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ALLAMA IQBAL OPEN UNIVERSITY ISLAMABAD

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SOURCES OF KNOWLEDGE

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SCIENCE AND THE SCIENTIFIC APPROACH

To understand any complex human activity we must grasp the language and approach of the individuals who pursue it. So it is with understanding science and scientific research. One must know and understand, at least in part, scientific language and the scientific approach to problem solving.

One of the most confusing things to the student of science is the special way the scientist uses ordinary words. To make matters worse, he invents new words. There are good reasons for this specialized use of language, which will become evident later. Suffice it to say now that we must understand and learn the language of psychological and educational scientists. When a psychological investigator tells us about his independent and dependent variables we must know what he means. When he tells us that he has randomized his experimental procedures, we must not only know what he means—we must understand why he does what he does.

Similarly, the scientist's approach to his problems must be clearly understood. It is not so much that this approach is different from the layman's. It is different, of course, but it is not strange and esoteric. Quite the contrary, When understood, it will seem natural and almost inevitable that the scientist does what he does Indeed, we will probably wonder why much more human thinking and problem-solving are not consciously structured along such lines.

The purpose of Part 1 of this book, then is to help the student learn and understand the language and approach of science and research. In the chapters of this part many of the basic constructs of the social and educational scientist will be studied. In some cases it will not be possible to give complete and satisfactory definitions because of lack of background at this early point in our development. In such cases we shall attempt to formulate and use reasonably accurate first approximations to later, more satisfactory definitions. Let us begin our study by considering how the scientist approaches his problems and how this approach differs from what might be called a commonsense approach.

Science and Common Sense

Whitehead has pointed out that in creative thought common sense is a bad master. "Its sole criterion for judgment is that the new ideas shall look like the old ones." [1] This is well said. Common sense may often be a bad master for the evaluation of knowledge. But how are science and common sense alike and how are they different? From one viewpoint, science and common sense are alike. This view would say that science is a systematic and controlled extension of common sense, since common sense as Conant points out, is a series of concepts and conceptual schemes satisfactory for the practical uses of mankind[2]. But these concepts and conceptual schemes may be seriously misleading in modern science--and particularly in psychology and education. It was self-evident to many educators of the last century—it was only common sense—to use punishment as a basic tool of pedagogy. Now we have evidence that this older, commonsense view of motivation may be quite erroneous. Regard seems more effective than punishment in aiding learning.

Science and common sense differ sharply in five ways. These disagreements revolve around the words "systematic" and "'controlled." First, the uses of conceptual schemes and theoretical structures are strikingly different while the man in the street uses

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1 A. Whitehead an introduction to Mathematics. New York: Holt, Rinehart and Winston. 1911. p. 157.

2 J. Conant. Science and Common Sense. New Haven: Yale University Press, 1951. pp. 32-33. A concept is a word that expresses an abstraction formed by generalization from particulars. "Aggression" is a concept, an abstraction that expresses a number of particular actions having the similar characteristic of hurting people or objects, A conceptual scheme is a set of concepts interrelated by hypothetical and theoretical propositions, (See ibid; pp, 25, 47—48.) A construct is a concept with the additional meaning of having been created or appropriated for special scientific purposes. "Mass.", "energy.", "hostility." "introversion." and "Achievement." are constructs. They might more accurately be called "constructed types" or "constructed classes" classes or sets of objects or events hound together by the possession of common characteristics defined by the scientist The term " variable"' will be defined in a later chapter. For now let in mean a symbol or name of characteristic that takes on different numerical values.

"theories" and concepts; he ordinarily does so in a loose fashion. He often blandly accepts fanciful explanations of natural and human phenomena. An illness, for instance, may be thought to be a punishment for sinfulness. An economic depression may be attributed to Jews. The scientist, on the other hand, systematically builds his theoretical structures test them for internal consistency, and subjects aspects of them to empirical test. Furthermore, he realizes that the concepts he is using are man made terms that may or may not exhibit a close relation to reality.

Second, the scientist systematically and empirically tests his theories and hypotheses. The man in the street test his "hypotheses," too, but he tests them in what might be called a selective fashion. He often "selects" evidence simply because it is consistent with his hypothesis. Take the stereotype: Blacks are musical. If a person believes this, he can easily "verify" his belief by noting that many blacks are musicians. Exceptions to the stereotype, the unmusical or tone-deaf black, for example, are not perceived. The sophisticated social scientist, knowing this "selection tendency" to be a common psychological phenomenon, carefully guards his research against his own preconceptions and predilections and against selective support of his hypotheses. For one thing, he is not content with armchair exploration of a relation; he must lest the relation in the laboratory or in the field. He is not content, for example, with the presumed relations between methods of teaching an achievement, between intelligence and creativity, between values and administrative decisions. He insists upon systematic, controlled, and empirical testing of these relations.

A third difference lies in the notion of control. In scientific research, control means several things. For the present let it mean that the scientist tries systematically to role out variables that are possible "causes" of the effects he is studying other than the variables that he has hypothesized to be the "causes." The layman seldom bothers to control his explanations of observed phenomena in a systematic manner. He ordinarily makes little effort to control extraneous sources oil influence. He tends to accept those explanations that are in accord with his preconceptions and biases. If he believes that slum conditions produce delinquency, he will tend to disregard delinquency in no slum neighborhoods. The scientist, on the other hand, seeks out and "controls" delinquency incidence in different kinds of neighborhoods. The difference, of course, is profound,

Another difference between science and common sense is perhaps not so sharp. It was said earlier that the scientist is constantly preoccupied with relations among phenomena. So is the layman who invokes common sense for his explanations of phenomena. But the scientist consciously and systematically pursues relations. The layman's preoccupation with relations is loose, unsystematic, uncontrolled. He often seizes, for example, on the fortuitous occurrence of two phenomena and immediately links them indissolubly as cause and effect.

Take the relation tested in a study by Hurlock.[3] In more recent terminology, this relation might be expressed: Positive reinforcement (reward) produces greater increments of learning than does negative reinforcement (punishment) or no reinforcement. The relation is between reinforcement (or reward and punishment) and learning. Educators and parents of the nineteenth century often assumed that negative reinforcement (punishment) was the more effective agent in Seaming. Educators and parents of the present often assume that positive reinforcement (reward) is more effective. Both may say that their viewpoints are "only common sense." It is obvious, they may say, that if you reward (or punish) a child he will learn better the scientist, on the other hand, while he may personally espouse one or the other or neither of these viewpoints, would probably insist on systematic and controlled testing of both (and other) relations, as Hurlock did.

A final difference between common sense and science lies in different explanations of observed, phenomena. The scientist, when attempting to explain the relations among observed phenomena, carefully rules out what have been called "metaphysical explanations." A metaphysical explanation is simply a proposition that cannot be tested. To say, for example, that people are poor and

[3] E. Hurlock, "An Evaluation of Certain Incentives Used in Schoolwork." Journal of Educational Psychology, XVI (1925). 145-159.

starving because God wills it, that studying hard subjects improves the child's moral character, or that it is wrong to be authoritarian in the classroom is to talk metaphysically.

None of these propositions can be tested; thus they are metaphysical. As such, science is not concerned with them. This does not mean that a scientist would necessarily spurn such statements, rule them out of life, say they are not true, or claim they are meaningless. It simply means that as a scientist he is not concerned with them. In short, science is concerned with things that can be publicly observed and tested. If propositions or questions do not contain implications for such public observation and testing, they are not scientific questions.

Four Methods of Knowing

Charles Pierce, the great American philosopher, said that there are four general ways of knowing or, as he put it, of fixing belief[4]. The first is the method of tenacity. Here men hold firmly to the truth, the truth that they know to be true because they hold firmly to it, because they have always known it to be true. Frequent repetition of such "truths" seems to enhance their validity. Recent psychological evidence has shown us that men will often cling to their beliefs in the face of clearly conflicting facts. And they will also infer "new" knowledge from propositions that may be false.

A second method of knowing or fixing belief is the method of authority. This is the method of established belief. If the Bible says it, it is so. If a noted physicist says there is a God, it is so. If an idea has the weight of tradition and public sanction behind it, it is so. As Peirce points out, this method is superior to the method of tenacity, because human progress, although slow, can be achieved using the method. Actually, life could not go on without the method of authority. We must take a large body of facts and information on the basis of authority. Thus, it should not be concluded that the method

[4] J. Buhler. ed. Philosophical Writings of Pierce. New York: Dover. 1955. Chap.2. In the ensuing discussion. I am taking some liberties with Peirce’s original formulation in an attempt to clarify the ideas and to make them more germane to the present work. For a good discussion of the four methods, sec M. Cohen and E. Nagel. An Introduction to Logic and Scientific Method. New York: Harcourt. 1934. pp. 193-196.

of authority is unsound; it is only unsound under certain circumstances.

The a *priori method* is the third way of knowing or fixing belief. (Cohen and Nagel call it the *method of intuition.*) It rests its case for superiority on the assum0ption that the propositions accepted by the "a priorist" are self-evident. Note that a priori propositions "agree with reason" and not necessarily with experience. The idea seems to be that men, by free communication and intercourse, can reach the truth because their natural inclinations tend toward truth the difficulty with this rationalistic position lies in the expression "agree with reason," Whose reason? Suppose two good men, using rational processes, reach different conclusions, as they often do. Which one is right? Is it a matter of taste, as Peirce puts it? If something is self-evident to many men—for instance, that learning hard subjects trains the mind and builds moral character, that American education is inferior to Russian and European education, that women are poor drivers—does this mean it is so? According to the a priori method, it does—it just "stands to reason."

The fourth method is the method of science. Peirce says:

> To satisfy our doubts.... therefore, it is necessary that a method should be found[5] by which our beliefs might be determined by nothing human, but by some external permanency—by something upon which our thinking has no effect.... The method must be such that the ultimate conclusion of every man shall be the same. Such is the method of science. Its fundamental hypothesis... is this: There are real things, whose characters are entirely independent of our opinions about them….

The scientific approach[6] has one characteristic that no other method of attaining knowledge has: self-correction. There are built in checks all along the way to scientific knowledge. These checks are so conceived and used that they control and verify the scientist's activities and conclusions to the end of attaining dependable

[5] Buchler, op cit. p.18.

[6] This book's position is that there is no one scientific method as such. Rather, there are a number of methods that scientists can and do use, but it can probably be validity said that there is one scientific approach.

knowledge outside himself. Even if a hypothesis seems to be supported in an experiment, the scientist will test alternative hypotheses that, if also supported, may cast doubt on the first hypothesis. A scientist does not accept a statement as true, even though the evidence at first looks promising. He insists upon testing it. He also insists that any testing procedure be open to public inspection.

As Peirce says, the checks used in scientific research are anchored as much as possible in reality lying outside the scientist and his personal beliefs, perceptions, biases, values, attitudes, and emotions. Perhaps the best single word to express this is objectivity. But, as we shall see later, the scientific approach involves more than this. The point is that more dependable knowledge is attained through science because science ultimately appeals to evidence: propositions are subjected to empirical test. An objection may be raised: Theory, which the scientist uses and exalts, is part of man himself. But, as Polanyi points out, "A theory is something other than myself"[7] thus a theory helps the scientist to attain greater objectivity. In short, scientists systematically and consciously use the self-corrective aspect of the scientific approach.

Science and its Functions

What is science? This question is not easy to answer. Indeed, no definition of science will be directly attempted. We shall, instead, talk about notions and views of science and then try to explain the functions of science.

Science is a badly misunderstood word. There seem to be three popular stereotypes that impede understanding of scientific activity. One is the white coat-stethoscope-laboratory stereotype. The scientist is perceived as a peculiar person who works with facts in laboratories. He uses complicated equipment, does innumerable experiments, and piles up facts for the ultimate purpose of improving the lot of mankind. Thus, while he is somewhat of an unimaginative grubber after facts, he is redeemed by his noble motives. And you can believe him when, for example, he tells you that such and such toothpaste is good for you or that you should not smoke cigarettes.

[7] M.Polanyi, Personal Knowledge Chicago: University of Chicago Press, 1958, p.4.

The second stereotype of the scientist is that he is a ‘brilliant' individual who thinks, spins complex theories, and generally spends his time in the ivory tower aloof from the world and its problems. This scientist is a rather impractical theorist, even though his thinking and theory occasionally lead to results of practical significance like atomic bombs.

The third stereotype equates science with engineering and technology. The building of bridges, the improvement of automobiles and missiles, the automation of industry, the invention of teaching machines, and the like are thought to be science. The scientist's job in this conception, is to work at the improvement of man's inventions and artifacts. The scientist himself is conceived to be a sort of highly skilled engineer working to make life smooth and efficient.

These notions impede student understanding of science, the activities and thinking of the scientist, and scientific research in general. In short, they make the student's task harder than it would otherwise be. Thus they should be cleared away to make room for more adequate notions.

In the scientific world itself there are two broad views of science: the static and the dynamic.[8] The static view the view that seems to influence most laymen and students, is that science is an activity that contributes systematized information to the world. The scientist's job is to discover new facts and to add them to the already existing body of information. In short, science is even conceived to be a body of facts. Science, in this view, is also a way of explaining observed phenomena. The emphasis, then, is on the present stale of knowledge and adding to it, on the extent of knowledge, and on the present set of laws, theories, hypotheses, and principles.

The dynamic view, on the other hand, regards science more as an activity, what scientists do. The present slate of knowledge is important, of course. But it is important mainly because it is a base for further scientific theory and research. This has been called a heuristic view. The word "heuristic," meaning serving to discover or

[8] Conant. Op. cit., pp. 23-27.

reveal, now has the notion of self-discovery connected with it. A heuristic method of teaching, for instance, emphasizes students discovering things for themselves. The heuristic view in science emphasizes theory and interconnected conceptual schemata that are fruitful for further research. A heuristic emphasis is a discovery emphasis.

Deobold B. Van Dalen, (1973)	**Understanding Educational Research,** 3rd ed. New York, McGraw-Hill Book Company, pp, 1-9	1-2

METHODS OF ACQUIRING KNOWLEDGE

1

Knowledge, broadly speaking, consists of facts and theories that enable one to understand phenomena and to solve problems. The pragmatic test of knowledge and one's command of it is: Can I use this information to comprehend, explain, control, predict, or cope with a given situation? Knowledge can range from the simplest perception of an object to the most profound understanding of a complex theory. Knowledge can be obtained from direct personal experience or from the many secondhand sources that inundate us constantly with rival claims of useful information.

Knowledge claims on any level of complexity or from any source may range from those that are highly reliable to those that are completely unreliable. The flickering motion pictures recorded on our consciousness may trick us into making inaccurate observations of phenomena. The secondhand authority upon whom we rely for information may not know what he is talking about. To be certified as reliable, knowledge must pass successfully certain tests: it must be supported by evidence. What evidence is required? How much evidence is required? At what point does man really know he knows? The degree of reliability required of knowledge depends on the use that is to be made of it.

Scientists have developed exacting methods of observation and specific criteria for validating facts and theories. Moreover, they have not merely discovered knowledge, presented supporting evidence, and stored it forevermore in a knowledge warehouse. Our scientists' work is never done. The discovery of new evidence, the imaginative reordering of old evidence, and the intellectual insights of gifted men all these illuminate new, unified patterns of meaning. These patterns, in turn, give broader and deeper understandings of phenomena, understandings that repeatedly upset the knowledge warehouse. Acquiring reliable knowledge is not a one-shot, finished business; it is a complex, challenging, continuous adventure.

We are all somewhat scientific in nature; we are creatures capable of knowing and have a desire to test our capacity. We are also notoriously inconsistent. On the one hand, we are curious, exploratory animals who want to understand our environment and to solve problems; on the other hand, we are lazy creatures of habit who seek personal comfort and social approval. In many instances, acting without accurate knowledge does not deeply disturb us. We accept alleged knowledge without testing it settle for ad hoc solutions, improvise something that works in the immediate situation even though in the long run the consequences may be undesirable. Indeed, we may not only refrain from exerting the self-discipline to obtain reliable knowledge ourselves but also may ruthlessly repress others who construct theories or develop inventions that would make us change our behavior or beliefs. The adventure of coping with new ideas and adopting new life-styles may excite us or frighten us. Not uncommonly, we fear change. We fear that it may adversely affect our economic or social status, may require us to reeducate ourselves, or may force us to alter our customary lie patterns. We feel safer sticking with the status quo. The acquisition and expansion of reliable knowledge is not an automatic, self-perpetuating process. It rests on our willingness to develop critical thinking skills and the moral fiber necessary to accept change as a constant.

Centuries of effort were required for our predecessors to improve their capacity and readiness to obtain reliable knowledge. To gain some insight into the tortuous pathway they traversed, the following discussion briefly examines various sources of knowledge they have drawn upon to solve problems: (1) authority, (2) personal experience, (3) deductive reasoning, and (4) the scientific method.

Methods of Acquiring Knowledge

When his habitual method of dealing with situations produced discouraging results, man resorted to crude trial-and-error methods of seeking solutions. Through considerable experience with problem solving, he was gradually able to refine his knowledge-seeking methods. Periods of complacency and retardation periodically halted cultural progress, but exciting leaps forward also occurred, and the long term trend was characterized by an extension of knowledge.

Authority

Seeking advice from an authority was a well-established method of solving problems even in the earliest civilizations. Pre-literate man appealed to the medicine man to relieve him of pain and plied the tribal chieftain with questions about the elements. When floods, famine, lightning, or leprosy terrified him, he blindly accepted the ancestral explanations that his elders imparted, and he appealed to supernatural powers for help. Rather than attempting to determine truth independently, modern man may also seek advice from authorities. A trial lawyer may ask a psychiatrist to testify concerning the sanity of the defendant, a ballistics expert to give opinions concerning weapons, and a handwriting specialist to compare signatures. A housewife may consult a childcare book or a doctor concerning the spots on her son's chest. Turning to authorities to obtain knowledge often saves time and effort but care must be employed in choosing authorities and evaluating their pronouncements.

Tradition in many situations modern man does not evaluate the truth or falsity of his beliefs any more than his forefathers did. He unconsciously or unquestioningly accepts many traditions of his culture, such as the customary modes of dress, speech, food, worship, and etiquette. In the World of practical affairs this automatic acceptance of approved patterns of behavior is often necessary, for one cannot question all things. But one should not make the mistake of assuming that everything that has customarily been done is right or that an appeal to the accumulated wisdom of the ages will always lead to the truth.

Historical records reveal that man has not only solved many problems and accumulated much wisdom but has also formulated many erroneous explanations of phenomena. Many long-revered educational, medical, and scientific theories have been proved false. For instance, man once believed that children differed from adults only in size and dignity, that asafetida bags warded off disease, and that the planets revolved around the earth. Truth is not a guaranteed product of a popularity contest: a statement is not true merely because "everyone knows it" or "everybody has always believed it." Age, alone, is not sufficient to establish the truth or falsity of a belief.

Church, State, and Ancient Scholars Preliterate man turned to Tribal leaders when seeking knowledge. In medieval times, man believed that ancient scholars and churchmen had discovered the truth for all time and that their pronouncements could not be questioned. The Scholastics, for example, Accepted Aristotle's conjecture that women have more teeth than men as absolutely true, even though simple observation and enumeration would have provided evidence to the contrary. When invited by Galileo to view the newly discovered moons of Jupiter, one scholar refused to look through the telescope. He was convinced that the moons could not possibly be seen because Aristotle had not mentioned them in his discussions on astronomy. Like most scholars of that era, the man who declined Galileo's invitation clung blindly to faulty Grecian theories and attacked any new idea that contradicted the accepted authorities.

With the rise of strong secular states after the Middle Ages, man began to turn to kings, legislatures, and courts as sources of information. Today, many citizens also expect government officials to solve problems concerning agricultural surpluses, international trade, and labor-management difficulties. Some people appeal to the courts for interpretations on basic issues confronting them, such as the validity of Darwin's theory of natural selection, segregated school practices, and the use of prayers in public schools. From the earliest times to the present, man has sought guidance and information from his oracles, leaders, and rulers.

Man often prefers to rely on the judgment of outstanding authorities whose beliefs have withstood the test of time, because he fears that if he himself searched for answers to difficult questions he might make errors. But if modern man can make errors when searching for knowledge, his ancestors must have been subject to the same weakness. If tradition, the church, and the state are to be the source of all reliable information, what happens when these institutions render opinions that conflict with one another? The authorities in different churches and states do not always agree, and traditions of cultures vary. Man may encounter perplexing problems when he turns to the multiplicity of existing authorities in a search for answers to his questions. Ignoring the cultural accumulations of the centuries is imprudent, for little progress will occur if each generation rejects the judgment of the ages and starts from scratch to accumulate knowledge. On the other hand, refusing ever to question any accepted belief—total reliance on dogmatic authority—will result in social stagnation.

Expert Opinion When searching for knowledge, man sometimes seeks the testimony of experts who, because of their intellect, training, experience, or aptitudes, are better informed than other people. Experts are necessary in a complicated culture such as ours. An effort must be made, however, to find out whether the experts are recognized by other authorities in the field and whether they are in a position to know the facts about the particular problem under consideration. One should check not only the credentials of experts but also the arguments and evidence upon which they base their claims to knowledge. Accepting experts' opinions unconditionally and for all time is a dubious if not a dangerous practice.

Personal Experience

When confronted with a problem, man often tries to recall or to seek a personal experience that will help him reach a solution. When searching for food, ancient nomads probably remembered that certain berries always made them ill, that fish were more plentiful in some streams than others, and that grains ripened at particular times of the year. When trying to determine the quickest route to work, modern man may time himself on different roads. When deciding where to plant seeds, a gardener may try to remember in what part of the yard flowers grew best last year. When given a handful of coins to divide with his brother, a small boy may recall that selecting the biggest piece of candy on a plate is usually a wise choice; because of his previous experience with candy, he may decide to keep the big nickels and give his brother the little dimes.

Appealing to personal experiences is a useful and common method of seeking knowledge. An uncritical use of personal experience, however, may lead to incorrect conclusions as the boy who selected the nickels with his "candy measuring stick" discovered. A person may make errors when observing or when reporting what he has seem or done. He may (1) omit evidence that does not agree with his opinion, (2) use measuring instruments that require many subjective estimates, (3) establish a belief on insufficient evidence, (4) fail to observe significant factors relating to a specific situation, or (5) draw improper conclusions or inferences owing to personal prejudices. To avoid dangerous pitfalls, the modern research worker exercises many precautions when he turns to experience in his search for reliable knowledge.

Deduction

To obtain more reliable knowledge, Aristotle developed the syllogism a deductive argument which provides a means of testing the validity of a particular conclusion. A syllogism consists of three statements or propositions. The first two statements are called "premises," since they furnish the evidence or grounds for the conclusion, which is the statement standing last. Aristotle defined the syllogism as "a discourse in which certain things being posited, something else than what is posited necessarily follows from them." The following categorical syllogism is an example of such a discourse:

(Major premise)	All mammals are mortal. (middle) M (major) P	If all M are P, and
(Minor premise)	All men are mammals (minor) S (middle) M	All S are M then
(Conclusion)	All men are mortal. (minor) S (major) P	All S are P.

A valid syllogism contains terms referring to three and only three classes[1] of things. In the above argument the classes are mortals, mammals, and men. Each statement in the categorical syllogism contains two terms. Each term appears twice in the syllogism. The subject term S of the conclusion (men), which is called the "minor term," also appears in the minor premise. (See above.) The predicate term P of the conclusion (mortal), which is known as the "major term," is also found in the major premise. The third or middle term M (mammals) occurs once in each premise and does not appear in the conclusion. The function of the middle term is to establish the relationship between the minor term arid major term, which is asserted in the conclusion.

In the argument above, "mammals" is the middle term or mediating factor which brings the minor term "men" in the conclusion into the asserted relation with the major term "mortal." The function of the middle term will become clearer if you examine Figure 1.1 as you read the following review of the argument. If the class of mammals M is included in the large class of mortals P as the major premise stipulates, and the class of men S is included in the class of mammals M as the minor premise stipulates, then it follows, logically that the class of men S is included in the class of mortals P. Thus, this argument is valid, for the premises are related to the conclusion in such a way that the conclusion must be true if the premises are true. If a person accepts the premises, he must agree to the conclusion that follows, because the conclusion merely states explicitly or reformulates information which is already implicit in the premises.

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1 A logical class is a collection of particulars - things, persons, qualities- which are all alike in some defining respect. Consequently, one can infer with confidence knowledge about members of the class room knowledge of the class. Whatever can be asserted or denied of a whole class can be asserted or denied of any member of that class.

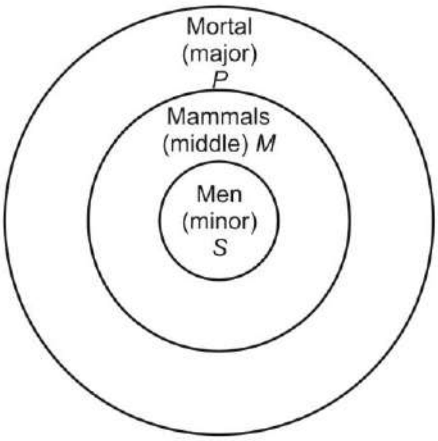

Figure 1.1 a schematic representation of a valid argument.

Categorical syllogisms may be cast in various forms. The position of the terms M. P, and S may be ordered in four different ways in the premises. These four forms are known as figures of the syllogism.

M-P	P-M	M-P	P-M
S-M	S-M	M-S	M-S
S-P	S-P	S-P	S-P

The nature of the categorical statements in a syllogism may also vary. The four types of categorical statements are (1) universal affirmative (example: All students are white), (2) universal negative (example: No students are white), (3) particular affirmative (example: Some students are white), and (4) particular negative (example: Some students are not white). A categorical syllogism may contain any three of these four types of statements in various combinations. By varying the types of statements used in the four figures, one can state arguments in 256 forms, but most of them are invalid. From two negative premises or from two particular premises, for example, no conclusion can be inferred.

A syllogism does not have to be composed exclusively of categorical statements. As the examples below reveal, arguments may involve hypothetical, alternative, and disjunctive propositions.

Hypothetical.

If the school is on fire, the children are in danger.
The school is on fire.
Therefore, the children are in danger.

Alternative.

Either I will get a passing mark on this test, or I will flunk the course.
I will not get a passing mark on this test.
Therefore, I will flunk the course.

Disjunctive.

It is not the case that it is both a rainy day and a good day to present the school pageant outdoors.
It is a rainy day.
Therefore, it is not a good day to present the school pageant outdoors.

As you note in the examples, each syllogism is labeled according to the type of proposition occurring in the major premise. Each type of syllogism is used in different stages of assurance concerning knowledge. Let us examine when the various types of syllogisms are used.

Categorical propositions represent a certain settled stage of our knowledge, and conclusions validly drawn from categorical syllogisms are unconditional. Hypothetical or conditional propositions, however, represent an unsettled stage in thinking and knowing. Hypothetical thinking proceeds on various levels, from the solution of simple problems of daily life, and the detection of crime, to the technique of identification and classification in science, and the search after scientific laws by means of the statement and testing of hypotheses. Likewise alternative arguments represent an unsettled state of knowledge, but within limits; the alternative often being quite well within the possibility of progressive elimination or verification. The disjunctive syllogism is a combination of knowledge and ignorance, like the alternative, but is an advance upon the alternative in the direction of more definite knowledge, and reaches a conclusion by means of what is known and can be asserted in the minor premise [1 20:1 14-1 15].[2]

In personal and professional life, you use deductive reasoning when solving problems. The lawyer, doctor, soldier, and detective often resort to deductive argument in investigating a murder case, a prosecuting attorney may search through piles of evidence—existing knowledge select previously unconnected facts, and combine them in such a way that they logically imply a hitherto unsuspected conclusion. Deductive reasoning enables him to organize premises into patterns that provide conclusive evidence for the validity of his particular conclusion.

The modern research worker also utilizes deductive reasoning to carry out certain phases of his work. Some men scoff at the role of reason in research and contend that an investigator is only concerned with facts he can obtain through observation and experiment. But collecting facts is not sufficient. Without deduction "most of our preoccupation with facts would be fruitless, since we could not fit them into the increasingly deductive systems which we call sciences. The latter are man's must economical instruments" (86:113). The scientist frequently tries to pigeonhole a particular instance under an already established principle from which the instance can be deduced. Through the use of the tools of deduction, he hypothetically manipulates and explores possibilities that may open up new areas of inquiry.

In daily discourse many assertions are deductive in nature and may be logically correct without appearing in a syllogistic form. Outside of logic texts one rarely finds arguments set off in the middle of the page and explicitly labeled. The premises may or may not precede the conclusion, and some premises may be missing. The conclusion may come first, last, or even in the middle of the argument. One must be able to recognize arguments that appear in prose or discourse; locate the premises and conclusion; supply the missing premises, if necessary; restate the argument in a complete and explicit form; and then apply logical standards to determine whether the argument is logically correct or fallacious.

When analyzing a deductive argument, one must pay close

[2] Numbers in brackets refer to the numbers bibliography on pages 507-515.

attention to language. Words may have more than one meaning; consequently, language may play tricks that lead thinking astray. A syllogistic argument is not valid unless each term is used in the same sense throughout the argument. A shift in the meaning of any term leads to an error in reasoning. Examine the following syllogism:

- Only man can talk.
- No woman is a man.
- All women cannot talk.

The above argument would be valid if the term "man" had the same meaning in each premise, but in the major premise the term "man" means "human being," and in the minor premise it means "human male." Since the meaning of the middle term "man" has been changed during the course of the argument, there is no mediating term which links the two premises together so that they yield a logical conclusion.

The categorical syllogism has severe limitations. The content of the conclusion of the syllogism cannot exceed the content of the premises. A categorical syllogism deduces the consequences of preexisting knowledge; it does not enable man to gain new knowledge or to make new discoveries. A second weakness of deductive reasoning lies in the possibility that one or more of the premises are not materially true. When the validity of a deductive argument is checked, questions are not raised about the content (truth or falsity) of the statements but about the forms of the arguments. One asks: Are these premises related to the conclusion in such a way that a person cannot accept the premises and reject the conclusion? The formal reasoning in an argument may be sound even if the argument is based on false premises. Consider the following as an example:

Deobold B. Van Dalen,(1973)	**Understanding Educational Research,** 3rd ed. New York, McGraw-Hill Book Company, pp. 10-17	1-3

- All professors of education hold doctoral degrees.
- All men in this meeting are professors of education.
- Hence, all men in this meeting hold doctoral degrees.

The conclusion "All men in this meeting hold doctoral degrees" is valid, for it necessarily follows from the premises given. But the conclusion is not true in fact, for some professors in the meeting hold only masters' degrees. In this instance the major premise was not true in fact.

The conclusion reached by a deductive argument produces reliable knowledge only if it is deduced from true premises and the premises are properly related to the conclusion. Deductive logic, therefore, cannot be relied upon exclusively in searching for the truth, because it is not a self-sufficient means of securing dependable knowledge.

Induction

If the conclusions reached by deductive reasoning are true only if derived from true premises, man must find some way of determining whether his premises are true. Consequently, he has devised inductive reasoning to complement deductive reasoning as a means of searching for knowledge. In inductive reasoning, an investigator initiates his inquiry by observing particular instances (concrete facts). From his examination of these facts, he establishes a general conclusion about the whole class to which these particular instances belong. If an investigator arrives at general conclusions through induction he may use them as major premises .for deductive inferences.

Perfect Induction One form of induction is complete enumeration. In this form of induction, one simply counts all the instances in a given class and announces his results in a general conclusion. In other words, a conclusion about all instances of a class is drawn from premises, which refer to the observed instances of the class. For example; to determine the occupations of the members of a club, one questions each member, tabulates the results, and announces the conclusion. All twenty-five members of this club are teachers. Perfect induction obtains reliable information. But how often does one have an opportunity to examine all the instances to which a conclusion refers? This type of enumeration cannot be employed as a method of investigation in the solution of most Problems.

Baconian Induction Francis Bacon (1561-1626) severely criticized the medieval practice of deducing conclusions from self-evident or authoritative premises. He held that man should not enslave himself to other men's thoughts. Rather than accepting the premises (generalizations, theories) handed down by authorities as absolute truths, Bacon believed the investigator himself should study nature closely and establish general conclusions on the bases of direct observation.

The system Bacon recommended for arriving at generalizations was laborious. He advised the investigator to tabulate all the facts concerning nature and to study these facts for their "forms," that is, for the underlying essence of the phenomena. To accomplish this task, the investigator was to compile three tables:(1) positive instances—instances where certain phenomena appeared, (2) negative instances—instances where certain phenomena did not appear, and (3) instances where certain phenomena appeared in varying degrees and where the form varied accordingly. The purpose of the tables was to determine what properties were invariably connected with certain forms. Bacon cautioned against formulating any solution to a problem until all the facts had been gathered. His demand that the investigator first search for the facts was justified, but the exhaustive collection of facts he required was beyond the realm of human capacity.

Imperfect induction whereas perfect induction establishes a conclusion by an exhaustive enumeration of all instances that are subsumable under it, imperfect induction arrives at a generalization by observing only some instances that make up the class. The research worker utilizes imperfect induction more often than perfect induction, for in most investigations he cannot examine all of the instances to which a conclusion refers. From observing some instances, however, he can draw a general conclusion regarding all similar instances, some of which he has not observed.

When examining all the instances of a class under consideration is not practical, the investigator does the next best thing: he arrives at a generalization by observing an adequate and representative sample from the entire class. To check on the purity of the water in a swimming pool, for instance, a health officer may take a single sample of water, test it, and draw a conclusion about the purity of the water in the entire swimming pool. Perhaps on the same day his friend, a restaurant owner, purchases 500 steaks. To ascertain whether they are of choice quality without examining each steak, he selects at random a few steaks and finds hat they are choice grade. From his selective observations he draws the conclusion that all the steaks are probably of choice quality.

Drawing an inference about a whole class of things after sampling a few of its members does not necessarily yield absolutely certain knowledge. The size and representative ness of the instances observed determine whether one arrives at a sound conclusion. If the material observed is homogeneous, one or a few samples may be adequate for arriving at a reliable generalization. If the material is not homogeneous, the same number of samples probably will yield a less reliable generalization. The conclusion drawn from one sample of water, for example, may be more satisfactory than one drawn from several samples of steak. Previous knowledge of the composition of water gives the health officer greater assurance (that all the water in the pool is like the small sample) than his friend can expect from a larger number of instances taken from cattle of different breeds and environments.

Both deductive and inductive arguments have advantages and disadvantages. A deductive argument does not guarantee that the conclusion is true, but if the two premises are true, the deductive argument arrives at a conclusion that is necessarily true. The conclusion of the deductive argument, however, does not probe beyond that which is already known—already present, at least implicitly, in the premises. In an imperfect inductive argument, the conclusion does contain information that is not present, even implicitly, in one of the premises (the observed instances). This type of argument is absolutely necessary if man is to extend his knowledge. Through imperfect induction, however, an investigator merely arrives at conclusions of varying degrees of probability. If all the premises (observed instances) are true, the conclusion is probably but not necessarily true. The possibility always exists that some unexamined instance of the class does not agree with the conclusion. To summarize, the inductive argument expands the content of the premises at the expense of achieving absolutely certain knowledge; the deductive argument arrives at absolutely certain knowledge (if the premises are true) by sacrificing any expansion of the content (116:15).

Modern Method of Acquiring Knowledge

About the seventeenth century, man developed a new method of acquiring knowledge and as a result gave birth to the modem scientific movement. Francis Bacon planted the seeds of the scientific method when he attacked the deductive method of reaching conclusions on the basis of authoritative premises, and he recommended reaching general conclusions on the basis of observed facts. As was previously noted, Bacon's method of gathering random facts produced masses of unwieldy information. To construct a more practical method of attaining reliable knowledge, such men as Newton, Galileo, and their successors eventually combined the inductive and the deductive thought processes. This synthesis of reason and observation produced the modern scientific method of research.

Steps in the Scientific Method:

In the scientific method, purposeful fact gathering replaces unsystematic fact gathering, and premises are tested probabilities rather than assumed truths. When using the scientific method, man shuttles back and forth between deduction and induction; he engages in reflective thinking. In 1910, John Dewey in how we think analyzed the stages of activity involved in the act of reflective thinking. The fallowing discussion distinguishes five stages in the act of problem solving:

1. A felt difficulty.

Man encounters some obstacle, experience, or problem that puzzles him.

a. He lacks the means to get to the end desired.

b. He has difficulty in identifying the character of an object.

c. He cannot explain an unexpected event.

2. **Location and dominion difficulty.**

Man makes observations—gathers facts—that enable him to define his difficulty more precisely.

3. **Suggested solutions of the problem—hypotheses.**

From his preliminary study of the facts man makes intelligent guesses about possible solutions of the problem. The conjectural statements—generalizations he offers to explain the facts that are causing the difficulty are called hypotheses.

4. **Deductively reasoning out the consequences of the suggested solutions.**

Man deductively reasons that if each hypothesis is true, certain consequences should follow.

5. **Testing the hypotheses by action.**

Man tests each hypothesis by searching for observable evidence that will confirm whether or not the consequences that should follow actually occur. By this process, he finds out which hypothesis is in harmony with observable facts and thus offers the most reliable solution to his problem.

These steps in the act of reflective thinking reveal how induction and deduction serve as opposing blades of the scientific shears that cut out segments of truth. "Induction provides the groundwork for hypotheses, and deduction explores the logical consequences of the hypotheses, in order to eliminate those that are inconsistent with the facts, while induction again contributes to the verification of the remaining hypothesis" (120:4). The research worker continually shifts among collecting facts; making generalizations (hypotheses) to explain facts; deducing the consequences of his hypotheses; and seeking additional facts to test the hypotheses. By employing both induction and deduction, he is able to arrive at reliable knowledge.

The scientific method of thinking presented above gives an insight into the procedures that are involved in conducting an investigation. Listing these steps separately and distinctly, however, may give an in accurate impression of the research process. These steps do not provide a rigid pattern into which a scientist must force his thinking, for thinking simply cannot be scheduled. Investigators rarely follow a prescribed sequence of procedures. Research is often a confused, floundering process rather than a logical, orderly one. An investigator does not tackle one step at a time, complete that process, and then move on to the next step. He may tackle the steps out of order, shuffle back and forth between steps, or work on two steps more or less simultaneously. Some steps may requite little effort; other steps may absorb a disproportionate amount of time and effort. When the investigator reports his findings to the scientific community, however, he structures his presentation in a precise and logically arranged form which closely parallels the steps of the scientific method listed above.

Illustration of the Scientific Method

The five steps or processes in reflective thinking will be discussed in greater detail in later chapters. For the time being, the following homely illustration may give you a better insight into the scientific method of securing knowledge.

A man returns from his vacation and discovers that his garden is destroyed (felt difficulty-step 1). He examines the garden and finds a twisted fence, flattened flowers, and uprooted stakes (concrete facts that enable him to define the precise nature of the difficulty—step 2). While searching for an explanation of these facts, he considers whether the neighbors' children may have deliberately destroyed the garden (hypothesis or generalization explaining the facts-step 3). His hypothesis goes beyond existing knowledge, for he did not see the children perform the act. He also thinks of a second hypothesis, which may explain the facts—a bad storm may have wrecked the garden. Consequently, he suspends judgment and searches for proof.

By deduction, the man reasons out the consequences of his first hypothesis (step 4): If the children wrecked the garden, they had to be at home during the time he was on his vacation. To test his hypothesis (step 5), he questions the neighbors and learns that the children were away at camp while he was on vacation. Thus, he must reject his first hypothesis, for it is not in harmony with the verifiable facts. He then reasons out deductively the consequences of his second hypothesis (step 4); if a severe storm destroyed the garden, it probably wrecked other nearby gardens. To test this hypothesis (step 5), he observes other gardens and finds they have also been destroyed. He checks in newspapers and finds an account of a storm, which destroyed many gardens in his section of the city. A neighbor tells him he watched the hail and wind uproot the garden. The man concludes that his second hypothesis is a reasonable explanation of the facts.

