What is Research?

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Everywhere, our knowledge is incomplete and problems are waiting to be solved. We address the void in our knowledge and those unresolved problems by asking relevant questions and seeking answers to them. The role of research is to provide a method for obtaining those answers by inquiringly studying the evidence within the parameters of the scientific method.

The word *research* is used in everyday speech to cover a broad spectrum of meaning, which makes it a decidedly confusing term for students -- especially graduate students -- who must learn to use the word in its specialized denotation. Much that students have learned they must suddenly unlearn; many of the false concepts they had previously learned they must discard.

Unfortunately, many students have been taught misconceptions about the nature of research. From elementary school to college, they have heard the word research used loosely and given multiple, misleading meanings. On one hand, the word connotes the finding of an item of information or the making of notes and the writing of a documented paper. On the other hand, it is used for the act of informing oneself about what one does not know or of rummaging through available sources to retrieve a bit of information. Merchandisers use the word to suggest the discovery of a revolutionary product when, often, the truth is that only a minor alteration has been made to an existing product, with the purpose of enhancing the product's sales appeal. All these activities have been called research but should have been called by their appropriate names: information gathering, library skills, documentation, self-enlightenment, and an attention-getting sales pitch.

The word research has a certain mystique about it. It suggests to many people an activity that is exclusive and removed from everyday life. Researchers are sometimes regarded as esoteric individuals who seclude themselves in laboratories, in scholarly libraries, or within the precincts of an academic environment. The public generally is not aware of their daily activity or of the important contributions their work frequently makes to people's comfort and general welfare. Many people, therefore, regard research as a way of life dissociated from the common activities of the everyday world.

The purpose of this chapter is to dispel these myths and misconceptions and to present an accurate definition of research. I define *research* here as the systematic process of collecting and analyzing information (data) in order to increase our understanding of the phenomenon with which we are concerned or interested. Although this conception of research may seem somewhat remote and academic, many people rely on a truncated form of it each day to solve smaller problems than those resolved by the more elaborate methodology of formal research. It is with formal research, however, that we are concerned in this text.

To appreciate the difference between people's common understanding of research and the more accurate definition, we can perhaps better understand the latter by first looking at the nature of the former.

WHAT RESEARCH IS NOT

I have suggested that the word research has been so loosely employed in everyday speech that few people have any idea of its real meaning. Here are a few guidelines as to what research is not; accompanying each guideline is an illustration depicting the popular concept often held about research.

1. Research is not mere information gathering. A fourth-grade child came home from school with this announcement: "Mom, the teacher sent us to the library today to do research, and I learned a lot about Columbus." This child has been given the idea that research means going to the library to get information or to glean a few facts. This may be *information discovery;* it may be learning *reference skills;* but it certainly is not, as the teacher so termed it, research.

2. Research is not mere transportation of facts from one location to another. A student completes a "research paper" on the Dark Lady in the sonnets of William Shakespeare. Although the student did, indeed, go through certain activities associated with formal research -- collecting data, assembling a bibliography, referencing statements properly -- these activities still do not add up to a true "research" paper. The student missed the essence of research: the interpretation of data. Nowhere in the paper did the student say, in effect. "These facts that I have gathered seem to indicate *this* about the Dark Lady." Nowhere did the student draw conclusions or interpret the facts themselves. This student is next door to genuine research; but the mere compilation of facts, presented with reference citations and arranged in a series, no matter how appealingly neat the format, misses genuine research by a hair. A little farther, and this student would have traveled from one world to another: from the world of mere transportation of fact to the world of interpretation of fact. The difference between the two worlds is the distinction between transference of information and genuine research -- a distinction that is important to understand.

Unfortunately, many students think that looking up a few facts and transferring them to a written paper with benefit of references constitutes research. Such activity is, of course, more realistically called *fact discovery, fact transportation,* and / or *fact transcription.*

3. Research is not merely rummaging for information. The house across the street is for sale. I consider buying it, and so I call my realtor to find out how much my own home would sell for. "I'll have to do some research," the realtor says, "to find the fair market value of your property." What the realtor calls "doing some research" means, of course, going through files of recent sales of properties comparable to mine to see what they have sold for; this will give the realtor an estimate to report to me. This so-called research is little more than rummaging through files to find what the realtor did not know. Rummaging, whether in one's personal records or in the public or college library. is not research. It is accurately termed an exercise in self-enlightenment.

