples must be explored.

An Example.   What would constitute a model case of creativity? Green (1971) suggests starting with the construct's "most literal and ordinary usage,"

> the most plain and unquestioned use of the term or construct. . . .[4] One way to identify a model . . . example is to describe the conditions that you would be most likely to point to or show someone if you wanted to teach him the meaning of a certain term or the use of a certain concept. (pp. 207–208)

For *creativity,* would it not be that a person creates a work of art different from any already done by that person or any other person? What would seem to be the defining characteristics of this model case? They appear to be that the work is new in the sense that it is different from what anyone has done before. So far, so good; let us turn to contrary cases.

As Green (1971) notes:

> The study of model cases should yield some initial formulation of the necessary, if not sufficient, conditions that must be satisfied if any example is to be a genuine case of the concept. . . . The purpose in developing contrary cases is precisely to test those initial suspicions. (p. 208)

Can we think of contrary cases where the work is different from what the individual or anyone else has done before? Suppose that the work of art were to be carved out of a piece of foamglass measuring 5 by 8 by 5 inches, a problem that had been used repeatedly with previous art classes. If one student's sculpture were unique in this class but duplicated the work of many individuals in previous classes, would it still be creative? We can assume that had this been a very large class, this student's version would have appeared as a quite common solution to the foamglass problem and hence would not have been considered creative. So we learn that the uniqueness of the creation must be judged by a standard that goes beyond a comparison with other work of the moment.

What about borderline cases? Suppose the work of art resembles, but is not quite the same as, previous work by this student—it is a variation on the

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kinds of cases. We might consider these strata, but they are still closer to quota sampling because we typically seek at least one in each category of model cases, borderlines cases, and invented cases. Contrary and related cases are sampled from nearby but different populations. How many cases need be sampled? The more varied the population, the more are needed; the more homogeneous it is, the fewer will be needed to make inferences—the same principles as before!

4. If seeking the way a construct is used in a particular problem context, start with its use in that context if it differs from common usage.

same theme. If the student's original work was unique and this is a variation on that theme, is this also to be considered original? Or must each new creation be entirely different from the previous ones to be creative? And what do we mean by different? How different is different when it is used to help define creativity? Clearly, we must make a judgment here, though difficult: one that determines whether something is creative—a judgment with which others may not agree. We have come to one borderline of the term *creativity* where things switch from being creative to not being so, depending on the judgment of how different the new piece must be.

What about related cases? Are there related terms that throw light on the nature of creativity? What about *imaginative*? Is a person who is creative also imaginative, and vice versa? When we refer to someone as imaginative, we think of that person as demonstrating repeated and varied instances of imagination, not just one. Come to think of it, that is true of saying that a person is creative: one instance won't do; creativity is shown by repeated acts. More than that, it is demonstrated in different circumstances and with respect to a variety of situations. The related case helps reveal another defining characteristic of *creativity*: that it is demonstrated in repeated acts, so much so that we could say that the individual's behavior is characterized by them. Further, the acts are repeated in more than one field of endeavor.

But are all imaginative acts creative? Sometimes we imagine things that have never existed. Where those are unique, they are creative, and both terms apply. But we can also imagine situations that have occurred before. If we are simply reliving them, we would probably not call them creative. The determination again falls in terms of the uniqueness of the experience—this doesn't add to our understanding.

What about the term *inventive*? Inventions are by definition unique instances of creativity. Are all inventions instances of creativity? Some inventions are simply modifications of something someone else thought of before. Is that the result of creativity? Probably, but here we come to the same problem we encountered in the borderline case: how much difference is required? Another blind alley; let's move on.

Finally, we come to invented cases. Sometimes it helps to release all the normal restraints and play with a construct. What would the world be like if suddenly all the highly creative people were wiped out by a special virus to which their creativity made them susceptible? What would happen? Behaviors that had been learned would continue. Individuals could learn those behaviors from others. But once those were learned by all survivors, no new behaviors would occur. Hence creative acts go beyond what one has specifically already learned.

So we have three defining characteristics of a creative person: (1) the person engages in acts unique in terms of both his or her own and others' experiences (the standard for uniqueness is a matter of judgment), (2) such acts occur with sufficient frequency and variety that we can say that they characterize the person's behavior, and (3) they go beyond what the individual has learned earlier.