Thus, by reflective thinking man moves from particular facts to general statements of explanation about these facts and from his general statements of explanation to a search for facts that will support them. He continues to shuttle between inductive and deductive approaches to the problem until he establishes a defensible explanation of the facts. Research workers follow procedures similar to those of the garden owner, but they carry them out in a more systematic manner.

Applicability of the Scientific Method

The scientific method is a tool that investigators use to solve diverse types of problems. A worker engaged in pure research uses this method to ferret out new knowledge about the mysteries of the universe. A worker engaged in applied research uses it to develop a new product that will improve some existing condition. As J. R. Angell, a former president of Yale University, pointed out, "The objects of research in pure science and the motives inspiring the work may be appreciably different from those encountered in the field of applied science. But the technique of the procedure in the two cases may be all but indistinguishable" (4:27). The scientific method provides a key to advances in both pure and applied research.

Progress Made in Acquiring Knowledge

Man has made considerable progress in developing better methods of seeking knowledge through the ages and, in so doing, has learned to approach the unknown with greater humility. Man once believed that he possessed a store of absolutely reliable knowledge that enabled him to give authoritative answers to questions. The modern research worker is less dogmatic, for he knows that the revolutionary advances made by science within the past century have overthrown some long-standing theories. His awareness of the tentative, evolutionary status of knowledge makes him more willing to challenge accepted theories when he becomes suspicious about their validity. After carrying out an investigation, he makes no claim that his conclusions are infallible; rather, he invites others to confirm, modify, or refute them. If his hypothesis is found to be incompatible with reliable evidence produced in later experiments, he knows that the scientific community will abandon or alter it. A modern researcher is cognizant of the notorious fallibility of knowledge. He exposes his ideas to critical examination, because he knows that only through testing, rechecking, and refining our concepts concerning the nature of phenomena will uncertainty be reduced and knowledge become cumulative.

The scientific method does not lead to absolute certainties, but Cohen and Nagel point out that this method of obtaining knowledge is more reliable than some methods that claim they do.

The other methods ... are all inflexible, that is, none of them can admit that it will lead us into error. Hence, none of them can make provision for correcting its own results. What is called scientific method differs radically from these by encouraging and developing the utmost possible doubt, so that what is left after such doubt is always supported by the best available evidence. As new evidence or new doubts arise, it is the essence of scientific method to incorporate them—to make them an integral part of the body of knowledge so far attained. Its method, then, makes science progressive because it is never too certain about its results [31:195].

The scientific method is a powerful and practical torchlight for man to use in lighting the way to the discovery of new knowledge. Searching for knowledge in this manner is a slow process, but the tentative solutions to problems that are found may be accepted with greater confidence than definitive answers that are based on arbitrary assumptions and pontifical pronouncements, which preclude any further investigation.

Despite the improvements man has made in searching for knowledge, he has not yet arrived at a perfect method for seeking answers to his questions. Authority, experience, and both inductive and deductive reasoning have certain limitations as research tools. The scientific method has proved to be an especially useful means of reeking knowledge in the natural sciences, and it has also helped educators to probe into problems. But the scientific method is not a suitable instrument for seeking answers to certain types of questions. James B. Conant declares that "only an occasional brave man will be found nowadays to claim that the so-called scientific method is applicable to the solution of almost all the problems of daily life in the modern world" (33:10). The many lively debates that appear in scholarly periodicals reveal that authorities have not reached a common agreement concerning the breadth of the applicability of the scientific method.

Some critics contend that the scientific method cannot be used except in the natural sciences. Others question whether the scientific method follows a single method of investigation. They believe that no rigid set of logical rules can be established for physical scientists, archaeologists, mathematicians, psychologists, sociologists, educators, and historians to follow in their respective undertakings. These critics argue that since sciences differ from one another, each science requires a different method. When questioned about the existence of a general scientific method, other scholars note the numerous common features in scientific inquiries conducted in different fields and suggest that.

On a highly conceptual level science may be considered a general method. When scientists study specific problems, however, this general method is modified in numerous ways, and many of these adaptations are of sufficient importance and sufficiently general in nature to be considered methods within themselves. Science, then, is a very general method, modified in various ways into many less general methods that are utilized in the study of specific problems [17:5].

Controversy exists concerning the nature and use of the scientific method, but most scholars regard this intellectual tool as one of the most promising instruments that man possesses for pushing back the frontiers of human understanding and increasing the accumulation of tested and verified knowledge. Thus, you will want to become better acquainted with this disciplined and scholarly method of investigation.

UNIT—2

INTRODUCTION TO EDUCATIONAL RESEARCH

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RESEARCH—AN INTRODUCTION

Before we discuss the implications and importance of research, it is desirable that we try to understand its meanings.

Dictionaries describe it as careful search or inquiry, endeavor to discover new ideas by scientific study—a course of critical investigation.

Research is such a vast and multi-dimensional concept that ordinary definitions cannot project its meanings completely. Various definitions given by experts in the subject are being reproduced below in order to obtain a better understanding of its meanings.

Research is endless quest for knowledge or unending search for truth. It brings to light new knowledge or corrects previous errors and misconceptions and adds in an orderly way to the existing body of knowledge. The knowledge obtained by research is scientific and objective and is a matter of rational understanding, common verification and experience.

It is a deliberate effort to collect information, to sift it, to analyze it, to put it together and to evaluate it. It works with a high degree of organization on a rather well-defined problem and pursues it hopefully to a successful conclusion. It is a careful search for solutions to the problems that plague and puzzle the mankind.

P.M. Cook—Research is an honest, exhaustive, intelligent searching for facts and their meanings or implications with reference to a given problem. It is the process of arriving at dependable solutions to problems through the planned and systematic collection, analysis and interpretation of data. The best research is that which is reliable, verifiable and exhaustive so that it provides information in which we have confidence.

J.W. Best. Research is considered to be the more formal, systematic, intensive process of carrying on the scientific method of analysis. It involves a more systematic structure of investigation usually resulting in some sort of formal record of procedures and a report of results or conclusions.

C.C. Crawford—Research is a systematic and refined technique of thinking, employing specialized tools, instruments and procedures in order to obtain a more adequate solution of a problem than would be possible under ordinary means. It starts with a problem, collects data or facts, analyses them critically and reaches decisions based on the actual evidence.

Travers—Educational research is that activity which is directed towards development of a science of behavior in educational institutions. The ultimate aim of such a science is to provide knowledge that will permit the educator to achieve his goals by the most effective methods.

J. Francis Rummel—Research is an endeavor to discover, develop and verify knowledge. It is an intellectual process that has developed over hundreds of years, ever changing in purpose and form and always searching for truth.

Clifford Woody—Research is a careful inquiry or examination in seeking facts or principles, a diligent investigation to ascertain something.

R.M. Hutchins—Research in the sense of the development, elaboration and refinement of principles together with the collection and use of empirical materials to aid in these processes, is one of the highest activities of a university and one in which all its professors should be engaged.

Rusk—Research is a point of view, an attitude of inquiry or a frame of mind. It asks questions which have hitherto not been asked and it seeks to answer them by following a fairly definite procedure. It is not a mere theorizing, but rather an attempt to elicit facts and to face them once they have been assembled.

Research is likewise not an attempt to bolster up preconceived opinions, and it implies a readiness to accept the conclusions to which an inquiry leads, no matter how unwelcome they may prove.

When successful, research adds to the scientific knowledge of the subject.

George G. Mouly—The systematic and scholarly application of the scientific method, interpreted in its broadest sense, to the solution of educational problems; conversely, any systematic study designed to promote the development of education as a science can be considered educational research.

W.S. Monroe—Research maybe defined as a method of studying problems whose solutions are to be desired partly or wholly from facts. The facts dealt with in research may be statements of opinions, historical facts, those contained in records and reports, the results of tests, answers to questionnaires, experimental data of any sort, and so forth. The final purpose of educational research is to ascertain principles and develop procedures for use in the field of education; therefore, it should conclude by formulating principles or procedures. The mere collection and tabulation of facts is not enough, though it may be preliminary to it or even a part there of.

KNOWLEDGE AND RESEARCH

Human knowledge works at two levels. At the primary level it functions as the basis of useful human activities, as when a teacher solves mathematical problems for the students or as when a doctor uses his knowledge to cure diseases. At the secondary level, knowledge is employed to obtain increments in the existing knowledge. The activity that produces this new knowledge is known as research. All research is an advance on existing frontiers of knowledge. It takes us beyond the frontiers of present knowledge. Both breaking fresh ground and improving existing knowledge are the proper functions of research.

Research adds to the existing knowledge in an orderly way. This orderliness is to be particularly emphasized. Mere aimless and confused groping for new knowledge does not stands for research.

The knowledge, which accrues from research, is verified and is verifiable by anybody who may like to do so. The process by which it has been derived is replicable i.e. it can be repeated and the stated results confirmed. It is objective and capable of 'third party' verification.

RESEARCH AND PROGRESS

Research has proved to be an essential and powerful tool in leading man towards progress. Without systematic research, and its application, there would have been very little progress.

"The secret of our cultural development has been research, pushing back the areas of ignorance by discovering new truths, which, in turn, lead to better ways of doing things and better products".

All significant research leads to progress in one field of life or the other. Every, other day new ways of doing things enter into our lives. All of these and many more are the fruits and rewards of our research effort. Research shows us the way in our difficulties. It opens new avenues and provides to us better alternatives. The gifts of research are exceedingly evident in the form of cures for diseases considered earlier as incurable, machines capable to replace man, green revolution, taming of rivers, sophisticated methods and techniques for every profession, scientific understanding of human behavior, knowledge explosion and so on.

John, Best and James V.Kahn (1992)	**Research in Educational**, 6th ed. New Delhi, Prentice Hall of India (Pvt) Ltd. pp. 17-20	2-2

WHAT IS RESEARCH?

How is research related to scientific method? The terms research and scientific method are sometimes used synonymously in educational discussions. Although it is true that the terms have some common elements of meaning a distinction is helpful.

For the purposes of this discussion, research is considered to be the more formal, systematic, and intensive process of carrying on a scientific method of analysis. Scientific method in problem solving may be an informal application of problem identification, hypothesis formulation observation, analysis, and conclusion. You could reach a conclusion why your car wouldn't start or why a fire occurred in an unoccupied house by employing a scientific method, but the processes involved probably would not be as structured as those of research. Research is a more systematic activity that is directed toward discovery and the development of an organized body of knowledge. Research may be defined as the systematic and objective and recording of controlled observation that may lead to the development of generalization principles or theories resulting in prediction and possibility ultimate control of events.

Because definitions of this sort are rather abstract, a summary of some of the characteristics of research may help no clarify its spirit and meaning.

1. Research is directed toward the solution of a problem. The ultimate goal is to discover cause-and-effect relationships between variables, though researchers often have to settle for the useful discovery of a systematic relationship because the evidence for a cause-and-effect relationship is insufficient.
2. Research emphasizes the development of generalizations, principles or theories that will be helpful in predicting future occurrences. Research usually goes beyond the specific objects, groups, or situations investigated and infers

characteristics of a target population from the sample observed. Research is more than information retrieval, the simple gathering of information. Although many school research departments gather and tabulate statistical information that may be useful in decision-making, these activities are not properly termed research.

3. Research is based upon observable experience or empirical evidence. Certain interesting questions do not lend themselves to research procedures because they cannot be observed. Research rejects revelation and dogma as methods of establishing knowledge and accepts only what can be verified by observation.

4. Research demands accurate observation and description. Researchers use quantitative measuring devices, the most precise form of description. When this is not possible or appropriate, they use qualitative or non-quantitative descriptions of their observations. They select or devise valid data-gathering procedures and, when feasible, employ mechanical electronic, or psychometric devices to refine observation description, and analysis of data.

5. Research involves gathering new data from primary or firsthand sources or using existing data for a new purpose. Teachers frequently assign a so-called research project that involves writing a paper dealing with the life of a prominent person. The students are expected to read a number of encyclopedias, books, or periodical references and to synthesize the information in a written report. This is not research, for the data are not new. Merely reorganizing or restating what is already known and has already been written, valuable as it maybe as a learning experience, is not research. It adds nothing to what is known.

6. Although research activity may at times be somewhat random and unsystematic, it is more often characterized by carefully designed procedures that apply rigorous analysis. Although trial and error are often involved, research is rarely a blind, shotgun investigation or an experiment just to see what

happens.

7. Research requires expertise. The researcher knows what is already known about the problem and how others have investigated it. He or she has searched the related literature carefully and is also thoroughly grounded in the terminology, concepts, and technical skills necessary to understand and analyze the data gathered.

8. Research strives to be objective and logical, applying every possible test to validate the procedures employed, the data collected, and the conclusions reached. The researcher attempts to eliminate personal bias. There is no attempt to persuade or to prove an emotionally held conviction. The emphasis is on testing rather than on proving the hypothesis. Although absolute objectivity is as elusive as pure righteousness, the researcher tries to suppress bias and emotion in his or her analysis.

9. Research involves the quest for answers to unsolved problems. Pushing back the frontiers of ignorance is its goal, and originality is frequently the quality of a good research project. However, previous important studies are deliberately repeated, using identical or similar procedures, with different subjects, different settings, and at a different time. This process is replication, a fusion of the words repetition and duplication. Replication is always desirable to confirm or to raise questions about the conclusions of a previous study.

10. Research is characterized by patient and unhurried activity. It is rarely spectacular, and researchers must expect disappointment and discouragement as they pursue the answers to difficult questions.

~~1.~~11. Research is carefully recorded and reported. Each important term is defined, limiting factors are recognized, procedures are described in detail, references are carefully documented, results are objectively recorded, and conclusions are presented with scholarly caution and restraint. The written report and accompanying data are made available to the scrutiny of associates or other scholars. Any competent scholar will have the information necessary to analyze, evaluate, and even replicate the study.

12. Research sometimes requires courage. The history of science reveals that many important discoveries were made in spite of the opposition of political and religious authorities. The Polish scientist Copernicus (1473—1543) was condemned by church authorities when he announced his conclusion concerning the nature of the solar system. His theory, in direct conflict with the older Ptolemaic theory, held that the sun, not the earth, was the center of the solar system. Copernicus angered supporters of prevailing religious dogma, who viewed his theory as a denial of the story of creation as described in the book of Genesis. Modern researchers in such fields as genetics, sexual behavior, and even business practices have aroused violent criticism from those whose personal convictions; experiences, or observations were in conflict with some of the research conclusions.

The rigorous standards of scientific research are apparent from an examination of these characteristics. The research worker should be a scholarly, imaginative person of the highest integrity, who is willing to spend long hours painstakingly seeking truth. However, it must be recognized that researchers are human beings. The ideals that have been listed are probably never completely realized. Like righteousness, they are goals to strive for and are not all achieved by every researcher.

Many people have a superficial concept of research, picturing research workers as strange introverted individuals who, shunning the company of their fellows, find refuge in their laboratory. There, surrounded by test tubes, retorts, beakers, and other gadgets, they carry on their mysterious activities. In reality the picture is quite different. Research is not all mysterious, and it is carried on by thousands of quite normal individuals, more often in teams than alone, very often in the factory, the school, or the community, as well as in the laboratory. Its importance is attested to by the tremendous amounts of time, manpower, and money spent on research by industry, universities, government agencies, and the; professions. The key to the cultural development of the Western world has been research, the reduction of areas of ignorance by discovering new truths, which in turn lead to better predictions, better ways of doing things, and new and better products. We recognize the fruits of research; better consumer products, better ways of preventing and treating disease, better ways of understanding the behavior of individuals and groups, and a better understanding of the world in which we live. In the field of education, we identify research with a better understanding of the individual and a better understanding of the teaching-learning process and the conditions under which it is most successfully carried on.

PURPOSES OF RESEARCH

Fundamental or Basic Research

To this point we have described research in its more formal aspects. Research has drawn its pattern and spirit from the physical sciences and has represented a rigorous, structured type of analysis. We have presented the goal of research as the development of theories by the discovery of broad generalizations or principles. We have employed careful sampling procedures in order to extend the findings beyond the group or situation studied. So far, our discussion has shown little concern for the application of the findings to actual problems in areas considered to be the concern of people.

S.P.S. Sukhia P.V.Mehroa R.N. Mehroa (1991)	**Elements of Educational Research,** 3rd ed. New Delhi, Allied Publishers Limited pp. 1-6**.**	**2-3**

CHAPTER ONE

RESEARCH IN EDUCATION: SIGNIFICANCE, NEED AND CHARACTERISTICS

Research and progress. Significance of and need for research in education. Educational research and scientific research their common characteristics. Special characteristics of educational research. Summing up.

Research has proved to be an essential and powerful tool in leading man towards progress. Their would have been very little progress, as we find it today, without systematic research.

> “The secret of our cultural development has been research, pushing back the areas of ignorance by discovering new truths, which, in turn, lead to better ways of doing things and better products."[1]

> "Research is a power of suspending judgment with patience, of meditating with pleasures, of asserting with caution, of correcting with readiness and of arranging thought with scrupulous pain. — Francis Bacon

All significant research leads to progress in some field of life or the other. Each year new products, new facts, new concepts and new ways of doing things come into our lives due to ever-increasing significant research in the physical, the biological, as well as the social and the psychological fields. Research activity is no longer confined to the science laboratory. Even as the manufacturers, the agricultural experts and the archaeologists carry on research in their respective spheres so also, the sociologists, anthropologists, economists and the educationists.

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[1] John W. Best. Research in Education, U.S.A; Prentice-Hall Inc.. Englewood Cliffs, 1959, p. 9.

The goal of all research is progress and good life. In so far as good education is recognized as the basis of adequate individual and social development, need for research, in education to improve educational practices and policies are being realized increasingly. The educationists are constantly searching for more effective methods of instruction, more satisfactory techniques of evaluation, richer learning materials, more comfortable physical facilities, more efficient systems of administrative organization, and so on. This search is assuming greater urgency because of the very rapid expansion and democratization of education throughout the world during the last few decades. Since the right of every individual to full development through education has been recognized everywhere, every country is aiming at providing universal education to its people in the shortest possible time. As a result a number of new educational problems, never imagined hitherto, have arisen, and many old problems in various educational fields have become more complicated and acute. For a successful solution of the multitude of old and new problems, and for a full realization of the educational aims set up during the present times, it is realized that research work, adequate both in quantity and quality, should be carried out by properly trained research workers. The abstract quoted below brings home very effectively this very fact.

Article 26 (i) of the Universal Declaration of Human Rights states:

> "Every one has the right to education. Education shall be free at least in the elementary and fundamental stages. Elementary education shall be compulsory, technical and professional education shall be made generally available and high education shall be equally accessible to all on the basis of men.
>
> "To realize this goal, the nations of the world will have greatly to expand their educational efforts; more facilities must be provided; more teachers must be trained; new curricula must be developed; and new teaching materials must be provided. It is inconceivable that this can be done efficiently, or indeed that it can be ever done at all, without detailed guidance from the facts collected and the principles established through educational

research."[2]

No amount of learning by trial and error, no amount of experience gathered through actual practices and no amount of wisdom collected in the form of casual observations, traditions or recommendations of groups of individuals can ever promise such rapid progress and improvement in education as is required all over the world today. Decisions based on systematic research in education would surely save time, money, energy and a lot of failure and frustration, and show us the path of progress.

"In many of its recommendations, the International Conference on Public Education has stressed the need for psycho-educational knowledge of the child as the starting point for any educational activity. It has also shown that research formed an indispensable basis for any national organization of education, especially as regards curricula, syllabuses and methods as well as for financing education, for its planning, and for the building of schools."[3]

Thus, it is not difficult to show that research in education is extremely necessary and very worthwhile. But to the question—'what is educational research and what are its characteristics?' there may not be one agreed answer. It might be helpful to acquaint ourselves with some of the accepted connotations of the term educational research.

> "Research is considered to be the more formal, systematic, intensive process of carrying on the scientific method of analysis. It involves a more systematic structure of investigation, usually resulting in some sort of formal record of procedures and a report of results or conclusions."[4]

> "Educational research is that activity which is directed towards development of a science of behavior in educational situations. The ultimate aim of such a science is to provide knowledge that will permit the educator to achieve his goals by the most effective

2 Report of the First International Conference on Educational Research. Educational Studies and Documents, No. XX.:Paris, UNESCO, 1956. p. 16.

3 International Bureau of Education: The Organization of Educational Research, Unesco, Paris, Publication No. 228, I966, p. xix.

4 J. W. Best, op. cit., p. 6.

methods."[5]

"At least one general definition of research would be that which refers to the activity of collecting information in-an orderly and systematic fashion. Research is literally speaking a kind of human behavior, an activity in which people engage. In education, teachers, administrators, scholars, or others engage in educational research when they systematically assemble information's about schools, school children, the social matrix in which a school system is determined, the characteristics of the learner or the interaction between the school and the pupils."[6]

"By educational research is meant here the whole of the efforts carried out by public or private bodies in order to improve educational methods and educational activity in general, whether involving scientific research at a high level or more modest experiments concerning the school system and educational methods."[7]

Definitions and interpretations of educational research, however, variously worded like the above, do all agree in their implication that educational research involves an application of' the main principles of scientific research to the solution of educational problems. As such, much of what is considered educational research would be classified as 'development, demonstration or operations research' since it "works day in and day out to help the teacher or principals or agencies in authority over school system."[8]

Education, like Medicine, is an applied science. So research in Education, like research in Medicine, is mostly applied research.

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5 Robert M. W. Travers. An Introduction to Educational Research, New York: Macmillan and Co. Ltd, 1958. p. 5.

6 Francis G. Cornell, Report of the First International Conference on Educational Research, op. cit, p, 29.

7 Paul F. Lazarsfeld and Sam D. Sieber, Organizing Educational Research. Englewood Cliffs, Prentice-Hal! Inc., 1964. p. 112

8 LOC. cit. Cf. "Better education means better development and formulation of Instructional aims better motivation of pupils, Better teaching methods, better evaluation and better supervision and administration. These are all activities or operations "—Stephen M. Curey. "Some thoughts about educational research". Education and psychology Review. VoL I. No. 1, 1961

"The primary function of research in education as in medicine—is to find improvements for education or medicine both to be understood as fields of human actions, not as fields of knowledge."[9]

But, educational research may be basic too. It is basic or fundamental when it is not concerned so much with day-to-day matters and specific phenomena and problems as with the solution of fundamental problems, and when it results in broad generalizations or principles and theories of education. Discovery of such useful concepts as those of motivation, reinforcement, concept formation and social environment in learning are a result of fundamental (or 'backroom' research) educational research.

A very significant trend in educational research in the recent years has been the involvement of practitioners of education in research work. Traditionally, it has been considered that educational research is the province of the well-trained research expert. It has been believed that those who are expected to practice or apply the research findings cannot be expected to be sufficiently objective. But, now the approach of action research emphasize; encouraging the practitioner—schoolteachers, administrators and others—to do research in order to improve him or herself. The objective of the research by teachers, for example, will be to improve classroom practices.

"A useful definition of action research is the research a person conducts in order to enable him to achieve his purposes more effectively. A teacher conducts action research to improve his own teaching. A school administrator conducts action research to improve his administrative behavior,"[10]

A good teacher normally takes decisions about his work on the basis of tradition, or recommendation of experts, or experience of others, or his own experience guided by common-sense. Action research is a step ahead of the commonsense approach. The

9 Eric Hylla, Report of the First International Conference on Educational Research, op. cit., p. 32,

10 S.M Corey, Research in Education, New Delhi. National Council of Educational Research and Training, 1962.

difference between the two is mainly of degree of refinement and discipline in the various steps for taking a decision. In action research, the teacher is deliberately more scientific and careful in diagnosing the problem, in collecting facts, in designing hypotheses in experiments with tentative practices and actions, and in evaluating results of the actions taken. At every stage, however, he tries to keep the experimental approach towards problem-solving in close touch with reality.

Action research may be individual or co-operative. When many people are concerned about a problem, or when the experiment is likely to affect many people, the- research could directly involve all these people. It then becomes co-operative action research.

It is a well-known fact that much of the research work done by professional students of educational research is not noticed by the workers in the actual field of education. Even when some research is fully reported and is in point, not many consciously benefit by it. The advantages of action research vis-à-vis improvement in educational practices are very many.

> "He (the practitioner) does not read about these practices, he engages in them. And he learns what he does, placing an exaggerated value on what may happen as a consequence of publishing traditional research studies of educational problems in one of the occupational diseases of pedagogues, who are strongly disposed to over-estimate the extent to which reading will change behaviour."[11]

There are many high-level educationists who lament this current concentration of interest in the practical problems. They worry that even in those rare instances where a research worker succeeds in resisting the allurements of applied research, it is found that ultimately utilitarian consideration infiltrate the high-level investigations and pollute the spirit of pure research. According to this school of thought, the willful neglect of research in pure theory:

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11 S. M. Corey, Action Research to Improve School Practices, New York: Teachers College, Columbia University, 1953.

".. is symptomatic of the pragmatic drive that compels the present day world to seek and obtain quick results in every field of human endeavor irrespective of their intrinsic value. These drives are the hall-mark of the technician and the technologists, and not of the creative thinker[12]

12 P S Naidu. An unpublished paper presented at a Seminar of Research Students. Agra. 1963.

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RESEARCH IN EDUCATION

Educational field has a large number of problems at various levels. They can engage both the highly trained professional research student and the ordinary practitioner in both the basic and the applied investigate
tins. Educational research may be looked at in two ways, viz. according to the objects that are investigated and according to our aims. There are two important classes of objects studied by educational researchers:

1. Individuals, e.g., pupils, teachers, researchers; administrators;
2. Organizations, e.g., class-room, school; society; state. There are two important aims of research involved in studying these objects:

1. Improving services.

~~1.~~2. Increasing knowledge.

The process of action research has the following aspects:

1. Self-dissatisfaction: The researcher is dissatisfied and perturbed with the way things are happening in his field of work.
2. Confidence: Yet, he has the confidence that improvement can be brought about.
3. Specifies the dissatisfaction: He is then able to pinpoint the problems, which are causing his dissatisfaction.
4. Defines the problem: This then enables him to define his problems.
5. Diagnosis: He then locates the weaknesses, which cause the problem.
6. Search for more promising practice.
7. Design the testing of the hypothesis. Based on(1).
8. The action hypothesis.

Thus, as a result of research, there may be an improvement in teaching, administration or human relations, or an increase in comparative, developmental, historical knowledge and its philosophical, sociological or psychological foundations.

"Among the advantages claimed for action research as a method of bringing about change are these:

a. The person who must improve if the problem is to be solved is active in the change process from the beginning.
b. Facts and evidence are stressed, which keep the change process anchored more continuously to reality.
c. The approach is experimental and tentative rather than dogmatic.
d. An integral part of action research is 'the experiment' which actually is change-evaluated.

~~a.~~e. Action research emphasizes a desirable decentralization of decision making and action."[13]

Whether educational research be of the basic or the applied type, it shares some of the main characteristics of scientific research. They may be analyzed as below:

1. Research is highly purposive. It deals with problems to be solved.
~~1.~~2. Research is expert, systematic and accurate investigation. Data are gathered, recorded and analyzed with as complete accuracy as possible.
3. Research usually involves, as a step, a hypothesis or a set of hypotheses concerning the explanation of a phenomenon or the solution of a problem.
~~2.~~4. Research collects facts, i.e. gathers new knowledge or data from primary or first hand sources. .
~~3.~~5. Research is logical and objective. The data gathered and procedures employed are verified at each step. Emphasis is always on testing rather than proving the hypothesis through close observation and/or accurate experiment.

13 NCERT. Research in Education, New Delhi. 1962, p. 84.

~~4.~~6. Research endeavors to organize data in quantitative terms as far as possible, and to express them in numerical measures. Even otherwise, research is carefully recorded and reported. Every term is carefully defined; all procedures are described in detail; all limiting factors are fully recognized; all references are carefully documented and all results are objectively recorded.

~~5.~~7. Research places emphasis upon the discovery of general principles and scientific generalizations that can be applied to the solution of a wide range of problems.

~~6.~~8. Research is patient and unhurried and required great courage and persistence. The researcher is willing to follow his procedure to conclusions that may be unpopular and may bring social disapproval. The research worker must be not only a scholarly and imaginative person but also of the highest integrity, willing to spend long hours, painstakingly, in search of truth and must have courage to express his findings without being influenced by any extraneous considerations.

The rigorous standards of scientific research are evident from an examination of the above characteristics. Educational research, however, cannot always be viewed as strictly scientific, i.e. empirical, inductive and exact. Educational Research acquires, because of the nature of the material handled, a few special features characteristic of all systematic, social and mental studies. They may be analyzed as below:

1. A sound philosophy of education must form the basis of evaluating any principles and activities of educational research. By reason of the social nature of education, most of the problems are highly complex and its philosophical nature demands that in the solution we must reckon with ultimate values.[14]
2. Educational research deals with the problems of motivation

[14] Robert R. Rusk, Research in Education: An Introduction. London: University of London Press Ltd., 1962. p. 86. Cf. Ibid.: p. 93 "...in the application of scientific procedure to education a sound philosophy—as well as sound commonsense —must be invoked to save the scientific procedure from itself.

and ethics which admit of varied interpretations and assumptions on the part of the investigator as well as the subjects. The educational researcher, therefore, needs imagination and insight as much as a scientific attitude of mind."[15]

3. The educational arena is inter-disciplinary and an educational problem can require the characteristic of several disciplines—Psychology, Sociology, History, Economics, Anthropology and Political Science, etc.
~~2.~~4. Much of educational research which deals with historical, philosophical or comparative data involves a good deal of subjective interpretation and deductive reasoning.[16]
5. Social or behavioral sciences like Sociology, Economics and Psychology have not achieved the degree of specification possible in the physical sciences. The method of interview, for example commonly employed by these sciences still combines art and science.
6. Almost all problems of educators are sociological problems. Social problems present an increasingly large range of variables and a multitude of causes brings about a certain result. Difficulties of manipulating and controlling all the variables outside the laboratory put limits on the exactness and precision of results arrived at in Social or Psychological experimentation.
7. Most educational experiments do not require very costly

15 C.f ibid ,pp_ 99.100 "The problems of education are 'telic'—the realization of ends which are the products of creative imagination and the verification in practice of experiments that have not been tried before. The strictly scientific attitude obscures these issues . Education by its reliance on research must never fail to realize that in addition to its practical practitioners and skilled investigators, it stands in need of men and women of imaginative insight, who look beyond the present and behold the vision splendid if the vision should fade in to the light of common day not only will the people perish, but research itself will become a sterile futility."

16 Cf. ERIC Hylla. "The Nature and Functions of Educational Research" Report of the first International Conference on Educational Research, Op. cit.p,13.
The sciences of mind commonly use methods of description explanation, interpretation, sympathetic or intuitive understanding—methods which are mainly speculative and deductive in character and which rarely furnish results that can be subjected to measurement or mathematical procedures".

apparatus, but (a) paper and pencil (b) human material—children, (c) some mathematical equipment—knowledge of elementary Statistics, (d) library facilities and (e) facilities for publishing research papers.

~~3.~~8. Educational research is not the field of the specialist only. "Any teacher with common sense, intelligence and insight can undertake research in a problem. In the beginning such workers may require some guidance and training but this can be made easily available to them at the hand of experts."[17]

The significance and characteristics of educational research, as discussed above, can be easily summed up in the following words of C. N. Patwardhan:

"Progress depending on experience, it is rightly observed, is accidental and slow, whereas research seeks to settle the question here and now and avails itself of experiment rather than experience. Moreover, research further analyses 'experience' and tries to synthesize 'tradition' and abstract forms like 'good teaching', 'creative activity', etc., in a scientific process, the contents and results of which can be used verified and accepted or corrected, if necessary, by others."[18]

In the words of Principal Lahiri,

"Research economics effort, prevents wastages, increases efficiency and reacts vitalize and dignify the work of the teacher."[19]

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[17] V. V. Xamat, "Can a Teacher Do Research ?", Teaching. Vol. XXX, No. 1, Sept, 1947, pp. 3-8

[18] C. N.Patwardhan, "Educational Research—The Principles and Procedures", Progress of Education. Vol. XXIX. No 2, p. 55.
Cf. Madhuri Shah, "Improving Instruction by Research—A Challenge", Teaching Vol. XXX, No 1.
"Reach is a word which frightens a lot of people. It need not. As a matter of fact it is essentially a. state of mind—a friendly, welcoming attitude towards change. Research for practical people such as teachers, headmasters and supervisors should arise out of a desire to do things better. It should help them to narrow down the proverbial gap between and practice in education."

[19] J. Lahiri, "Research Experiments in Education in India", Educational India, Vol. XXV. No. 5, Nov. 1957, p. 150.
Cf., Madhuri Shah, "According to Buckingham, research will (1) powerfully and

Undoubtedly, significant educational research must, by its very nature develop a faith in new methods, result in improved educational practices; provide" a vision for a better future and promote policies and plans that shall lead to progress.

It may be underlined that a research without a strong base of clear-cut theory does not lead to any sound results. Systematic knowledge has to be based on broad foundations; otherwise, the insights of education are limited to narrow specific settings. A sound "theory increases the fruit fullness of research by providing significant leads for inquiry, by relating seemingly discrete findings by means of similar underlying processes, by providing an explanation of observed relationships. The more research is directed by systematic theory the more likely are its results to contribute directly to the development and further organization of knowledge.[20]

> "The relation of theory and research is one of mutual contribution. Theory can point to areas in which research is likely to be fruitful, can summarize the findings of a number of specific studies, and can provide a basis for explanation and prediction. Research findings, on the other hand, can test theories which have been worked out, can clarify theoretical concept and can suggest new theoretical formulations or extend old ones. Moreover, the process of reciprocal contributions is a continuing one; research stimulated by theoretical considerations may raise new theoretical issues, which in turn lead to further research and so on....
>
> To conduct research without theoretical interpretation or to theorize without research is to ignore the essential function of theory as a tool for achieving economy of thought."[21]

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rapidly develop the technique of teaching, (2) vitalize and dignify the work of the individual teacher. (3} develop professional expertness, open-eyed, open-minded scientific spirit of inquiry, and (4) create new interest and new confidence in his own abilities".

20 M. Zahoda, et. al., Research Method in Social Relations. Methuen & Co., London, Revised Edition. 1967 p. 491.

21 Ibid., p. 498.

Summary

1. Research is as indispensable for progress in education as it is for progress in any other field of life.
2. The need for research in education has increased with the changing ideas and the rapid expansion and democratization of education all over the world.
3. Educational research is the application of the principles and methods of scientific research for the solution of problems in the field of education.
4. Educational research is more often applied than fundamental. Involvement of the practitioner in what is known as action research has been emphasized for some time.
5. The characteristics of educational research common with those of scientific research are:

   i. It is highly purposive.
   ii. It is expert, systematic and accurate.
   iii. It involves the formulation and testing of hypotheses.
   iv. It gathers new knowledge or data.
   ~~iv.~~v. It is logical and objective.
   vi. It organizes data in quantitative terms and records and reports the studies carefully.
   vii. It emphasizes the discovery of general principles.
   viii. It is patient and unhurried and requires a man of integrity, Imagination and scholarship.

6. The characteristics of educational research common with those of social, behavioral and mental studies are:

   i. It reckons with ultimate values and ethics and needs a sound philosophy and commonsense.
   ii. It needs imagination and insight as much as a scientific attitude of mind.
   iii. It is interdisciplinary and requires the help of other sciences.
   iv. It uses speculative and deductive methods to a great extent.
   v. Its procedures are not absolutely exact.
   vi. The results are not precise due to the difficulty of controlling a wide range of variables.

vii. It doe not usually require costly apparatus.
viii. It is not the field of the specialist only.

7. Indian educationists have well realized and expressed the need and significance of educational research:

Question and Problems

1. Why is research in the field of education necessary? How does educational research help in the advancement of education? Illustrate your answer with examples.
2. "The mere reporting, defining, and stating amassing of facts, even in numerical form is in itself not educational research". (Eric Hylla). Elaborate upon this idea with reference to the functions and uses of educational research.
3. “Educational research should not be viewed only as scientific research which is empirical, inductive and exact." (Eric Hylla). Discuss this statement in the light of the special characteristics of educational research.
4. What do you understand by the term 'sciences of the human mind’? Would you consider educational research in the fields of the philosophy of education, the history of education, and comparative education more in the nature of scientific research or of search in 'the sciences of the human mind’? why?

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UNIT –3

CLASSIFICATION OF DUCATIONAL RESEARCH BY PURPOSE

Sr.No.	Contents	Page No.
3.1	J.C. Aggarwal (1991)	
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J. C. Aggarwal, (1991)	**Educational Research: An Introduction**; New Delhi, Arya Book Depot, pp. 25 – 37.	3-1

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Classification of Educational Research

Research is perhaps the only assurance we have that a discipline or a profession will not decay into meaningless scraps of dogmatic utterances.

BERNARD MEHL

Classification of Educational Research

Educational research may be classified under three categories; basic research', 'applied research' and 'action research'. It must, however, be remembered that there are no clear-cut lines that differentiate these types of research. Basic research has been primarily the activity of psychologists rather than educators. Most of the educational research is applied research. Action research, usually, is the domain of classroom teachers.

Basic or Fundamental Research Meaning

Meaning This is sometime also called 'pure research' or 'fundamental research'. It is aimed at the discovery of basic truth or principles and is not immediately concerned with direct field application. Basic research emphasizes control and precision and gives less attention to direct application of the result in a field situation. According to Travers, "Basic research is designed to add to an organized body of scientific knowledge and does not necessarily produce results of immediate practical value".

Laboratory approach—Basic research is usually carried out in the laboratory and a good deal of equipment and apparatus is needed to carry out experiments.

Researcher use animal subjects—As research workers are concerned with fundamental principles of behavior and research with animals permits a much higher level of control than is possible with human subjects; basic research uses animal rather than human subjects.

Research done by workers in other fields—A lot of basic research bearing implications on education has been done by workers in the other behavioral sciences such as sociology.

Applied Research

Meaning—Applied research or often called 'field research' is concerned primarily with establishing relationships and testing theories in the field setting and applying to other samples of the population from which the research subjects are taken. For example, a study of the friendship pattern of eighth class students is very valuable if the sample has been chosen in such a way that the results may be expected to apply reasonably well to other samples of the same population. Travers observes that applied research is undertaken to solve an immediate problem and the goal of adding to scientific knowledge is secondary.

Applied research sacrifices controls and precision to some extent as compared with fundamental research.

Basic and Applied Research

Meaning—In basic research, the researcher attempts to control a situation by the use of laboratory techniques or other techniques. In applied research, the researcher is engaged in conducting enquiries in the complicated psycho-sociological climate of on-going educational activities. There are a large number of variables in applied research which limit control and precision.

Applied research is of course, conducted in real situations which provide motivation to the researcher who is interested in the immediate solution of the problem. In basic research, motivation is intrinsic and the value of research is in its contribution to the advancement of knowledge.

Both the basic research as well as applied research is committed to the high standards of scientific objectivity and scholarship. In each type of research, the researcher tries to define the problem being studied with precision, derives his hypotheses from a rich background of information related to the problem, designs the study so that it results in a genuine test of hypothesis, collects and analyses facts or evidence carefully and attempts to draw generalizations objectively. However, the conditions under which the two researchers conduct their studies may differ as observed earlier if terms of the control and precision.

Action Research

Meaning—Action research sometimes called on-the-job research involves the application of the steps of the scientific method to class-room problems. Action research is similar to applied research in many ways. Applied research, usually involves a larger number of samples as compared with action research. In action research many research projects are carried out in a single classroom by a single teacher, while others may be carried on by all teachers in a school or even a school district.

According to Best, “Action Research is focused on the immediate application, not on the development of theory, nor upon general application." Action research places its emphasis on a problem, 'here and now'. It is applicable in local setting.

In the words of Jane Franseth of the U.S. office of education, "Action research is a systematic examination conducted by individuals or groups studying their own practices in search of sound answers to unresolved problems in their work and aimed at improving their own performance on their own jobs".

Corey says of action research, "One of the best ways to enable people to improve their curricular practices is to make it possible for them to study what they are doing to experiment with ideas that seem to be more promising and to get evidence to find out if they are better".