4. Research is not a catchword used to get attention. The morning mail arrives. I open an envelope and pull out its contents. A statement in boldface type commands attention:

Years of Research Have Produced a New Car Wash!
Give Your Car a Miracle Shine with Soapy Suds!

The phrase "years of research" catches my attention. The product must be good, I reason, because "years of research" have been spent on developing it. I order the product -- and what do I get? Dish-washing detergent! No research. merely the clever use of a catch-word that, indeed, fulfilled its purpose: to catch my attention. "Years of research" -- what an attention-getting phrase, yet how misleading!

Formal research is entirely different from any of the above activities. I outline its essential nature and characteristics in the following section.

WHAT RESEARCH IS

Research is a process through which we attempt to achieve systematically and with the support of data the answer to a question, the resolution of a problem, or a greater understanding of a phenomenon. This process, which is frequently called *research methodology*, has eight distinct characteristics:

1. Research originates with a question or problem.
2. Research requires a clear articulation of a goal.
3. Research follows a specific plan of procedure.
4. Research usually divides the principal problem into more manageable subproblems.
5. Research is guided by the specific research problem, question, or hypothesis.
6. Research accepts certain critical assumptions.
7. Research requires the collection and interpretation of data in attempting to resolve the problem that initiated the research.
8. Research is, by its nature, cyclical; or more exactly, helical.

I discuss each of these characteristics in turn so that you appreciate more fully the precise nature of formal research.

Characteristics of Formal Research

1. Research originates with a question or problem. The world is filled with unanswered questions, unresolved problems. Everywhere we look, we observe things that cause us to wonder, to speculate, to ask questions. And by asking questions, we strike the first spark igniting a chain reaction that terminates in the research process. An inquisitive mind is the beginning of research. There is so much that we do not know that we do not understand! The hope of mitigating our ignorance lies in the questions we ask and the information we gather and in whose collective meaning we may find insight.

Look around you. Consider the unresolved situations that evoke these questions: Why? What's the cause of that? What does it all mean? These are everyday questions. With questions like these, research begins.

In Chapter 3, I discuss the research problem at greater length. The problem and its statement are important because they are the point of origin of formal research.

2. Research requires a clear articulation of a goal. A clear, unambiguous statement of the problem is critical. This statement is an exercise in intellectual honesty. It cannot brook vagueness, welshing, or the avoidance of an obligation to set forth clearly and in a grammatically complete sentence precisely what the ultimate goal of the research is. The statement asks the researcher, "What precisely do you intend to do?" This is basic and is required for the success of any research undertaking. Without it, the research is on shaky ground indeed.

3. Research requires a specific plan of procedure. Research is not an excursion into happy expectation, of fondly hoping that the data necessary to solve the problem will somehow fortuitously turn up. It is, instead, a carefully planned attack, a search-and-discover mission explicitly planned in advance. Consider the title of this text: *Practical Research: Planning and Design.* The last three words are the important ones. The overall research effort must be explicitly planned and logically designed. Researchers plan their overall research design and specific research methods in a purposeful way -- that is, to yield data relevant to their particular research problem. Depending on the specific research question, different designs and methods will be more or less appropriate.

In the section immediately preceding this one, you considered the goal for research; that was what you intended to do. Here, you state the plan, the design; this is how you propose to reach that goal. You must not wait until you're chin deep in the project to plan and design your strategy; In the formative stages of the research project, much can be decided: Where are the data? Do any existent data address themselves to the research problem? Even if the data exist, is it reasonable that you have access to them? Presuming that you have access to the data, what will you do with them after they are in your possession? I might go on and on. These questions merely hint that planning and design cannot be postponed. Each of the questions above must have an answer early in the research process.

4. Research usually divides the principal problem into more manageable subproblems. The whole is composed of the sum of its parts. That is a universal natural law; that is also a good precept to observe in thinking about one's principal goal in research. We break down principal problems much more frequently than we realize.

Let's take an everyday problem to see how it breaks down into a number of subproblems. Suppose you want to get from your town to a town 50 miles away. Your principal goal is to get from one location to the other as expeditiously as possible. You soon realize, however, that at the outset some subproblems must be considered. Here is a structuralization of the problem and its attendant subproblems:

Main problem: How do I get from Town A to Town B?

Subproblems:

1. What is the most direct route?
2. How far do I travel on the thruway?
3. What is the number of the exit I take in leaving the thruway?