Before going further, let's look back at what we have done, using Figure 9.1 to show it schematically. In the figure, the construct to be defined is
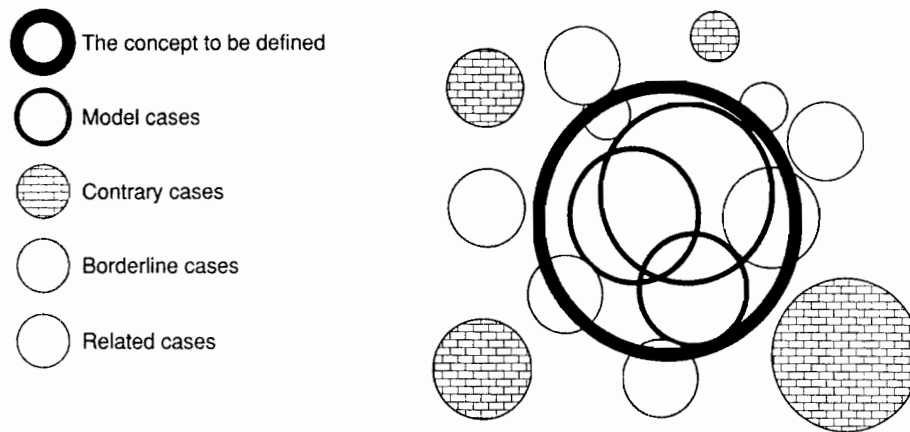
FIGURE 9.1   A diagram of some of the initial steps in the conceptual analysis process.

enclosed in the heaviest line, the thick black ring. Model examples fall inside that ring and illuminate its characteristics. Contrary cases help define the territory outside the ring; chosen so that they are related to the construct, they help us cut away territory that might otherwise be considered in the ring. Borderline cases help locate the position of the ring itself more precisely. Related cases are just outside the ring; like borderline cases, they help define the periphery. Since it is impossible to predict the location of imaginary cases, which could be anywhere, we have not included them in the figure.

Step 2: Test Each of the Defining Conditions

The second step is to test each of the defining characteristics to see whether it really is a necessary condition for the term to apply. To do this, we ask whether we can think of a real, honest-to-goodness instance of creativity, real or imaginary, that is not characterized by each of these characteristics. As we consider each characteristic, if the answer is no, we can't think of any instance without that characteristic, then it is defining. If, conversely, we can think of such an exception, then, of course, it is not. In our example, I could not think of such an instance.

Step 3: Ask, "Is the Set Complete?"
and Step 4: Ask, "If Not, What Must Be Added?"

The third step is to ask whether the set of characteristics we have developed is complete—whether it is sufficient to delineate the instances in which the term would and would not apply. Are there situations that have all these characteristics to which the term would not apply? If the answer is yes, it leads to the fourth and final step of finding additional missing defining characteristics and then returning to the third to test the set once again for completeness.

So, in our example, we must ask, "Are there persons who regularly and frequently have a variety of unique thoughts that we would not describe as creative? Well, yes, individuals with delusions and hallucinations have unique thoughts, often thoughts of a kind other people would be terrified to have. They do so regularly and with respect to a variety of situations and content. Sometimes they put these down on paper as "art." Many of us have seen exhibitions of the often grotesque and erratic creations of institutionalized people. Indeed, their art is often used to help diagnose and understand their condition. Young children often form crude pieces that we say are creative but if done by an adult would be considered more bizarre than creative.

Ah, you are saying, who is to judge this as bizarre? Aren't there "modern" art pieces that some would say are bizarre and others the work of a creative genius? What about the work of van Gogh, who cut off a hunk of his ear? Obviously we have come, as the British like to say, to "a sticky wicket." For most of us, creativity must be exercised within the "rules of the game." To be considered creative, art must somehow be pleasing or at least affect our sensibilities in a way that we are willing and even eager to entertain. Haiku provides a clear example of "rules of the game." Haiku is a Japanese verse form consisting of three lines of five, seven, and five syllables, respectively. The poet must be creative within this format. Although the "rules" for art may differ among art forms, schools of art, and individuals, for most of us there is some art that exceeds our personal boundary and is judged bizarre.

So creativity has another characteristic, one we missed: it is exercised within certain boundaries or rules. But note that because some persons would argue that bizarre actions could be creative, we are making a **stipulative definition** of creativity. That is, we indicate we are going to use the term in a specific way, one that requires that creative acts result in something pleasing or at least something we willingly entertain. This is not a definition that everyone would accept, especially advocates of certain kinds of modern art.