Action research is not mainly concerned in obtaining generalized scientific knowledge about educational problems but in obtaining specific knowledge concerning the subjects involved in the study.

Stephen M. Corey, a pioneer in the field describes action research as:

"Most of the study of what should be kept in the schools and what should go and what should be added must be done in hundreds and thousands of classrooms and thousands of communities. The studies must be undertaken by those who may have to change the way they do things as a result of the studies. Our schools cannot keep up with the life they are supposed to sustain and improve unless teachers, pupils, supervisors, administrators and school patrons continuously examine that they are doing. Single and in groups, they must use there imagination and creatively and constructively to identify the practices that must be changed to meet the needs and demands of modern life, courageously try out those practices that give better promise, and methodically gather evidence to test their worth.

This is the process I call action research. I hold no special brief for the name, but it has some currency and is sufficiently to descriptive."

Lehmann and Mehrens (1971) point out; "Action research is a type of applied or decision oriented research, but with the stipulation that the researcher is the same person as the practitioner who will make and live with the decision."

Practitioner and Action Research

In Action research in education, the researchers are usually teachers, curriculum workers, principals, supervisors or others whose main function is to help provide good learning experiences for pupils.

The fundamental point is that teachers, supervisors, and administrators would make better decisions and engaged in more effective practices if they, too, were able and willing to conduct research as a base for these decisions and practices. The process by which practitioners attempt to study their problems scientifically in order to guide, correct, and evaluate their decisions and actions is what a number of people have called action research.

A publication entitled 'Research in Education' publishes by National Institute of Basic Education stated as;

"Action research is the research a person conduct in order to enable him to achieve his purposes more effectively. A teacher conducts action research to improve his own teaching. A school administrator conducts action research to improve his administrative behaviour.

Action research represents and attempts to be more disciplined, more objective, more scientific. It results in a more careful problem diagnosis and more objective evaluation of the consequences of action. To the degree and action intended to solve a practical problem results from objective, disciplined inquiry into the problem and its causes, the problem is more apt actually to be solved. The customary commonsense approach leads to action but afterwards the problem is often still there. Action research is a procedure that tries to keep problem solving in close touch with reality at every stage."

Scope—The action research approach to dealing with practical problems seems to be appropriate and promising for all kinds of professional workers in education so long as their desire is to improve their own professional behavior. An administrator who is dissatisfied with his efforts to develop good morale in his staff could approach this problem with action research, for example. He would only do so, however, if he accepted some responsibility for the morale situation and was willing to effect some changes in his own behavior to improve it.

Characteristics of Action Research

i. It is focused on the immediate problem.
ii. It is applicable in a local setting.
iii. It aims at improving classroom and school practices.
iv. It aims at the improvement of professional efficiency.
v. It involves very little finances.
vi. The researcher and the practitioner is the one and the same person.

Advantages of Action Research

1. A person improves if he remains active in the process and

programme he is engaged in.

2. Action research emphasizes a desirable decentralization of decision making and action-taking.
3. Action research broadens and deepens the general as well as specific fund of knowledge of the worker.
4. Facts and evidences are stressed which keep the changed process anchored more continuously to reality.
5. Action research approach is experimental rather than dogmatic.
6. Action research helps the teacher acquire new interests, new motives and new insights.
7. One's own findings are willingly implemented and in this context, action research is very useful.
8. After having involved himself in action research, the teacher can play a better role in translating various research findings into action.
9. Action research has a great stimulating effect upon the teacher for finding better ways of doing things.
10. The entry of the teachers into the world of research will enable them to read reports or summaries of research findings more intelligently.
11. Action research introduces experimental outlook among teachers.
12. Action research enables the teacher to organize instructional procedures on a more reliable and sound bases.
13. Action research on the part of the teacher helps students acquire skill in problem-solving and scientific methods.

Limitations of Action Research

1. Action research is relatively of poor quality. According to Georg G. Mouly, "Action research can become a case of the blind leading the blind, and the problem is further aggravated by the fact that teachers generally are too close to their problems and too untrained in scientific objectivity to be vigorous and objective in their approach"
2. The applicability of the findings to another school or class in

the event of teacher transfer, is even questionable. Action research by and large, is a localized affair.

~~1.~~3. Action research is frequently added to the shoulders of already but busy teachers who have only limited freedom to say 'no'.

Action Research Design

The following steps may be followed in preparing an action research design:

1. ***Identification of problem area***—It is important to identify the problem area first. Some of the problem areas are: Teaching of different school subjects such as English, Hindi, Science, Mathematics, History, Geography, etc., Student Indiscipline, Human Relations; etc.
2. ***Selection of the problem***—When the problem area has been identified, the teacher differentiates a more specific (pin-pointed) problem for which he wants to do something. For example, in the area of 'Teaching of Hindi', the pinpointed problem may be 'Improving the Hindi Pronunciation of 5th Class Students'.
3. ***Problem analysis*—**Problem analysis is of great importance in action research. When the problem has been pin-pointed, probable causes should be outlined.
4. ***Action hypothesis*—**From the probable causes, those most relevant to the situation in the school where action research is to be conducted are selected from the action hypothesis.
5. ***The Experiment*—**data to be collected—After deciding upon an action hypothesis the teacher designs an experiment. At this stage, sources of data collection and the nature of data to be collected are explored.
6. ***Tools to be used***—The teacher decides about the research tools to be used.
7. ***Action programme***—The teacher works out the programme for conducting experiment.
8. ***Evaluation***—The teacher finds out the difference in the result.

Action Research and the Teacher

Generally people think that educational research is the job of specialists only. As the definition given in a previous chapter clearly shows that it is just an attitude of mind which is to be developed by all and not merely by the specialists. Such an attitude which may rightly be called a scientific attitude is needed not only by specialists but also by teachers.

Action research cay be easily taken up by a school teacher. The idea of 'Action Research' is to enable the teacher to tackle everyday problems that he faces in the classroom. It aims at developing in the teacher an attitude of inquiry rather than making him a research scientist. There is no theorizing here as in fundamental research. During the course of classroom teaching the teacher starts with certain expectations or aspirations. In actual practice when he finds that those are not fulfilled, he feels dissatisfied. This dissatisfaction leads him to take up action research. The teacher then rise to focus his attention on the problem and clearly apprehends it. Suppose, he finds that the children in his class do not have a good handwriting and he is eager to improve the handwriting of his children. First he finds out the causes of bad handwriting of the children. This may be designated as diagnosing the problem. Then the teacher carefully analyses the causes and tries to pick up those which he can remove. For example, he finds out that the following are the causes of bad handwriting:

i. The children do not have enough good specimens of hand-writing to copy.

ii. The children do not have comfortable seats; and

iii. They do not have proper pens to write.

He may now start his experiment. He evaluates the handwriting of some children before the start of the experiment. Then he provides good specimens of handwriting and good writing material to a group of children during their writing periods and again evaluates their handwriting after say three months. Then he makes a comparison of the results achieved in the improvement of the handwriting of the children experimented upon with those not subjected to the experiment. From this he draws his conclusion. This is an example of simple 'Action Research.'

All teachers can try out experiments of this type. The main point in "Action Research' is that the approach of the teacher is more careful, disciplined and objective rather than haphazard and slipshod.

This type of research i.e. 'Action Research' is necessary for all types of teachers. This will help them in achieving objectivity in their life and also enable them to grow professionally. The school will benefit from such programmes of 'Action Research', because they will go a long way in improving the existing school practices.

The purpose of action research is not only to improve school practices but also at the same time to improve those who are to improve the practices.

It is unrealistic to assume that every teacher can carry on a continuous programme of research. Not every one who is a good teacher wants to carry on a continuous research programme. What is important is that every teacher is sympathetic to the spirit of research.

Summer research programmes—There are a good many research programmes in which teachers may participate away from their schools. For most teachers these would be limited to summer programmes some of which provide good incentives. Many universities are in a position to provide space and supervision in the summer time for teachers and students from other schools without interfering with their own regular programme.

Limitations of the Teachers in Undertaking Research

1. Lack of background and formal preparation in the statistical and measurement procedures in education.

~~1.~~2. Certain limitations in time and/or ability to pursue studies that go beyond the confines of the classroom i.e. follow up studies.

~~2.~~3. Heavy teaching loads and extra-curricular responsibilities.

Assets of the Classroom Teachers

1. Their direct contact with the pupils and knowledge of their problems, their intellectual potential, their socio-economic development and the like.
2. Ability to record happenings in the classroom and put them in proper perspective as they affect the teaching-learning process.
3. Some capacity to manipulate the educational environment and observe the corresponding reactions of the pupils.

Need and Importance of Action Research in Indian Schools

The need and importance of action research in Indian Schools is being felt by all concerned to keep pace with latest developments in the field of education. A teacher while teaching his students comes across numerous problems. Sometimes he tries to tackle them with great patience and other times being in an angry mood, he scolds the students, turns them out of the class, gives punishment of one form or the other and still at some other times, he overlooks them. If the teachers are encouraged to come out with their problems and are provided necessary facilities in the form of guidance and help in conducting action research, they can solve their problems themselves with great satisfaction to themselves and consequently leading to their professional growth and development.

J. W. Best suggests, "If classroom teachers are to make an active research contribution, it will probably be in the area of action research. Studies will be made for the purpose of improving school practices. Many educational observers see in action research one of the most promising avenues of teacher growth, professional improvement and the development of better curriculum".

W. C. Radford discusses the functions of the school as; "What is the function of the school in educational research? Should it be doing research, and if so, are there any limits to it? I think that there is a limitation—what I call a geographical one. I do not believe we can expect a school, established to serve a particular community, to go beyond that community in its research. Each school is an entity with its own setting, and its own particular complex of factors affecting its operation. I believe that the school should be doing research but within that setting and on its own complex. Every aspect of the educational process is therefore study-learning experiences, pupil-teacher relationships, administration. Nothing inside the school is more important than what is going on within it. All, or almost all aspects of the process can be examined, studied, appraised and the conclusions drawn used to affect the process immediately."

Difference between Fundamental Research and Action Research

Area	Fundamental Research	Action Research
1.Objectives	Its purpose is to develop and test educational theories and to obtain principles that will be applicable to a broad population.	Knowledge obtained is intended to be applied in local setting and to provide a sort of in-service training to participating teachers and administrators.
2.Training	Expert training is needed in measurement, research methods and statistics.	Only a limited training is needed. Even if the research skills of a teacher are low, action research can be done under the guidance or assistance of a consultant.
3.Locating research problem	A wide range of methods is used to locate the research problem.	The participating teachers identify problems which hinder classroom teaching-learning process.
4. Involvement	The research worker is not usually involved in the problem he selects for research.	The teacher is invariably involved in the research problem.
5. Hypotheses	Highly specific hypotheses are developed.	Usually a specific statement of the problem serves as a hypothesis.
6. Review of the literature	AN exhaustive and thorough review of the literature is done to have a thorough understanding of the accumulated knowledge in the research area.	There is no need for such a thorough and intensive review. A glance at the review will serve the purpose of developing general understanding of the area.
7. Sampling	Research worker is required to obtain a random or otherwise unbiased sample of the population being studied.	Pupils studying in the doss of the teacher are used as subjects.
8.Experimental design	Careful attention is given to maintain comparable conditions and reducing error and bias.	Bias is usually present because participating teachers are ego-involved in the research situation. Procedures are planned only in general terms.
9.Analysis of data	Complex analysis is often called for.	Simple analysis procedures are usually sufficient.
10.Statistical treatment	Statistical significance is usually stressed.	Subjective opinion of participating teachers is often weighted heavily.
11.Application of results	Lack of coordination between research workers and teachers generate a serious practical problem. The generalizations usually remain confined to books and research reports.	Findings are applied immediately to the classes of participating teachers and lead to far-reaching improvements in the teaching-learning process.

The Cooperative Research Programme

Cooperation is essential to progress and achievement. This is as true in education as it is in industry or business.

The Cooperative Research Programme is representative of the new emphasis on educational research in the United States.

Public Law 531and its purpose—In recognition of the need for research in education and for federal funds to support such research, the Eighty-third Congress, Second Session, enacted Public Law 531 in 1954 which authorizes the Commissioner of Education "…to enter into contracts of jointly financed cooperative arrangements with universities, colleges and State educational agencies for the conduct of research, surveys, and demonstrations in the field of education.

The programmed aims at developing new knowledge about major problems in education and devising new applications of existing knowledge in solving such problems.

A substantial amount of the necessary financial support of project is provided by the office of education. The cooperating institution of agency also contributes to the total cost of a project, usually by providing personnel, professional services and facilities.

Complementary programme activities—The following activities complement the Basic research contracts of the Cooperative Research Programme:

1. Individual Research Development Contracts.
2. Conferences to stimulative Interest and exchange Information.
3. Seminars to develop Major Research Plans.
4. Dissemination Activities, which include:

(a) Documents Expediting Project.
(b) Cooperative Research Monograph Series.
(c) Articles in Professional Journals.

Contribution of cooperative research—The following brief descriptions of sample investigations illustrate the contribution of Cooperative Research:

1. Cooperative Research Programme Projects at the University of Chicago and Minnesota have documented the significant fact that creative ability and measured intelligence. (IQ) are not identical.
2. Substantial evidence has emerged that creative ability, unlike intelligence (which remains relatively constant), can be developed, extended and improved.
3. A Cooperative Research Programme Project at Brooklyn College proved that the impact of the teacher on students is determined by the teacher's approach and professional personality on the one hand and by the feelings and levels of intelligence of learners on the other.
4. Of the three types of teacher behavior studies—classified as turbulent, self-controlled and fearful—the self-controlled type of teacher achieved the most uniform learning gains with children of different personality, types and levels of ability.
5. CRP study at the University of California at Los Angles demonstrated that young children (first graders) can double their rate of mastery of mathematics if it is taught in relation to basic algebraic structures.
6. No proof was available for the presumption underlying the argument that larger school districts would increase student learning.
7. Experiments point out that some of the children that have been labelled "mentally retarded", may, in reality, merely be the products of "retarded homes". The evidence proves that some such children can often be taught to read at an early age.
8. A CRP Project at the University of Louisville, has proved that the rate of learning of blind children can be increased fourfold (from 64 to 240 words per minute) by improving the listening comprehension of such students.
9. Studies supported by the CRP have produced evidence that specific types of delinquency are attributable to specific causes, just as are different types of diseases.
10. One CRP study, conducted in ten rural and ten urban high schools in and near Chicago, identified the impact that adolescent climates in school and community, have motivation to learn.

Problems for Discussion

1. Define basic research, applied research and action research. Give examples to bring out the difference.
2. Why is action research sometimes called on the job research? Suggest a few situations related to on the job research.
3. "Action research places its emphasis on a problem here and now". Comment on this statement.
4. Elucidate the process of action research with suitable examples.
5. "Action research is the job of the specialist only". Explain this statement.
6. State the need, scope, merits and limitations of action research.
7. In what way action research is helpful to the classroom teacher?

John W. Best & James V. Kakn, (1992)	**Research in Education,** 6th ed. New Delhi, Prentice - Hall of India (Pvt.) Ltd, pp. 20-22.	3-2

PURPOSES OF RESEARCH

Fundamental or Basic Research

To this point we have described research in its more formal aspects. Research has drawn its pattern, and spirit from the physical sciences and has represented a rigorous, structured type of analysis. We have presented the goal of research as the development of theories by the discovery of broad generalizations or principles. We have employed careful sampling procedures in order to extend the findings beyond the group or situation studied. So far, our discussion has shown little concern for the application of the findings to actual problems in areas considered to be the concern of people other than the investigator. This methodology is the approach of basic or fundamental research.

Fundamental research is usually carried on in a laboratory situation, sometimes with animals as subjects. This type of research has been primarily the activity of psychologists rather than educators.

Applied Research

Applied research has most of the characteristics of fundamental research, including the use of sampling techniques and the subsequent inferences about the target population. However, its purpose is improving a product or a process—testing theoretical concepts in actual problem situations. Most educational research is applied research, for it attempts to develop generalizations about teaching-learning processes and instructional materials. Fundamental research in the behavioral sciences may be concerned with the development and testing of theories of behavior. Educational research is concerned with the development and testing of theories of how students behave in an educational setting.

Action Research

Since the late 1930s the fields of social psychology and education have shown great interest in what has been called action research. In education this movement has had as its goal the involvement of both research specialist and classroom teacher in the study and application of research to educational problems in a particular classroom setting.

Action research is focused on immediate application, not on the development of theory or on general application. It has placed its emphasis on a problem here and now in a local setting. Its findings are to be evaluated in terms of local applicability, not universal validity. Its purpose is to improve school practices and, at the same time to improve those who try to improve the practices:-to combine the research processes, habits of thinking, ability to work harmoniously with others, and professional spirit.

If most classroom teachers are to be involved in research activity, it will probably be in the area of action research. Modest studies may be made for the purpose of trying to improve local classroom practices. It is not likely that many teachers will have the time, resources, or technical background to engage in the more formal aspects of research activity. Fundamental research must continue to make its essential contribution to behavioral theory, and applied research to the improvement of educational practices. These activities, however, will be primarily the function of research specialists, many of them subsidized by universities, private and government agencies, professional associations, and philanthropic foundations.

Many observers have deprecated action research as nothing more than the application of common sense or good management. But whether or not it is worthy of the term research, it does apply scientific thinking and methods to real-life problems and represents a great improvement over teachers subjective judgments and decisions based upon folklore and limited personal experiences.

In concluding this discussion, it is important to realize that research may be carried on at various levels of complexity.

Respectable research Studies may be the simple descriptive fact-finding variety that leads to useful generalizations. Actually, many of the early studies in the behavioral sciences were useful in providing needed generalizations about the behavior or characteristics of individuals and groups. Subsequent experimental studies of a more complex nature needed this groundwork information to suggest hypotheses for more precise analysis. For example, descriptive studies of the intellectually gifted, carried on since the early 1920s by the late Lewis M. Terman and his associates, have provided useful generalizations about the characteristics of this segment of the school population. Although these studies did not explain the factors underlying giftedness, they did provide many hypotheses to be investigated by more sophisticated experimental methods.

Assessment, Evaluation, and Descriptive Research

The term descriptive research has often been used incorrectly to describe three types of investigation that are basically different. Perhaps their superficial similarities have obscured their differences. Each of them employs the process of disciplined inquiry through the gathering and analysis of empirical data and each attempts to develop knowledge. To be done competently, each requires the expertise of the careful and systematic investigator. A brief explanation may serve to put each one in proper perspective.

Assessment is a fact-finding activity that describes conditions that exist at a particular time. No hypotheses are proposed or tested, no variable relationships are examined, and no recommendations for action are suggested.

The national census is a massive assessment type of investigation conducted by the Bureau of the Census, a division of the United States Department of Commerce. Every 10 years an enumeration of the population is conducted, with data classified by nationality, citizenship, age, sex, race, marital status, educational level, regional and community residence, employment, economic status, births, deaths, and other characteristics. These data provide a valuable basis for social analysis and government action.

UNIT—4

CLASSIFICATION OF EDUCATIONAL RESEARCH

Sr.No.	Contents	Page No.
4.1	John W. Best James V. Kahn (1992)	
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3

HISTORICAL RESEARCH

Historical research differs markedly from the sort of research conducted by most scientists, including behavioral and social scientists. In fact, it is so different from other types of research that it almost does not belong as a topic in this book. It is included because many areas of concern to education can best be studied in this way, because the quantity and quality of research on the history of education has increased greatly in the past two decades e.g., Best, 1983; Warren, 1978 and because a review of the research literature which is done prior to other types of research is in effect, a historical study.

History is a meaningful record of human achievement. It is not merely a list of chronological events but a truthful integrated account of the relationships between persons, events, times, and places. We use history to understand the past and to try to understand the present in light of past events and developments. We also use it to prevent "reinventing the wheel" every few years. Historical analysis may be directed toward an individual, an idea, a movement, or an institution. However, none of these objects of historical observation can be considered in isolation. People cannot be subjected to historical investigation without some consideration of their interaction with the ideas, movements, and/or institutions of their times. The focus merely determines the points of emphasis toward which historians direct their attention.

TABLE 3-1 Some Examples of the Historical Interrelationship among Men, Movements, and Institution.

		INSTITUTIONS	
MEN	MOVEMENTS	General Type	Name
Ignatius of Loyola	Counter-Reformation	Religious Teaching Order	Society of Jesus, 1534 (Jesuit Society)
Benjamin Franidin	Scientific Movement Education for Life	Academy	Philadelphia Academy, 1751
Daniel Coit Gilman G. Stanley Hall	Graduate study and Research	University Graduate School	Johns Hopkins University, 1876
Win. Rainy Harper			Clark University, 1887 University of Chicago, 1892
John Dewey	Experimentalism Progressive Education	Experimental School	University of Chicago Elementary School. 1895
W. E. B. Dubois Walter White	Racial Integration in the Public Schools	Persuasion Organization	National Assn for the Advancement of Colored People. 1909
B. R. Buckingham	Scientific Research in Education	Research Periodical, Research Organization	Journal of Ed. Research, 1920 American Educational Research Assn., 1931

Table 3-1 illustrates several historical interrelationships that have been taken from the history of education. For example, no matter whether the historian chooses for study the Jesuit Society, religious teaching orders, the Counter-Reformation, or Ignatius of Loyola, each of the other elements appears as a prominent influence or result and as an indispensable part of the account. The interrelationship of this institution, movement, and man would make the study of one in isolation from the others meaningless, if not impossible.

Those who wish to engage in historical research should read the works of historians regarding the methods and approaches to conducting historical studies in education (e.g. Best. 1983; Belington. 1975: Brickman. 1982; Gottschalk. 1950; Hocked. 1948; Warren. 1978).

The History Of American Education

Historical studies deal with almost every aspect of American education. Such investigations have pointed out the important contributions, of both educators and statesmen. They have examined the growth and development of colleges and universities, elementary and secondary schools, educational organizations and associations, the rise and decline of educational movements, the introduction of new teaching methods, and the issues that have persistently confronted American education.

An understanding of the history of education is important to professional workers in this field. It helps them to understand the how and why of educational movements that have appeared and, in some cases, continue to prevail in the schools. It helps them to evaluate not only lasting contributions but also the fads and "bandwagon" schemes that have appeared on the educational scene only to be discarded.

An examination of many developments of the past seems to confirm the observation that little in education is really new. Practices hailed as innovative are often old ideas that have previously been tried and replaced by something else. Innovators should examine the reasons why such practices were discarded and consider whether their own proposals are likely to prove more successful. Several studies, briefly described, illustrate the historical background of some contemporary educational movements and issues.

Organized programs of individualized instruction introduced in a number of school systems in the 1960s seem to be similar in many respects to those introduced in a number of schools in the 1890s and in the first quarter of the twentieth century. First introduced at Pueblo, Colorado, and known as the Pueblo Plan, later modified and known as the Winnetka and Dalton Plans, these programs do seem to have common elements. Dispensing with group class activity in academic courses, students were given units of work to complete at their own rate before proceeding to more advanced units. Individual progress based upon mastery of subject matter units was the criterion for promotion or completion of a course. Search (1901) advocated this plan, and his influence upon Carleton Washburn in the elementary schools of Winnetka. Illinois, and Helen Park Hurst in the secondary schools at Dalton, Massachusetts, is generally recognized. Whether the Pueblo, Winnetka, or Dalton plans were fads or sound programs, the fact remains that they disappeared from the schools before reappearing in the 1960s.

The place of religion in public education is an issue that concerns many people. In the period following World War II, in a series of Supreme Court decisions, religious instruction and religious exercises within public schools have been declared unconstitutional and in violation of the First Amendment of the United States Constitution. In 1963, in the case of Abington School District v. Schempp. The Court held that a Pennsylvania law requiring daily Bible reading was in violation of the First Amendment. Much resentment and criticism of the Supreme Court followed this decision and several efforts have been made to introduce amendments to the Constitution to permit religious exercises in the public schools.

The Bible reading issue was also a bitter one more than 100 years ago. The Philadelphia Bible Riots of 1840 (Lannie & Die thorn, 1968) resulted in the deaths of about 45 soldiers and civilians, serious injury to about 140, and property damage to homes and churches valued at nearly $500,000. Natives/foreign-born, and Catholic/Protestant conflicts produced the tense atmosphere, but the Bible reading issue precipitated the riots. It is apparent that Bible reading is not an issue of recent origin and that an understanding of previous conflicts places the issue in clearer perspective.

The contributions of Thomas Jefferson, Benjamin Franklin. Calvin Stowe, Catherine Beecher, Horace Mann. Maria Montessori, Henry Barnard, Ella Flag Young. William Holmes McGuffey, Daniel Coit Gilman, John Dewey, and many other eminent educators have been carefully examined in many studies, and their impact on American education has been noted.

Thurs field (1945) studied Henry Barnard's *American Journal of* Education, published in 31 massive volumes between 1855 and 1881. He points out the Journal's vital contribution to the development of American education. Through its comprehensive treatment of all aspects of education it provided a readily available medium for the presentation and exchange of ideas of many of the great educators of the period. It has been stated that almost every educational reform adopted in the last half of the nineteenth century was largely due to the influence of the Journal. Among its contributors were Henry Barnard, Horace Mann, Bronson Alcott, Daniel Coit, Gillman, William T. Harris, Calvin Stowe, and Herbert Spencer, in addition to many prominent foreign contributors.

Cremin (1961) examined the reason for the rise and decline of the Progressive Education movement, including the major changes in philosophy and practices that transformed American education and the forces that brought the movement to a halt in the 1950s. Although some historians differ with his conclusions, Cretin's analysis is the definitive history of Progressive Education in America.

These historical studies are examples of but a few of the thousands of books, monographs, and periodical articles that depict the story of American education. In addition to examining these works, students are urged to consult the History of Education Quarterly, in which scholarly book reviews and critical analyses of contemporary historical research are presented.

History And Science

Opinions differ as to whether or not the activities of the historian can be considered scientific or whether there is such a thing as historical research.

Those who take the negative position may point out the following limitations:

1. Although the purpose of science is prediction, the historian cannot usually generalize on the basis of past events. Because past events were often unplanned or did not develop as planned, because there were so many uncontrolled factors, and because the influence of one or a few individuals was so crucial, the same pattern of factors is not repeated.
2. The historian must depend upon the reported observations of others, often witnesses of doubtful competence and sometimes of doubtful objectivity.
3. The historian is much like a person trying to complete a complicated jigsaw puzzle with many of the parts missing. On the basis of what is often incomplete evidence, the historian must fill in the gaps by inferring what has happened and why it happened,
4. History does not operate in a closed system such as may be created in the physical science laboratory. The historian cannot control the conditions of observation nor manipulate the significant variables.

Those who contend that historical investigation may have the characteristics of scientific research activity present these arguments:

1. The historian delimits a problem, formulates hypotheses or raises questions to be answered, gathers and analyzes primary data, tests the hypotheses as consistent or inconsistent with the evidence, and formulates generalizations or conclusions.
2. Although the historian may not have witnessed an event or gathered data directly, he or she may have the testimony of a number of witnesses who have observed the event from different vantage points. It is possible that subsequent events

have provided additional information not available to contemporary observers. The historian rigorously subjects the evidence to critical analysis in order to establish its authenticity, truthfulness, and accuracy.

3. In reaching conclusions, the historian employs principles of probability similar to those used by physical scientists.

4. Although it is true that the historian cannot control the variables directly, this limitation also characterizes most behavioral research, particularly non-laboratory investigations in sociology, social psychology and economics.

5. The observations of historians may be described in qualitative or quantitative terms depending on the subject matter and the approach of the historian. In general, the traditional approach is qualitative while the revisionists use quantitative analyses. The traditional, qualitative approach in many historical studies does not preclude the application of scientific methodology. As Brick man (1982) points out it simply requires "the synthesis and presentation of the facts in a logically organized form" (p. 91).

Historical Generalization

There is some difference of opinion, even among historians, as to whether or not historical investigations can establish generalizations. Most historians would agree that some generalizations are possible, but they disagree on the validity of applying them to different times and places. Gottschalk (1963) states the case of the comparative historian in this way:

Sooner [2]or later one or more investigators of a period or area begin to suspect some kind of nexus within the matter of their historical investigation. Though such "hunches," "insights," "guesses." "hypotheses"—whatever you may call them—may be rejected out of hand by some of them, the bolder or rasher among them venture to examine the possibility of objective reality of such a

2 From "Categories of Historical Generalization" in the Writing of History, Louis Gottschalk , ed. (Chicago: University of Chicago Press, 1963). 121-22. Used with permission of the publisher.

nexus, and then it is likely to become a subject of debate, and perhaps of eventual refinement to the point of wide recognition in the learned world. The process is not very different from the way analytical scholars in other fields precede—Darwin, for example, or Freud. If this process serves no other purpose, it at least may furnish propositions upon which to focus future investigations and debates....

But do not these historical syntheses, no matter what their author's intention, invariably have a wider applicability than to any single set of data from which they rose? If Weber was right, isn't it implicit in this concept of the Protestant ethic that where a certain kind of religious attitude prevails, their the spirit of capitalism will, or at least may, flourish? ... If Mahan was right, couldn't victory in war (at least before the invention of the airplane) be regarded as dependent on maritime control? If Turner was right, won't his frontier thesis apply to some extent to all societies that have frontiers to conquer in the future, as well as it have applied to American society in the past? (pp. 121-122)'

Finely (1963) Comments on Generalization:

Ultimately the question at issue is the nature of the historian's function. Is it only to recapture the individual concrete events of a past age, as in a mirror, so that the progress of history is merely one of rediscovering lost data and of building bigger and better reflectors? If so, then the chronicle is the only correct form for his work. But if it is to understand—however one chooses to define the word—then it is to generalize, for every explanation is, or implies, one or more generalizations, (p. 34)

Aydelotte (1963) States the Argument for Generalization:

Certainly the impossibility of final proof of any historical generalization must be at once conceded. Our knowledge of the past is both too limited and too extensive. Only a minute fraction of what has happened has been recorded and only too often the points on which we need most information are those on which our sources are most inadequate. On the other hand, the fragmentary and incomplete information we do have about the past is too abundant to prevent our coming to terms with it; its sheer bulk prevents its being easily manipulated, or even easily assimilated, for historical purposes.

Further, historians deal with complex problems, and the patterns of the events they Study, even supposing it to exist, seems too intricate (to be easily grasped. Doubtless, finality of knowledge is impossible in all areas of study. We have learned through works of popularization how far this holds true even for the natural sciences, and, as Crane Briton says the historian no longer needs to feel that "the uncertainties and inaccuracies of his investigation leave him in a position of hopeless inferiority before the glorious certainties of physical science." (pp. 156-157)

The foregoing quotations are presented in support of the position that the activities of the historian are not different from those of the scientist. Historical research as it is defined in this chapter includes, delimiting a problem, formulating hypotheses or generalizations to be tested or questions to be answered, gathering and analyzing data, and arriving at probability-type conclusions or at generalizations based upon deductive-inductive reasoning.

The Historical Hypothesis

Nevins (1962) illustrates the use of hypotheses in the historical research of Edward Channing in answering the question, "Why did the Confederacy collapse in April 1865?" Chinning formulated four hypotheses and tested each one in light of evidence gathered from letters, diaries, and official records of the army and the government of the Confederacy. He hypothesized that the Confederacy collapsed because of

1. The military defeat of the Confederate army
2. The dearth of military supplies
3. The starving condition of the Confederate soldiers and the civilians
4. The disintegration of the will to continue the war

Channing produced evidence that seemed to refute the first three hypotheses. More than 200,000 well-equipped soldiers were under arms at the time of the surrender, the effective production of powder and arms provided sufficient military supplies to continue the war, and enough food was available to sustain fighting men and civilians.

Channing concluded that hypothesis 4, the disintegration of the will to continue the war was substantiated by the excessive number of desertions of enlisted men and officers. Confederate military officials testified that they had intercepted many letters from home urging the soldiers to desert

Although the hypothesis sustained was not specific enough to be particularly helpful, the rejection of the first three did claim to dispose of some commonly held explanations. This example illustrates a historical study in which hypotheses were explicitly stated.

Hypotheses in Educational Historical Research

Hypotheses may be formulated in historical investigations of education. Several examples are listed.

1. The educational innovations of the 1950s and 1960s were based upon practices that previously have been tried and discarded.

2. Christian countries whose educational systems required religious instruction have had lower church attendance rates than those countries in which religious instruction was not provided in the schools.

3. The observation of European school systems by American educators during the nineteenth century had an important effect upon American educational practices.

4. The monitorial system had no significant effect upon American education.

Although hypotheses are not always explicitly stated in historical investigations, they are usually implied. The historian gathers evidence and carefully evaluates its trustworthiness. If the evidence is compatible with the consequences of the hypothesis, it is confirmed. If the evidence is not compatible, or negative, the hypothesis is not confirmed. It is through such synthesis that historical generalizations are established.

The activities of the historian, when education is his or her field of inquiry, are no different from those employed in any other field.

The sources of evidence may be concerned with schools, educational practices and policies, movements, or individuals, but the-historical processes are the same.

Difficulties Encountered in Historical Research

The problems involved in the process of historical research make it a somewhat difficult task. A major difficulty is delimiting the problem so that a satisfactory analysis is possible. Too often, beginners state a problem much too broadly; the experienced historian realizes that historical research must involve a penetrating analysis of a limited problem rather than a superficial examination of a broad area. The weapon of research is the target pistol, not the shotgun.

Since historians may not have lived during the time they are studying and may be removed from the events they investigate, they must often depend upon inference and logical analysis, using the recorded experience of other rather than direct observation. To ensure that their information is as trustworthy as possible, they must rely on primary, or firsthand, accounts. Finding appropriate primary sources of data requires imagination, hard work, and resourcefulness.

Historians must also keep in mind the context in which the events being studied occurred and were recorded. It is necessary to keep the biases and beliefs of those who recorded the events in mind, as well as the social and political climate in which they wrote.

Sources of Data

Historical data are usually classified into two main categories:

1. Primary sources are eyewitness accounts. They are reported by an actual observer or participant in an event.
2. Secondary sources are accounts of an event that were not actually witnessed by the reporter. The reporter may have talked with an actual observer or read an account by an observer, but his or her testimony is not that of an actual participant or observer.
3. Secondary sources may sometimes be used, but because of the distortion in passing on information, the historian uses

them only when primary data are not available.

Primary Source of Data

Documents. Documents are the records kept and written by actual participants in, or witnesses of, an event. These sources are produced for the purpose of transmitting information to be used in the future. Documents classified as primary sources are constitutions, charters, laws, court decisions, official minutes or records, autobiographies, letters, diaries, genealogies, census information, contracts, deeds, wills, permits, licenses, affidavits, depositions, declarations, proclamations, certificates, lists, handbills, bills, receipts, newspaper and magazine accounts, advertisements, maps, diagrams, books, pamphlets, catalogs, films, pictures, paintings, inscriptions, recordings, transcriptions, and research reports.

Remains or Relics. Remains or relics are objects associated with a person, group, or period. Fossils, skeletons, tools, weapons, food, utensils, clothing, buildings, furniture, pictures, paintings, coins, and art objects are examples of those relics and remains that were not deliberately intended for use in transmitting information or as records. However, these sources may provide clear evidence about the past. The contents of an ancient burial place, for instance, may reveal a great deal of information about the way of life of a people—their food. Clothing, tools, weapons, are religious beliefs, means of livelihood, and customs. Similarly, the contents of an institution for the mentally ill or mentally retarded can reveal a good deal of information about the way the clients were treated, including the quality of food, the opportunity for work and recreational activities, and whether abuses regularly occurred.

Oral Testimony. Oral testimony is the spoken account of a witness of, or participant in, an event. This evidence is obtained in a personal interview and may be recorded or transcribed as the witness relates his or her experiences.

Primary Sources of Educational Data

Many of the old materials mentioned in the preceding section provide primary evidence that may be useful specifically in studying the history of education. A number are listed here.

Official Records and Other Documentary Materials. Included in this category are records and reports of legislative bodies and state departments of public instruction, city superintendents, principals, presidents, deans, department heads, educational committees, minutes of school boards and boards of trustees, surveys, charters, deeds, wills, professional and lay periodicals, school newspapers, annuals, bulletins, catalogs, courses of study, curriculum guides, athletic game records, programs (for graduation, dramatic, musical, and athletic events), licenses, certificates, textbooks, examinations, report cards, pictures, drawings, maps, letters, diaries, autobiographies, teacher and pupil personnel files, samples of student work, and recordings.

Oral Testimony. Included here are interviews with administrators, teachers and other school employees, students and relatives, school patrons or lay dozens, and members of governing bodies.

Relics. Included in this category ore buildings, furniture, teaching materials, equipment, murals, decorative pictures, textbooks, examinations, and samples of student work.

Secondary Source of Data

Secondary sources are the reports of a person who relates the testimony of an actual witness of, or participant in, an event. The writer of the secondary source was not on the scene of the event, but merely reports what the person who was there said or wrote. Secondary sources of data are usually of limited worth for research purposes because of the errors that may result when information is passed on from one person to another most history textbooks and encyclopedias are examples of secondary sources for they are often several times removed from the original, firsthand account of events.

Some types of material may be secondary sources for some purposes and primary sources for another. For example, a high school textbook in American history is ordinarily a secondary source. But if one were making a study of the changing emphasis on nationalism in high school American history textbooks, the book would be a primary document or source of data.

Historical Criticism

It has been noted that the historian does not often use the method of direct observation. Past events cannot be repeated at will. Because the historian must get much to the data from the reports of those who witnessed or participated in these events, the data must be carefully analyzed to sift the true from the false, irrelevant, or misleading.

Trustworthy, usable data in historical research are known as *historical evidence.* That body of validated information can be accepted as a trustworthy and proper basis for the testing and interoperation of a hypothesis. Historical evidence is derived from historical data by the process of criticism, which is of two types: external and internal.

External Criticism

External criticism establishes the authenticity or genuineness of data. Is the relic or document a true one rather than a forgery a counterfeit, or a hoax? Various tests of genuineness may be employed.

Establishing the age or authorship of documents may require intricate tests of signature, handwriting, script, type, spelling, language usage, documentation, knowledge available at the time and consistency with what is known. It may involve physical and chemical tests of ink, paint, paper, parchment, cloth, stone, metals, or wood. Are these elements consistent with known facts about the person, the knowledge available, and (he technology of the period in which the remain or the document originated?

Internal criticism

After the authenticity of historical documents or relics has been established, there is still the problem of evaluating their accuracy or worth. Although they may be genuine, do they reveal a true picture? What of the writers or creators. Were they competent, honest, unbiased, and actually acquainted with the facts, or were they too antagonistic or too sympathetic to give a true picture? Did they have any motives for distorting the account? Were they subject to pressure, fear or vanity? How long after the event did they make a record of their testimony, and were they able to remember accurately what happened? Were they in agreement with other competent witnesses?

These questions are often difficult to answer, but the historian must be sure that the data are authentic and accurate. Only then may he or she introduce them as historical evidence, worthy of serious consideration.

The following examples describe ways in which evidence is tested for authenticity. The first is an example of historical criticism of a scholarly type, carried on by scientists and biblical scholars, in which historic documents were proven to be genuine.

The Dead Sea Scrolls. One of the most interesting and significant historical discoveries of the past century was the finding of the Dead Sea Scrolls. This collection of ancient manuscripts was discovered in 1947 by a group of Bedouins of the Ta'amere tribe. Five leather scrolls were found, sealed in tall earthenware jars in the Qumran caves near Alm Feshkha, on the northwest shore of the Dead Sea (Davies, 1956)[2]

The Bedouins took the scrolls to Metropolitan Mar Athanesius Yeshue Samuel, of St. Mark's monastery in Jerusalem, who purchased them after discovering that they were written in ancient Hebrew. A consultation with biblical scholars confirmed the fact that they were very old and possibly valuable. They were later purchased by Professor Sukenik, an archaeologist of Hebrew University at Jerusalem, who began to translate them. He also had portions of the scrolls photographed to send to other biblical scholars for evaluation. Upon examining some of the photographs. Dr. William F. Albright of Johns Hopkins University pronounced them "the greatest manuscript discovery of modern times."