What seems like a simple primary question can be divided into at least three other questions before the principal question can be resolved. So it is with most research problems. The researcher usually cannot deal with the principal research problem in toto. To proceed logically, one should closely inspect the principal problem because research will soon cause the appropriate and, in fact, necessary subproblems to float to the surface. By resolving them, we finally resolve the main problem.

If researchers don't take the time or trouble to isolate the lesser problems within the major problem, their research projects become cumbersome and unwieldy. From a design standpoint, therefore, it is expedient to reduce the main problem to a series of logical subproblems that, when resolved, will resolve the main problem.

5. Research is guided by the specific research problem, question, or hypothesis. Having stated the problem and the attendant subproblems, each subproblem is then viewed through a construct called a hypothesis. A hypothesis is a logical supposition, a reasonable guess, an educated conjecture. It may direct your thinking to the possible source of information that will aid in resolving the research problem through the resolution of each attendant subproblem.

Hypotheses are nothing new. They are constant, recurring features of every day life. They represent the natural working of the human mind. Something happens. Immediately, you attempt to account for the cause of the happening by constructing a series of reasonable guesses. In so doing, you are hypothesizing. Let's take a commonplace occurrence: You come home after dark, open the front door, and reach inside to turn on the lamp that stands on a nearby table. Your fingers find the switch. You turn it. No light.

At this point, you begin to construct a series of reasonable guesses -- hypotheses -- for the cause of the lamp failure:

1. The bulb has burned out.
2. The lamp is not plugged into the wall outlet.
3. A late afternoon thunderstorm interrupted the electrical service.
4. The wire from the lamp to the wall outlet is defective.
5. You forgot to pay your electric bill.

Each of these hypotheses provides a direction for exploration to locate the information that may resolve the problem of the malfunction. I must mention here that hypotheses are never proved nor disproved; they are either supported or not supported (rejected).

Now, you go in search of information to determine which of your hypotheses may be correct.

1. You go out to your car, get a flashlight, find a new bulb, and insert the new bulb. The lamp fails to light. (Hypothesis 1 is rejected.)
2. You glance down at the wall outlet and see that the lamp is plugged into it. (Hypothesis 2 is rejected.)
3. You look at your neighbors' homes. Everyone has electrical power. (Hypothesis 3 is rejected.)
4. You go back into your home and lift the cord connecting the lamp to the wall outlet. The lamp lights briefly and then goes out. You lift the cord again. Again, the lamp lights briefly. The connecting cord is defective. (Hypothesis 4 is supported.)
5. Fortunately, hypothesis 4 solved the problem and you can count on adequate light to study by for another month.

After the hypotheses comes information (data). The data either support or fail to support the hypotheses.

Many of the greatest discoveries in science have begun as hypotheses. Scientists call hypotheses *theories*. Albert Einstein's general theory of relativity is essentially a hypothesis. His mathematical equations suggested what only the data could ultimately verify. Take the matter of the nature of light, for example. Einstein postulated that light passes through space as protons -- minute masses of spectral energy -- If light, Einstein reasoned, has mass, then it is subject to the pull of a gravitational field. Einstein proposed his general theory in 1915. A year later K. Schwarzchild produced the first exact solution of the field equations with respect to the gravitational field of the sun. According to the Einstein-Schwarzchild hypothesis rays of light should be deflected twice the amount that Isaac Newton had predicted earlier.

In May 1919, an eclipse of the sun occurred. Members of the Royal Society and the Royal Astronomical Society, both of London, traveled to Brazil and North Africa to observe the aberration of the light of a distant star, caused by the gravitational field of the sun. After the data were analyzed and interpreted, the results clearly validated Einstein's hypothesis.

6. Research accepts certain critical assumptions. In research, assumptions are equivalent to axioms in geometry-self-evident truths, the sine qua non of research. The assumption must be valid or else the research cannot proceed. For this reason, careful researchers -- certainly in academic research -- set forth a statement of the assumptions as the bedrock upon which the study must rest. In your research, therefore, it is important that others know what you assume with respect to your project. For, if one is to judge the quality of your study, then the knowledge of what you assume as basic to the very existence of your study is vitally important.

An example may clarify the point. Suppose your problem is to investigate whether students acquire facility in grasping the ambience of a language more quickly by learning only one foreign language at a time or by attempting to learn two foreign languages concurrently. By ambience, I mean the native accent, a comprehension of the expressive characteristics of grammatical, idiomatic, accentual, and similar unique aspects of the language.

What assumptions would underlie such a problem?