Finally, we repeat step 3 to see whether we can think of any situation where a person socialized to what is and is not offensive regularly has unique thoughts that we would not call creative. If we can think of none, we are through. If we can think of instances, we must repeat the fourth step and again return to the third, and so on, until no new instances occur.

Some Additional Comments

Clearly, although we have illustrated all the steps in the process, not all have been helpful. Ideally, we end up having the necessary and sufficient characteristics for the term to apply. If our sampling in step 3 turns up no examples but there really are some, we have missed one or more additional defining characteristics. No doubt each reader of this material would have chosen different examples or found different ways of describing the defining characteristics. The process is unquestionably part art. But it is nonetheless highly useful. Research shows that having a model to follow facilitates problem solving (Elstein, Shulman, and Sprafka, 1978). The steps of conceptual analysis provide one such useful model.

Is the analysis of creativity helpful? It certainly tells us what characteristics

to build into a measure of creativity. Such a measure should present a situation to which the individual can respond uniquely if it is natural to so do. The situation will have to be given to many individuals to learn which are the common responses and which are rare. It should include problems that sample each testee's behavior over a variety of situations and times, since one instance of creativity is not enough to characterize a person. Although a standard of common responses is established, the answers will have to be rated by someone with reasoned judgment, as it may be difficult to determine what represents a response "different" from a common one. The standard should consist of unusual situations to which the individual will not be able to apply directly, without modification, what has previously been learned. And we will need to set some "rules of the game" within which responses must be framed (for example, the response must be communicated in 25 words or less, and the first and last words must rhyme). So the analysis tells us something about how to develop situations that help us recognize creativity and suggests what we might do to measure it. We return to this topic in the discussion of construct validity in chapter 11.

Although it may seem as though we are simply playing with words, the process of conceptual analysis is analogous at a conceptual level to hypothesis testing with actual data. But instead of gathering data, we are doing studies mentally to see whether we can think of examples or situations that fit or do not fit the particular check on the term being considered (Is this a model case? A borderline case?) (D. P. Ericson, personal communication, 1990). Is this a poor substitute for data? No; in thinking through a term's meaning, it can bring past research to bear, highlight relationships to other bodies of literature, and save considerable time by rediscovering relationships through data.

Note too that conceptual analysis can map out and illuminate the conceptual framework in which the term is embedded (D. P. Ericson, personal communication, 1990). Thus our earlier analysis of creativity related it to inventions, imagination, and previously learned behavior. Clearly, we could go further and relate it to such areas as intelligence, social conformity, and spatial visualization. Each would provide additional insight into what we mean by creativity, the conditions under which we might expect it to appear, and where conditions are likely to limit its appearing. The further we carry the analysis, the more clearly we reveal the conceptual and theoretical structure that surrounds the term.

Notice that we have discussed conceptual analysis as a skill for furthering a research project. But the product, the definition of when and how a term is to be used, is sometimes a research product in and of itself. For a good example, see Green's (1971) analysis of the act of teaching. This excellent analysis is much quoted in the teaching literature.

Should we do a conceptual analysis alone or in concert with others? Going the lone road, we must keep the audience firmly in mind, as well as our problem. Remember, the set of conditions resulting from the analysis must be communicated to and accepted by the audience we intend to reach. The results of a conceptual analysis employed in a research study undergo the same scrutiny in the journey from findings to knowledge as the rest of the study. Failure of a consensus to form about the proper meaning of terms or the

peculiar stipulations and conditions on a term may reduce the value and usefulness of the study. Doing the analysis with others probably reduces this risk.

A way of pooling data from others has been developed by Trochim (1986, 1989a, 1989b), using a process related to conceptual analysis he calls concept mapping. It involves sophisticated statistics, cluster analysis, and multidimensional scaling to develop a map describing an idea, the concepts within it, and their interrelationships. The group supplying the data may compare its map with an ideal or with maps prepared by other groups with contrasting orientations as a basis for research, planning, or evaluation.