A systematic search of the Wadi Qumran area caves in 1952 yielded other leather scrolls, many manuscript fragments, and two additional scrolls of copper that were so completely oxidized that they could not be unrolled without being destroyed. By 1956,

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2 From the Meaning of the Dead Sea Scrolls New York: New American Library of World Literature. 1956). p. 9. Used with permission of the publisher.

scientists at the University of Manchester, England, had devised a method of passing a spindle through the scrolls, spraying them with aircraft glue, baking them, and then sawing them across their rolled-up length to yield strips which could be photographed.

The origin, the age, and the historic value of the scrolls have been questioned. By careful and systematic external and internal criticism, however, certain facts have been established and are quite generally accepted by biblical scholars and scientists.

The scrolls are very old, probably dating back to the first century A.D. They are written in ancient Hebrew and probably originated in a pre-Christian monastery of one of the Jewish sects. The writings contain two versions (one complete and one incomplete) of the Book of Isaiah, a commentary or Midrash on the Book of Habakkuk, a set of rules of the ancient Jewish monastery, a collection of about twenty psalms similar to those of the Old Testament, and several scrolls of apocalyptic writings, similar to the Book of Revelation.

The contents of the copper scrolls and other fragments have now been translated, it is possible that more scrolls and writings may be discovered in the area, and it is likely that these ancient documents may throw new light on the Bible and the origins of Christianity. It is interesting to note how these documents were authenticated, dated, and evaluated by:

1. Paleography, an analysis of the Hebrew alphabet forms used. These written characters were similar to those observed in other documents known to have been written in the first century.

2. A radiocarbon test of the age of the linen scroll covering conducted by the Institute of Nuclear Research at the University of Chicago. All organic matter contains radiocarbon 14, which is introduced by the interaction of cosmic rays from outer space with the nitrogen in the earth's atmosphere. The radioactivity constantly introduced throughout the life of the specimen ceases at death and disintegrates at a constant known rate. At the time of death, all organic matter yields 15.3 disintegration's per minute per gram of carbon content. The number of disintegration’s is

reduced by one-half after 5568 years plus or minus 30 years. By measuring disintegration's by using a Geiger type counter, it is possible to estimate the age of specimens within reasonable limits of accuracy. Through use of this technique, the date of the scrolls was estimated at A.D. 33, plus or minus 200 years.

3. Careful examination of the pottery form in which the scrolls were sealed. These jars, Precisely shaped to fit the manuscripts, were the type commonly used during the first century.

4. Examination of coins found in the caves with the scrolls. These dated Roman coins provided convincing evidence of the age of the scrolls.

5. Translation of the scrolls. When translated, the scrolls compared to other writings, both biblical and no biblical, of known antiquity.

Although external criticism has now produced convincing evidence of the genuineness and age of the Dead Sea Scrolls, internal criticism of their validity and relevance will be pursued by biblical scholars for many years to come and may provide many new hypotheses concerning biblical Writings and the early history of Christianity and the pre-Christian Jewish sects.

Modern approaches to historical research have applied advanced technology emphasizing the usefulness of both qualitative and quantitative data. As we have seen in this example, researchers employed the radiocarbon 14 tests to verify the authenticity of the scrolls. The next example illustrates the use of the computer in archaeological and historical research.

Stonehenge (Hanging Stones). For centuries historians, and archaeologists have debated the origin and purpose of Stonehenge, a curious arrangement of stones and archways, each weighing more than 40 tons, located on the Salisbury Plain about 90 miles southwest of London. From the beginning of recorded history, writers have speculated about the stones. Their construction and arrangement have been attributed to many tribes and national groups who invaded or inhabited England. Modern radiocarbon dating of a deer anther found in the stone fill seems, to date their erection at about 1900 to 1600 B.C Their purpose has been explained in many legends—a city of the dead, a place of human sacrifice, a temple of the sun, a pagan cathedral, and a Druid ceremonial place.

More recently some scientists and historians have suggested that Stonehenge was a type of astronomic computer calendar used by early Britons who were apparently sophisticated enough to compute the position of the sun and the moon at there various stages. Using an IBM 704 computer, Gerald's. Hawkins, an astronomer at the Smithsonian Astrophysical Observatory at Cambridge, Massachusetts, entered into the computer 240 stone alignments, translated into celestial declination's. Accomplishing in less than a minute a task that would have required more than 4 months of human calculator activity, the computer compared the alignments with the precise sun/moon extreme positions as of 1500 B.C. and indicated that they matched with amazing accuracy.

Hawkins suggests that the stone arrangements may have been created for several possible reasons: They made a calendar that would be useful for planting crops; they helped to create and maintain priestly power, by enabling the priest to call out the people to see the rise and setting of the midsummer sun and moon over the heel stone and midwinter sunset through the great trilithon: or possibly they served as an intellectual exercise. Hawkins concludes:

In any case, for whatever reasons those Stonehenge builders built as they did their final completed creation was a marvel. As intricately aligned as an interlocking series of astronomical instrument (which indeed it was) and yet architecturally perfectly simple, in function subtle and elaborate, in appearance stark, imposing, awesome, Stonehey was a thing of surpassing ingenuity of design, variety of usefulness and grandeur—in concept and construction an eighth wonder of the world. (Hawkins & White. 1966. pp.117-118.

This interesting historical-archaeological controversy illustrates the use of sophisticated computer technology to test a hypothesis.

Example of Topic for Educational Historical Study

Brickman (1982) provides a number of possible topics by types of historical research in education and an example for each. We repeal his list here:

1. PERIOD. "Education during the First Half of the Fifteenth century."
2. GEOGRAPHICAL REGION. "German Education under Frederick the Great."
3. EDUCATIONAL LEVEL. "The Secondary Schools of Ancient Rome,"
4. INSTITUTION. "Amherst College in the Nineteenth Century."
5. BIOGRAPHY. "Bronson Alcott as an Educator." Biographical detail, as such, is of less importance for term-report purposes than an exposition of the man's educational ideas, work, and influence.
6. INNOVATIONS. "Three Decades of Audio-Visual Education."
7. PHILOSOPHY. "Changing Concepts of American Higher Education in the Nineteenth Century."
8. METHODOLOGY. "Herbartianism in American Educational Practice."
9. CURRICULUM. "The Subject of Rhetoric in Ancient Greece."
10. PERSONNEL. "The Role of the Teacher during the Renaissance."
11. CHILDREN. "Changing Attitudes toward Corporal Punishment of Children in the United States."
12. LEGISLATION. "Compulsory School Attendance Laws in Prussia During the Eighteenth Century."
13. MATERIALS. "The Evolution of American School Readers, 1700-1830."
14. NONSCHOOL AGENCIES. "The Development of the

Library in Nineteenth-century America."

15. ORGANIZATIONS. "History of the Public School Society of New York."

16. FINANCE. "Methods of School Taxation in Pennsylvania. 1820-1880"

17. ARCHITECTURE. "The Evolution of the School Building in Illinois."

18. ADMINISTRATION." The Rise of the State Superintendence of Schools."

19. LITERATURE. "A Century of Educational Periodicals in the United States."

20. INFLUENCE. "The Influence of Rousseau upon Postalozzi."

21. REPUTATION. "The Reception of Horace Mann's Educational Ideas in Latin America."

~~2.~~22. COMPARISON. "A Comparative Study of Renaissance Theories of the Education of the Prince."

~~3.~~23. TEXTBOOK ANALYSIS."A Study of the Treatment of Primitive Education in Textbooks in Educational History"(pp 5-5)[3]

Obviously, these topics are too broad for a student project, and in some cases, would probably take most of a career. The processes of delimitation and hypothesis formation are needed to make these topics useful.

Writing The Historical Report

No less challenging than research itself is the writing of the report, which calls for creativity in addition to the qualities of imagination and resourcefulness already illustrated. It is an extremely difficult task to take often seemingly disparate pieces of information and synthesize them into a meaningful whole. Research

[3] Used with the permission of Emeritus. Inc., Publisher.

reports should be written in a dignified and objective style. However, the historian is permitted a little more freedom in reporting. Hockett suggests that "the historian is not condemned to a bald, plain, unattractive style" and that "for the sake of relieving the monotony of statement after statement of bare facts, it is permissible, now and then, to indulge in a bit of color." He concludes, however, by warning that "above all, embellishments must never become a first aim, or be allowed to hide or distort the truth" (Hackett, 1948, p. 139).

An evaluation of graduate students' historical-research projects generally reveals one or more of the following faults:

1. Problem to broadly stated.
2. Tendency to use easy-to-find secondary sources of data rather than sufficient primary sources, which are harder to locate but usually more trustworthy
3. Inadequate historical criticism of data because of failure to establish authenticity of sources and trustworthiness of data. For example, there .is often a tendency to accept the truth of a statement if several observers agree. It is possible that one may have influenced the other or that all were influenced by the same inaccurate source of information.
4. Poor logical analysis resulting from:
    a. Oversimplification—failure to recognize the fact that causes of events are more often multiple and complex than single and simple.
    b. Overgeneralization on the basis of insufficient evidence, and false reasoning by analogy, basing conclusions upon superficial similarities of situations.
    c. Failure to interpret words and expressions in the light of there accepted meaning in an earlier period.
    d. Failure to distinguish between significant facts in a situation and those that are irrelevant or unimportant.
    e. Failure to consider the documents in the context of their time, that is, the existing beliefs, biases, and so forth.

5. Expression of personal bias, as revealed by statements lifted out of context for purposes of persuasion, assuming too generous or uncritical an attitude toward a person or idea (or being too unfriendly or critical), excessive admiration for the past (sometimes known as the "old oaken bucket" delusion), or an equally unrealistic admiration for the new or contemporary, assuming that all change represents progress

6. Poor reporting in a style that is dull and colorless, too flowery or flippant, too persuasive or of the "soap-box" type, or improper in usage.

It is apparent that historical research is difficult and demanding, The gathering of historical evidence requires long hours of careful examination of such documents as court records of legislative bodies, letters, diaries, official minutes of organizations, or other primary sources of data.. Historical research may involve traveling to distant places to examine the necessary documents or relics. In fact, any significant historical study would make demands that few students have the time, financial resources, patience, or expertise to meet. For these reasons, good historical studies are not often attempted for the purpose of meeting academic degree requirements.

Summary

History, the meaningful record of human achievement, helps us to understand the present and, to some extent, to predict the future. Historical research is the application of scientific method to the description and analysis of past events.

Historians ordinarily draw their data from the observations and experience of others. Because they are not likely to have been at the scene of the event, they must use logical inferences to supplement what is probably an incomplete account.

Primary sources may be "unconscious" testimony, not intended to be left as a record—relics or remains such as bones, fossils, clothing, food, utensils, weapons, coins, and an objects are useful. Conscious testimony, in the form of records or documents, is another primary source of information—examples are constitutions, laws, court decisions, official minutes, autobiographies, letters, contracts, wills, certificates, newspaper and magazine accounts, films, recordings, and research reports.

Historical criticism is the evaluation of primary data. External criticism is concerned with the authenticity or genuineness of remains or documents, and internal criticism is concerned with the trustworthiness or veracity of materials. The accounts of the Dead Sea Scrolls and Stonehenge illustrate the processes of historical criticism.

The historical research studies of graduate students often reveal serious limitations. Frequently encountered are such faults as slating the problem too broadly, inadequate primary sources of data, unskillful Historical criticism, poor logical analysis of data, personal bias, and ineffective reporting.

Exercises

1. Write a proposal for a historical study in a local setting. You may select a community, school, church, religious or ethnic group, or individual. State an appropriate title, present your hypothesis, indicate the primary sources of data that you would search, and tell how you would evaluate the authenticity and validity of your data.
2. Select a thesis of the historical type from the university library and analyze it in terms of

    a. hypothesis proposed or questions raised

    b. primary and secondary sources of data used

    c. external and Internal criticism employed

    d. logical analysis of data relationships

    e. soundness of conclusions

    f. documentation

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4
ASSESSMENT EVALUATION AND DESCRIPTIVE RESEARCH

A descriptive study describes and interprets what is. It is concerned with conditions or relationships that exist, opinions that are held, processes that are going on, effects that are evident, or trends that are developing. It is primarily concerned with the present, although it often considers past events and influences as they relate to current conditions.

The term descriptive study conceals an important distinction, for not all descriptive studies fall into the category of research. In Chapter 1 the similarities and differences between assessment, evaluation, and research were briefly discussed. We will restate those similarities and differences in this discussion of descriptive studies.

Assessment describes the status of a phenomenon at a particular time. It describes without value judgment a situation that prevails; it attempts no explanation of underlying reasons and makes no recommendations for action. It may deal with prevailing opinion, knowledge, practices, or conditions. As it is ordinarily used in education, assessment describes the progress students have made toward educational goals at a particular time. For example, in the National Assessment of Education Progress program, the data are gathered by a testing program and a sampling procedure in such a way that no individual is tested over the entire test battery. It is not designed to determine the effectiveness of a particular process or program but merely to estimate the degree of achievement of a large number of individuals who have been exposed to a great variety of educational and environmental influences. It does not generally provide recommendations, but there may be some implied judgment on the satisfactoriness of the situation or the fulfillment of society's expectations.

Evaluation is a process used to determine what has happened during a given activity or in an institution. The purpose of evaluation is to see if a given program is working, an institution is successful according to the goals set for it, or the original intent is being successfully carried out. To assessment, evaluation adds the ingredient of value judgment of the social utility, desirability, or effectiveness of a process, product, or program, and it sometimes includes a recommendation for some course of action. School surveys are usually evaluation studies; educational products and programs are examined to determine their effectiveness in meeting accepted objectives, often with recommendations for constructive action.

Descriptive research, sometimes known as non experimental or correctional research, deals with the relationships between variables, the testing of hypotheses, and the development of generalizations, principles, or theories that have universal validity. It is concerned with functional relationships. The expectation is that if variable A is systematically associated with variable B, prediction of future phenomena may be possible and the results may suggest additional or competing hypotheses to test.

In carrying out a descriptive research project, in contrast to an experiment i.e. researcher does not manipulate the variable, decide who receives the treatment, or arrange for events to happen. In fact, the events that are observed and described would have happened even though there had been no observation or analysis. Descriptive research also involves events that have already taken place and may be related to a present condition).

The method of descriptive research is particularly appropriate in the behavioral sciences because many of the types of behavior that interest the researcher cannot be arranged in a realistic setting. Introducing significant variables may be harmful of threatening to human subjects. Ethical considerations often preclude exposing human subjects to harmful manipulation. For example, it would be unthinkable for an experimenter to randomly decide who should smoke cigarettes and who should not smoke them for the purpose of studying the effect of smoking on cancer, heart disease, or other illnesses thought to be caused by cigarette smoke. Similarly, to deliberately arrange auto accidents, except when manikins are used in order to evaluate the effectiveness of seat belts or other restraints in preventing serious injury would be absurd.

Although many experimental studies of human behavior can be appropriately carried out both in the laboratory and in the field, the prevailing research method of the behavioral sciences is descriptive. Under the conditions that naturally occur in the home, the classroom, the recreational center, the office, or the factory, human behavior can be systematically examined and analyzed.

The many similarities between these types of descriptive studies may have tended to cloud the distinctions between them. They are all characterized by disciplined inquiry, which requires expertise, objectivity, and careful execution. They all develop knowledge, adding to what is already known. They use similar techniques of observation, description, and analysis. The differences between them lie in the motivation of the investigator, the treatment of the data, the nature of the possible conclusions, and the use of the findings. The critical distinctions are that the three types of studies have different purposes and, therefore, approach the problem differently and that only descriptive research studies lead to generalizations beyond the given sample and situation.

It is also possible for a single study to have multiple purposes. For instance, a study may evaluate the success/failure of an innovative program and also include sufficient controls to qualify as a descriptive research study. Similarly, an assessment study may include elements that result in descriptive research too.

Examples of these three types of descriptive studies are presented next. It is important to keep in mind that, while these examples are presented to illustrate each individual type of study (assessment, evaluation, or descriptive research), they are not mutually exclusive. That is, for example, surveys are also used in descriptive research and case studies are also used in assessment studies.

ASSESSMENT STUDIES

The Survey

The survey method gathers data from a relatively large number of cases at a particular time. It is not concerned with characteristic of individuals as individuals. It is concerned with the generalized statistics that result when data are abstracted from a number of individual cases, it is essentially cross-sectional.

Ninety-four percent of American homes have at least one television set. About three out of five students who enter the American secondary school remain to graduate. Fifty-six percent of adult Americans voted in the 1972 presidential election. The average American consumes about 103 pounds of refined sugar annually. The ratio of female births to male births in the United States in 1974 was 946 to 1000. The population of Illinois according to the 1980 census, was 11,426,518. Data like these result from many types of surveys. Each statement pictures a prevailing condition at a particular time.

In analyzing political, social, or economic conditions, one of the first steps is to get the facts about the situation—or a picture of conditions that prevail or that are developing. These data may be gathered from surveys of the entire population. Others are inferred from a study of a sample group, carefully selected from the total population. And at times, the survey may describe a limited population, which is the only group under consideration.

The survey is an important type of study. It must not be confused with the mere clerical routine of gathering and tabulating figures. It involves a clearly defined problem and definite objectives. It requires expert and imaginative planning, careful analysis and interpretation of the data gathered, and logical and skillful reporting of the findings.

Social Surveys

In the late 1930s is an significant social survey was directed by the Swedish sociologist Gunner Myrdal and sponsored by the Carnegie Foundation. Myrdal and his staff of researchers made a comprehensive analysis of the social, political, and economic life of black persons in the United States, yielding a great mass of data on race relations in America (Myrdal, 1944).

The late Alfred Kinsey (1948) of Indiana University made a comprehensive survey of the sexual behavior of the human male, based on data gathered from more than 12,000 cases. His second study (Kinsey, 1953) of the behavior of the human female followed later. Although these studies have raised considerable controversy, they represent a scientific approach to the study of an important social problem and have many implications for jurists, legislators, social workers, and educators.

Witty (1967) has studied the television viewing habits of school children, and has published annual reports on his investigations. These studies were conducted in the Chicago area and indicate the amount of time devoted to viewing and the program preferences of elementary and secondary students, their parents, and their teachers. Willy attempted to relate television viewing to intelligence, reading habits, academic achievement, and other factors.

Shaw and McKay (1942) conducted a study of juvenile delinquency in Chicago yielding significant data on the nature and extent of delinquency in large urban communities.

Lang and Kahn (1986) examined special education teacher estimates of their students' criminal acts and crime victimizations. The data indicated that special education students seem to be victimized in the same way as others but to a greater degree. This preliminary study led to Lang's (1987) dissertation, an experiment aimed at reducing the rate of victimization of mentally retarded students.

The National Safely Council conducts surveys on the nature, extent, and causes of automobile accidents in all parts of the United States. State high school athletic associations conduct surveys on the nature and extent of athletic injuries in member schools.

Public Opinion Surveys

In our culture, where so many opinions on controversial subjects are expressed by well-organized special interest groups, it is important to find out what the people think. Without a means of polling public opinion, the views of only the highly organized minorities are effectively presented through the printed page, radio, and television.

How do people feel about legalized abortion, the foreign aid program, busing to achieve racial integration in the public schools, or the adequacy of the public schools? What candidate do they intend to vote for in the next election? Such questions can be partially answered by means of the public opinion survey. Many research agencies carry on these surveys and report their findings in magazines and in syndicated articles in daily newspapers.

Since it would be impracticable or even impossible to get an expression of opinion from every person, sampling techniques are employed in such a way that the resulting opinions of a limited number of people can be used to infer the reactions of the entire population.

The names Gallup, Roper, and Harris are familiar to newspaper readers in connection with public opinion surveys. These surveys of opinion are frequently analyzed and reported by such classifications as age groups, sex, educational level, occupation, income level, political affiliation, or area of residence. Researchers are aware of the existence of many publics, or segments of the public, who may hold conflicting points of view. This further analysis of opinion by subgroups adds meaning to the analysis of public opinion in general.

Those who conduct opinion polls have developed more sophisticated methods of determining public attitudes through more precise sampling procedures and by profiting from errors that plagued early efforts. In prediction of voter behavior several well-known polls have proved to be poor estimators of election results.

In 1936, a prominent poll with a sample of over 2 million voters predicted the election of Alfred Landon over President Roosevelt by nearly 15 percentage points. The primary reason for this failure in prediction was the poll's sampling procedure. The sample was taken from telephone directories and automobile registration lists, which did not adequately represent poor persons, who in this election voted in unprecedented numbers. Gallup, on the other hand, correctly predicted that Roosevelt would win, using a new procedure, quota sampling, in which various components of the population are included in the sample in the same proportion that they are represented in the population. However, there are problems with this procedure, which resulted in Gallup and others being wrong in 1948 (Babbie, 1973).

In the 1948 election campaign most polls predicted the election of Thomas E. Dewey over President Truman. This time the pollsters were wrong, perhaps partly because of the sampling procedure and partly because the polls were taken too far before the election despite a trend toward Truman throughout the campaign. Had the survey been made just prior to Election Day, a more accurate prediction might have resulted. In addition, most survey researchers (including pollsters) use probability sampling today instead of quota sampling. This results in all members of a given population having the same probability of being chosen for the sample. In the 1968 election the predictions of both Gallup and Harris polls were less than 2 percentage points away from Richard Nixon's actual percent of the vote with samples of only about 2000 voters. This accuracy was possible due to the use of probability sampling (Babbie, 1973).

In addition to the limitations suggested, there is a hazard of careless responses, given in an offhand way, that are sometimes at variance with the more serious opinions that are expressed as actual decisions.

Since 1969 the Gallup organization has conducted an annual nationwide opinion poll of public attitudes toward education. Using a stratified cluster sample of 1500 or more individuals over 18 years of age, the data have been gathered by personal interviews from seven geographic areas and four size of-community categories. The responses were analyzed by age, sex, race, occupation, income level, political affiliation, and level of education. A wide range of problem areas has been considered. In the 1975 poll such problem areas confronting education were the use of drugs and alcohol; programs on drugs or alcohol; behavior standards in the schools; policies on suspension from school; work required of students, including amount of homework; requirements for graduation from high school; federal aid to public schools; the non graded school program; open education; alternative schools; job training: right of teachers to strike; textbook censorship; and the role of the school principal as part of management (Elam, 1979). The 1982 poll indicated the public's clear support for education. Education was ranked first among twelve funding categories considered in the survey—above health care, welfare, and military defense-with 55 percent selecting public education as one of their first three choices (Nation at Risk. 1983, p. 17).

National Assessment of Educational Progress

The National Assessment of Educational Progress was the first nationwide, comprehensive survey of educational achievement to be conducted in the United States. Originally financed be the Carnegie Foundation and the Fund for the Advancement of Education, with a supporting grant from the U.S. Office of Education, the Committee on Assessing the Progress of Education (CAPE) began its first survey in the spring of 1969. It gathered achievement test data by a sampling process such that no one individual was tested over the whole test battery or spent more than 40 minutes in the process. Achievement was assessed every 3 years in four age groups (9, 13, 17, and young adults between 26 and 35), in four geographical areas (Northeast, Southeast, Central, and West), for four types of communities (large city, urban fringe, rural, and small city), and for several socioeconomic levels and ethnic groups.

Achievement has been assessed in art, reading, writing, social studies, science, mathematics, literature, citizenship; and music. Comparisons between individuals, schools, or school systems have never been made,

The agency now conducting the assessment is the National Assessment of Educational Progress (NAEP), financed by the National Center for Educational Statistics, a division of the Department of Education. Periodic reports are provided for educators, interested lay adults, and for the general public through press releases to periodicals.

International Assessment

The international Association for the Evaluation of Educational Achievement, with headquarters in Stockholm, Sweden, has been carrying on an assessment program in a number of countries since 1964. The first study, The International Study of Achievement in Mathematics (Trosten, 1967]. Compared achievement in twelve countries: Austria, Belgium, England, Finland. France, West Germany, Israel, Japan, the Netherlands, Scotland, Sweden, and the United States. Short answer and multiple choice tests were administered to 13-year-olds and to students in their last year of the upper secondary schools, prior to university entrance. More than 132,000 pupils and 5000 schools were involved in the survey. Japanese students excelled above all others, regardless of their socioeconomic status, and United States students ranked near the bottom

Although the purpose of assessment is not to compare school systems, the data lead observers to make such comparisons. Critics of the first assessment pointed out the inappropriateness of comparing 17-year-olds in the United States, where more than 75 percent are enrolled in secondary schools, with 17-year-olds in other countries in which those, enrolled in upper secondary schools comprise a small, highly selected population.

More recent assessments reveal that, although 10 percent of the top United states students surpassed similar groups in all other countries in reading, in science they occupied seventh place (Hechinger & Hechinger, 1974).

Other assessments have been carried out and the number of participating countries has been increased to twenty-two.

Activity Analysis

The analysis of the activities or processes that an individual is called upon to perform is important, both in industry and in various types of social agencies. This process of analysis is appropriate in any field of work and at all levels of responsibility. It is useful in the industrial plant, where needed skills and competencies of thousands of jobs are carefully studied, jobs ranging in complexity from unskilled laborer to plant manager.

In school systems the roles of the superintendent, the principal, the teacher, and the custodian have been carefully analyzed to discover what these individuals do and need to be able to do. The Commonwealth Teacher Training Study (Charters & Waples, 1929) described and analyzed the activities of several thousand teachers, and searched previous studies for opinions of writers on additional activities in which classroom teachers should engage. A more recent study (Morris, Crowson, Porterr-Gehrie, & Hurwitz, 1984) described and analyzed the activities of school principals. This study is described in some detail later in this chapter as an example of ethnographic research.

This type of analysis may yield valuable information that would prove useful in establishing

1. The requirements for a particular job or position
2. A program for the preparation or training of individuals for various jobs or positions
3. An in-service program for improvement in job competence or for upgrading of individuals already employed
4. Equitable wage or salary schedules for various jobs or positions.

Trend Studies

The trend study is an interesting application of the descriptive method. In essence it is based upon a longitudinal consideration of recorded data, indicating what has been happening in the past, what the present situation reveals, and on the basis of these data, what is likely to happen in the future. For example, if the population in an area shows consistent growth over a period of time, one might predict that by a certain date in the future the population will reach a given level. These assumptions are based upon the likelihood that the factors producing the change or growth will continue to exert their influence in the future. The trend study points to conclusions reached by the combined methods of historical and descriptive analysis, and is illustrated by Problems and Outlook of Small Private Liberal Arts Colleges:

Report to the Congress of the United States by the Comptroller Genera (1978). In response to a questionnaire sent to 332 institutions, 283 furnished data on facility construction, loan repayments, enrollment, the effectiveness of methods used to attract more students, financial aid provided, and the general financial health of their institutions.

Based upon past and present experience, such influences as the growth of the community college, the effect of inflation on operating costs, tuition, living expenses and fees, and the decline in the number of college age students were projected for the years 1978 to 1985 and their impact upon the financial stability of the small liberal arts college assessed.

The following trend study topics would also be-appropriate:

1. The Growing Participation of Women in Intercollegiate Sports Programs

2. Trends in the Methods of Financial Support of Public Education

3. The Growth of Black Student Enrollment in Graduate Study Programs

~~1.~~4. The Minimum Competency Requirement Movement in American Secondary Education

EVALUATION STUDIES

School Surveys

What has traditionally been called a school survey is usually an assessment and evaluation study. Its purpose is to gather detailed information to be used as a basis for judging the effectiveness of the instructional facilities, curriculum, teaching and supervisory personnel, and financial resources in terms of best practices and standards in education for example, professional and regional accrediting agencies send visitation teams to gather data on the characteristics of the institution seeking accreditation. Usually, following a self-evaluation by the school staff, the visiting educators evaluate the institution's characteristics on the basis of agency guidelines.

Many city, township, and county school systems have been studied by this method for the purpose of determining status and adequacy. These survey-evaluations are sometimes carried on by an agency of a university in the area. Frequently a large part of the data is gathered by local educators, with the university staff providing direction and advisory services.

Program Evaluation

The most common use of evaluation is to determine the effectiveness of a program and sometimes the organization. The school surveys described above are evaluations only of the organization. Program evaluations, while often including the organization, focus primarily on program effectiveness results. As Kaufmnn and Thomas (1980) put it: Evaluation deals with results, intended and unintended. The questions asked during evaluation are usually the same. Regardless of the context, evaluation seeks to answer the following questions:

1. What are the goals and objectives of the organization?
2. What should be the goals and objectives of the organization?
3. What results were intended by the program, project, activity, or organization?
4. What results were obtained by the program, project, activity, or organization?
5. What were the value and usefulness of the methods and means used to achieve the results?
6. How well was the program, project, activity, or organization administered and managed?
7. What, if anything, about the program project, activity, or organization should be changed?
8. What, if anything, about the program, project, activity, or organization should be continued?
9. Should the organization project, program, or activity exist at all?

These questions are basic. They probe the issue of activities and the worth of these activities in terms of what they accomplished.

Evaluation is more than testing or measuring: it includes asking and answering basic questions about efforts and results, (pp. 1—2)[1]

There are a number of evaluation models that evaluators use. Some models are actually research approaches to evaluation Ruttman (1977) used the term evaluation research to describe evaluation procedures that use rigorous research methodology. Other models are less rigorous. The mode! selected should depend on the purpose for the evaluation. Kaufman and Thomas (1980) describe eight possible models.

Assessment And Evaluation In Problem Solving

In solving a problem or charting a course of action several sorts of information may be needed. These data may be gathered through assessment and evaluation methods.

The first type of information is based upon present conditions. Where are we now? From what point do we start? These data may be gathered by a systematic description and analysis of all the important aspects of the present situation

The second type of information involves what we may want. In what direction may we go? What conditions are desirable or are considered to represent best practice? This clarification of objectives or goals may come from a study, of what we think we want possibly resulting from a study of conditions existing elsewhere, or of what experts consider to be adequate or desirable.

The third type of information is concerned with how to get there. This analysis may involve finding out about the experience of others who have been involved in similar situations. It may involve the opinions of experts, who presumably know best how to reach the goal.

Some studies emphasize only one of these aspects of problem solving. Others may-deal with two, or even three, of the elements. Although a study does not necessarily embrace all the steps necessary for the solution of a problem it may make a valuable contribution by clarifying only one of the necessary steps—from

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description of present status to the charting of the path to the goal.

Assessment and evaluation methods may supply some or all of the needed information. An example will illustrate how they can be used to help solve an educational problem.

Washington Township has a school building problem. Its present educational facilities seem inadequate, and if present developments continue, conditions may be much worse in the future The patrons and educational leaders in the community know that a problem exists, but they realize that this vague awareness does not provide a sound basis for action. Three steps are necessary to provide such a basis.

The first step involves a systematic analysis of present condition. How many school-age children are there in the township? How many children are of preschool age? Where do they live? How many classrooms now exist? How adequate are they? What is the average class size? How are these present buildings located in relation to residential housing? How adequate are the facilities for food, library, health, and recreational services? What is the present annual budget? How is it related to the tax rate and the ability of the community to provide adequate educational facilities?

The second step projects goals for the future. What will the school population be in 5, 10, or 20 years? Where will the children live? How many buildings and classrooms will be needed? What provisions should be made for special school services, for libraries, cafeterias, gymnasiums, and play areas to take care of expected educational demands?

Step three considers how to reach those goals, which have been established by the analysis of step two. Among the questions to be answered are the following: Should existing facilities be expanded or new buildings constructed? If new buildings are needed, what kind should be provided? should schools be designed for grades 1 through 8, or should 6-year elementary schools and separate 2 or 3-year junior high schools be provided how will the money be raised? When and how much should the tax rate be increased? When should the construction program get underway?

Many of the answers to the questions raised in step three will be arrived at by analysis of practices of other townships, the expressed opinions of school patrons and local educational leaders, and the opinions of experts in the areas of school buildings, school organization, community planning, and public finance. Of course, this analysis of school building needs is but one phase of the larger educational problem of providing an adequate educational program for tomorrow's children. There remain problems of curriculum, pupil transportation, and school personnel. Using similar methods of assessment and evaluation can also attack these problems.

The Follow-Up Study

The follow up study investigates individuals who have left an institution after having completed a program, a treatment, or a course of study. The study is concerned with what has happened to them, and what has been the impact upon them of the institution and its program. By examining their status or seeking their opinions, one may get some idea of the adequacy or inadequacy of the institution's program. Which courses, experience, or treatments proved to be of value? Which proved to be ineffective or of limited value? Studies of this type enable an institution to evaluate various aspects of its program in light of actual results.

Dillon's (1949) study of early school leavers has yielded information that may lead to the improvement of the curriculum, guidance services. Administrative procedures, and thus the holding power of the American secondary school.

Project talent (U.S. Office of Education, 1965) was an educational survey conducted by the University of Pittsburgh with support from the Cooperative Research Program of the U.S. Office of Education, the National Institutes of Health, the National Science Foundation, and the Department of Defense. The survey consisted of the administration of a 2-day battery of aptitude, ability, and achievement tests, and inventories of the background characteristics of 440,000 students enrolled in 1353 secondary schools in all parts of the United States. Five basic purposes of the survey were stated:

1. To obtain an inventory of the capacities and potentialities of American youth

2. To establish a set of standards for educational and psychological measurement

3. To provide a comprehensive counseling guide indicating patterns of career success

4. To provide information on how youth choose their life work

5. To provide better understanding of the educational experiences which prepare students for their life work.

In addition to the testing program, questionnaire follow-up studies have been conducted, and are planned at regular intervals, to relate the information gathered to patterns of aptitude and ability required by various types of occupations The vast amount of data stored in the data bank, now available in the computer tiles, will make significant educational research possible and may provide a basis for possible changes in the educational patterns of American secondary schools.

Project talent, described as an example of an educational survey, also provides an illustration of a follow-up study. One phase of the longitudinal study reported by Combs and Cooley (1968), Involved the follow-up of the ninth-grade group who failed to complete the high school program. This group, which represented a random sample of the ninth-grade secondary school population, provided an estimate of the characteristics of the drop-out population, compared with those of a random sample of students who graduated but did not enter a junior college or 4-year institution of higher learning. These two samples were compared on a number of characteristics, such as academic achievement, participation in extracurricular activities, work experiences, hobbies, contacts with school counselors, and self reported personal qualities.

The students who graduated scored significantly higher on most of the characteristics, except self-reported qualities of leadership and impulsiveness. One unusual finding indicated that the dropouts earned as much as those who had finished high school and had been earning it longer. It was pointed out, however, that the economic advantages of finishing high school could not be adequately evaluated until later in life.

Project Talent, funded by the National Institute of Education, maintained contact with the original students and has completed the eleventh year follow-up survey. Many of the students expressed dissatisfaction with their schooling and regretted that they had not gone on to college or vocational school and that they had married too early. More than half still live within 30 miles of their high schools, a surprising observation in a society that is believed to be extremely mobile. The more mobile half were the high academic achievers. Eighty percent of the men, but only 65 percent of the women expressed satisfaction with their jobs in meeting their long-range goals.

Descriptive Research

The examples discussed up to this point in the chapter have been designated as assessment studies and evaluation studies. Descriptive research studies have all of the following characteristics which distinguish them from the type previously described and from those described in the next chapter.

1. They involve hypothesis formulation and testing.
2. ~~1.~~ They use the logical methods of inductive-deductive reasoning to arrive at generalizations.
3. They often employ methods of randomization so that error may be estimated when inferring population characteristics from observations of samples.
4. The variables and procedures are described as accurately and completely as possible so that other researchers' can replicate the study.
5. They are non experimental, for they deal with the relationships between non-manipulated variables in a natural rather than artificial setting. Since the events or conditions have already occurred or exist, the researcher selects the relevant variables for an analysis of their relationships.

Quantitative and Qualitative Research

Descriptive research can be divided into two broad categories: quantitative research and qualitative research. Quantitative research consists of those studies in which the data concerned can be analyzed in terms of numbers. An example of quantitative research might be a study comparing two methods of teaching reading to first-grade children, because the data used to determine which method is more successful will be a test score. The average score of the children receiving one method will be compared to the average score of children receiving the other method. This example would be an experimental study (discussed in Chapter 5) if the experimenter randomly assigned the children to the methods, or a descriptive study if the children had already received the instruction and the experimenter was merely examining the results after the fact (sec ex post facto studies later in this chapter). In either case the study wooed one considered quantitative.

Research can also be qualitative, that is, it can describe events, persons, and so forth scientifically without the use of numerical data. A study consisting of interviews of mothers of handicapped infants to determine how their lives and beliefs were affected by the birth of their handicapped children is an example of qualitative research. Such a study would carefully and logically analyze the responses of the mothers and report those responses that are consistent as well as areas of disagreement.

Each of these types of research has advantages and disadvantages. In quantitative research, the experimenter has carefully planned the study including the tests, or other data collection instruments, to be used. Each subject is studied in an identical manner and there is little room for human bias to create problems with the data. Qualitative research is also planned carefully. Yet, qualitative studies leave open the possibility to change, to ask different questions, and to go in the direction that the observation may lead the experimenter. Quantitative research is based more directly on its original plans and its results are more readily analyzed and interpreted. Qualitative research is more open and responsive to its subject. Both types of research are valid and useful. They are also not mutually exclusive. It is possible for a single investigation to use both methods. For instance, a study of mothers of handicapped infants might include interviews, as mentioned earlier, and measures of religiosity and knowledge regarding their child's handicap. Such a study would interpret the interview data qualitatively and the measures of religiosity and knowledge quantitatively. While studies combining these approaches are rare and difficult, the benefits can outweigh the difficulties.

Of the types of descriptive research that follow, the first three, document analysis, case studies, and ethnographic studies, are types of qualitative research. The ex-postfacto studies in this chapter and the experimental and quasi-experimental designs in Chapter 5 are quantitative research.

Document or Content Analysis

Documents are an important source of data in many areas of investigation, and the methods of analysis are similar to those used by historians. The major difference between this type of research and historical research is that, while historical research often uses document analysis, it deals solely with past events. ‘When document analysis is used as descriptive research, current documents and issues are the foci. The analysis is concerned with the explanation of the status of some phenomenon at a particular time or its development over a period of time. The activity may be classified as descriptive research, for problem identification, 'hypothesis formulation, sampling, and systematic observation of variable relationships may lead to generalizations. It serves a useful purpose in adding knowledge to fields of inquiry and in explaining certain social events. Its application to educational research is suggested in some of the studies listed as examples.

In documentary analysis, the following may be used as sources of data: records, reports, printed forms, letters, autobiographies, diaries compositions, themes or other academic work. Books, periodicals, bulletins or catalogues, syllabi, court decisions, pictures, films, and cartoons.

When using documentary sources, one must bear in mind that data appearing in print are not necessarily trustworthy. Documents used in descriptive research must be subjected to the same careful types of criticism employed by the historian. Not only is the authenticity of the document important, but also the validity of its contents is crucial. It is the researcher's obligation to establish the trustworthiness of all data that he or she draws from documentary sources.

The following purposes may be served through documentary analysts (examples of actual studies are given as illustrations). The first five purposes are of a descriptive research nature while the subsequent three are historical in nature:

1. To describe prevailing practice or condition. Entrance Requirements of Ohio Colleges as Revealed by an Analysis of College Bulletins Criteria for Primary Pupil Evaluation Used on Marion County Report Cards

2. To discover the relative importance of, or interest in, certain topics or problems, Public Information an Education as Measured by Newspaper Coverage in Three Indianapolis Daily Newspapers during the Month of December, 1958

   Statistical Concepts Presented in College Textbooks in Educational Research Published since 1940.

3. To discover the level of difficulty of presentation in textbooks or in other publication.

   The Vocabulary Level of Intermediate Science Textbook Abstract Concepts Found in First-grade Readers

4. To evaluate bias, prejudice, or propaganda in textbook presentation. The Soviet Union as Presented in High School History Textbooks The Free Enterprise System as Pictured in High School Social Problems Textbooks Racial and Religious Stereotypes in Junior High School Literature Textbooks

5. To analyze types of errors in Students' work.

   Typing Errors of First Semester Typing Students at Shortridge High School Errors in English Usage Found in Letters of Application for Admission to the University of Wisconsin.