- It would be assumed that the teacher would be competent to teach the language or languages and would have mastered the linguistic ambience.
- It would be assumed that those students taking part in the research are readily capable of hearing the subtleties of accent and alert to other unique characteristics of the language.
- It would be assumed that the languages selected would have distinguishable ambience characteristics that could be recognized and learned and practiced by the students selected for the study.

A distinction should be made here between a hypothesis and an assumption. A *hypothesis* is a conjectural supposition that is posited in order to facilitate the search for facts but that is held in abeyance until the data are available and have been interpreted. At that point, the data either support or do not support the hypothesis. An *assumption* is quite a different matter. An assumption is a condition that is taken for granted, without which the research situation would be impossible. In the Einstein example given above, we assume that the astronomers who went to observe the aberration of the star's light were competent to do so and that their instruments were critical enough to make the

sensitive measurements necessary to detect the slight aberrational difference caused by the gravitational pull so that a valid conclusion could be drawn from them.

Assumptions are usually so self-evident that, many times, we consider it unnecessary to mention them; but, careful researchers do, so that those inspecting the research procedure may see every component and evaluate it accordingly. For the beginning researcher, it is better to be overexplicit than to take too much for granted.

7. Research requires the collection and interpretation of data in attempting to resolve the problem that initiated the research. Having now isolated the problem, divided it into appropriate subproblems, posited reasonable questions or hypotheses, and recognized the assumptions that are basic to the entire effort, the next step is to collect whatever data seem appropriate and to organize them in meaningful ways so that they can be interpreted.

In later chapters, I suggest appropriate methods of organizing and interpreting data. But the present discussion is intended to make you aware that simply because you have a collection of data, those data are not necessarily appropriate for interpretation.

Data, events, happenings, and observations are of themselves only data, events, happenings, and observations -- nothing more. But all these are potentially meaningful. The significance of the data depends on the way the human brain extracts meaning from those data. In research, data unprocessed by the human brain are worthless.

You will recall what some wit defined as an "education": notes that pass from the notebook of the instructor to the notebook of the student without going through the head of either. Research data can never travel on such an expeditious thruway! For, unless research data pass through the human mind and are processed there, they can never qualify as furthering the research process.

Data demand interpretation. But no rule, no formula, will lead the researcher unerringly to the correct interpretation. Interpretation is subjective: It depends entirely on the logical mind, inductive reasoning skill, and objectivity of the researcher.

Consider the library of books that have been written on the assassination of President John F. Kennedy. Different historians have studied the same events: One may interpret them one way, and another may arrive at an entirely different conclusion. Which one is right? Perhaps they both are; perhaps neither is. Both may have merely posed new problems for other historians to try to resolve. Different minds frequently see different meanings in the same set of facts. This is an axiom of interpretation that all researchers must recognize.

Once, we believed that clocks measured time and that yardsticks measured space. In one sense, they still do. We further assumed that time and space were two different entities. Then came relativity, and time and space became locked into one concept: the time-space continuum. What is the difference between the old concept and the new? The way we think about -- interpret -- the same information. The realities of time and space have not changed; the way we interpret them has.

Now, think of the way this chapter began. I outlined certain activities and indicated that none of them could be accurately called research. At this point, you can understand why. None of them demands that the researcher draw any conclusions or make any interpretation of the data.

8. Research is, by its nature, cyclical; or more exactly, helical. The research process follows a cycle and begins simply. It follows logical, developmental steps:

a. A questioning mind observes a particular situation and asks, Why? What caused that? How come? (This is the subjective origin of research.)

b. The answer to those questions becomes formally stated as a problem. (This is the overt beginning of research.)

c. Data are gathered that seem to bear on the problem.

d. The data seem to point to a tentative solution of the problem. A guess is made; a hypothesis or guiding question is formed.

e. The quest for more data continues.

f. The body of data is processed and interpreted.

g. A discovery is made; a conclusion is reached.

h. The tentative hypothesis is either supported by the data or is not supported; the question is partially / completely answered or not.

i. The cycle is complete.

The resolution of the problem or the tentative answer to the question completes the cycle. Such is the format of all research. Different academic disciplines merely use different routes to arrive at the same destination.

What seems like a neatly closed circle is, however, deceptive. Research is never conclusive. In a truer sense, the "circle of research" might be more accurately conceived of as a helix, or spiral, of research. In exploring an area, one comes across additional problems that need resolving. Research begets research.