SUMMARY

Conceptual analysis is a process for making our constructs explicit so that we can communicate them to others and use them in doing research. This process helps us to understand the construct clearly and see its relation to other terms and may lead to new and useful distinctions. The process consists of the following steps:

1. Examine many examples of the way the construct in question is used, and make some guesses or hypotheses about its defining characteristics. The following are particularly useful types of examples:
   - Model cases—examples that are the "most plain and unquestioned use of the term or construct" (Green, 1971, p. 207)—mark the heart of the construct's territory.
   - Contrary cases, which lack one or more of the defining characteristics, help define what is excluded.
   - Borderline cases, which could be either in or out of the territory, help determine how far the territory of the construct extends and where it ends.
   - Related cases, involving a term that is almost but not quite the same as the one being considered, also help set the boundaries of the territory.
   - Invented cases, which allow free play of our imagination about the construct, point up otherwise unnoticed regularities of our world.
2. Test each of the defining characteristics to determine whether we can imagine a situation where the term would apply although the characteristic is missing. If we can't find such cases, we consider it a defining (necessary) characteristic.
3. Check to see whether there are missing defining characteristics by asking whether there are situations that have all of these characteristics, yet the term would not apply. If there are none, we have what seems to be the sufficient conditions for discriminating when the term would and would not apply.
4. Find any missing characteristics; then repeat step 3 until all have been found.

A CONCEPTUAL ANALYSIS EXAMPLE FOR "APTITUDE"

Aptitude

Step 1: Find Examples. What is the model case of a person exhibiting an aptitude for something? That person must first be capable of some particular task or skill, must be good at something. Further, the person must have a natural capability or inclination—a talent for that task or skill.

What about contrary cases? Does a person who has been taught a task or skill have an aptitude for it? Presumably yes, or the person should not have been capable of learning it. So having been taught about the task or skill is not an excluding characteristic. What if a person demonstrates an ability to do something once but can't repeat it despite practice and instruction? It is possible this was a chance performance. A sharpshooter who hits the bull's-eye of a target one time out of many tries cannot be considered to be demonstrating an aptitude. Thus we must take consistent performance into account.

How about borderline cases? Do we really have to be talented to be able? What degree of aptitude equates with being "apt"? What constitutes being good at something? Often comparison is made with others to place an individual somewhere on a continuum. The research literature on the topic of aptitude, for example, is rife with interpretations of high, medium, and low aptitudes. In each such study, a standard for high, medium, or low is set. A student showing high verbal aptitude, for instance, might be judged so on the basis of performance on some standardized scale.

There is also a judgment here of ease of doing or learning something. An athlete who is considered to be a natural usually outperforms others but also learns the sport more easily. The term *aptitude* implies the ability to learn a skill easily.

What of related cases? What about a person's nature or temperament? Is aptitude a function of volition or willingness? What role does motivation play here? You have probably known a person whom you judged an "underachiever," a capable student or athlete, for example, who normally wasn't motivated to perform yet occasionally demonstrated great skill or could do so on demand. Aptitude, apparently, is something beyond interest or willingness. One person can be better at a task or a skill than another as the result of instruction or practice. But presumably, if the latter had greater aptitude for it, then with the equivalent training, the latter would outperform the former.

How about invented cases? What if individuals could not improve their performance of a particular task or skill by learning, practice, and so on? What if motivation played no part in its performance either? In that case, either people would differ in their performance on the basis of aptitude, or they wouldn't differ at all. The latter seems unlikely though, given the biological differences among people. Hence there appears to be an innate quality to aptitude.

The defining characteristics of a person demonstrating a particular aptitude, then, are that the person be capable of that task or skill (the standard for capability being a matter of judgment), that this capability have some innate quality, and that the person be able to demonstrate the task or skill at the judged level with some degree of consistency (again a matter of judgment).

Step 2: Test Defining Conditions. Is each of the conditions in step 1 necessary for the term to apply? Can you think of any exceptions? Consider *overachievers.* This term implies that individuals can learn to perform at a level beyond their supposed aptitude. But can this really happen? Can people actually achieve more than what they are capable of? To me, the term *overachiever* merely indicates that an individual has worked (studied, practiced) harder than the majority of others against whose performance that person's is compared. All others of the equivalent aptitude level should be capable of the same. It is not an exception to the defining characteristics.

Steps 3 and 4: Exhaust Possibilities. Are the defining characteristics sufficient for the term to apply? Can you think of situations that have all the characteristics but to which *aptitude* does not apply? I could not, so the analysis is considered complete.