6. To analyze the use of symbols representing persons, political parties or institutions, countries, or points of view.

   Great Britain as a Symbol, as Represented in New York City Newspaper Cartoons in the Decade, 1930-1940.

The New Dealer as Depicted in the American Press from 1932 to 1942

7. To identify the literary style, concepts, or beliefs of a writer Shakespeare's Use of the Metaphor

Alexander Campbell's Concept Of the Trinity, as Revealed in is Sermons John Dewey's Interpretation of Education as Growth

8. To explain the possible causal factors related to some outcome, action, or event. The Effect of Media Coverage upon the Outcome of the 1976 Presidential Election

The Influence of Newspaper Editorials upon the Action of the State Assembly on Sales Tax Legislation

Content or document analysis should serve a useful purpose in yielding information that is helpful in evaluating or explaining social or educational practices. Since there are so many significant areas to be investigated, setting up studies for the pure joy of counting and tabulating has little justification. "The Uses of Shall and Will in the Spectator Papers" or "The Use of Too. Meaning also, in the Works of Keats" would seem to add little useful knowledge to the field of literature.

The Case Study

The case study is a way of organizing social data for the purpose of viewing social reality. It examines a social unit as a whole. The unit may be a person, a family, a social group, a social institution, or a community. The purpose is to understand the life cycle or an important part of the life cycle of the unit. The case study probes deeply and analyzes interactions between the factors that explain present status or that influence change or growth. It is a longitudinal approach, showing development over a period of time.

The element of typical ness, rather than uniqueness, is the focus of attention, for an emphasis upon uniqueness would preclude scientific abstraction and generalization of findings. As Bromley (1986) notes. "A 'case' is not only about a 'person' but also about that 'kind of person". A case is an exemplar of, perhaps even a prototype for, a category of individuals" (p. 295). Thus, the selection of the subject of the case study needs to be done carefully in order to assure that he or she is typical of those to whom we wish to generalize.

Data may be gathered by a wide variety of methods, including

1. Observation by the researcher or his or her informants of physical characteristics, social qualities, or behavior
2. Interviews with the subject (s), relatives, friends, teachers, counselors, and others
3. Questionnaires, opinionates, Psychological tests and inventories
4. Recorded data from newspapers, schools, courts, clinics, government agencies, or other sources.

A single case study emphasizes analysis in depth. Though it may be fruitful in developing hypotheses to be tested, it is not directed toward broad generalizations. One cannot generalize from a number (N) of 1. To the extent that a single case may represent an atypical situation, the observation is sound. But if the objective analysis of an adequate sample of cases leads researchers to consistent observations of significant variable relationships, hypotheses may be confirmed, leading to valid generalizations.

The individual case study has been a time-honored, procedure in the field of medicine and medical research. Sigmund Freud was a pioneer in using case study methods in the field of psychiatry. In an effort to treat his psychoneurotic patient, he began to discover consistent patterns of experience. Under his careful probing, patients recalled long-forgotten, traumatic incidents in their childhood and youth. Freud hypothesized that these incidents probably explained their neurotic behavior (Starchey, 1964).

His famous case history of Sergei Petrov, "the Wolf Man," published in 1918 under the title From the History of an Infantile Neurosis, is one of the classic examples of Freud's use of the case study. He believed that these case studies confirmed his hypothesis, leading to psychoanalysis as a method of treatment. He also used them to demonstrate how theoretical models could be used to provide concrete examples.

Case studies are not confined to the study of individuals and their behavioral characteristics. Case studies have been made of all types of communities, from hamlet to great metropolis, and of all types of individuals—alcoholics, drug addicts, juvenile delinquents, migratory workers. Sharecroppers, industrial workers, members of professions, executives, army wives, trailer court residents, members of social classes, Quakers, Amish, members of other religious sects and denominations, black Americans, American Indians, Chinese-Americans, Hispanics, and many other social and ethnic groups. Such institutions as colleges, churches, corrective institutions, welfare agencies, fraternal organizations, and business groups have been Studied as cases. These studies have been conducted for the purpose of understanding the culture and the development of variable relationships.

For example, a community study is a thorough observation and analysis of a group of people living together in a particular geographic location in a corporate way. The study deals with such elements of community life as location, appearance, prevailing economic activity, climate and natural resources, historical development, mode of life, social structure, goals or life values and patterns, the individuals or power groups that exert the dominant influence, and the impact of the outside world. It also evaluates the social institutions that meet the basic human needs of health, protection, making a living, education, religious expression, and recreation.

The early community studies of Lynda and Lynda are well known. The first, *Middletown* (1929), and the second, Middletown in Transition (1937), described the way of life in Muncie, Indiana, a typical Midwestern, average-size city, tracing its development from the gas boom of the 1890s through World War I, the prosperity of the twenties, and the depression of the thirties. West (1945) described the nature of a very small community in the Ozark region in Plainville. USA. Sherman and Henry {1933} studied the way of life in five "hollow" communities, hidden in the Blue Ridge Mountains, *in Hollow Folk.*

Some community studies have singled out particular aspects for special investigation. Drake and Cayton (1945) described life in the black section of Chicago in Black Metropolis. Hollingshead (1949) portrayed the life of adolescents in a small Illinois community in Elmtown's Youth. Warner and Lunt (1941) developed a hypothesis of social class structure in a New England community in their study of Newburyport, Massachusetts, in Social Life in a Modern Community. Lucas (1970) compared the way of life in three Canadian communities in Mine town, Milltown, Rail town: Life in Canadian Communities of Single Industry.

Although the case study is a useful method of organizing research observations, certain precautions should be considered:

1. The method may look deceptively simple. To use it effectively, the researcher must be thoroughly familiar with existing theoretical knowledge of the field of inquiry, and skillful in isolating the significant variables from many that are irrelevant. There is a tendency to select variables because of their spectacular nature rather than for their crucial significance.

2. Subjective bias is a constant threat to objective data gathering and analysis. The danger of selecting variable relationships based upon preconceived conviction and the apparent consistency of a too limited sample of observations may lead the researcher to an unwarranted feeling of certainty about the validity of his or her conclusions.

3. Effects may be wrongly attributed to factors that are merely associated rather than cause-and-effect related. While the case study process is susceptible to this post hoc fallacy, it is also a hazard associated with other types of non-experimental studies.

Ethnographic Studies

Ethnography, sometimes known as cultural anthropology or more recently as naturalistic *inquiry*, is a method of field study observation that became popular in the latter part of the nineteenth century. It has continued to show significant development, suggesting promising techniques for the study of behavior in an educational situation. In its early application, it consisted of participant observation, conversation, and the use of informants to study the cultural characteristics of primitive people: African, South See Island, and American Indian tribes. These groups were small in number. Geographically and culturally isolated, with little specialization in social function, and with simple economies and technology. Such cultural features as language, marriage and family life, child-rearing practices, religious beliefs and practices, social relations and rules of conduct, political institutions and methods of production were analyzed.

The data gathered consisted of observation of patterns of action, verbal and nonverbal interaction between members of the tribe as well as between the subjects and the researcher and his or her informants, and the examination of whatever records or artifacts were available.

Many early studies were subsequently criticized on the grounds that the anthropologist spent too little time among the people of the tribe to get more than a superficial view, didn't learn the native language and had to depend too much on the reports of poorly trained informants, and relied too much on his or her own cultural perspective, reaching ethnocentric, judgmental conclusions that resulted in stereotyped theories of the development of the primitive society.

Later investigators realized that studies of this type would be invalid unless the observer

1. Lived for a much more extensive period of time among the tribe and became an integrated member of the social group.

2. Learned the native language, enabling him or her to develop the sensitivity to think, feel, and interpret observations in terms of the tribes concepts, feelings, and values, while at the same time supplementing his or her own objective judgment in interpreting observations.

3. Trained his or her informants to systematically record field data in their own language and cultural perspective.

This refinement of participant observation resulted in more objective and valid observation and analysis. Some studies were directed toward the examination of the total way of life of a group. Other studies singled out a particular phase of the culture for intensive analysis, taking into account those elements that were relevant to the problem.

In her classic study, Coming of Age in Samoa, Mead (1928) observed the development of 53 adolescent girls in a permissive Samoan society. She concluded that there were no differences in the physical processes of adolescent growth between Samoan and American girls: The differences were differences in response. The difficulties of this period of development, a troublesome feature of American life, do not occur in Samoa. She attributed the difference to Samoa's more homogeneous culture, a single set of religious and moral beliefs, and a wider kinship network that conferred authority and affection. The difficulties of American girls were attributed to cultural restraints, not nature.

Many of the time-honored techniques of the ethnograpl study involving integration into the group and observation are being applied to psychology and education, as well as anthropology and sociology. An excellent example of this methodology applied to an educational issue is a recent study of school principals. Morris, Crowson, Porter-Gehrie, and Hurwitz (1984) were interested in determining exactly what principals actually do and how much time is spent on those activities. Their procedure was to have each principal observed for up to 12 full work days. The observers followed the principal wherever he or she went. The authors "were interested in whom the principal interacted with and by what means (verbal face to face, written word, telephone, etc.). We wanted to know which party initiated each interchange, whether it was planned or spontaneous, how long it lasted, and where it took place. Most important, we warned to follow the changing subject matters of these conversations, not only to see what topics consumed the principal's time but also to trace the rhythm of the principal's working hours" (Morris, et al. 1984. p. v).[2] One of the conclusions of this study was that principals usually spend less than half their workday in their

[2] Used with the permission of the authors and of Charles E. Merrill Publishing Co.

offices, That they have a good deal of discretion in their decision-making, and that the principal's behavior "affects four distinct 'constituencies ": teachers and students, parents and others in the community, superiors, and the principal him or herself (Morris, et al. 1984. p.v).

The ethnographic study is a qualitative approach, employing few, if any, quantitative data-gathering instruments. Using the method of observation. The researcher observes, listens to, and sometimes converses with the subjects in as free and natural an atmosphere as possible. The assumption is that the most important behavior of individuals in groups is a dynamic process of complex interactions and consists of more than a set of facts, statistics, or even discrete incidents. The strength of this kind of study lies in the observation of natural behavior in a real-life setting, free from the constraints of more conventional research procedures.

Another assumption is that human behavior is influenced by the setting in which it occurs. The researcher must understand that setting and the nature of the social structure: its traditions, values, and norms of behavior. It is important to observe and interpret as an outside observer but also to observe and interpret in terms of the subjects—how they view the situation, how they interpret their own thoughts, words, and activities, as well as those of others in the group. The researcher gets inside the minds of the subjects, while at the same time interpreting the behavior from his or her own perspective.

The relationship of researchers to their subjects is based upon trust and confidence. Researchers do not allow themselves to be aligned with either the authority figures or the subjects. A position of neutrality is essential to objective participant observation.

Unlike conventional deductive quantitative research, participant observers begin without preconceptions and hypotheses. Using inductive logic, they build their hypotheses as they are suggested by observations. They periodically reevaluate them on the basis of new observations, modifying them when they appear to be inconsistent with the evidence. They look for negative evidence to challenge their temporary hypotheses. In a sense, this type of research has the characteristics of a series of consecutive studies. Unlike the conventional research study, the interpretation is not deferred to the conclusion but is a constant ongoing process of testing tentative hypotheses against additional observations in a real situation.

Ethnographic methods of research have been used to investigate such problems as:

1. Student Leadership Roles in an Urban, Racially Integrated High School
2. Pupil-Teacher Relationships in a Suburban Junior High School
3. Social Relationships in a Class of Emotionally Disturbed Children
4. Changes in Attitudes and Behavior in a Drug Abuse Rehabilitation Center
5. The Social Class Structure of a Florida, Cuban-American Community
6. Staff-Parent Interactions in an Individualized Education Plan (IEP) Staffing

Post Facto Or Causal-Comparative Studies

Descriptive research seeks to find answers to questions through the analysis of variable relationships. What factors seem to be associated with certain occurrences, outcomes, conditions, or types of behaviors? Because it is often impracticable or unethical to arrange occurrences, an analysis of past events or of already existing conditions may be the only feasible way to study causation. This type of research is usually referred to as ex post facto or causal-comparative research or, when correlational analyses are used, it may be referred to as *correlational research.*

For example, one would not arrange automobile accident in order to study their causes. The automobile industry, police departments, safety commissions, and insurance companies study the conditions associated with the accidents that have occurred. Such factors as mechanical faults or failures excessive speed, driving under the influence of alcohol, and others have been identified as causal.

However, while studies of past events may be the only practicable way to investigate certain problems, the researcher needs to be aware of the problems inherent in this type of research. The researcher must be cognizant of the fact that the information used in ex post facto studies may be incomplete. That is the researcher may not have sufficient information about all of the events and variables that were occurring at the time being studied. This lack of control or even of knowledge regarding what variables were controlled makes causal statements based upon this type of research very difficult to make.

Research on cigarette smoking has had a tremendous effect on society Laws banning television advertising and cigarette smoking in certain areas resulted from the U.S. Surgeon General's reports (1964.1979). These reports compiled the research of epidemiologists on the effects of smoking on a person's health. Epidemiological research methods are used to study trends and incidences of disease and are descriptive in nature. The epi- demonological research on smoking included two types of descriptive methodology: retrospective studies relate personal histories with medical and mortality records; prospective studies follow a group of individuals for an indefinite period or until they die. The early studies, from 1939 to the early 1960s, were primarily retrospective. These studies found that persons who had Jed of lung cancer were more likely to have been cigarette smokers than nonsmoker.

TABLE 4-1 Expected Death Rates for Smokers

UNDERLYING CAUSE OF DEATH	EXPECTED DEATHS	OBSERVED DEATHS	MORTALITY RATIO
Cancer of lung (162-3)	170.3	l,833	10.3
Bronchitis and emphysema (502, 521.1)	89.5	546	5.1
	14.0	75	5.4
Cancer of larynx (161)	37.0	152	4.1
Oral cancer (140-8)	33.7	113	3.4
Cancer of esophagus (150)	105.1	294	2.8
Stomach and duodenal ulcers (540, 541)	254.0	649	2.6
	169-2	379	2.2
Other circulatory diseases (451-68)	111.6	216	1.9
Cirrhosis of liver (581)	5,430.7	11,177	1.7
Cancer of bladder (181)	526.0	868	1.7
Coronary artery disease (420)	409.2	631	1.5
Other heart diseases (421-2, 430-4)	210.7	310	1.5
Hypertensive heart (440-3)	79.0	120	1.5
General arteriosclerosis (450)			
Cancer of kidney (180)	15,653.9	23,223	1.68
All causes			

(Surgeon Generals Report, 19&4).

A number of prospective studies, begun in the 1950s, found a greater likelihood of a variety of health problems among smokers than nonsmokers. Table 4-1 (Table 2 in Chapter 4 of the U.S. Surgeon General's [1964] report) shows the expected number of deaths, based on the overall death rates for persons, the ages of the subjects, and the actual number of deaths for seven prospective studies combined. Mortality ratio is simply observed deaths divided by expected deaths. As the Surgeon General's report states:

The mortality ratio for male cigarette smokers compared with non-smokers, for all causes of death taken together, is 1.68. representing a total death rate nearly 70 percent higher than for non-smokers. (This ratio includes death rates for diseases not listed in the table as well as the 14 disease categories shown.)

In the combined results from the seven studies, the mortality ratio of cigarette smokers over non-smokers was particularly high for a number of diseases: cancer of the lung (10.8). bronchitis and emphysema (6.I). cancer of the larynx (5.4), oral Cancer (4.1), cancer of the esophagus (3.4). peptic ulcer(2.8), and the group of other circulatory diseases (2.6). For coronary artery disease the mortality ratio was 1.7.

Expressed in percentage-form, this is equivalent to a statement that for coronary artery disease, the leading cause of death in this country, the death rate is 70 percent higher for cigarette smokers. For chronic bronchitis and emphysema, which are among the leading causes of severe disability, the death rate for cigarette smokers is 500 percent higher than for non-smokers. For lung cancer, the most frequent site of cancer in men, the death rate is nearly 1,000 percent higher, (pp. 28-29)

While this evidence appears overwhelming, it is not totally convincing by itself. Since the researchers could not randomly assign persons to the smoking and nonsmoking groups, it is possible that persons who decide to smoke are particularly nervous individuals and that it is their nervousness, not their smoking, that causes their greater incidence of illness and early death. Of course this research, along with chemical analyses indicating carcinogens in cigarette smoke and animal studies, is convincing to the vast majority of scientists and the public.

Studies of juvenile delinquency may compare the social and educational backgrounds of delinquents and non delinquents. What factors, if any, were common to the non-delinquent group? Any factors common to one group, but not to the other, might serve as a possible explanation of the underlying causes of delinquency.

Some efforts have been made to associate good or poor teaching with the type of educational institution in which the teachers prepared. Those studies have proved inconclusive, possibly for a number of reasons. In addition to the difficulty of finding valid and satisfactory criteria of good and poor teaching, many factors other than type of college attended seem to be significant. Such variables as quality of scholarship, socioeconomic status, personality qualities, types of non school experiences, attitudes toward the leaching profession, and a host of others have possible relevancy.

Sesame Street studies. Minton (1975) studied the effect of viewing the children's television program, "Sesame Street," on the reading readiness of kindergarten children. Of three sample groups, a 1968, a 1969, and a 1970 group, only the 1970 group had viewed the program.

Reading Readiness and "Sesame Street"

SAMPLE GROUP	N	WHITE	BLACK	SPANISH-SPEAKING
1968	482	431	51	18
1969	495	434	61	9
1970	524	436	88	25

From impact of Sesame Street on Reading readiness" by J M Minton, Sociology of Education, 1975, 48. l41-51, Reported by permission.

Scores on the Metropolitan Reading Readiness Test battery, consisting of six subtests (word meanings, listening, matching, alphabet letter recognition, numbers, and copying text) were used to measure readiness. Using pretest- posttest design, the mean gain scores of the 1970 group were compared with those of the 1968 and 1969 groups.

No significant differences at the 0.05 levels were observed in total scores. On only one of the subtests, letter recognition, was a significant difference observed, favoring the 1970 group. In a classification by socio-economic status, advantaged children watched more and scored higher than disadvantaged children. The hypothesis that viewing "Sesame Street" would help to close the gap between advantaged and disadvantaged children was not supported; rather, the gap was widened.

Anderson and Levin (1976) studied the effect of age on the viewing attention of small children to a 57-minute taped "Sesame Street" program, consisting of 4.1 bits, each ranging in length from 10 to 453 seconds. Six groups of five boys and five girls, ages 12,18,24,30,36,42, and 48 months were observed by video tape recordings. In a viewing room, in the presence of parents, toys were provided as alternatives to viewing. The following observations were reported:

1. Length of attention increased with age. The younger children appeared to be more interested in the toys and interacting with their mothers.
2. Length of attention decreased as bit length increased.
3. Attention to animals increased to 24 months but dropped thereafter.
4. Children showed more interest in the presence of women, lively music, puppets, peculiar voices, rhyming, repetition, and motion.
5. Children showed less interest in the presence of adult men, animals, inactivity, and still drawings.

Replication and Secondary Analysis

Replication, a combination of the terms repeat and *duplicate*, is an important method of challenging or verifying the conclusions of a previous study. Using different subjects at a different time and in a different setting, arriving at conclusions that are consistent with those of the previous study would strengthen its conclusions and justify more confidence in its validity. Replication is essential to the development and verification of new generalizations and theories.

Another useful procedure, known as secondary analysis, consists of reanalyzing the data gathered by a previous investigator, and may involve different hypotheses, different experimental designs, or different methods of statistical analysis. The subjects are the same and the data are the same. The difference is that of alternative methods of analysis.

Secondary analysis has a number of advantages that commend its use:

1. The new investigator may bring an objectivity, a fresh point of view, to the investigation and may think of better questions to be raised or hypotheses to be tested. For example, the viewpoint of a psychologist rather than that of a sociologist (or vice versa) may find greater meaning in the data already available.
2. Secondary analysts may bring greater expertise to the area of

investigation and greater skill in experimental design and statistical analysis.

3. The reanalysis would involve less expense in both time and money. Because the data are already available, a more modest appropriation of funds would be possible. It would not be necessary to intrude upon the time of subjects (teachers and students) whose primary activities had been diverted in the original investigation.

4. Secondary analysis may provide useful experience for students of research methodology by enabling them to use real data, rather than simulated or inferior data, for the purposes of the exercise.

Secondary analysis has played an important part in educational research. Probably no investigation has been subjected to as great a degree of secondary analysis as the Equality of Educational Opportunity study described next.

Equality of Educational Opportunity study. In 1964, the Congress of the United States passed the Civil Rights Act. which directed the United States Commissioner of Education to carry out a study of "the lack of educational opportunity by reason of race, color religion, or national origin in public educational institutions at all levels in the United States, its territories and possessions, and the District of Columbia."

This authorization assumed that educational opportunity for members of minority groups was unequal to that available for white students. This study was one of the largest of its type ever conducted. The report of its findings, commonly known as the Coleman Report, was tilled Equality of Educational Opportunity (Coleman, et al., 1966).

The nationwide investigation selected, by a two-stage probability sample, 640,000 public school pupils in grades 1, 3, 6, 9, and 12, and 60,000 teachers in more than 4000 schools. Data were also gathered from parents, school principals, school district superintendents, and prominent community members. In addition, case studies of individual cities were conducted be educators, lawyers, and sociologists. For comparative purposes he data were organized by geographic location as northern, northern metropolitan, southern and southwestern, southern metropolitan, and mid-western and western. Individuals were classified as white, black, Asian, Indian, Mexican-American, and Puerto Rican.

As much as possible, data-gathering instruments were checked for validity and reliability. Methods of data analysis included multiple correlation and factorial analysis of variance and covariance.

Although it would not be feasible to present a detailed account of the findings of the study, a few of the major conclusions are included:

1. The report rejected the assumption that the educational opportunities provided for minority children were unequal. There seemed to be little difference in almost all school facilities that would relate to equality of opportunity. In some areas, minority schools seemed to be more adequate than predominantly white schools.

2. Family background, rather than the characteristics of the school, appeared to be the major influence on school achievement. It was apparent that, over the years, the school experience did little to narrow the initial achievement gap.

3. The socioeconomic composition of the student body was more highly related to achievement than any school factor.

4. The achievement level in rank order was white. Asian - American, American Indian, Mexican- American, Puerio Rican, and black. While white students scored significantly higher than any other group. Asian Americans excelled in nonverbal and mathematics achievement.

5. Inequalities of educational opportunity ware more closely related to regional differences, rather than to differences between predominantly black and white schools. Schools in the North, Midwest, and West seemed to have better facilities than those in the South and Southwest.

6. Social class differences within all groups appeared to be more significant them the differences between ethnic groups.

The Coleman Report has been subjected to criticism both by experienced researchers and by members of special interest groups. The findings were unacceptable to some, who pointed out flaws in the gathering of data and their interpretation. Others found procedural defects in sampling and statistical analysis of the data.

Of 900.000 pupils solicited, only about 640,000, or about two-thirds of the invited sample, were tested. Twenty-one metropolitan school districts refused to participate in the study, including such large cities as Boston. Chicago, Indianapolis, and Los Angeles. In addition, twenty-three other school districts, who participated to a limited degree, refused to test their pupils. The provision for an equal number of white and nonwhite participants in the sample introduced a possible element of invalidity in the statistical analysis of the data.

The questionnaires were criticized for their lack of what has been termed a "qualitative bite," the effort to get beneath the surface for more meaningful responses. There was also a high degree of non-response to the questionnaires, particularly on some items of an emotional or controversial nature. For example, one-third of the principals failed to answer questions on the racial composition of their faculties.

Some critics believed that the report did not make a highly significant contribution to education, but most agreed that it did stimulate interest in further research concerning the relationship of the family, the school, and the community.

The fact that no previous study has generated so much controversy is not surprising considering the complexity of the problems involved and the sensitive nature of the issues. For example, both advocates and opponents of school busing viewed the data in the light of their own established positions.

A number of studies using secondary analysis were authorized by various government agencies, special commissions, and philanthropic foundations. Using the Coleman Report data, various aspects of the problem were examined more closely, using different statistical procedures and raising different questions. Some confined their investigations to data relating to a single geographic area while others considered a wider range of data analysis. Helpful resumes of several of these studies are included in the publication, On Equality of *Educational Opportunity*, edited by Mosteller and Moynihan (1972).

Meta Analysis. A relatively recent innovation that allows a researcher to systematically and statistically combines the findings of several previous studies is known as meta-analysis, research synthesis, or research integration. There are a number of quantitative techniques, ranging from fairly simple to quite complex, by which the data from previously published studies can be combined. Glass (1978) and his colleagues (Glass, Smith, & Barton, 1979), have developed and described some of these techniques. Walberg (1986) discusses the relative advantages of the traditional review of the literature and the statistical research synthesis. He suggests that a combination of these approaches can be useful in estimating the effects of a number of studies. Walberg and his colleagues have conducted a number of studies using these techniques. See the special issue of Evaluation in Education, 1980, Vol. 4, pp. 1- 142, edited by Walberg and Haertel, for a selection of these and other research integration efforts.

The Post Hoc Fallacy

One of the most serious dangers of ex post facto and causal comparative research is the post hoc fallacy, the conclusion that because two factors go together one must be the cause and the other the effect. Because there seems to be a high relationship between the number of years of education completed and earned income, many educators have argued that staying in school will add x number of dollars of income over a period of time for each additional year of education completed. Although there may be such a relationship, it is also likely that some of the factors. That influence young people to seek additional education are more important than the educational level completed. Such factors as socioeconomic status, persistence, desire, willingness to postpone immediate gratification, and intelligence level are undoubtedly significant factors in vocational success. Staying in school may be a symptom rather than the cause.

Some critics of cigarette-cancer research have advanced a similar argument. The case that they propose follows this line of reason: Let us suppose that certain individuals with a type of glandular imbalance have a tendency toward cancer. The imbalance induces a certain amount, of nervous tension. Because excessive cigarette smoking is a type of nervous tension release, these individuals tend to be heavy smokers. The cancer could result from the glandular imbalance rather than from the smoking, which is only a symptom. This error of confusing symptoms or merely associated factors with cause could lead researchers to deduce a false cause-an d-effect relationship.

This illustration is not presented to discredit this type of cancer research. Substantial evidence does suggest a significant relationship. Laboratory experiments have supported a causal relationship between the coaltar products that are distilled from cigarette combustion and malignant growth in animals. The association explanation, however, is one that should always be examined carefully.

Ex post facto and causal-comparative research is widely and appropriately used, particularly in the behavioral sciences. In education, because it is impossible, impracticable, or unthinkable to manipulate such variables as aptitude, intelligence, personality traits, cultural deprivation, teacher competence, and some variables that might present an unacceptable threat to human beings, this method will continue to be used.

However, its limitations should be recognized:

1. The independent variables cannot be manipulated.
2. Subjects cannot be randomly, or otherwise, assigned to treatment groups
3. Causes are often multiple rather than single.

For these reasons scientists are reluctant to use the expression cause and effect in no experimental studies in which the variables have not been pears, variable B is consistently associated, possibly for reasons not completely understood or explained.

Since there is a danger of confusing symptoms with causes, ex post facto research should test not just one hypothesis but other logical alternate or competing hypotheses as well. Properly employed and cautiously interpreted, it will continue to provide a useful methodology for the development of knowledge.

Students who have completed a course in research methods should be sensitive to the operation of extraneous variables that threaten the validity of conclusions. Glass (1968) cautions educators of the need for critical analysis of reported research. He cites a number of interesting examples of carelessly conducted studies that resulted in completely false conclusions. Unfortunately, these conclusions were accepted by gullible readers and widely reported in popular periodicals and some educational psychology textbooks.

The authors trust that the experience of the introductory course in educational research will help students and educators to read research reports more carefully and to apply more rigorous standards of judgment.

Summary

The term descriptive studies has been used to classify a number of different types of activity. This change points out the distinctions between three, major categories: assessment, evaluation, and descriptive research.

Assessment describes the status of a phenomenon at a particular time without value judgment, explanation of reasons or underlying causes, or recommendations for action.

Evaluation adds to the description of status the element of value judgment, in terms of effectiveness, desirability, or social utility, and may suggest a course of action. No generalizations are extended beyond the situation evaluated.

Descriptive research is concerned with the analysis of the relationships between non-manipulated variables and the development of generalizations, extending its conclusions beyond the sample observed.

Assessment type of studies described are surveys, public opinion polls, the National Assessment of Educational Progress, the

International Assessment of Educational Achievement, activity-analysis, and trend studies.

Evaluation studies included are school surveys and follow-up studies. The application of evaluation findings to social problem solving is discussed.

Descriptive research studies include document or content analysis, case studies, community studies, ethnographic studies, and Ex post facto or explanatory observational studies. These methods have been described and examples provided. The hazards of the post hoc fallacy have been emphasized.

Exercises

1. Why is it sometimes difficult to distinguish between an assessment studies, an evaluation study, and a descriptive research project? Illustrate with an example.
2. Public opinion polls base their conclusions on a sample of approximately 1500 respondents. Is this an adequate sample for a nationwide survey?
3. In a 1974 study, the West Virginia State Department of Education reported that counties with the highest per-pupil expenditure were the counties with the highest level of academia achievement, and that this "shows for the first time the clearest possible relationship between student achievement and the amount of money invested in the public schools." Can you suggest several competing hypotheses that might account for high academic achievement?
4. What is the difference between a study and a research project?
5. In what ways does conducting longitudinal studies run the risk of the violation of confidentiality of personal information?
6. How can a study of money and investment trends help you provide for your future financial security?
7. Draw up a proposal for a follow-up study of your high school graduating class of 5 years ago. Indicate what information you believe would be helpful in improving the curriculum of the school.

8. Of what value are the findings of the annual Gallup poll of public attitudes toward education?
9. How could the survey type of study be helpful in arriving at solutions to the crime problem in large cities?

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18

Methods of Research Experimental

> If we are to advance beyond the dark ages of educational pre-science, we must emulate the experimental proficiency and zeal of colleagues in other behavioral sciences.
>
> ***JULIAN C. STANLEY***

Significance of Experimental Work

Experiment has proved to be an essential and powerful tool in leading man towards progress. There would have been very little progress, as we find it today, without systematic experimentation.

The goal of all experiments is progress and good life. In so far as good education is recognized as the basis of adequate individual and social development, need for experimentation in education to improve educational practices and policies is being realized increasingly. The educationists are constantly searching for more effective methods of instruction, more satisfactory techniques of evaluation, richer learning materials, more efficient systems of administrative organization. This search is assuming greater urgency in India because of the very rapid expansion and democratization of education. A number of new educational problems have arisen. For a successful solution of the multitude of problems and for the full realization of the educational aims set up, experimental work, adequate both in quality, should be carried out in varying degrees by all those who are engaged in the teaching profession.

Meaning of Experimentation—Experimentation differs from normative or descriptive survey methods and from other techniques of research in that the experimenter has some degree of control over some variables involved and the conditions under which variables are observed.

According to J. W. Best, "Experimental research is the description and analysis of what will be, or what will occur under carefully controlled condition."

Basic Assumption Behind Experimentation

The basic assumption behind the experimentation is the law of the single variable formulated by John Stuart Mill. The principle reads as "If an instance in which the phenomenon under investigation occurs, and an instance in which it does not occur have every circumstance in common save one, that one occurring only in the former, the circumstances in which alone the two instances differ is the effect, or the cause, or an indispensable part of the cause, of the phenomenon."

Stated in a simple language, if two situations are alike in every respect, and one element is added to or removed from one but not the other, any difference that develops is the result of the operation of that element added or removed.

Experimental research describes 'what will be' when all relevant conditions are carefully controlled.

Educational Experimentation

Meaning—W. S. Monore and M. D. Engelhard describe as "Experimentation" is the name given to the type of educational research in which the investigator controls the educative factors to which a child or group of children is subjected during the period of inquiry and observes the resulting achievement...In the simplest type of educational experiment the investigator seeks to evaluate the influence of some one educative or "experimental" factor on a single group of children. He must start the experiment with some measurement of the initial attainment of the children in the trait or ability to be influenced. He then subjects the group to the experimental factor, such as particular type of drill material in arithmetic, for the duration of the experiment. At the end, the investigator applies a final test for the purpose of determining the gain in achievement that has resulted from the application of the experimental factor"

Jahoda and others, regard social experiment as a method of testing hypothesis. Greenwood suggests that an experiment is the proof of a hypothesis which seeks to take up two factors into causal relationship through the study of contrasting situations which have been controlled on all factors except the one of interest the latter being either the hypothetical cause or the hypothetical effect. According to Festinger, "The essence of an experiment may be described as observing the effect on a dependent variable of the manipulation of an independent variable."

Five Types of Experiments

Greenwood has mentioned following five types of experiments:

1. Trial and Error Experiment.
2. Controlled Observational Study.
3. Natural Experiment.
4. Ex-post facto Experiment.

~~1.~~4. Laboratory Experiment.

Experimentation and Laboratory Method

According to Travers, "Experimentation may occur within the laboratory or outside it Laboratory studies usually require relatively small numbers of subjects and the careful control of many factors that can not be controlled in other situations. When experimentation requires equipment or complex apparatus, it may be necessary to work within the laboratory. Of course, the laboratory itself introduces variables, which it may be desirable to control but which cannot be controlled easily. For instance, human subjects who are introduced into a laboratory except to behave in a certain way, or at least feel that the situation calls for certain kinds of responses."

Walter R. Borg. thinks "The experiment is the ultimate form of research design, providing the most rigorous test of hypothesis that is available to the scientist".

According to John W. Best, "Experimental research is the description and analysis of what will be, or what will occur, under care fully controlled situation."

Georg. G. Mouly describes this method as, "Experimentation can be considered a "technique of deliberately staging a situation designed to force nature to provide a 'yes' or 'no' answer to Specific hypothesis concerning the phenomenon under discussion. "The same writer thinks that an experiment 'must be self-contained' and this in turn, calls for the satisfaction of three basic interrelated conditions :

(i) Control.
(ii) Randomization,
(iii) Replication.

An experiment cannot be interpreted accurately unless these conditions are fulfilled.

Main Features of the Experimental Method

1. Experimentation involves an attempt to control all essential factors except a single variable, which is manipulated with a view to determine and measure the effects of its operation.
2. It has been applied with considerable success in the classroom by controlling significant factors within certain limits.
3. In educational research, the basic condition of other things being equal' is difficult for fulfillment. In education we deal with those subjects i.e., human beings who are complex.
4. The control group and experimental group are never as identical as they ought to be for an exact experiment.
5. Experimental studies in education though never strictly empirical can yet approximate strictly empirical research in many areas.
6. All experiments in education are ultimately experiments with children. It is, therefore, very important from ethical point of view that they are not subjected to conditions that may harm them.

History of Educational Experimentation

The second half of the nineteenth century saw the beginning of educational experimentation. Wundt set up a psychology laboratory at Leipzig in 1879 where he studied experimentally the learning process and tried to clarify and define learning patterns. In the 1880's Ebbinghaus invented methods of measuring association and memory, which affected teaching techniques. Thereafter, the experimental work of Thorndike, Judd and Freeman paved the way for further experimental research in education. The work of Rice and Cornmad during the last decade of the 19th century that was done on spelling achievement among students may be called the beginning of strict educational experimentation.

Uses of Experimentation in Education

Main uses of experimentation in education are:

1. Determining and evaluating the adequacy and effectiveness of educational aims and objectives through the measurement of outcome.
2. Serving as a basis for the formulation, execution and modification of educational policies and programmes.
3. Ascertaining the effect of any change in the normal educational practices and programmes.

Major Steps in the Experimental Method

1. Selecting and delimiting the problem.
2. Reviewing the literature.
3. Defining the population.
4. Planning the experiment.
5. Conducting the experiment.
6. Measuring the outcomes.
7. Analyzing and interpreting the outcome.
8. Drawing up the conclusions.
9. Reporting the results.

I. Selecting and Delimiting the Problem. This involves;

i. Investigating the needs in the field of action and deciding upon a problem.

ii. Conversion of the problem into a hypothesis that can be verified or refuted by the experimental data.

II. Reviewing the Literature- This implies the study of the literature related to similar problems.

III. Defining the population- It is necessary to define the population precisely so that there can be no question about the population to which the conclusion are to apply.

IV. Planning the Experiment. This includes;

(i) Determining the methods of experimentation.
(ii) Place of the experimentation.
(iii) Duration of the experiment.
(iv) Determining the materials of the experiment.
(v) Conducting a pilot study.
(vi) Selecting the subjects and groups.

V. Conducting the Experiment- This includes the following sub steps:

(a) Control of variables and non-experimental factors.
(b) Keeping a careful record of steps in the procedure.
(c) Applying the experimental factor or factors.

VI. Measuring the Outcome—This implies giving a careful consideration to the selection of the criterion on the basis of which the results are to be measured.

VII. Analyzing and Interpreting the Outcomes—This implies the need for competence in statistical procedures.

VIII. Drawing up the Conclusions—Care must be taken to restrict the conclusions to the conditions actually present in the experiment. The conclusions of the study must be restricted to the population actually investigated and care must be exercised not to over generalize the results.

IX. Reporting the Results—The study should be reported in such a way that the reader can make a judgment as to its adequacy.

General Description of an Experimental Method

Control Factor—The customary method or device of doing a job is known as the control factor.

Experimental Factor—This is the new method, arrangement or device, which is being introduced to develop pupil growth in skills and knowledge in a new setting.

A comparison is made between the results of these situations and the difference between the control pupil mean and the experiment pupil mean would determine the relative superiority of the method or factor showing the greatest pupil gain.

The various steps in a simple experiment of this type can be represented thus:

Experimental Group	**Control Group**
1. Pretest	1. Pretest.
2. Application of experimental factor	2. Application of control factor.
3. Final test.	3. Final test.
4. Measurement of pupil mean gain (Final test scores minus pretest scores.)	4. Measurement of pupil mean gain (Final test scores minus pretest scores.)

Experimental Designs

1. The single individual or single group design.
2. The parallel-group design (two or more).
   a. Equated by random sample.
   b. Equated by mean score.
   c. Equated by matched pairs
   d. Co-twin method.
3. Rotational method.
   a. Single group.
   b. Parallel, equated groups.

1. The single Individual or single group design—This type is probably the most elementary and less rigorous design. This type of experiment is carried on in comparing the growth of a single individual or growth under two-sets of conditions. The group is subjected to an experimental and a control factor for equivalent periods of time and then outcomes are compared. The procedure may be listed as follows;
   a. Test the group.
   b. Introduce Method A.
   c. Test and group again.
   d. Note the gains.
   e. Allow for a period of transition.
   f. Test the group again.
   g. Introduce Method B.
   ~~a.~~h. Test the group again and note the gain.
   i. Compare the games in (d) and (h).

Advantages

1. It is simple to plan and operate.
2. It requires no equation or rotation of groups.
3. It is well suited to classroom use and provides a stimulus to better classroom teaching.

Limitations

1. The teacher may not necessarily be equally effective and enthusiastic about both the methods.
2. ~~1.~~2. Gains Due to practice efforts are generally greater in the second testing than the first one.
3. In the second phase of this experiment, students involved are a little older and a little mature than they were when they entered the first phase.
4. The very novelty of the new method may produce greater gain, irrespective of its real merit

Some Important Points to be Considered while Applying this Method

1. The unit of work should be of equal difficulty.
2. The unit of work should be equally interesting.
3. Each unit of work should be given the same time.
4. The tests produce scores of equate scale value.

Parallel or Equivalent Group Method

This method of grouping is more complex than the one-group experiment but more accurate. In this, two or more groups of subjects equivalent in all significant respects are selected One of these parallel groups serves as the control group and the experimental factor or factors are applied to the other groups, one by one for a specified period of time. The difference observed at the end of the period between. The control and the experimental groups is expected to be due to the introduction of experimental factor.

i. The main steps in this method are:
ii. Securing equivalent groups.
iii. Applying the experimental factor.
iv. Comparing the results.
v. Interpreting and reporting the results.

Factors Leading to the Formation of Equating Groups

i. Chronological age.
ii. Intelligence quotient.
iii. Sex.
iv. Race.
v. Physical conditions.
vi. Previous achievement.
vii. Study habits.
viii. Personality traits.