To view research in this way is to invest it with a dynamic quality that is its true nature -- a far cry from the conventional view, which sees research as a one-time act -- static, self-contained, an end in itself. That is another difference between the so-called research examples with which this chapter opened and true research. Every researcher soon learns that genuine research creates more problems than it resolves. Such is the nature of the discovery of knowledge.

Research Methodology: A Summary

The core concept underlying all research is its methodology. It is not enough to follow the research procedures without an intimate understanding that research methodology directs the whole endeavor -- where critical decisions are made and where organizing, planning, and directing the whole project take place. The methodology controls the study, dictates the acquisition of the data, arranges them in logical relationships. sets up a means of refining the raw data, contrives an approach so that the meanings that lie below the surface of those data become manifest, and finally issues a conclusion or series of conclusions that lead to an expansion of knowledge. The entire process is a unified effort as well as an appreciation of its component parts. Thus, research methodology has two primary functions:

1. To control and dictate the acquisition of data
2. To corral the data after acquisition and extract meaningfulness from them

That's what I mean by the phrase "the interpretation of the data." It is a sudden, enlightening awareness of what the data mean. And, unless there is a discovery of the meaning of the data, there is no research.

DISCOVERING THE DISCIPLINE OF RESEARCH

I mentioned earlier in this chapter the apparent remoteness in popular thinking of the role and relevance of research and researcher from everyday living. Even graduate students working on theses or dissertations may feel a sense of isolation and consider their task mere academic busy- work that has no intimate relation to the world outside the campus precincts. This is simply not true. The research demanded in the production of an acceptable thesis or dissertation is one of the most valuable educational experiences a person can have. It has an immediate connection with the profound research activity in the practical world, which advances the welfare and comfort of all of us Great discoveries that push back the frontiers of knowledge and enhance our well-being are commonplace announcements in the contemporary media. To make the whole research process more intimate, it may help if you could see its benefits and realize that what you are doing is but a link in that ongoing endeavor.

If you are not aware of or acquainted with the "dedicated men and women who attempt to know the unknown and do the undoable" you can learn of the tremendous research activity that has been reported during the last year. The total of it staggers the imagination. To find this information look in the major indexes and reviews of some well-known volumes in the library or computerized references available on the library system.

A important skill of a researcher is the ability to review the work of others and to grasp what is being described. In some cases, this is quite easily accomplished; in others, it is more difficult. By acquiring the ability to evaluate others' work, you will begin to understand how your own work can be improved. I suggest that you begin to develop your evaluation skills by going to the library and finding several articles from the list of journals provided or from other journals that are relevant to your interests. As you read and study the articles, consider the following questions.

CHECKLIST:

Reflective Questions to Consider When Evaluating Research

Does the article have a stated research question or problem; that is, could you determine the focus of this author's work?
Is this an article that describes the collection of data, or does it describe other studies in which data were collected?
Was the article organized in a manner that was logical and easy too follow? What could have been done to improve its organization?

Did the article contain a section that outlined and reviewed studies that had previously been done on this topic? In what ways was this previous literature relevant?

If the author explained procedures that were followed in the study, were they clear enough that you could repeat the work and get similar results? What additional information would have been helpful or required?

If data were collected, could you describe how they were collected and how they were analyzed? Do you agree with what was done? What additional things would you have completed?

Do you agree with the interpretation of the results? Why or why not?

Finally, reflect over the entire article. What was most important to you? What did you find most interesting? What do you think are the strengths and weaknesses of this article? Will you remember this article in the future? Why or why not?

As you begin to evaluate selected articles by using these questions, it may be wise to consider three things. First, it is often helpful to keep a research journal, writing log, notebook, or annotated bibliography of these articles and your comments. Include the bibliographic information such as (a) author's name; (b) article title; (c) name of the journal, year, volume, number, month, and pages; and (d) keywords that capture the focus of the article. Even though you think that you will never forget this article and that you will always be able to recall where it was and what you got out of it, you will forget.

Second, whenever you review someone else's work, take time to consider how you can improve your own because of it. Ask yourself, What have I learned that I would (or would not) want to incorporate within my own research? Perhaps it is a specific type of writing strategy or a particular method of data analysis or a questioning technique. Constantly question and reflect on what is presented.

Finally, don't just read one or two articles and think that you are done. Get used to reading and evaluating; for a researcher, this is a lifelong pursuit. Always look for additional things you can learn.

FOR FURTHER READING

What Is Research?

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