Four Ways of Equating Groups

a) By random selection—This consists of selecting groups by some system of random selection
b) By equating on the basis of mean scores and standard deviations—Groups are selected whose mean ages, intelligence scores and other factors considered significant are the same.
c) By matched pairs—Pairs of students are formed whose characteristics are as nearly alike as possible in respect of age, sex, intelligence, home back ground, race, etc.
d) By co-twin method— Pairs of identical twins are placed in the control and the experimental factor.

Limiting Factors

i. Equating groups,
ii. Tremendous administrative problems involved in recognizing classes.
iii. Teacher's competency and enthusiasm.
iv. Problem of satisfactory validity and reliability of the measuring instruments.

Rotational Methods—Groups are rotated at periodical interval. For example, Groups A and B may use methods A and B, respectively for a particular period and then exchange methods for the same period. A comparison is then made of the relative gains of each of the groups under two methods.

This method enables us to minimize the influence of uncontrolled factors and to provide a more convincing test of the superiority of the particular method under investigation.

Need for a Cautious Approach to Experimentation

1. The subjects should be representative as to the age, sex,

grade, intelligence, etc.

2. Such subjects should be selected as are reasonably expected to be available throughout the period of the experiment.
3. The number of subjects be adequately large to allow for losses for elimination on account of absences from one or more tests.
4. The materials must be appropriate to the subjects and the experimenter.
5. The place in which the experiment is to be conducted must be typical of the situations to which the results of the experiments are expected to apply.
6. Appropriate measuring instruments should be used.
7. Since the effectiveness of teaching learning in any classroom situation can rarely be attributed to a single factor, it is very essential to exercise great caution in interpreting the 'resulting experimental conclusions. The basic conditions of ‘other things being equal' is difficult of fulfillment in educational research. Besides the control group and the experimental group are never as identical as they ought to be for an exact experiment.

Advantages of Experimental Method

1. Establishing direction of causality—The most important advantage of the experiment is that the relationship that you actually observe is clear in its casual direction.
2. Low cost—Compared to that of alternative research methods, the laboratory cost of a laboratory experiment can often be low.
3. Convenience—An experiment can be done whenever you like, to suit your convenience.
4. Adjustability of variables and parameters—Unlike a survey, an experiment permits us to arrange the parameters and vary the variables in whatever fashion we desire, to look for whatever effects interest us.
   In experimentation we can systematically refine the relationship we are investigating..
5. Replication— By repeating (replicating) an experiment, we can obtain an average result; our conclusion is not based on a

single observation that might be unusually high or unusually low. Replication is one of the most useful tools in obtaining valid results.

~~5.~~6. Unraveling Multivariable Causation—If two independent variables are closely related in the world outside the laboratory, a survey cannot easily determine which of them causes variation in the dependent variable. A laboratory experimenter can track down the extent to which each is responsible for change in the independent variable because the laboratory experiment holds some factors constant as it varies others and vice versa.

Disadvantage of Experiments

1. Lack of Reality—The most important disadvantage of the laboratory experiment is that we can never be sure that the analogy between the experiment and the real world really holds.
2. Unrepresentative Samples—Subjects on whom the experiment is run in the laboratory may be very unlike the people in the real world about whom we wish to draw conclusions.
3. Expensive—Some experiments may be very costly than other research methods.
4. Hazardous Outcomes—Most of the sex experiments may be- unethical or objectionable to good taste.

Limitations of Experimental Method

Experimental method suffers from a score of limitations:

Extraneous Variables—In educational experiments, a number of extraneous variables are present in the situation or are generated by the experimental design and procedures, which influence the results of the experiment in ways, which are difficult to evaluate.

Concept of Causation—Causation means an invariant one-to-one relationship between certain antecedents and certain consequents. It is almost impossible to equate into situations in all respects except for the factor whose effect is being investigated.

Experimental Control—Imposed control in an educational situation tends to make it artificial.

Maturation—There is every possibility that between initial and subsequent observations, children may become tired or wiser or influenced by incidental learning's and experiences that they encounter through normal maturation.

Testing-Testing may sensitize children by making them more .aware of the concealed purposes of the researcher and may serve as a stimulus to change.

Unsuitable Instruments—Use of unsuitable instruments or techniques to describe and measure various aspects of behavior of children is likely to affect the validity of an experiment.

Differential Selection—Selection bias is represented by the non-equivalence of control and experimental groups.

Contamination—Contamination is a type of bias introduced when a. researcher has some previous knowledge about the children involved in an experiment.

Problems for Discussion

1. Bring out clearly the need for experimental research. What are its chief characteristics and limitations?
2. What precautions should be taken in an experiment in education to obtain reliable results?

UNIT—5

SCIENTIFIC METHOD

Sr. No.	Contents	Page No.
5.1	Fred N. Kerlinger (1983)	
5.2	Fred N. Kerlinger (1983)	
5.3	Kulbir Singh Sindhu (1987)	

Fred. Kerlinger, (1983)	**Foundations of Behavioral Research** New Delhi, Surjeet Publications pp. 11-27	5-1

SCIENCE AND THE SCIENTIFIC APPROACH

Scientific research is systematic, controlled, empirical, and critical investigation of hypothetical propositions about the presumed relations among natural phenomena.

This definition requires little explanation since it is mostly a condensed and formalized statement of much that was said earlier or that will be said soon. Two points need emphasis, however. First, when we say that scientific research is systematic and controlled, we mean, in effect, that scientific investigation is so ordered that investigators can have critical confidence in research outcomes. As we shall see later, this means that the research observations are tightly disciplined. Among the many alternative explanations of a phenomenon, all but one are systematically ruled out. One can thus have greater confidence that a tested relation is as it is than if one had not controlled the observations and ruled out alternative possibilities.

Second, scientific investigation is empirical. If the scientist believes something is so, he must somehow or other put his belief to a test outside himself. Subjective belief, in other words, must be checked against objective reality. The scientist must always subject his notions to the court of empirical inquiry and test. He is hypercritical of the results of his own and others' research results. Every scientist writing a research report has other scientists reading what he writes while he writes it. Though it is easy to err, to exaggerate, to over generalize when writing up one's own work, it is not easy to escape the feeling of scientific eyes constantly peering over one's shoulder.

The Scientific Approach

The scientific approach is a special systematized form of all reflective thinking and inquiry. Dewey, in his famous analysis of reflective thinking. How We Think, has given a general paradigm of problematical inquiry.[13] The present discussion of the scientific approach is based on Dewey's analysis. Dewey's treatment, however, is altered somewhat to suit the scientific framework in which we are working.

Problem Obstacle Idea

The scientist will usually experience an obstacle to understanding, a vague unrest about observed and unobserved phenomena, and a curiosity as to why something is as it is. His first and most important step is to get the idea out in the open to express the problem in some reasonably manageable form. Rarely or never will the problem spring full-blown at this stage. He must struggle with it, try it out, live with it. Dewey says. "There is a troubled, perplexed, trying situation, where the difficulty is as it were, spread throughout the entire situation, infecting it as a whole."[14]

Sooner or later, explicitly or implicitly, he states the problem, even if his expression of it is inchoate and tentative. Here he intellectualizes as Dewey puts it. "What at first is merely an emotional quality of the whole situation."[15] In some respects, this is the most difficult and most important part of the whole process. Without some sort of statement of the problem, the scientist can rarely go further and expect his work to be fruitful.

Hypothesis

After intellectualizing the problem, after turning back on experience for possible solutions, after observing relevant phenomena, the scientist may formulate a hypothesis. A hypothesis is a conjectural statement, a tentative proposition, about the relation between two or more phenomena or variables. Our scientist will say "If such-and-such occurs, then so-and-so results."

Reasoning-Deduction

This step or activity is frequently overlooked or

13 Dewey How We Think. Boston: Health 1933 pp. 106-118

14 Ibid---p.108

15 Ibid,. P. 109

underemphasized.[16] In some respects it is perhaps the most important part of Dewey's contribution to the analysis of reflective thinking. The scientist now deduces the consequences of the hypothesis he has formulated. Connat in talking about the rise of modern science, says that the new element added in the seventeenth century was the use of deductive reasoning." Here is where experience, knowledge, and perspicuity are important. Often the scientist, when deducing the consequences, of a hypothesis he has formulated, will arrive at a problem quite different from the one he started with. On the other hand, he may find that his deductions lead him to believe that the problem cannot be solved with present technical tools. For example, before modern statistics was developed, certain behavioral research problems were insoluble. It was difficult, if not impossible, to test two or three interdependent hypotheses at one time. It was next to impossible to test the interactive effect of variables. And we now have reason to believe that certain problems are insoluble unless they are tackled in a multivariate manner. An example of this is teaching method and their relation to achievement and other variables. It is likely that teaching methods, per se, do not differ much if we study only their simple effects. Teaching methods probably work differently under different conditions, with different teachers, and with different pupils.

An example may help us-understand this reasoning-deduction step. Suppose an investigator becomes intrigued with aggressive behavior. He wonders why people are often aggressive in situations where aggressiveness may not be too appropriate. He has noted that aggressive behavior seems to occur when people have experienced difficulties of one kind or-another (Note the vagueness of the problem here.). After thinking for some time, reading the literature for clues, and making further observations, he formulates a hypothesis: Frustration leads to aggression.

He defines "frustration" as prevention from reaching a goal and "aggression" as behavior characterized by physical or verbal attack on other persons or objects.

He may now reason somewhat as follows. If frustration leads to

[16] Conant, op; cit,. P. 46

aggression then we should find a great deal of aggression among children who are in school that are restrictive, schools that do not permit children much freedom and self-expression. Similarly, in difficult social situations, assuming such situations are frustrating, we should expect more aggression than is "usual." Reasoning further, if we give experimental subjects interesting problems to solve and then prevent them from solving them. We can predict some kind of aggressive behavior.

Reasoning may, as indicated above, change the problem. We may realize that the initial problem was only a special case of a broader, more fundamental and important problem. We may, for example, start with a narrower hypothesis: Restrictive school situations lead to negativism in children. Then we can generalize the problem to the form: Frustration leads to aggression. While this is a different form of thinking from that discussed earlier, it is important because of what can almost be called its heuristic quality. Reasoning can help lead to wider, more basic, and thus more significant problems, as well as provide operational (testable) implications of the original hypothesis.

Observation Test Experiment

It should be clear by now that the observation-test-experiment phase is only pary of the scientific enterprise. If the problem has been well stated, the hypothesis or hypotheses adequately formulated, and the implications of the hypotheses carefully deduced, this step is almost automatic—assuming that the investigator is technically competent.

The essence of testing a hypothesis is to test the relation expressed by the hypothesis. We do not test variables, as such; we test the relation between the variables. All observation, all testing, all experimentation is for one large purpose; puttina the problem relation to empirical test. To test without knowing at least fairly well what and why one is testing is usually to blunder. Simply to have a vague and poorly stated problem (such as "What effect does the core curriculum have on students?: and then to test students for their achievement in. say, social studies is an inadequate procedure that can lead only to ignorance and. worse, to misguided information. Similarly, to say one is going to study grouping practices (grouping children by intellectual level, reading level, and the like) of teachers without knowing," really, why one is doing it or without stating a relation between grouping practices and some other variable or variables is research nonsense.

Another point about testing hypotheses is that we do not test a hypothesis: directly. As indicated in the previous step on reasoning, we test the deduced implications of the hypothesis. Our hypothesis might be. "Writing remarks on student papers will improve future papers," which was deduced, say from a broader hypothesis. "Reinforcement of responses leads to an increment in the response rate and strength." We are not testing "writing remarks on student papers" nor" the improvement of future papers." We are testing the relation between them.

Dewey emphasized that the temporal sequence of reflective thinking or inquiry is not fixed. We can repeat and reemphasize what he says in our own framework. The steps of the scientific approach are not neatly fixed. The first step is not neatly completed before the second step begins. Further, we may test before adequately deducing the implications of the hypothesis. The hypothesis itself may seem to need elaboration or refinement as a result of deducing implications from it.[17]

Feedback to the problem, the hypotheses, and, finally, the theory of the results of research is highly important. Learning theorists and .researchers, for example, have frequently altered their theories and research as a result of experimental findings.[18] Theorists and researchers have been working on the effects of early environment and training on later development. Their research has yielded varied evidence converging on this extremely important theoretical and practical problem.[19] Part of the essential core of scientific research is

17 Hypotheses and their expression will often be found inadequate when implications are deduced from them. A frequent difficulty occurs when a hypothesis is so vague that one deduction is as good as another - that is the Hypotheses, may not yield to precise test.

18 E. Hilgard and G. Bower. Theories Of Learning. 3d Ed. New York: Appleton. 1966

19 For example. E Bennett et al,. "Chemical and Anatomical plasticity of Brain." Science OXI VI (1964). 610-619 J. Hunt. Intelligence and Experience. New York Ronald. 1961, M Whitman and M Deutsch "Social Disadvantage as Related to Intellective and Language Development" In M. Deutsch I Katz and A Jensen. eds. Stool class, Race And Psychological Development New York Holt Rine hant and Winston. 1968.pp.111.

the constant effort to replicate and check findings, to correct theory on the basis of empirical evidence, and to find better explanations of natural phenomena. One can even go so far as to say that science has a cyclic aspect. A researcher finds, say, that A is related to B in such-and-such a way. He then does more research to determine under what other conditions A is similarly related to B. Other researchers challenge his theory and his research, offering explanations and evidence of their own. The original researcher, hopefully, alters his work in the light of his own and others' evidence. The process never ends.

Let us summarize the so-called scientific approach to inquiry. First there is doubt, a barrier, an indeterminate situation crying out to be made determinate. The scientist experiences vague doubts, emotional disturbance, and inchoate ideas. He struggles to formulate the problem, even if inadequately. He studies the literature, scans his own experience and the experience of others. Often he simply has to wait for an inventive leap of the mind. Maybe it will occur; maybe not. With the problem formulated, with the basic question or questions properly asked, the rest is much easier. Then the hypothesis is constructed, after which its empirical implications are deduced. In this process the original problem, and of course the original hypothesis, may be changed. It may be broadened or narrowed. It may even be abandoned. Last, but not finally, the relation expressed by the hypothesis is tested by observation and experimentation. On the basis of the research evidence, the hypothesis is accepted or rejected. This information is then fed back to the original problem, and the problem is kept or altered as dictated by the evidence. Dewey pointed out that one phase of the process may be expanded and be of great importance, another may be skimped, and there may be fewer or more steps involved. Research is rarely an orderly business anyway. Indeed, it is much more disorderly than the above discussion may imply. Order and disorder, however, are not of primary importance. What is much more important is the controlled rationality of scientific research as a process of reflective inquiry, the interdependent nature of the parts of the process, and the paramount importance of the problem and its statement.

CHAPTER 2

PROBLEMS AND HYPOTHESES

Many people think that science is basically a fact gathering activity. It is not As Cohen says:

There is no genuine progress in scientific insight through the Baconian method of accumulating empirical facts without hypotheses or anticipation of nature. Without some guiding idea we do not know what facts to gather... we cannot determine what is relevant and what is irrelevant[1]

The scientifically uninformed person often has the idea that the scientist is a highly objective individual who gathers data without preconceived ideas. Poincare long ago pointed out how wrong this idea is. He said:

It is often said that experiments should be made without preconceived ideas. That is impossible. Not only would it make every experiment fruitless, but also even if we wished to do so, it could not be done.[2]

Problems

It is not always possible for a researcher to formulate his problem simply, clearly, and completely. He may often have only a rather general, diffuse, even confused notion of the problem. This is in the nature of the complexity of scientific research. It may even take investigator years of exploration, thought, and research before he can clearly say what questions he has been seeking answers to.

Nevertheless adequate statement of the research problem is one of the most important parts of research. That it may be difficult or impossible to state a research problem satisfactorily at a given time should not allow us to lose sight of ultimate desirability and

[1] M Cohen. A preface to Logu. New York: Meridian, 1956, p. 148.

[2] H. Poincare, Science and Hypothesis. New York: Dover, 1952.p 143.

necessity of doing so. Nor should the difficulty be used as a rationalization to avoid stating the problem.

Bearing this difficulty in mind, a fundamental principle can be stated, if one wants to solve a problem, one must generally know what the problem is. It can be said that a large part of the solution lies in knowing what it is one is trying to do. Another part lies in knowing what a problem is and especially what a scientific problem is.

What is a good problem statement? Although research problems differ greatly, and although there is no one "right" way to state one, certain characteristics of problems and problem statements can be learned and used to good advantage. To start, let us take two or three examples of published research problems and study their characteristics. First, take the problem of the study by Hurlock mentioned in Chapter 1: What are the effects on pupil performance of different types of incentives? Note that the problem is stated in question form. The simplest way is here the best way. Also note that the problem states a relation between variables, in this case between the variables incentives and pupil performance (achievement).

A problem, then, is an interrogative sentence or statement that asks: What relation exists between two or more variables? [3]The answer is what is being sought in the research, if the problem is a scientific one, it will almost always contain two or more variables. In the Hurlock example, the problem statement relates incentives to pupil performance. Another problem, by Page, is; Do teacher comments cause improvement in student performance?[4] One variable is teacher comments (or reinforcement), and the other variable is student performance. The relational part of the question is expressed by the word "cause". Still another problem, by-Harlow is

3 E. Hurlock, "An Evaluation of Certain Incentives Used in Schoolwork, "Journal of Educational Psychology, XVI (1925), 145-159. When citing problems and hypotheses from the literature I have not always used the words of the authors. In fact, the statements of some of the problems are mine and not those of the cited authors. Some authors use only problem statements: some use only hypothesis, others use both.

4 E. Page, “Teacher Comments and Students performance: A Seventy-Four Classroom Experiment in School Motivation, "Journal of Educational Psychology, XLIX (1958), 173-181

more complex: Under what conditions does learning how to learn transfer to new situations?[5] One variable is "learning how to learn" (or set); the other variable is transfer (of learning).[6]

Criteria of Problems and Problem Statements

There are three criteria of good problems and problem statement. One, the problem should express a relation between two or more variables. It asks, in effect, questions like: Is A related to B? How are A and B related to C? How is a related to B under conditions C and D? The rare exceptions to this dictum occur mostly in taxonomic or methodological research. (See Appendix B.)

Two, the problem should be stated clearly and unambiguously in question form. Instead of saying, for instance, "the problem is...." Are "the purpose of this study is...." Ask a question. Questions have the virtue of posing problems directly. The purpose of study is not necessarily the same as the problem of a study. The purpose of the Hurlock study for instance, was to throw light on the use of incentives in school situations the problem was the question about the relation between incentives and performance. Again, the simplest way is the best way: ask a question.

The third criterion is often difficult to satisfy. It demands that the problem and the problem statement should be such as to imply possibilities of empirical testing. A problem that does not contain implications for testing it's stated relation or relations is not a scientific problem. This means not only that an actual relation is stated, but also that the variables of the relation can somehow be measured. Many interesting and important questions are not scientific questions simply because they are not amenable to testing. Certain philosophic and theological questions, while perhaps important to the Individuals who consider them, cannot be tested empirically and are thus of no interest to the scientist as a scientist. The epistemological question, "How do we know?" is such a

5 H. Harlow, "The Formation of Learning Sets," Psychological Review, I,VI (19490 51-65

6 Problems have the same form in different behavioral sciences. Here is a psychological problem suggested by Elzitim (there are others below): Does conflicts engance in impede the efficiency of organizations A. Etziono. Modern Organizations. Englewood Cliffs. N.J. Prentice-Hall, p-22

question. A medieval theological classic is "How many angels can dance on the head of a pin?"[7] Education has many interesting but nonscientific questions, such as,

"Does democratic education improve the learning of youngsters?" "Are group processes good for children?" These questions can be called metaphysical in the sense that they are, at least as stated, beyond empirical testing possibilities. The key difficulties are that some of them are not relations, and most of their constructs are very difficult or impossible to so define that they can be measured.

Hypotheses

A hypothesis is a conjectural statement of the relation between two or more variables. Hypotheses are always in declarative sentence form, and they relate, either generally or specifically, variables to variables. There are two criteria for "good" hypotheses and hypothesis statements. They are the same as two of those for problems and problem statements. One, hypotheses are statements about the relations between variables. Two, hypotheses carry clear implications for testing the stated relations. These criteria mean, then, that hypothesis statements contain two or more variables that are measurable or potentially measurable and that they specify how the variables are related. A statement that lacks either or both these characteristics is no hypothesis in the scientific sense of the word.[8]

Let us take three hypotheses from the literature and apply the two criteria to them. First, consider a very simple hypothesis: Group

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7 Webb, working from a different point of view, has proposed the following criteria of research problems: knowledge (of the researcher): dissatisfaction (skepticism, going against the idea, etc): generality (wideness of applicability): webb's article is dubly valuable because he effectively disposes of an irrelevant criteria, such as conformability, cupidity ("payola"): conformity ("everybody's doing it"). W.Webb, "the choice of problem, " American psychologist, XVI (1961), 223-227.

8 "There are legitimate hypotheses that, at least on the surface, lack the relation criterion. For intense, in factor analytic investigation, to be discussed later, we might have some such problem statement as: what are the factors underlying social attitudes? A hypothesis such as this might be used: there are two underlying factors behind social attitudes: (1) Liberalism and (II) conservatism, in this book however work, relational statement will be emphasized.

study contributes to higher-grade achievement.[9] We have here a relation stated between one variable group study, and another variable, grade achievement. Since measurement of the variables is readily conceivable, implications for testing the hypothesis, too, are readily conceivable. The criteria are satisfied. A second hypothesis is different because it states the relation in the so-called null form: Practice in a mental function has no effect on the future learning of that mental function.[10] Note that the relation is stated directly and clearly: one variable, practice in a mental function, is related to another variable, future learning, by the words "has no effect on." On the Criterion of potential testability, however, we meet with difficulty. We are faced with the problem of so defining "mental function" and "future learning" that they are measurable. If we can solve this problem satisfactorily, then we definitely have a hypothesis. Indeed, we have a famous one-but one that has usually not been stated as a hypothesis but as a fact by many educators of the past and the present.

The third hypothesis represents a very numerous and important class. Here the relation is indirect, concealed, as it were. It customarily comes in the form of a statement that Groups A and B will differ on some characteristic. For example; Middle-class children more often than lower-class children will avoid finger-painting tasks.[11] Note that this statement is one step removed from the actual hypothesis, which might be stated: Finger-painting behavior is in part a function of social class. If the latter statement were the hypothesis stated, then the first might be called & sub hypothesis, or a specific prediction based on the original hypothesis.

Let us consider another hypothesis of this type but removed one step further individuals having the same or similar occupational role

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9 J. Dlue "The Effects, of Group Study on Grade Achievement." Journal of Educational Psychology, XLIX(I958). 118-123.

10 A. Gates and G. Taylor, "An Experimental Study of the Nature of Improvement Resulting from Practice in a Mental Function," Journal of Education Psychology, XVI (1925). 583-592.

11 T. Alper. H. Blane, and B. Adams. "Reactions of Middle and Lower Class Children to Finger paints as a Function of Class Differences in Child-Training Practices, "Journal of Abnormal and Social Psychology. LI (1955). 439-448.

will hold similar attitudes toward a cognitive object significantly related to the occupational role.[12] ("Cognitive objects" are any concrete or abstract things perceived and "known" by individuals. People, groups, the government, and education are examples of cognitive objects.) The relation in this case, of course, is between occupational role and attitudes (toward a cognitive object related to the role for example role do educator and attitudes toward education). In order to test this hypothesis, it would be necessary to have at least two groups, each representing a different occupational role, and then to compare me attitudes of the groups. For instance, we might take a group of teachers and compare their attitudes toward education to those or, say, a. group of businessmen. Thus the hypothesis, as stated, is really a "difference" hypothesis. Still, it, too, can be reduced to the general Relational form with which we started: Attitudes toward cognitive objects significantly related to occupational roles are in part a function of the behavior and expectations associated with the roles.

The Importance of Problems and Hypotheses

There is little doubt that hypotheses are important and indispensable tools of scientific research. There are three main reasons for this belief. One, they are, so to speak, the working instruments of theory. Hypotheses can be deduced from theory and from other hypotheses. If, for instance, we are working on a theory of aggression, we are presumably looking for causes and effects of aggressive behavior. We might have observed cases of aggressive behavior occurring after frustrating circumstances. The theory, then, might include the proposition: Frustration produces aggression.[13] From this broad hypothesis we may deduce more specific hypotheses, such as: To prevent children from reaching goals they find desirable (frustration) will result in their fighting with each other (aggression); if children are deprived of parental love (frustration), they will react in part with aggressive behavior.

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12 F Kerlinger. The Attitude Structure of the Individual: A Q-Study of the Educational Attitudes of professors and Laymen, "Genetic Psychology Monographs. LIll (1956),283.

13 J Dollard et al., Frustration and Aggression. New Haven. Yale University Press, 1939.

The second reason is that hypotheses can be tested and shown to be probably true or probably false. Isolated facts are not tested, as we said before; only relations are tested. Since hypotheses are relational propositions, this is probably the main reason they are used in scientific inquiry. They are, in essence, predictions of the form, "If A, then B," which we set up to test the relation between A and B. We let the facts have a chance to establish the probable truth or falsity of the hypothesis.

Three, hypotheses are powerful tools for the advancement of knowledge because they enable man to get outside himself. Though constructed by man, hypothesis exist can be tested, and can be shown to be probably correct or incorrect a part from man's values and opinions. This is so important that we venture to say that there would be no science in any complete sense without hypotheses.

Just as important as Hypotheses are the problems behind the hypotheses. As Dewey has well pointed out, research usually starts with a problem, with a problematic situation. Dewey says that there is first an indeterminate situation in which ideas are vague, doubts are raised, and the thinker is perplexed.[14] He further points out that the problem is not enunciated, indeed cannot be enunciated, until one has experienced such as indeterminate situation.

The indeterminacy, however, must ultimately be removed. Though it is true as stated earlier, that a researcher may often have only a general and diffuse notion of his problem, sooner or later he has to have a fairly clear idea of what the problem is. Though this statement seems self-evident, one of the most difficult things to do, apparently, is to state one's, research problem clearly and completely.

In other words, you must know what you are trying to find out. When you finally do know, the problem is a long way toward solution.

Virtues of Problems and Hypotheses

Problems and hypotheses, then, have important virtues. One, they

[14] 1. Dewey, Logic: The Theory of Inquiry. New York. Holt Rinehart and Winston, 1938.pp. 105-107.

direct investigation. The relations expressed in the hypotheses tell the investigator, in effect what to do. Two, problems and hypotheses, because they are ordinarily generalized relational statements enable the researcher to deduce specific empirical manifestations implied by the problems and hypotheses. We may say, following Allport and Ross: If it is indeed true that people of extrinsic religious orientation (they use religion) are prejudiced, whereas people of intrinsic religious orientation (they live religion) are not, then it follows that churchgoers should be more prejudiced than no churchgoers. They should perhaps also have a "jungle" philosophy: genera! suspicion and distrust of the world.[15]

There are important differences between problems and hypotheses. Hypotheses, if properly stated, can be tested. While a given hypothesis may be too broad to be directly tested, if it is a "good" hypothesis, then other testable hypotheses can be deduced from it. The point is that facts or variables are not tested as such. The relations stated by the hypotheses are tested. And a problem really cannot be scientifically solved unless it is reduced to hypothesis form, because a problem is a question, usually of a broad nature, and., not directly testable. One does not test the questions: Does anxiety affect achievement? Do ghetto conditions produce delinquency? One tests one or more hypotheses implied by these questions for example: Test anxiety reduces achievement test scores, and delinquency rates are higher in ghetto than in non-ghetto areas of cities.

Problems and hypotheses advance scientific knowledge by helping the investigator confirm or disconfirm theory. Suppose a psychological investigator gives a number of subjects three or four tests, among which is a test of anxiety and an arithmetic test. Routinely computing the Interco relations between the three or four tests, he finds that the correlation between anxiety and arithmetic is negative. He concludes, therefore, that the greater the anxiety the lower the arithmetic scores. But it is quite conceivable that the relation is fortuitous or even spurious. If, however, he had

15 G. AIlport and J. Rross. "Personal Religious and Prejudice," Joumal of Personality and Social Psychology. V(1967), 432-443

hypothesized the relation on the basis of theory, the investigator could have greater confidence in the results. The investigator who does not hypothesized a relation in advance, in short, does not give the facts a chance to prove or disapprove anything.[16] This use of the hypothesis is similar to playing a game of chance. The rules of the game are set up in advance, and bets are made in advance. One cannot change the rules after an outcome, nor can one change one's bets after making them. That would not be "fair." One cannot throw the dice first and then bet. Similarly, if one gathers data first and then selects a datum and comes to a conclusion on the basis of the datum, one has violated the rules of the scientific game.

The game is not "fair" because the investigator can easily capitalize on, say two significant relations -out of five tested. What happens to the other three? They are usually forgotten. But in a fair game every throw of the dice is counted, in the sense that one either wins or does not win on the basis of the outcome of each throw. The main point, perhaps, is that the purpose of hypotheses is to direct inquiry. As Darwin pointed out long ago, all observations have to be for or against some view if they are to be of any use:

A final point about hypotheses has already been made, but it needs formal statement, even repetition. Hypotheses incorporate the theory, or part of it, in testable or near-testable form. Earlier, an example of reinforcement theory was given in which testable hypotheses were deduced from the general problem. The importance of recognizing this function of hypotheses may be shown by going through the back door and using a theory that is very difficult, or perhaps Impossible, to test. Freud's theory of anxiety includes the construct of repression. Now, by repression Freud meant the forcing of unacceptable Ideas deep into the unconscious. In order to test the

16 The words "prove" and "disprove" are not to be taken here in their usual literal sense. It should .be remembered that a hypothesis is never really proved or disproved. To be more accurate we should probably say something like: the weight of evidence is on the side of the hypothesis, or the weight of the evidence casts doubt on the hypothesis. Braithwaite says: "Thus the empirical evidence of its instance never proves the hypothesis: in suitable cases we may say that it establishes the hypothesis meaning by this that the evidence makes it reasonable to accept the hypotheses: but it never proves the hypothesis in the sense that the hypothesis is a logical consequence of the evidence." (R Braithwaite, Scientific Explanation. Cambridge; Cambridge University Press, 1955, p 14).

Freudian theory of anxiety it is necessary to deduce relations suggested by the theory. These deductions will, of course, have to include the repression notion, which includes the construct of the unconscious. Hypotheses can be formulated using these constructs; in order to test the theory, they have to be so formulated. But testing them is another, more difficult matter because of the extreme difficulty of so defining terms such as "repression" and "unconscious" that they can be measured. To the present, no one has succeeded in defining these two constructs without seriously departing from the original Freudian meaning and usage. Hypotheses, then are important bridges between theory and empirical inquiry.

Problems, Values, and Definitions

To clarify further the nature of problems and hypotheses, two or three common errors will now be discussed. First, scientific problems are not moral and ethical questions. Are punitive disciplinary measures bad for children? Should an organization's leadership be democratic? What is the best way to teach college students? To ask these questions is to ask value and judgmental questions that science cannot answer. Many so-called hypotheses are not hypotheses at all. For instance:

The small-group method of teaching is better than the lecture method. This is a value statement: it is an article of faith and not a hypothesis. If it were possible to state a relation between the variables, and if it were possible to define the variables so as to permit testing the relation, then we might have a hypothesis. But there is no way to test value questions scientifically.

A quick and relatively easy way to detect value questions and statements is to look for words such as "should" "ought," better than ("instead of "greater than"), and similar words that indicate cultured or personal judgments or preferences. Value statements, however, are tricky. While a "should" statement is obviously a value statement, certain other kinds of statements are not so obvious. Take the statement: Authoritarian methods of teaching lead to poor learning, here there is a relation. But the statement fails as a scientific hypothesis because it uses two value expressions or words, "authoritarian methods of teaching" and "poor learning" neither of which can be defined for measurement purposes without deleting the words "authoritarian" and "poor" The word "poor" is obviously a value word: it expresses a value judgment. To attain scientific respectability, the expression "poor learning" has to be deleted and some expression substituted such as "decreased problem-solving behavior" which implies measurement possibilities but no value Judgment The expression "authoritarian methods of learning" is perhaps almost hopeless at present, although its definition is conceivable. The trouble is that the mere use of the word "authoritarian" expresses a value judgment, at least in this case. As used today, it says, in effect, that such methods are "bad. Another difficulty is that at present we do not know what "authoritarian methods of teaching" means. Most often it seems to refer to the personal teaching biases of the person

using this method.[17]

Other kinds of statements that are not hypotheses or are poor ones are frequently formulated, especially in education. Consider, for instance. The core curriculum is an enriching experience. Another type, too frequent, is the vague generalization: Reading skill? Can be identified in the second grade. The goal of the unique individual is self-realization; Prejudice is related to certain personality traits.

Another common defect of problem statements often occurs in doctoral theses: the listing of methodological points or "problems" as sub problems. These methodological points have two characteristics that make them easy to detect: (1) they are not substantive problems that spring from the basic problem; and (2) they relate to techniques or methods of sampling, measuring or analyzing. They are usually not in question form, but rather contain the words "test," "determine" "measure," and the like. "To determine the reliability of the instruments used in this research," "To test the significance of the differences between the means," and "To assign pupils at random to the experimental groups" are symptomatic of this mistaken notion of problems and sub problems.

Generality and Specificity of Problems and Hypotheses

One difficulty that the research worker usually encounters and that almost all students working on a thesis find bothersome is the generality and specificity of problems and hypotheses. If the problem is too general, it is usually too vague and cannot be tested.

[17] An almost classic case of the use of the word "authoritarian" is the statement sometimes heard among educators: The lecture method is authoritarian. This means that the speaker does not like the lecture method and he is telling us that it is bad. Similarly, one of the most effective ways to criticize a teacher is to say that he is authoritarian. Although many studies of authoritarianism have been done with considerable success, it is doubtful that we know what authoritarianism in the classroom means. For instance, and action of a teacher that is authoritarian in one classroom may not be authoritarian in another classroom. The alleged democratic behavior exhibited by one teacher may even be called authoritarian if exhibited by another teacher such is not the stuff of science.

Thus, it is scientifically useless, though it may be interesting to read. Problems and hypotheses that are too general or too vague are common. For example: Creativity is a function of the self-actualization of the individual; Democratic education enhances social learning and citizenship: Authoritananism in the college classroom inhibits the creative imagination of students. These are interesting problems but in their present form, they are worse than useless scientifically, because they cannot be tested and because they give one the spurious assurance that they are hypotheses that can "some day" be tested.

Terms such as creativity 'self-actualization, "democracy" "authoritarianism." and he like have at the present time at least, no adequate empirical referents. Now it is quite true that we can define "creativity" say in a limited way by specifying one or two creativity test. This may be a legitimate procedure. Still, in so doing, we run the risk of getting far away from the original term and its meaning. This is particularly true when we speak-of -artistic creativity. We are often willing to accept the risk in order to be able to Investigate important problems of course. Yet terms like; "democracy" are almost hopeless to define. Even when we do define it we often find we have destroyed the original meaning of the term.

The other extreme is too great specificity. Every student has heard that it is necessary to narrow problem down to workable size. This is true. But, unfortunately we can also narrow the problem out of existence. In general, the more specific the problem or hypothesis the clearer are its testing implications. But triviality may be the price we pay. While the researcher cannot handle problems that are too broad because they rend to be too vague for adequate research operations, in his zeal to cut the problems down to workable size or to find a workable problem,' he may cut the life out of it. He may make it trivial or inconsequential. A thesis, for instance, on the simple relation between the speed of reading and size of type, while important, and maybe even interesting, is too thin for doctoral study. Too great specificity is perhaps a worse danger than too great generality. At any rate, some kind of compromise must be made between generality and specificity. The ability effectively to make such compromises a tuition partly of experience and party of much critical study of research problems.

The Multivariate Nature of Behavioral Research and Problems.

Until now the discussion of problems and hypotheses has been pretty much limited to two variables x and y. We must hasten to correct any impression that such problems and hypotheses are the norm in behavioral research. Researches in psychology, sociology, education and other behavioral sciences have become keenly aware of the multivariate nature of behavioral research. Instead of saying

If p. then q, it is often more appropriate to say: If $P_1.p_2$ ....Px then q or. If P_1 then *q*, under conditions r, s and *t.*

An example may clarify the point. Instead of simply stating the hypothesis. If frustration, then aggression, it is more realistic to recognize the multivariate nature of the determinants and influences of aggression by saying, for example: If high intelligence, middle class, male, and frustrated, then aggression. Or: if frustration, then aggression, under the conditions of high intelligence, middle class and male. Instead of one x, we now have four Although are phenomenon may be the most important in determining or influencing another phenomenon, it is unlikely that most of the phenomena of interest to behavioral scientists are determined simply. It is much more likely that they are determined multiply. It is much more likely that aggression is the result of several influences working in complex ways. Moreover, aggression itself has multiple aspects. After all, there are different kinds of aggression.

Problems and hypotheses thus have to reflect the multivariate complexity of psychological, sociological, and educational reality. Although we will talk of one x and one y, especially in the early past of the book, it must be understood that contemporary behavioral research, which used to be almost exclusively univariate in its approach, is rapidly becoming multivariate (For now, "univariate" means one x and one y, "Univariate" strictly speaking, applies to y. If there is more than one x or more than one y, the word "multivariate" is used, at-least in this book.) We will soon encounter multivariate conceptions and problems. And later parts of the book will be especially concerned with a multivariate approach and emphasis.

Concluding Remarks—The Special Power of Hypotheses

One will sometimes hear that hypotheses are unnecessary in research, that they unnecessarily restrict the investigative imagination, that the job of science and scientific investigation is to find out things and not to labor the obvious, that hypotheses are obsolete, and the like. Such statements are quite misleading. They misconstrue the purpose of hypotheses

It can almost be said that the hypothesis is the most powerful tool man has invented to achieve dependable knowledge. Man observes a phenomenon. He speculates on possible causes. Naturally, his culture has a stock of answers to account for most phenomena, many correct, many incorrect, many a mixture of fact and superstition, many pure superstition and mythology. It is the scientist's business to doubt most explanations of the; phenomena of his field. His doubts are systematic He insist upon subjecting explanations of phenomena to controlled empirical test. In order to do this, he must to formulate explanations that they are amenable to controlled empirical test. He formulates the explanations in the form of theories and hypotheses. In fact the explanations are hypotheses. The scientist simply disciplines the business by writing systematic and testable hypotheses. If an explanation cannot be formulated in the form of a testable hypothesis, then it can be considered to be a metaphysical explanation and thus not amenable to scientific investigation. As such it is dismissed by the scientist as being of no interest.

The power of hypotheses goes further than this, however. A hypothesis is a prediction. It says that if x occurs, y will also occur. That is, y predicted from x, if then, x is made occur (vary), and it is observed that y also occurs (varies concomitantly), then the hypothesis is confirmed. This is more powerful evidence than simply observing, without prediction, the co varying of x and y. It is more powerful in the betting-game sense discussed earlier. The scientist makes a bet that x leads to y. If, in an experiment, x does lead to y then he collects his money. He has won the bet. He cannot just enter the game at any point and pick a perhaps fortuitous common occurrence of x and y. Games are not played this way fastest in our culture). He must play according to the rules, and the rules in science are made to minimize error and man's fallibility. Hypotheses are part of the rules of the game.

Even when hypotheses are not confirmed, they have power. Even when y does not covary with x, knowledge is advanced. Negative findings are sometimes as important as positive ones, since they cut down the total universe of ignorance and sometimes point up fruitful further hypotheses and lines of investigation. Bte the scientist cannot tell positive from negative evidence unless he uses hypotheses. It is possible to conduct research without hypotheses, of course, particularly in exploratory investigations. But it is hard to conceive modern science in all its rigorous and disciplined fertility without the guiding power of hypotheses.

Study Suggestions

1. Use the following constructs to write research problems and hypotheses, level of aspiration, frustration, academic achievement, race, intelligence, verbal aptitude, social class, sex, reinforcement, teaching methods, reading readiness, introversion, incentives, anti-Semitism, occupational choice, permissiveness, ego involvement, education, income, classroom climate, need for achievement, social prestige, ethnic beliefs.

2. Seven problems from the research literature are given below. Study them carefully and construct one or two hypotheses based on them.

a) Do teacher comments cause improvement in student performance?[19]

b) Does learning how to learn transfer to new situations?[20]

c) Is similarity in belief more influential than race in accepting others?[21]

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19 Page. *Op.cit.*

20 Harlow.*op.cit.*

21 M. Rokeach and L. Mezei. "Race and Shared Belief as Factors in Social Choice." Science, CLI

d) Does practice in a mental function improve future learning of the mental function?[22]

e) How does organizational climate affect administrative performance?[23]

f) Does forced compliance induce change in belief?[24]

g) How does the socioeconomic status of blacks 'affect the social distance they accord whites?[25]

7. Seven hypotheses are given bellow. Discuss possibilities of testing them. Then read one or two of the original studies to see how the author(s) tested them.

a. The greater the cohesiveness of a group the greater its influence on its members.[26]

b. Prejudiced people identify minority-group members by their faces more readily than do unprejudiced people.[27]

c. The extent of role conflict is a function of the number and magnitude of incompatible expectations placed on or held by the individual.[28]

d. Deductive and associative types of concept learning depend on age of children and their instructional sets.[29]

(1966), 167-172.

22 "Gates and Taylor, op. cit.

23 N. Fredrriksen, O. Jensen and A. Beaton. Organizational Climates and Administrative Performance, Princeton. N.J. Educational testing service. 1968.

24 L. Festinger and J. Carl smith, "Cognitive Consequences of Forced Compliance." Journal of Abnormal and Social Psychology. LV111 (1959), 203-211, E.Schein." The Chinese Indoctrination Program or Prisoners of War: A Study of Attempted 'Brainwashing.'" In E. Maccoby. T. Ncwcomb, and E. Hardi. Eds,. Reading in Social Psychology. 3d Ed. New York: Holt. Rinehari and Winston. 1958.

25 F. Wrestle and D. Howard. "Social Status Differentials and the Race Attitudes of Negroes" American Sociological Review. XIX (1954). 584-591.

26 S. Schachter et al., "An Experiment Study of Cohesiveness and Productivity," Human Relations., IV (1951), 229-232

27 G.AIlport and B.Kramer. "Sonic Roots of Prejudice." Journal Sociological Review. XII(1946), 9-39.

28 J. Geizels and E, Guba, "Role, Role Conflict, and Effectiveness: An Empirical Study," American Sociological Review. XIX (1954). 164-175-39

29 H. Amster" Effect of Instructional Set and Variety of Instances of Children's Learning."

e. The learning and retention of unfamiliar but meaningful verbal material is facilitated by the advance introduction of relevant subsuming concepts (organizers).[30]

f. Pseudoprogressives will assess teachers exhibiting seemingly progressive (but not really progressive) behavior more positively than will genuine progressives.[31]

~~a.~~g. The probability of the occurrence of responses is increased if the responses are followed by statements consonant with the attitude of the respondents.[32]

4. To give the student a preliminary feeling for multivariate problems, three of them are given below.

a) How do academic aptitude, high school achievement, and level of aspiration influence academic achievement?[33]

b) What are the relative contributions to the verbal achievement of white and black elementary school pupils of home background, school facilities, and pupil attitudes?[34]

~~a)~~c) How are early experiences in the home and parental dominance, on the one hand, related to curiosity about people and desire for close personal relations, on the other hand?[35]

Journal of Educational Psychology. LVII (1960). 74-85.

30 D. Ausubel. "The Use of Advance Organizers in the learning and Retention for' Meaningful Verbal Material." Journal of Educational Psychology. LI (1960). 267-272.

31 E. Pedhazur, "Pseudoprogressivism and assessment of teacher behavior," Educational and Psychological Measurement, XXIX(1969). 377-386.

32 C.Golightly and D.Byrne, "Attitude statements as positive and Negative Reinforcements," Science, CXLVI(1961), 798-799.

33 L.Warrell,"Level of Aspiration and Academic success, "Journal of Educational Psychology, L(1959),47-54.

34 J.Coleman teal, Equality of Educational Opportunity. Washington, D.C.: U.S. Government Printing Office, 1966.

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21

Hypothesis Meaning and Significance

It serves a sort of guiding light in the world of darkness.

W. STANLEY JEVONS

The Meaning of Hypothesis

A Proposition to be put to test to determine its validity—in the words of Goode and Hat, "A hypothesis states what we are, looking for. A hypothesis looks forward. It is a proportion, which can be put to a test to determine its validity. It may prove to be correct or incorrect."

A Tentative supposition or provisional guess—According to James E. Creighton "It is a tentative supposition or provisional guess which seems to explain the situation under observation,"

A Tentative generalisation—A. Lundberg thinks, "A hypothesis is a tentative generalization the validity of which remains to be tested. In its most elementary stage the hypothesis may be any hunch, guess, imaginative idea which becomes the basis for further investigation."

Shrewd guess—According to John Best, "It is a shrewd guess or inference that is formulated and provisionally adopted to explain observed facts or conditions and to guide in further investigation.

Hypothesis guides the thinking process—R. D Carmichael explains this term as "Science employees hypothesis in guiding the thinking process. When our experience tells us that a given phenomenon follows regularly upon the appearance of certain other phenomena, we conclude that the former is connected with the latter by some sort of relationship and we form an hypothesis concerning this relationship."

A Statement temporarily accepted as true—Barr and Scaled define a hypothesis as. "A hypothesis is a statement temporarily accepted as true in the light of what is, at the time, known about a phenomenon, and it is employed as a basis for action in the search for new truth. When the hypothesis is fully established it may take the form of facts, principles of theories."

Guess as to the probable outcome—Waiter JFL Borg, Chairman Bureau of Educational Research, Utah State University states, "Hypotheses reflect the research worker's guess as to the probable outcomes of the experiments."

Informed or shrewd guess or inference—According to Carter V. Good, "A hypothesis is an informed guess or inference, with a reasonable chance of being right formulated and tentatively adopted to explain observed facts or conditions and to guide in further investigation. The scientist's hypothesis parallels the common man's personal opinion or truth."

A Statement whose tenability is to be tested—According to George G. Molly, "Hypothesis is an assumption or proposition, whose tenability is to be tested on the basis of the compatibility of its implications with empirical evidence and with previous knowledge.

A hypothesis, therefore, is an informed or shrewd guess or inference or supposition or hunch or a tentative generalization as to the existence of some fact, condition or relationship relative to some phenomenon which serves to explain such facts as already are known to exist in a given area of research and to guide the search for new truth.

Importance of a Hypothesis

1. Hypothesis as the investigator's "eye"—Carter V. Good thinks that by guiding the investigator in further investigations, it serves as the investigator's "eyes" in seeking answers to tentatively adopted generalizations.

2. It focuses research—William Goode and Paul K Hat feel that

without it research is unfocused. Research remains like a random empirical wandering. It serves as a necessary link between theory and the investigation.

3. It provides direction—It defines what is relevant and what is irrelevant.
4. It places clear and specific goals—Walter R. Borg writes, "The principal advantage of a well thought-out set of hypotheses is that they place clear and specific goals before the research worker and provide him with a basis for selecting samples and research procedures to meet these goals."
5. It is the pivotal point—John L. Hyman, Jr. regards it as the pivotal point between the problem and the procedure to be followed."
6. It links together—Good, Barr and Scales think, it serves the important function of linking together related facts and information and organizing them into wholes"
7. It prevents blind research—P. V. Young states, "The use of hypothesis prevents a blind search and indiscriminate gathering of masses of data which may later prove irrelevant to the problem under study.
8. As a sort of guiding light—W. Stanley Jevons-describes its importance as, "It serves a sort of guiding light in the world of darkness."
9. Islands in the stream of thought—M. T. McClure observes,. "Hypotheses are islands in the stream of thought."
10. It serves as a beacon light—In the words of Deobold D. Van Dalen, "A hypothesis serves as a powerful beacon that light the way for the research worker."
11. It serves as a framework—It provides the outline for stating conclusions in a meaningful way.

Purposes Served by the Hypotheses

George G. Molly thinks that hypotheses serve the following purposes:

i. They provide direction to research and prevent the review of irrelevant literature and the collection of useless or excess data.

ii. They sensitize the investigator certain aspects of situation, which are relevant from the standpoint of the problem at hand.

iii. They enable the investigator to understand with greater clarity his problem and its ramifications,

iv. They serve as a framework for the conclusive. In short a good hypothesis—

(a) Gives help in deciding the direction in which to proceed.
(b) It helps in selecting pertinent fact.
(c) It helps in drawing conclusions.
(d) It focuses research on specific points.
(e) It links facts together.
(f) It prevents blind research.
(g) It serves as a guiding light.

Sources of Hypothesis

1. General culture.
2. Scientific theory.
3. Analogies.
4. Personal experience.

Goode and Hat point out. "All the sources of hypotheses, value orientations of the culture, folk wisdom and cliché, rebellion against commonsense ideas, observation of deviant cases (the cases which' don't fit the rule'), social experience within the science, the application of analogies, and personal experience—provide a wealth of hypotheses. In fact it is an almost embarrassing profusion. The problem which this raises is how to select those ideas which may actually prove useful."

Different Forms of Hypotheses

1. *The declarative form* generally states a relationship between the variables that the experimenter expects will emerge. For example, the following hypothesis is stated in declarative

form, "There will be a significant difference in the instructional standards of day school as compared with shift schools."

2. *Null form.* A null hypothesis states that no relationship exists between the variables concerned. For example, in the null form, the aforementioned hypotheses could be stated, "There will be no significant difference in the instructional standards of day schools as compared with shift schools." The student is, sometimes, confused by the null hypothesis as it appears to him senseless to hypothesize the exact opposite of his expectations.

~~1.~~3. *Question form.* We may state the hypothesis in a question form. The afore-mentioned hypothesis in question form may read "Is there a significant difference in instructional standards of day schools and shift schools?"

Characteristics of Hypothesis

1. A good hypothesis is in agreement with the observed facts.
2. A good hypothesis does not conflict with any law of nature, which is known to be true.
3. A good hypothesis is stated in a scientific language.
4. A good hypothesis is stated in the simplest possible language.
5. A good hypothesis permits the application of deductive reasoning.
6. A good hypothesis is so designed that its test will provide an answer to the original problem, which forms the primary purpose of investigation.
7. A good hypothesis is stated in final form on the experiment before any attempt at verification is made.

Rebert M.W. Travers suggests the following characteristics of hypothesis:

1. It should be testable.
2. It should state relationships between variables.

3. Hypotheses should be limited in scope.

4. Hypotheses should be consistent with most known facts.

5. Hypotheses should be stated as far as possible in simple terms.

~~1.~~6. The hypotheses selected should be amenable to testing within a reasonable time.

Formulation of Hypothesis

According to Goode and Hatt, "The theorist who does not know what techniques are available to test his hypothesis is in a poor way to formulate usable question."

According to P.V. Young "The more insight the researcher has into the problem, the simpler will be his hypothesis about it."

A few examples of vague hypotheses—The above-mentioned points may be illustrated with the following examples:

1. "In ancient India supervision played an important role in raising the instructional programmes of schools."

   It is very difficult to test the accuracy of the statement. It may not be consistent with most known facts. It is also possible that in view of the paucity of literature on the subject, the hypothesis may not be test able.

2. "A high school course in civics will make the student a better adult citizen."

This is an objective which would be very difficult to test as it would require:

i. Waiting, till students taking the course become adults.
ii. Setting up criteria to determine how good a citizen each student would become.
iii. Determining, what aspects of adult citizenship of the former students could be directly attributed to the civic course.

3. "A counseling programmed is desirable and economically feasible at the elementary school level."

These objectives may be put to the formulation of such a hypothesis:

i. What aspects of the counseling programmers are to be studied?
ii. Which grade pupils are to be studied?
iii. What do we understand by the economic feasibility?

This hypothesis is very general and broad. It should be changed into specific hypothesis, each stating a specific relationship between two variables.

Fuzzy thinking and wrong setting up of hypotheses is likely to lead to frustration in later phases of the research and may well cause the research worker develop negative attitudes towards research rather than help him take the first step toward becoming an educational scientist.

Difficulties in the Formulation of Useful Hypotheses

1. Absence of knowledge of a clear theoretical framework.

2. Lack of ability to make use of the theoretical framework logically.

3. Lack of acquaintance with available research technique resulting in failure to be able to phrase the hypotheses properly.

Problems for Discussion

1. Explain the meaning and significance of hypothesis in a research study.

2. "A hypothesis is only theory in the making." Explain this statement

3. Consider the methodological status of hypothesis in educational research. Is research impossible without a hypothesis?

~~1.~~4. "A hypothesis serves as a powerful beacon that light the way for the research work." Elucidate the statement.

Kulbir Singh Sidhu(1987)	***Methodology of Research in Education,*** 2nd ed. New Delhi, Sterling Publishers (Put) Ltd. pp. 274-283.	5-3

TWENTY-ONE

Analysis and Interpretation of Data

Good, Barr and Scales write—"Analysis is a process which enters into research in one form or another form the very beginning... It may be fair to say that research consists in general of two larger steps—the gathering of data, and the analysis of these data, but no amount of analysis can validly extract from the data factors which, are not present."

Martz has pointed out— "... .bare facts, objective data, never determine anything. They become significant only as interpreted in the light of accepted standards and assumptions, and these standards in the final analysis are not susceptible to scientific determination. In ordinary life we seldom deal with bare facts but facts interpreted. This interpretation or evaluation is determined by the purpose to which we relate the facts."

Francis Rummle has said—"The analysis and interpretation of data involve the objective material in the possession of the researcher and his subjective reactions and desires to derive from the data the inherent meanings in their relation to the problem. To avoid making conclusions or interpretations from insufficient or invalid data, the final analysis must be anticipated in detail when plans are being made for collecting information. The problem should be analyzed in detail to see what data are necessary in its solution and to be assured that the methods used will provide for definite answers. The researcher must determine whether or not the factors chosen for study will satisfy all the conditions of the problem and if the sources to be used will provide the requisite data."

The data may be adequate, valid and reliable to any extent, it does not serve any worthwhile purpose unless it is carefully edited, systematically classified and tabulated; scientifically analyzed, intelligently interpreted and rationally concluded.

According to Wolfe, "The discovery of order in the phenomena of nature, notwithstanding their complexity and apparent confusion is rendered possible by the processes of analysis and synthesis, which are the foundation stone of all scientific methods.

Analysis from the Very Beginning

When the investigator selects a problem, and begins planning his attack upon it, he at once engages upon an analysis of the total problem in order to formulate a hypothesis which will enable him to start work with some plan, and in order to begin gathering data that will fit in with his hypothesis. One will further analyze the field and his problem in determining the factors for study in the general problem, and he will engage in more analysis when methods of measuring these factors are being considered. The final analysis must be anticipated in considerable detail when plans are being made for gathering data, which will reflect the requisite factors, and this calls for analysis of several kinds at the start of one's work. It is the responsibility of the worker to see that his early analysis of his problem, and of its requirements as it is subsequently developed, is sufficiently valid so that the later interpretation is not built mechanically upon an empty set of facts.

The early analysis is concerned with four things:

1. In the first place, one must analyze his problem carefully to see what is necessary to provide a solution of it. The worker must be able to assure him self and others, that his method of attacking the problem provides a crucial approach.
2. In the second place, one must see that the factors which he chooses for study will satisfy the conditions of his problem—a more detailed step than the first one. He should study enough factors or elements to yield a satisfactory answer to his problem.
3. In the third place, one must examine his source of data carefully to see that the factors in which he is interested will have an opportunity to demonstrate themselves. Are the limits, which he has set for his source-field (time, area or

other limiting conditions) sufficiently broad to permit ample operation of the factors to be studied? On the other hand, are the limits of the source-field too broad? Will many spurious factors enter and perhaps cause sufficiently different conditions within the source-field so that the important factors will average out or neutralize each other?

4. In the fourth place, one must examine the means, which he expects to employ in gathering data, to see that these means are capable of registering variations of appropriate magnitude, simplicity and at the same time complexity.

VARIOUS STEPS IN ANALYSIS AND INTERPRETATION

The process of analysis, interpretation and generalization will involve a number of steps:

Organization. The mass of data collected through the use of various reliable and valid tools, is yet but raw. It needs to be systematized and organized, i.e edited, classified, and tabulated before it can serve any worthwhile purpose. Editing implies the checking of gathered data for accuracy, utility and completeness. Classifying refers to the dividing up of the data into different categories, classifications, or subheadings for use. Tabulating denotes the recording of the classified material in accurate mathematical terms, e.g. marking and counting frequency tallies for different items on which information is gathered. Tabulation is a tedious and painstaking process, and must be done accurately. The entire raw data should be tested on the basis of the purpose for which they are gathered and only the useful and usable data should be tabulated. Tabulating machines and other mechanical aids to tabulating are coming into use. They are quick and precise but are very expensive or beyond the means of individual researchers.

Analysis. Analysis of data means studying the tabulated material in order to determine inherent facts or meanings. It involves breaking down existing complex factors into simpler parts and putting the parts together in new arrangements for purposes of interpretation. A plan of analysis can and should be prepared in advance before the actual collection of material. A preliminary analysis on the skeleton plan should, as the investigation proceeds, develop into a complete, final analysis enlarged and reworked as and when necessary. This process requires an alert, flexible and open mind. No similarities, differences, trends and outstanding factors should go unnoticed. Larger divisions of material should be broken down into smaller units and rearranged in new combinations to discover new factors and relationships. Data should be studied from as many angles as possible to find out new and newer facts.

When the plan of analysis has not been made beforehand, Good Barr and Scats suggest four helpful modes to start with the analysis of data:

i. To think in terms of significant tables that the data permit.
ii. To examine carefully the statement of the problem and the earlier analysis and to study the original records of the data.
iii. To get away from the data and to think about the problem in layman's terms, or to actually discuss that problem with others.
iv. To attack the data by making various simple statistical calculations.

Common Statistical Methods of Analysis

Most commonly used methods of analyzing data statistically are:

Ranks and percentile ranks. A rank is merely the relative position, which any particular case occupies in a group. Often it is of more significance than the measurement itself, for it contains a strong comparative element. For example, we arc more concerned with the fact that a certain pupil is at the head of his class, than we are in knowing his particular score. The significance of a rank is, of course, in part dependent upon the size of the group; a rank of ten is near one end of the distribution in a group of 1000, and it is near the other end of the distribution in a group of 11. To overcome this difficulty, the idea of percentile rank was developed. Percentile rank is essentially the rank that one would have in a group of hundred. A percentile rank of 40 means that 40% of the group lies below this case.

Measures of Central Tendency. There are several forms of averages, the most common being the mean. The median and the mode are the other common forms of average. The mode does not receive much use in educational problems. The median is popular, in part because of its significance, and in part because it is readily calculated. The mean is mathematically the most significant average and is used most extensively in advanced statistical analysis. But we should avoid the idea that there is any one best average; each one is best for certain particular purposes and we select the measure to suit the purpose.

Measures of variability. Dispersion or variability indicates the spread of the scores. The measure of variability is the most important corrective for too liberal a concept of the average. If one knows the extent of spread in the series, as well as the mean, he is not so likely to overlook the fact that the mean is merely a middle value and is limited in its powers of representation.

The commonly used measures of variability are the range, the quartile deviation, the average deviation and the standard deviation. The first is merely the difference between the extremes of the series; it is not extensively used because the extreme values are very unstable. The average deviation is the average distance out from the mean that the measures lie. The quartile deviation is the semi-inter-quartile range; the average distance out from the median that half of the measures on either side of the median lie. The standard deviation is the root mean squared deviation. It is a more complex function.

Measures of relationship. Correlation coefficients are common in theses and in many other studies. Correlation is the extent to which an individual tends to be in the same relative position in each of two series. It can be calculated between any two sets of paired measures. A common use of correlation is for prediction; the higher the degree of correlation, the greater the accuracy with which one can predict a score or other performance in a second series of measures, when the value in the first series is known. Correlation has an extensive use in connection with the critical study of tests and other instruments. The correlation of two series of measures that are supposed to represent the same thing (such as two applications of a standard test, or of comparable forms of it), is known as the coefficient of reliability. The correlation of test results with a criterion is known as the coefficient of validity.

Error and Probable Error. It becomes important at times to determine whether a change or a difference between any two values, is really caused by some significant factor or whether it is only a matter of chance. If the change (or difference) is equal to only one probable error, then there is nothing much to be said about it; it could easily have been caused by the operation of the chance factors that make results vary. It is not until a difference is equal to about four times the value of a probable error that one can begin to say with some feeling of certainty that a result is typically different from another. Any difference, that is equal to or greater than four times its probable error is commonly called a significant difference.

While analyzing their data, investigators usually make use of as many of the above simple statistical devices as necessary for the purpose of their study. There are some other devices of Statistical analysis which researchers use in particular experimental or complex causal studies. Some of them are: Testing of significance of differences through t-ratio and analysis of variance, chi-square test for testing null hypothesis, calculation of Biserial "r" and Teterachoric "r" for finding out causal relationships, calculation of Partial and Multiple correlation for the same purpose and factorial analysis for the purpose of analyzing the composition of certain complex phenomena.

INTERPRETATION

The interpretation of research data cannot be considered in the abstract. In view of the diversity of the research methods used in education, and the corresponding diversity of the data they seek, the interpretation of such data is best considered within the context of each of the methods. The analysis and interpretation of historical data, for example, is best viewed in the light of the historical method, its objectives, and its limitations. It is important to note in all circumstances that data do not interpret themselves, and that it is the investigator who must pass judgment on their meaning from the standpoint of the problem under investigation.

The process of interpretation is essentially one of stating what the results (findings) show. What do they mean? What is their significance? What is the answer to the original problem?

Interpretation is by no means a mechanical process. It calls for a critical examination of the results of one's analysis in the light of all the limitations of his data gathering. It is a very important step in the total procedure of research.

Necessary Precautions in interpretation

It is important to recognize that errors can be made in interpretation-just as they can in any of the other steps of the scientific method—and the specific errors to be guarded against vary with the different research methods. This step is almost purely subjective, and many errors are made at this point. If however, one is careful, and critical of his own thinking, he should be able to make satisfactory interpretations. The following are among the more common errors of interpretation, which need to be avoided:

1. *Failure to see the problem in proper perspective.* Sometimes the investigator may have an inadequate grasp of the problem in its broad Sense and too close a focus on its immediate aspect. Thus, the; Hard shorn and May studies are not to be interpreted as supporting the view that human behavior is inconsistent and haphazard, but rather that the consistency is internal rather-than external.

2. *Failure to appreciate the relevance of various elements.* The investigator may fail to see the relevance of the various elements of the situation due to an inadequate grasp of the problem, too rigid a mindset or even a lack of imagination. This may cause the investigator to overlook the operation of significant factors. Consequently, the outcomes of the study are attributed to the wrong antecedent.

3. *Failure to recognize limitations in the research evidence.* These limitations may be of many types such as non-representative ness in sampling biases in the data, inadequacies in the research design, defective; data-gathering instruments and inaccurate statistical analysis.

4. *Misinterpretation due to unstudied factors*. A given result is composed of many factors, it is not produced simply by a single factor. The factors which condition any result are

innumerable; usually we assume that those we have not studied will average out and will be the same for one group as for the other. This is an assumption, which is convenient, but not always safe.

In some instances the interpretation is difficult or inconsistent with other results because one has conceived of his problem in too narrow sense.

One's conclusions are always limited to the factors studied, and the cautious person will not draw generalizations which involve factors and conditions which be has only assumed.

5. *Ignoring selective factors.* In investigations where a selective group is made the subject of study (e.g. institutional delinquents) or where a selective factor is operating on the situations studied (year wise failures in a four-year course) one is likely to reach unwarranted conclusions if one ignores the selective factors. To find all the institutionalized delinquent children have a low level of intelligence to conclude, therefore, that all delinquents have a low intelligence level is ignoring the fact that there exist outside the institution, many delinquent children with normal or above-normal intelligence.

6. *Difficulties of Interpretative Evaluation.* In studies of the descriptive nature—historical or normative survey—proper interpretation of data rests on proper evaluation of facts. If fifty per cent of the teachers studied express that the curriculum prescribed for the Matriculation Examination is satisfactory while fifty percent say that it is unsatisfactory, what is the investigator to understand by his data? The investigator is not in a position to judge which of the two groups is right unless he has studied and evaluated the curriculum himself and assumed that his judgment on the point .is correct.

Explanation of one's research findings in terms of their practical implications, which often forms a usual part of the research undertaken is fraught with the danger of misrepresentation. Factual interpretation, and personal interpretation of their implications should never be confused. They should be kept apart in a research report.

COMPARISON IN INTERPRETATION

The element of comparison is fundamental to all research interpretations. Comparison of one's investigational findings with a criterion, with results of other comparable investigations, with normal or ideal conditions, with the judgment of a panel of judges or opinions of educational experts forms an important aspect of interpretative efforts of a researcher.

CONCLUSIONS AND GENERALIZATIONS

The chief purposes for which research is conducted are: (1) to determine the status of phenomena, past and present; (2) to ascertain the nature, composition, and processes that characterize phenomena; (3) to trace growth, change and developmental history; and (4) to study cause-and-effect relationships.

In the search for truth the investigator starts with some felt need or difficulty, and employing such knowledge of the situation as he may already possess or secure from a direct preliminary examination of the object or from previously reported experiences, he formulates some tentative conclusions, hypotheses, or suppositions as to the probable nature of the phenomenon under investigation. These hypotheses may be employed in the further examination of the data that are already available. Using these data, each hypothesis is carefully tested in both thought and fact and accepted, modified, or rejected as the available evidence indicates. If the evidence already available is sufficient to establish the hypothesis or hypotheses, the investigation may be concluded at this point, but if insufficient, a new appeal to experience must be made.

Careful Formulation of Generalization. In an earlier chapter, the characteristics of a good hypothesis were enumerated as follows: (1) a good hypothesis is conceivable and in agreement with the observed facts; (2) a good hypothesis does not conflict with any law of nature which is known to be true; (3) a good hypothesis is stated in the simplest possible terms, and (4) a good hypothesis admits of the application of deductive reasoning. These same characteristics are applicable to the conclusions drawn from educational investigations and should be so employed in evaluating the generalizations reached.

As the research worker comes to the conclusion of his investigation, he should review carefully the evidence for and against each hypothesis. Each generalization must agree with the facts revealed by the investigation The investigator will desire to check each generalization carefully, not only against the facts of his own study but against the facts and experiences of other investigators. As one turns to facts for the verification of hypotheses, one must return not only to the facts of one's own investigation but again to the facts of previous studies.

There are four common instances in which the conclusions of investigations do not accord with the known facts. In the first case the investigator gives conclusions, which are directly contrary to the facts. This situation arises occasionally where there are strongly preconceived ideas of the results. Then there is the case in which the investigator assumes that the names given to data-gathering devices accurately indicate what they measure. Many of the generalizations relative to the relationship between intelligence and scholastic success, for example, are subject to this error, in as much as most of the so-called intelligence tests do not really measure intelligence. A third type of situation, in which generalizations may not be in accordance with the data, is that in which the facts and relationships found to exist under certain conditions are held to be true under all conditions. Many illustrations of this fallacy may be found in the field of learning, where certain facts are discovered about the learning of certain materials like nonsense syllables by pupils of certain ages, interests and levels of intelligence under certain conditions, and these facts are held to be true for all materials, learned by all pupils under all conditions. Finally, the generalizations made in evaluative investigations are not always in accord with the facts, because of the partial measurement of outcomes. If one were investigating, for example, the relative merits of direct and activity learning, and measured only certain outcomes, it could be erroneous to say that the facts show either the direct or indirect method of learning superior to the other, since only part of the outcomes were studied, with only a limited number of pupils studying certain materials under given conditions. Experienced research workers limit conclusions to bring them into close agreement with the known facts.

A second test of the dependability of the conclusions drawn from any particular investigation is their agreement with previously established generalizations. If a conclusion is in conflict with a generalization already held to be true, this agreement must be resolved, either by showing that the conflict is not real or that the conflicting statement is false.

Attention has already been directed to the fact that the number of hypotheses should not be needlessly multiplied. Every generalization should be reduced to the simplest possible terms consistent with clarity of expression. The terminology must be simple and direct but of such a character as to summarize as precisely as possible the actual facts of the case. Each generalization should be studied with extreme care, in terms of accuracy, clarity, and simplicity of expression.

Remembering that the generalizations of one study may become the point of departure in a subsequent investigation, they should be formulated in terms, which render them subject to further verification. It is futile to employ mystical forces to explain educational phenomena. If the projected cause of a phenomenon cannot be verified in fact, however true it may appear, it must be discarded in all scientific explanations. That every generalization be verifiable is a fundamental principle of scientific method, which the investigator should consider carefully before casting a conclusion in final form.

Some Common Fallacies of Reasoning. There are some common fallacies of reasoning leading to erroneous generalizations. These fallacies can be enlisted as under:

1. Argument from a single or limited number of instances.
2. Argument from positive instances to the neglect of negative cases,
3. The omission of evidence contrary to one's opinion.
4. Failure to observe important circumstances attending different

phenomena.

5. Erroneous conclusions due to prepossessions, pre-conceived ideas and prejudices.

6. Attributing to a single variable, effects resulting from two or more variables.

7. Inaccurate instruments of measurement; dependence upon subjective judgment estimates and guesses.

8. Argument from analogy.

9. Failure to discriminate between material and immaterial circum stances.

10. Mistaken inferences of various sorts, and

11. Generalizations from insufficient data.

Fowler Further Lists the Following Fallacies:

1. Fallacy of non-observation, consisting of neglect either of some of the instances or some of the circumstances attendant on a given instance,

2. Fallacy of mal-observation.

3. Errors incidental to classification, nomenclature and terminology,

~~1.~~4. Errors commonly arising out of the use of the inductive methods: mistaking a for the cause of b when the real cause is c; mistaking a for the sole cause when a and c are the joint causes; mistaking the remote cause for the proximate cause or the reverse; inversion of cause and effect, and

5. False analogy including argument from final causes. As the research worker comes to the end of his investigation it is highly desirable that he take careful inventory of the data, processes, and conclusions of the study as a whole.

Much has already been said in the literature of education about the dangers involved in generalizations arising from the study of too few cases.

Aside from the above list of fallacies, the investigator should not lose sight of the fact that what one sees in the study of educational problems depends upon what he knows, and that one's conclusions are accurate, and fruitful, exactly in proportion to the thoroughness and correctness of one's previous knowledge. When previous knowledge is vague and indeterminate, the observation will lack definiteness and depth, and will ordinarily lead to unfruitful results.

There are two well-recognized levels of generalization attained in educational research: (1) empirical generalizations, and (2) complete scientific explanation. When one observes some uniformity of nature which he holds to be true and for which he has no adequate explanation, his knowledge is said to be empirical. If one knew, for example, nothing of the theory of gravitation and planetary motion, but had observed the sun to rise in the east each morning, his knowledge of the movement of the sun would be empirical. Most of the practices in the field of education today rest not upon complete scientific explanation but upon observed uniformities arising from either ordinary observation or scientific investigation for which there are as yet no satisfactory explanations. The distinguishing feature of empirical knowledge however, is not whether it has its origin in ordinary observation or in scientific investigation, but whether it is explained and understood. It arises not only in agriculture, medicine or education but also in the physical and biological sciences and wherever there are observed but unexplained uniformities.

The aim of every science is to extend knowledge beyond the facts of observation to other facts that have not been observed, by binding them together into one comprehensive system of knowledge. One desires to know not merely that the sun rises regularly in the east, but why it rises in the east and why it is likely to do so for some time to come. It is not merely that certain phenomena behave in certain observed uniform ways, but why they behave as they do is also to be known. To make such explanations one must refer the observed uniformities to some already established principle of science. One understands a thing only when he grasps its underlying principles.

Hints in Formulating Generalizations

1. Before drawing up conclusions and generalizations, it is advisable to summarize the findings of the study and compare them with the hypotheses formulated in the beginning.

2. The conclusions should be based on the evidence of sound, adequate data. All questionable or incomplete data and untested assumptions should be avoided.
3. The conclusions and generalizations must answer the questions asked in the statement of the problem.
4. They must prove or disprove the hypothesis or hypotheses framed in the beginning.
5. They must recognize the limitations due to faulty or incomplete data.

~~1.~~6. They may be accompanied by suggestions for application and implementation and suggestion of problems for further investigation.

UNIT—6

DEVELOPMENT RESEARCH PROPOSAL

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6.4	Kulbir Singh Sidhu (1987) see 6.1	
6.5	John W. Best and James V. Kahn (1992) see 6.2.	

Kulbir Singh Sidhu(1987)	*Methodology of Research in Education.* 2nd ed. New Delhi, Sterling Publishers (Pvt) Ltd. pp. 52-68	6-1 6-4

FOUR

Research Problem

One of the most difficult phases of any research project is the choice of a suitable problem. The beginner is likely to take a very long time in making his choice. In this first step of any research the research worker should not take a hasty decision. Every problem which comes to his mind or even that suggested by a more experienced person may not be a fit research problem. The identification of a good research problem should be considered a discovery in itself.

Problem Blindness

The beginner in research suffers from a big misconception. After his preliminary study of research literature comprising of numerous theses completed every year, research bulletins, research abstracts, research journals, research publications, etc. he thinks that most of the problems of education have already been studied. Thousands of research studies arc accomplished and published every year. Almost every significant problem has been studied not by one but many of his predecessors. He finds that any problem, which comes to his mind or is suggested by someone else has already been studied enough. There is no problem-area which may be rightly called unexplored. Thus most of the beginners in research suffer from "problem blindness."

No Dearth of Problems

But we should not forget that the complex phenomena of education is full of innumerable problems. Human nature is so complicated a phenomenon that a problem solved for one individual may still exist for another individual or a problem solved for one class may remain a problem for the class to come or a problem solved for one school will not automatically vanish from all the remaining schools or the problem solved by one teacher in his situation may continue to harass the other teachers or a problem solved in one system may remain persisting in another system or a problem solved for the time being may reappear with a lapse of time.

In the field of education, we have to deal with a host of variable factors in terms of pupils, teachers, parents, communities, curricula, text books etc. The interaction of these unstable variables in the complex phenomenon of education creates new situations, new permutations and combinations, new demands, new difficulties and new problems from moment to moment.

More and more of research does not mean that after some time or by a certain date all the existing problems will be solved for ever and there will be no more problems to solve. Rather it so happens that application of one remedy may cure the present malady but may leave behind many side effects, which may turn out to be more serious and dangerous than the original malady.

Advancement of knowledge through research awakens and enlightens us towards new problems of which we were not aware and conscious before. As a matter of fact, increased knowledge in a given field reveals many new problems pressing for solution.

It may be stressed once again that every child is unique and has no duplicate in the past, present, or future. No amount of research will enable us to generalize finally about all children for all times.

The problems lie everywhere around us. They even lie at our door step and in our back yards. Let us develop in us problem awareness, or problem consciousness in order to locate and recognize them.

How to Proceed

In the discovery of his problem, the investigator can take the help of the following procedure. This procedure can save him from wild search and aimless wandering.

1. He should select his field of specialization and become a scholar in that specialization as early as possible.
2. He should develop a concern for that field.
3. He should study critically the available research literature on one's field of specialization.
4. He should accept the difficulties or obstacles of that field as a challenge and try to exercise his originality and ability to tackle them.
5. He should prepare a record of problems already studied by others in his area of specialization.
6. He should acquaint himself with the research under way in that area.
7. He should analyze the trends in his field of specialization.
8. He should acquaint himself with the possibilities, commitment and prophecies in that particular field.
9. He should widely discuss any problem that comes to his mind.

The Sources of Problems

But where to look for a significant and genuine research problem? The most likely sources to which one may turn are as under:

1. *The classroom, school, home, community and other agencies* of education are obvious sources. Many of our prevailing educational practices are based on little or no research evidence. What is known about learning and teaching is still inadequate. There is need and scope for performing the daily teaching tasks more effectively.

   Many of the problems observed in the classroom, the school or the community are of greater importance, than those more remote from the teacher's experience. John W. Best has remarked—"Teachers will discover acres of diamonds in their own backyards, and the possessor of the inquisitive and imaginative mind may translate one of these problems into a worthwhile and practicable research project." The research worker should therefore search for his research problem in the immediate surroundings.

2. *Social developments and technological changes* are constantly bringing forth new problems and new opportunities for research. The development of commercial and educational television is a new factor in the field of education. How will it alter the role of the classroom teacher has to be decided on the basis of careful research. The unemployment of the educated and all round corruption are some social factors which are upsetting the steady programmers of education.

3. *Record of Previous Research.* Such specialized sources as the Encyclopedia of Educational Research, Research Abstracts, Research Bulletins, Research Reports, Journals of Educational Research, Dissertations and many similar publications are rich sources of research problems.

   Text, book assignments, special assignments, reports and term papers will suggest additional areas of needed research.

4. *Discussions.* Classroom discussions, seminars and exchange of ideas with the faculty members and fellow scholars and students will suggest many stimulating problems to be solved. Close professional relationships, academic discussions and constructive academic climate are especially advantageous opportunities.

5. *Questioning Attitude.* A questioning attitude towards prevailing practices and research-oriented academic experience will effectively promote problem-awareness.

6. *Consultations.* Consultations with an expert, research supervisor, research guide, a course instructor or a senior scholar will also be help-full. Several writers have ridiculed the student who expects the guide to assign a problem.

Although research problems should not be assigned or they should not be proposed and allotted by a guide but consultation with the more experienced faculty member or research worker are desirable practice.

To expect the beginner to come to the guide with a completely acceptable problem is quite unrealistic. One of the most important functions of the research guide is to help the student clarify his thinking, achieve a sense of focus, and develop a manageable problem from one that may be vague and too complex.

CRITERIA OF A GOOD RESEARCH PROBLEM

Before the proposed research problem can be finalized, several conditions and considerations have to be satisfied. Although there are no standard rules that will guarantee the suitability of a research problem, a number of criteria in the form of conditions might be listed for guidance in the selection of a topic.

1. Novelty. It should be sufficiently original so that it does not involve objectionable duplication. Originality is the basic credit point of any research. Ignorance of prior studies may lead a student to spend time on a problem already investigated by some other worker. Moreover the study should employ the most recent data.

While originality is an important consideration, the fact that a problem has been investigated in the past does not mean that it is no longer fit for study. There is constant need for verification of the findings of previous investigations, using newer and better devices and procedures. There is also a need for the testing of former findings under changed cultural conditions.

2. Interesting. The problem should be interesting for the investigator himself. If he is not interested in it, he will not be able to face and overcome the obstacles, which come at every step in research. He should have a strong inherent motivation for it. If it seems to him dull and boring, there is little hope that he would do justice to it. Interest may also sometimes develop with long familiarity, but it is not likely that the student can do his best work on a topic that has no personal meaning for him. A major reason for encouraging a worker to select his own research problem is that the result should prove better in terms of the growth of the investigator and the quality of his work.

His interest should be purely intellectual and should not be there only for a reward, material benefit, advancement in position, increased authority and so forth.

3. Importance. It should be significant enough and involve an important principle or practice. If it is not worthwhile, if it neither adds to knowledge nor lends to any improvement in the current practices it would be in vain. It should add to the development of Education as a discipline and to the previous research findings in any way. No research project should be undertaken unless its consequences give promise of improving significantly an important educational practice. The difference between the significant and non significant project lies not in the amount of work required in the case of the former but the amount of thought involved.

4. Feasibility or Amenability. The next question to be asked is that whether research into the problem would be feasible. The suitability of the problem for a particular research worker is the matters of its feasibility. It may be a very good problem, but it should be good for the investigator. He should be able to carry it through to a successful conclusion. He should possess the required competence, knowledge and understanding. He should be skilful enough to develop, administer and interpret the necessary data-gathering devices and procedures. He should possess a reasonable grounding in the necessary statistical techniques. He should be competent enough to carry out all the steps of his project. It should match his special qualifications, training and experience.

5. Availability of Data. The research worker should ensure the availability of valid and reliable data-gathering devices and procedures. In case the study demands a confidential, sensitive and classified information, will it be possible for him to obtain it?

6. Availability of Cooperation. The study may require cooperation from various institutions, authorities and individuals. It may need administration of tests to pupils, interviewing employees, observation of students at play, meeting the citizens, writing for data, going through records, conducting necessary experiments and going into prolonged study of exceptional cases. The investigator must make sure that necessary permission and cooperation will be readily available.

7. Availability of Guidance. Will I get necessary sponsorship and guidance? Is there an adequately qualified member of the faculty who would be willing to guide the research worker? Every research activity needs the patronage of a guide and the approval and sanction of a competent authority.

8. Availability of Other Facilities. Will I have the necessary financial resources to carry out the study? The investigators should be able to meet the expenses involved in data-gathering equipment, printing, test materials, travel, computerization, clerical help, postage, preparation of the report, etc. If the project is expensive in nature, he will explore the possibility of obtaining financial help or grant from some agency.

Will I have enough time to complete the project? Selecting a problem, library study, preparing the data-gathering devices, collecting and analyzing the data, writing the research report, etc. are all time-consuming processes. Most of the research programmes impose time limitations. Certain worthwhile studies of a longitudinal type are therefore out of question.

9. Immediate Application. Will my research help in solving an urgent problem? Supposing I choose to work on eradication of unfair means in the examinations, how far my research will solve the problem in hand? It is quite obvious that I would be completely wasting my research effort on this problem which is likely to defy every solution.

10. Aim of Research. The aim of research also influences the selection of the problem. If it is producer research, the problem will be studied to enhance existing knowledge for its own sake. If it is consumer type, the results should be fit for immediate application.

11. Level of Research. It is another criterion to help in the selection of a problem. The nature and scope of a study will be determined in the light of levels like, Master's Degree, M. Phil. Degree and Ph. D. it may simply be an action research or a research to produce a research paper or an experimental project.

12. Experience and Creativity. Good research problems stem from a clear understanding of the theoretical, empirical and practical aspects of the subject derived from personal experience and from a thorough review of the literature. Conversely, lack of familiarity with the subject is almost sure to result in a poor choice.

Another major contributor to the wise choice of a problem is creativity and the other personality factors that make for originality, flexibility, initiative, ingenuity and foresight. Thorough familiarity with a given field is conducive to original thinking.

13. Courage mud Confidence. Will I have the courage and determination to pursue the study in spite of the difficulties and social hazards that may be involved. Will I be able to work aggressively when data are difficult to gather and when others are reluctant to cooperate?

Will I be willing to risk the criticism, suspicion or even opposition that a delicate or controversial study may raise? Sex education, religious education, communism and other controversial problems are almost certain to stir up emotional reactions.

A GUIDE TO JUDGE A RESEARCH PROBLEM

Various authors have enlisted a number of questions to be asked while finalizing the selection of a problem or judging its merits. A composite list of these questions is given below:

1. Is the problem really important?
2. Does the field appeal to my interest?
3. Is the problem interesting to others?
4. Does it display originality and creativeness?
5. Does the field require extension of inquiry beyond the present limits of verified knowledge?
6. Am I really concerned with finding the answer?
7. Is the field pivotal or strategical from the standpoint of the immediate purposes?
8. Is the problem feasible with respect to financial and administrative backing, time and data required in its solution

9. Am I equipped with the general and specialized skills required in solving the problem?

10. Will I learn something new from the study of this problem?

11. Will my proposed data-gathering instruments actually give the information 1 want?

12. Is the study, including the application of its results practical?

13. Does the problem meet the personal purposes for which I have decided to undertake research?

FORMULATING AND STATING THE PROBLEM

After the problem has been selected, it must be definitely formulated and stated. If it is to serve as a guide in planning the study and interpreting its results, it is essential that the problem is stated in precise terms. The type of statement to be employed depends on the preference of the worker and the nature of the problem. Preferably it should be set as a question or in such form that the question to be answered is clearly indicated. There are two different ways of stating a problem.

1. Posing question/questions
2. Making declarative statement/statements.

One may choose any of these ways remembering that the question form has an advantage in sharpening and focusing the issue, but the declarative form is perhaps more common, and both of the ways may be combined easily in an initial statement.

DEFINITION OF THE PROBLEM

It implies the separation of the problem from the complex of difficulties and needs, it means to put a fence around it, to separate it by careful distinctions from like questions found in related situations of need.

To define a problem means to specify it in detail and with precision. Each question and subordinate question to be answered is to be specified. Sometimes it is necessary to formulate the point of view or educational theory on which the investigation is to be based. If certain assumptions are made, they are explicitly noted.

It is important to define and elucidate the problem as a whole and further define all the technical and unusual terms employed in the statement. By this the research worker removes the chance of misinterpretation of any of these crucial terms. The definition helps to establish the frame of reference with which the researcher approaches the problem.

In every area of research we have to proceed after making certain initial assumptions. For example, in educational research, the generally accepted assumptions are that school and education are necessary, a normal man is educable, there are differences among individuals and respect for individual is desirable as a way of life and education. Such other assumptions are stated as a part of the definition and development of the problem, and also in connection with the conclusions of the investigation.

The nature of study will also have to be explained, such as why it is a simple study, a critical study, an analytical study, an experimental study or a comparative study and what these terms stand for?

The basic importance of the problem and its definition indicates that they should appear early in a report of educational research.

DELIMITATION OF THE PROBLEM

Here the investigator states the restrictions and limitations which he imposes on his study. It is a statement of the limit or scope of the investigation. This statement will provide information concerning who, what, where and how many. It will determine the boundaries of the project in hand.

This delimitation will mention the geographical limits of the study—i.e., whether the study will be covering a single town, a district, a region, a state or a country. It will specify the time limits of the study—i.e., whether the stud will be spread over a few days, a few months, a year or a number of years. It will have to specify the type of institutions to be covered—i.e. the rural schools, the middle schools, the high schools, public schools, boys schools, girls schools, or coeducational schools. The type of subjects of the study will also be mentioned—i.e. the heads of the institutions, the science teachers, the parents, the adolescents or the sportsmen. Again it will be important to mention as to how many subjects will constitute the sample of the study and how they will be distributed over the institutions, geographical areas or time intervals, the age level, grade level, ability level, achievement level etc., will also have to be specified.

Recognition of the limitations of the study helps to focus attention on pertinent objectives and helps to minimize the danger of oversimplification. A time schedule should be prepared so that the researcher may budget his time and energy effectively. Dividing the project into parts and assigning dates for the completion of each part helps to systematize the project.

JUSTIFICATION OF THE PROBLEM

It will be important to state in the very beginning how the results of the research will influence educational theory or practice; the urgency and worthwhile ness of the project have to be justified. It will convince the readers about the significance of the investigation. This step would prevent a wastage of research effort on unimportant, trivial, superficial or insignificant problems. The problem should be broad-based enough to provide an investigation of real significance. The research worker would assess to what extent the solution of the problem would contribute for the furtherance of human knowledge. He has to indicate the chief purpose of the study at the outset and other subsidiary specific objectives that have compelled him to undertake such an investigation. The list of the objectives of the study magnifies further its utility and importance.

COMMON ERRORS IN SELECTING AND FORMULATING A RESEARCH PROBLEM

There are a number of errors, which are committed by an average research worker while selecting and formulating a research problem. These errors need to be carefully avoided. These are enlisted below:

1. *Naming a broad field or area of study instead of a specific problem.* For example an investigator may undertake to study

'The Higher Secondary System in India," or 'The Implementation of Kithara Commission Report," these are too vast areas to be studied why full justice.

~~1.~~2. *Stating it such that investigation is impossible.* For example someone may state his problem as "The effects of working mothers on the academic achievement of their offspring's" or "The desirability of introducing typing in the elementary school."

3. *Narrowing or localizing a topic.* The problem may be narrowed to such an extent that it becomes too small and insignificant from research point of view. For example someone may choose to study "The history of a village school" or undertake "A critical study of the poems included in a Text Book."
4. *Including in it terms of an unscientific, emotional or biased nature.* For example someone may like to work on "Teaching as a great adventure" or "The blessings of teaching profession". This bias or prejudice is a constant error.
5. *Lack of precision in the instruments.* The tools, test or devices, which are proposed to be used in data collection may not be precise enough resulting in another constant error.

FIVE

The Hypothesis

The derivation of a suitable hypothesis goes hand in hand with the selection of a research problem. When the mind has before it a number of observed facts about some phenomenon, there is a need to form some generalization relative to the phenomenon concerned.

THE MEANING OF HYPOTHESIS

A hypothesis is a statement temporarily accepted as true in the light of what is, at the time, known about a phenomenon, and it is employed as a basis for action in the search for new truth.

A hypothesis is a tentative assumption drawn from knowledge and theory which is used as a guide in the investigation of other facts and theories that are yet unknown.

It is a guess, supposition or tentative inference as to the existence of some fact, condition or relationship relative to some phenomenon which serves to explain such facts as already are known to exist in a given area of research and to guide the search for new truth.

A hypothesis states what we are looking for. A hypothesis looks forward. It is a proposition, which can be put to a test to determine its validity. It may prove to be correct or incorrect.

It is a tentative supposition or provisional guess, which seems to explain the situation under observation.

A hypothesis is a tentative generalization the validity of which remains to be seen. In its most elementary stage the hypothesis may be any hunch, guess, imaginative idea, which becomes the basis for further investigation.

Science employs hypotheses in guiding the thinking process. When our experience tells us that a given phenomenon follows regularly upon the appearance of certain other phenomena, we conclude that the former is connected with the latter by some sort of relationship and WE form a hypothesis concerning this relationship.

Hypotheses reflect the research worker's guess as to the probable outcome of the experiments.

A hypothesis is an assumption or proposition whose tenability is to be tested on the basis of the compatibility of its implications with empirical evidence and with previous knowledge.

A hypothesis is therefore a shrewd and intelligent guess, a supposition, inference, hunch, provisional statement or tentative generalization as to the existence of some fact, condition or relationship relative to some phenomenon which serves to explain already known facts in a given area of research and to guide the search for new truth on the basis of empirical evidence. The hypothesis is put to test for its tenability and for determining its validity.

IMPORTANCE OF HYPOTHESIS

Hypothesis has a very important place in research although it occupies a very small space in the body of a thesis. It is almost impossible for a research worker not to have one or more hypotheses before proceeding with his work. If he is not capable of formulating a hypothesis about his problem, he may not be ready to undertake its investigation. The aimless collection of data is not likely to lead him anywhere. The importance of hypothesis can be more specifically stated as under:

1. It provides direction to research. It defines what is relevant and what is irrelevant. Thus it prevents the review of irrelevant literature and the collection of useless or excess data. It not only prevents wastage in the collection of data, also ensures the collection of the data necessary to answer the question posed in the statement of the problem.

2. It sensitizes the investigator to certain aspects of the situation which are relevant from the standpoint of the problem at hand. It spells the difference between precision and haphazardness, between fruitful and fruitless research.

3. It is a guide to the thinking process and the process of discovery. It is the investigator's eye—a sort of guiding light in the world of darkness.

4. It focuses research. Without it research would be like a random and aimless wandering.

5. It prevents blind research. Prevents indiscriminate gathering of data which may later turn out to be irrelevant.

6. It sensitizes the individual to facts and conditions that might otherwise be overlooked.

7. It places clear and specific goals before us. These clear and specific goals provide the investigator with a basis for selecting samples and research procedures to meet these goals.

8. It serves the function of linking together related facts and information and organizing them into one comprehensible whole.

9. It enables the investigator to understand with greater clarity his problem and its ramifications, as well as the data which bear on it. It further enables a researcher to clarify the procedures and methods to be used in solving his problem and to rule out methods which are incapable of providing the necessary data.

10. It serves as a framework for drawing conclusions. It makes possible the interpretation of data in the light of tentative proposition or provisional guess. It provides the outline for stating conclusions in a meaningful way.

SOURCES OF HYPOTHESIS

The task of deriving adequate hypotheses is essentially parallel to that of selecting suitable problems. There is no royal road to the location of a suitable problem, likewise there is no royal road to the discovery of fruitful hypotheses. The derivation of a good hypothesis demands characteristics of experience and creativity. Though hypotheses should precede the gathering of data, a good hypothesis can come only from experience. Some degree of data gathering, the review of related literature, or a pilot study must precede the development and gradual refinement of the hypothesis.

The factor of persistence is no less important. Success in an investigation depends on the considerable time and effort spent in tracing and stating tentative hypotheses.

A good investigator must have not only an alert mind capable of deriving relevant hypotheses, but also a critical mind capable of rejecting faulty hypotheses. The person who is full of ideas may be lacking in critical analysis—that is, originality may be somewhat incompatible with a critical attitude.

The specific sources of hypothesis are being discussed below:

1. **General Culture**. In the Investigations for solving problems of Indian Education our hypotheses cannot lose sight of the broad general culture to which we belong, While formulating such hypotheses we cannot ignore religious or moral bias in Indian Education, typical role of family in Indian Education, play interests of Indian children, our prejudices against women education, compulsory education or co-education. Our cultural heritage is a great source of ideas, theories, tentative theories and provisional propositions.

2. **Scientific Theory**. There are various scientific laws or theories which are transferable to the field of educational researches. For example we have theories like—sound mind in a sound body, handicapped children face adjustment problems, rest relieves fatigue, etc.

3. **Personal Experience**. We have emphasized above that a good hypothesis can come only from experience. Some of our experiences may be directly changed into research hypotheses, for example—Teachers' character and personality are imbibed by the students, good study habits improve achievement, teacher's punctuality enhances 'student's punctuality, library reading enhances interest, in knowledge, etc.

4. **Analogies**. Although reasoning by analogy generally is considered unacceptable as a source of proof, it is a very fertile source of hypotheses. It is the process of framing hypothesis from the likenesses and similarities. It is assumed that the existence of similarities between two situations is not accidental, but that it is the result of the operation of some law common to the two situations. For example if our problem is similar in nature to a

problem studied in a foreign land, we may frame our hypothesis in the same manner.

CHARACTERISTICS OF HYPOTHESIS

To serve its intended purposes and to be up to the mark in view of its great importance the hypothesis must possess a number of characteristics, which are:

1. *A good hypothesis is in agreement with the observed facts.* A single unexplained conflict between fact and hypothesis is disastrous to the latter. A hypothesis is entirely plausible and conceivable. It is based directly on existing data. The investigator should not omit the evidence contrary to his own opinion, should not build his argument from positive instances and neglect the negative cases, should not argue from a limited number of instances and should not make supposition from insufficient data.

2. *A good hypothesis does not conflict with any law of nature which, is known to be true.* The idea involved in this principle is not very different from that expressed in the preceding principle. We know that there are a number of conflicting theories of learning and teaching. These conflicts arise partly out of the failure of research workers to produce hypotheses that are in agreement with fact, and are not in conflict with any law of nature. When we say that there can be a. memory tablet for strengthening memory, we are trying to disprove well-established laws of nature.

3. *A good hypothesis is expert. It is stated in a scientific and* research like language and is not an ordinary statement.

4. *A good hypothesis is stated in the simplest possible terms.* It is also called the principle of economy. Ultimate generalization of a science should be reduced to the simplest possible form. It is not a literary statement. The number of hypotheses must also not be needlessly multiplied. The more insight the researcher has into the problem, the simpler will be his hypothesis about it.

5. *A good hypothesis permits the application of deductive* reasoning. It should be verifiable and testable. A hypothesis cannot be verified until deductions can be made from it which are capable of empirical verifications. It should be capable of being proved or

refuted.

6. *It should be so designed that its test will provide an answer* to the original problem, which forms the primary purpose of the investigation. It should be related to available knowledge or theory concerning the original problem area.

7. *It must be stated in final form early in the experiment* before any attempt at verification is made.

THE DISCOVERY OF HYPOTHESIS

One of the most important aspects of any investigation is that of securing sound ideas about the facts, conditions and relationships involved in the phenomenon. This process of securing sound ideas stands for the discovery of hypothesis, which can be made more successful through following steps.

1. *The investigator should be well-read and well-informed about the problem.* The expert educational investigator, whether in the laboratory or in the field, is the one who is exceedingly well informed. Before a statement of hypothesis can be formalized in testable form, the researcher should review as much literature in the problem area and study as much related research as is practical under the circumstances.

2. *He should examine with care the commonplace features of objects.* We are so thoroughly habituated to our ordinary ways of thinking about things, that it is exceedingly difficult to see things in any other than the customary light. It is essential that those engaged in research be alert, not merely to the new and incidental features of objects, but to their more obvious features. They should free themselves from their bonds of conventional thinking and procedure and look with the greatest care at all of the ordinary and extraordinary aspects of the phenomena.

3. *He should see beyond the superficial aspects of objects.* The investigator should extend his vision to search for vital relationships beyond the superficial aspects of phenomena and to the underlying principles, conditions and uniformities. For example, objects, which appear to be quite unlike, may possess many similarities. He has to keep himself alert to the similarities

of seemingly unlike situations.

4. *He should note the uniform connection of events.* The almost universal condition for the formulation of generalization is that one observe the simultaneous occurrence of conditions and events. Such observations may be utilized in the formation of new hypotheses by enabling us to be more alert to the sequence of events.

5. *He should recognize the importance of analogy in the formation of hypothesis.* If two things resemble each other in one or more respects and a certain generalization is known to be true for one situation, it is considered to be true for the other. For the purpose of hypothesis, the points of resemblance must be weighed and not merely counted. The resemblances between objects may be of a superficial or non-essential nature. Science is concerned with essential likenesses and differences.

6. *He should recognize the importance of thinking about things.* We have discussed that one of the steps is to be well-read, and another is to come into first-hand contact with phenomena by systematically observing them or experimenting with them. A third step is to think about them.

THE USE OF HYPOTHESIS IN DIFFERENT TYPES OF RESEARCH

The use of hypothesis will vary somewhat with the type of research undertaken and the purposes to be served. In Historical research the purpose may be either to produce a faithful record of the past or to extend the experiences with phenomena in the present to the past in order to make the view of the phenomena more complete. For the latter purpose, hypothetical thinking serves the conventional purposes of limiting the research, sensitizing the observer and colligating facts. When the purpose is only to produce a faithful record of the past, little or no use is made of hypothetical thinking except in establishing the record itself.

In normative survey research the investigator may or may not employ the hypothetical type of thinking, depending upon his purpose. If he desires merely to know the status of certain phenomena, little or no use may be made of hypothesis. If however the investigator is working with some problem for which the solution depends upon study of the status of various diversified phenomena and their relationships, e.g., sex differences in the achievement of high school pupils, hypothetical thinking may play an important role. However, hypothesis does not appear to assume the significant role in normative-survey research that it does in either experimental or complex causal research. In this types of research, hypothetical thinking is best developed and plays an important part. Experiment is not the main source of scientific principles. It is the means of testing a deduction. Again, measurement is not the source of laws, it permits only the expression of a previously conceived law in mathematical terms.

DIFFERENT FORMS OF HYPOTHESIS

The hypothesis can be stated in a number of forms, which are—

1. **Null Form.** It states that no significant difference exists between the variables concerned. For example—There is no significant difference in the instructional standards of single shift and double shift schools. The null form is preferred by most of the experienced research personnel. This form of statement more readily defines the mathematical model to be utilized in the statistical test of the hypothesis. The no difference Statement assumes that the two groups will be tested and found to be equal.

2. **Prediction Form**. It is chosen because it allows the research worker to state principles which he actually expects to emerge from the experiment. This type of hypothesis is more useful in action research studies.

3. **Declarative Form**. It generally states a relationship between the variables concerned. For example we can state that—there will be a significant difference in the instructional standards of boys and girls schools.

4. **Question Form.** The above-mentioned hypothesis in question form may read—"Is there a significant difference in the instructional standards of boys and girls schools?"

DIFFICULTIES IN THE FORMULATION OF HYPOTHESIS

There are a number of difficulties from which a beginner may suffer at the stage of formulating good hypotheses:

1. Lack of knowledge and clarity of the theoretical framework of the area in which the investigator chooses to work.
2. Lack of ability to make use of the theoretical framework logically.
3. Lack of acquaintance with available research technique resulting in failure to be able to phrase the hypothesis properly.
4. Vagueness of the statement. For example—A course in ethics will make a student a more ethical adult.

TESTING THE HYPOTHESIS

The proof of the worth of a hypothesis lies in its ability to meet the test of its validity. After formulating a hypothesis, it is necessary to (i) deduce its consequences, (ii) select or develop tools that will determine whether these consequences actually occur, and (iii) use the tools thereby collecting facts that will either confirm or disconfirm the hypothesis.

There are two fairly important means of testing hypothesis: (l) the study of hypothesis for logical consistency; and (2) the study of hypothesis for agreement with fact.

The study of hypothesis for logical consistency is a phase of thinking. It consists of checking the logical character of the reasoning by which, the consequences of hypothesis are deduced for verification. In the second place, the study of hypothesis for logical consistency involves checking it for agreement with the already known laws of nature. It must not conflict with the highest and simplest laws of good thinking and it must not disagree with those principles of science which are considered valid beyond reasonable doubt. The suggested inferences are tested in thought, for logical coherence, before they are tested in action.

In the study of hypothesis for agreement with fact, one argues that if the hypothesis is true, certain facts, conditions or relationships will be found, then one looks to see if these conditions are present. After testing the hypothesis by applying it to already known facts, it may have to be tested by a new appeal to experience. In this new appeal the data are collected, recorded and manipulated according to the conventions of science. If the data already available are adequate, no new appeal to experience will be necessary.

A hypothesis is never proved, it is merely sustained or rejected. If it fails to meet the test of its validity, it must be modified or rejected. A hypothesis can be useful even if it is partly incorrect. The negative instances, which occur require only further clarification and refinement of the hypothesis rather than its outright rejection.

The confirmation of a hypothesis is always tentative and relative subject to later revision and even rejection as further evidence appears or as more adequate hypotheses are introduced. Hypothesis is more tentative and less fully developed than theory, is more subject to modification and to rejection. A hypothesis is only theory in the making. When a hypothesis is sustained by logical and empirical tests, it provides the basis for generalizations or conclusions. As further confirmation and clarification of the conditions under which the hypothesis holds, accumulate, a generalization may become a law or principle. Sound theories are reached only after many hypotheses have been tried out and discarded or modified to harmonize with established facts.

John. W. Best and James V. Kahn (1992)	**Research in Education** 6th ed New Delhi, Prentice- Half of India (Pvt) Ltd. pp. 36-39.	6.2 6.5

THE RESEARCH PROPOSAL

The preparation of a research proposal is an important step in the research process. Many institutions require that a proposal be submitted before any project is approved. This provides a basis for the evaluation of the project and gives the advisor a basis for assistance during the period of his or her direction. It also provides a systematic plan of procedure for the researcher to follow.

The proposal is comparable to the blueprint, which the architect prepares before the bids are let and building commences. The initial draft proposal is subject to modification in the light of the analysis by the student and his or her project advisor. Because good research must be carefully planned and systematically carried out, procedures that are improvised from step to step will not suffice. A worthwhile research project is likely to result only from a well-designed proposal.

The seven part proposal format presented here should not be considered the only satisfactory sequence. Many institutions suggest other formats for the research proposal.

Part 1: The Statement of the Problem. This is usually a declarative statement but may be in question form. This attempt to focus on a stated goal gives direction to the research process. It must be limited enough in scope to make a definite conclusion possible. The major statement may be followed by minor statements. The problem areas that previously have been listed in this chapter are not statements of problems. They are merely broad areas of concern from which problems may be selected.

A problem suggests a specific answer or conclusion. Usually a controversy or a difference of opinion exists. A cause-and-effect relationship may be suggested upon the basis of theory or previous research findings. Personal observation and experience may be the basis of a problem. Some examples of problem sitemaps are as follows: (1) Children who have had kindergarten experience might demonstrate greater academic achievement in the first grade than those who have not had this experience. (2) Participation in high school competitive athletics may be detrimental to academic achievement. (3) Racial segregation may have a damaging effect upon the self-image of minority group children, (4) knowledge of participation in an experiment may have stimulating effect upon the reading achievement of participants. These problem statements involve more than information gathering. They suggest answer or conclusions and provide a focus for research activity.

Part 2: The Significance of the Problem. It is important that the researcher point out how solution to the problem or the answer to the question can influence educational theory or practices. That is the researcher must demonstrate why it is worth the time, effort and expense required to carry out proposed research. Careful formulation and presentation of the implications or possible application of knowledge helps to give project an urgency, justifying its worth.

Failure to include this step in the proposal may well leave the researcher with a problem without significance a search for data of little ultimate value. Many of the tabulating or "social book keeping" research problem should be abandoned, if they do not pass the critical test of significance. Perhaps university library shelves would not groan with the weight of so many unread and forgotten dissertations if this criterion of significance had been rigorously applied. With so many gaps in educational theory, and so many areas of education practice in need of analysis, there is little justification for the expenditure of research effort on trivial or superficial investigation.

Part 3: Definitions, assumptions, limitations, and delimitation. It is important to define all unusual terms that could be misinterpreted. These definitions help establish the frame of reference with which the researcher approaches the problem. The variables to be considered should be defined in operational terms. Such expressions as academic achievement and intelligence are useful concepts, but they cannot be used as criteria unless they are defined as observable samples of behavior. Academic grades assigned by teachers or scores on standardized achievement test are operational definitions of achievement. A score on a standardized intelligence test is an operational definition of intelligence.

Assumptions are statements of what the researcher believes to be facts but cannot verify. A researcher may state the assumption that the participant observers in the classroom, after a period of three days, will establish rapport with the students and will not have a reactive effect on behavior to be observed.

Limitations are those conditions beyond the control of the researcher that may place restrictions on the conclusions of the study and their application to other situations. Administrative policies that preclude using more than one class in an experiment, a data-gathering instrument that has not been validated, or the inability to randomly select and assign subjects to experimental and control groups are examples of limitations.

Delimitations are the boundaries of the study. A study of attitudes toward racial minorities may be concerned only with middle class, fifth-grade pupils, and conclusions are not to be extended beyond this population sampled.

Part 4: *Review of related literature:* A summary of the writings of recognized authorities and of previous research provides evidence that the researcher is familiar with what is already known and what is still unknown and untested. Since effective research is based upon past knowledge, this step helps to eliminate the duplication of what has been done and provides useful hypotheses and helpful suggestions for significant investigation. Citing studies that show substantial agreement and those that seem to present conflicting conclusions helps to sharpen and define understanding of existing knowledge in the problem area, provides a background for the research project, and makes the reader aware of the status of the issue. Parading a long list of annotated studies relating to the problem is ineffective and inappropriate. Only those studies that are plainly relevant, competently executed, and clearly reported should be included.

In searching related literature, the researcher should note certain importance elements:

1. Reports of studies of closely related problems that have been investigated.
2. Design of the study, including procedures employed and data-

gathering instruments used.

3. Populations that were sampled and sampling methods employed.
4. Variables that were defined.
5. Extraneous variables that could have affected the findings.
6. Faults that could have been avoided.
7. Recommendations for further research.

Capitalizing on the reviews of expert researchers can be fruitful in providing helpful ideas and suggestions. Although review articles that summarize related studies are useful, they do not provide a satisfactory substitute for an independent search. Even though the review of related literature is presented as step 4 in the finished research proposal, the search for related literature is one of the first steps in the research process. It is a valuable guide to defining the problem, recognizing its significance, suggesting promising data-gathering devices, appropriate study design, and sources of data.

Part 5: The Hypothesis. It is appropriate here to formulate a major hypothesis and possibly several minor hypotheses. This approach further clarifies the nature of the problem and the logic underlying the investigation, and gives direction to the data-gathering process. A good hypothesis has several basic characteristics:

1. It should be reasonable.
2. It should be consistent with known facts or theories.
3. It should be stated in such a way that it can be tested and found to be probably true or probably false.
4. It should be stated in the simplest possible terms.

The research hypothesis is a tentative answer to a question. It is an educated guess or hunch, generally based upon prior research and/or theory, to be subjected to the process of verification or disconfirmation. The gathering of data and the logical analysis of data relationships provide a method of confirming or disconfirming the hypothesis by deducing its consequences.

It is important that the hypothesis be formulated before data are gathered. Suppose that the researcher gathers some data and, on the basis of these, notes something that looks like the basis for an alternative hypothesis. Since any particular set of observations may display an extreme distribution, using such observations to test the hypothesis would possibly lead to an unwarranted conclusion.

The formulation of the hypothesis in advance of the data-gathering process is necessary for an unbiased investigation. It is not inappropriate to formulate additional hypotheses after data are collected, but they should be tested on the basis of new data, not on the old data that suggested them.

Part 6: Methods. This part of the research proposal usually consists of three parts: *subjects, procedures, and data analysis. The subjects section* details the population from which the researcher plans to select the sample. Variables that are frequently included, depending on the type of project proposed, include: chronological age, grade level, socioeconomic status, sex, race IQ (if other than average), mental age (if significantly different from chronological age), academic achievement level, and other pertinent attributes of the targeted population. The number of subjects desired from the population and how they will be selected are also indicated in this section. The reader should be able to understand exactly from where and how the subjects are to be selected.

L.R Gay (1987)	**Educational Research: Competencies for Analysis and Application**. 3rd ed. London. Merill Publishing Company, pp. 35-38	6-3

Selection and Definition of A Problem

The quality of English composition. The variables to be defined are positive reinforcement" and "quality of English compositions." Positive reinforcement might be defined in terms of positive written comments on compositions such as "good thought" and much better." The quality of the compositions might be defined in terms of such factors as number of complete sentences and number, of words spelled incorrectly. In this example the relationship to be investigated between the variables is cause-effect the purpose of the study is to see if positive reinforcement (the cause) influences the quality of compositions (the effect).

A statement of the problem is invariably the first component of the introduction section of both a research plans and a research report on a completed Study. Since the problem statement gives direction to the rest of the plan or report, it should be stated as soon as possible. The statement of the problem should be accompanied by a presentation of the background of the problem, including a justification for the study in terms of the significance of the problem. Background' of the problem means information required for an understanding of the problem. The problem should be justified in terms of its contribution to educational theory or practice. For example; an introduction might begin with a problem statement such as "the purpose of this study is to compare the effectiveness of salaried paraprofessional and parent volunteers with respect to the reading achievement of first-grade children." This statement might be followed you a discussion concerning (1) the role of paraprofessional, (2) increased utilization of paraprofessional by schools, (3) the expense involved, and (4) the search for alternatives such as parent volunteers. The significance of the problem would be that it parent. Volunteers are equally effective, their use can be substituted for salaried paraprofessional at greave savings. Any educational practice that might increase achievement at no additional cost is certainly worthy of investigation.

After a problem has been carefully selected, delineated, and clearly stated, the researcher is ready to attack the review of related literature. The searcher typically has a tentative hypothesis that guides the review. In the above example, the tentative hypothesis would be that parent volunteers are equally effective as salaried paraprofessional. It is not unlikely that the tentative hypothesis will be modified, even changed radically, as a result of the review. It does, however, give direction to the literature search and narrows its scope to include only relevant topics.

REVIEW OF RELATED LITERATURE

Having happily found a suitable problem, the beginning researcher is usually raring to go. Too often the review of related literature is seen as a necessary evil to be completed as fast as possible so that one can get on with the Study. This feeling is due to a lack of understanding concerning the purpose and importance of the review and to a feeling of uneasiness on the part of students who are not too sure exactly how to go about it. The review of related literature, however, is as important as any other component of the research process, and it can be conducted quite painlessly if it is approached in an orderly manner. Some researchers even find the process quite enjoyable.

Definition Purpose, and Scope

The review of related literature involves the systematic identification, location, and analysis of document containing information related to the research problem. These documents include periodicals abstracts reviews, books, and other research reports. The review has several important functions, which make it well worth the time and effort. The major purpose of reviewing the literature is to determine what has already been done that relates to your problem. This knowledge not only avoids unintentional duplication, but it also provides the understanding and insights necessary for the development of a logical framework into which your problem fits. In other words, the review tells the researcher what has been done and what needs to be done. Studies that have been done will provide the rationale for your research hypothesis;

indications of what reeds to be done will form the basis for the justification for your study.

Another important function of the literature review is that it points out research strategies and specific procedures and measuring instruments that have and have not been found to be productive in investigate your problem. This information will help you to avoid other researchers' mistakes and to profit from their experiences. It may suggest approaches and procedures previously not considered. For example, suppose your problem involved the comparative effectiveness of programmed versus traditional instruction on the achievement of ninth grade algebra students. The review of literature might reveal 10 studies already conducted which have found no differences in achievement. Several of the studies, however, might suggest that programmed instruction may be more effective for certain kinds of students than others. Thus, you might reformulate your problem to involve the comparative effectiveness of programmed versus traditional instruction in algebra on the achievement of low aptitude ninth-grade algebra students. Being familiar with previous research also facilitates interpretation of the result of your study. The results can be discussed in terms of whether they agree with, and support, previous findings or not: if the results contradict previous findings, differences between your study and the others can be described, providing a rationale for the discrepancy. If your results are consistent with other findings, your report should include suggestions for the "next step" if they are not consistent, your report should include suggestions for studies that will resolve the conflict.

Beginning researchers seem to have difficulty in determining how broad their literature review should be. They understand that all literature directly related to their problem should be reviewed; they Just don't know when to quit' they have trouble determining which articles are "related enough" to their problem to be included. Unfortunately, there is no statistical formula that can be applied; the decisions must be based on judgment.

These judgments become easier as one acquires experience, there are some general guidelines, however, which can assist the beginner. First, avoid the temptation to include everything you find; bigger does not mean better. A smaller, well-organized review is definitely to be preferred to a review containing many studies that are more or less related to the problem. Second, heavily researched areas usually provide enough references directly related to a specific problem to eliminate the need for relying on less related studies. For example, the role of feedback in learning has been extensively researched for both animals and human beings, for verbal learning and nonverbal teaming, and for a variety of different learning tasks. If you were concerned with the relationship between frequency of feedback and chemistry achievement, you would probably not have to review, for example, feedback studies related to animal learning. Third, and conversely, new or little-researched problem areas usually require review of any study related in some meaningful way to the problem in order to develop a logical framework for the study and a sound rationale for the research hypothesis. For example, a study concerned with the effectiveness of formal preschool reading instruction would probably include in its literature search any study concerned with preschool reading instruction, formal or informal. Ten years from now there will probably be enough research on formal programs to eliminate the-need for reviewing informal efforts.

A common misconception among beginning researchers is the idea that the worth of their problem is a function of the amount of literature available on the topic. This is not the case. There are many new, important areas of research for which there is comparatively little available literature; formal preschool reading instructions is one such area. The very lack of such research increases the worth of the study. On the other hand, the fact that 1,000 studies have already been done in a given problem area does not mean there is no further need for research in that area. Such an area will generally be very well developed with additional needed research readily identifiable. Such an area is anxiety theory, which us concerned with the relationships between anxieties learning.

Preparation

Since it will be a second home to you, at least for a while, you should become completely familiar with the library before beginning your review. Time spent initially will save time in the long run. You should find out what references are available and where they are located. You should also be familiar with services offered by the library as well as the rules and regulation regarding the use of library materials. Since most of the references you will be seeking will be located in educational journals, you should spend extra time getting well acquainted with the various periodicals.

Many libraries provide written guides detailing what the library has to offer and the procedures for references and services. While many references are standard and can be found in most libraries some sources, such as the [4]ERIC microfiche collection are not necessarily available. Services also vary from library to library, the stacks, for example, may or may not be available for direct use by graduate students. One important service that is offered by most libraries is the interlibrary loan. This service permits you to obtain references not available in your library but available in another library. The small fee usually charged is generally happily paid by the researcher who "needs" a locally unavailable reference. Many libraries offer guided tours of the facilities such tours are generally scheduled for groups. While librarians are usually very willing to help individuals, you should learn to use the library all by yourself: the librarian may not be as cheerful the tenth time you approach as he or she was the first time!

Having formulated your problem, and acquainted yourself with the library, there is one more thing you need to do before you go marching merrily off into the library-make a list of key words to guide your literature search. Most of the sources you will consult will have alphabetical subject indexes to help you locate specific references. You will look in these indexes under the key words you have selected. For example, if your problem concerned the effects of microcomputer-assisted instruction on the math achievement of elementary students, the logical key words would be microcomputers and mathematics. You will also need to think of alternative words under which your topic might be listed. For example, references related to the above problem might be found using the key word computers, rather than microcomputers. Usually, the key words will be obvious, sometimes you may have to pay detective. Some years

[4] The ERIC system will be discussed in the next section.

ago, a student of mine was interested in the effect of artificial turf on knee injuries in football. He looked under every key word he could think of such as surface, playing surface, turf, and artificial turf. He could find nothing. Since we both knew that studies had been done, he kept trying. When he finally did find a reference it was listed under, of all things, lawns! Identifying key words is usually not such a big deal. In looking in initial sources you may identify additional key words that will help you in succeeding sources. However, giving some thought initially to possible key words should facilitate an efficient beginning to a task that requires organization. After you have identified your key words, you will finally be ready to begin to consult appropriate sources.

Sources

There are usually many sources of literature that might be related to a given problem. In general, however, there are a number of major sources commonly used by educational researchers. Some of these sources are primary sources and some are secondary; with a historical research, primary sources are definitely preferable. In historical research, a primary source is an eyewitness or an original document or relic; in the literature, a primary source is a description of a study written by the person who conducted it. A secondary source in the literature is generally a much briefer description of a study written by someone other than the original researcher. The Review of Educational Research, for example, summarizes many research studies conducted on a given topic.[5] Since secondary sources usually give complete bibliographic information on references cited, they direct the researcher to relevant primly sources. You should not be satisfied with only the information contained in secondary sources; the corresponding primary sources will be considerably more detailed and will give you information 'straight from the horse's mouth, "as they say.

The number of individual references that could be consulted for a given problem is staggering; fortunately there are indexes, abstracts, and other retrieval mechanisms.

[5] See footnote 1.

UNIT—7

SOURCE OF EDUCATION

Sr. No.	Contents	Page No.
7.1	S.P. Sukhia, P.V. Mehrotra, R.N Mehrotra (1991)	
7.2	Gary, L.R. (1987)	

S.P. Sukhia P.V. Mehrotra R.N. Mehrotra (1991)	**Elements of Educational Research** 7th ed. New Delhi, Allied Publishers Limited pp. 101-127	7-1

PROCEDURE IN EDUCATIONAL RESEARCH-B SURVEY AND COLLECTION OF RELATED INFORMATION

Need to know about related literature in any field of enquiry. Availability of sources and possession of knowledge about them, both are necessary. Two forms of such literature—direct and indirect. Direct, i.e. educational literature: periodicals, journals, books, bulletins, yearbooks, theses, government publications, etc. Indirect, i.e. guides to educational literature: encyclopedias, indexes, abstracts, bibliographies and directories, biographical references, etc. Available sources of each type indicated—American, English, Indian and International. Survey of the sources and collection of useful data—preliminary reading, critical reading, compiling a bibliography and note-taking.

"Practically all human knowledge can be found in books and libraries. Unlike other animals that must start anew with each generation, man builds upon the accumulated and recorded knowledge of the past."[1]

For any worthwhile study in any field of knowledge the research worker needs an adequate familiarity with the library and its many resources. Only then will an effective search for specialized knowledge be possible. The search for reference material is a time-consuming but very fruitful phase of a research programme. Every investigator must know what sources are available in his field of enquiry, which of them he is likely to use and where and how to find them.

In the field of education, as in other fields too, the research

[1] John W. BET Op. cit, p. 31.

worker needs to acquire up-to-date information about what has been thought and done in the particular area from which he intends to take up a problem for research. But it is found that generally the extent of important, up-to-date information regarding educational research and ideas possessed by educational workers is very limited. Good, Barr and Scates quote the poor results of investigations carried out on this point by D. A. Worcstor and Ashbaugh, and rightly conclude that the present status of professional information in education was at a very low level.[2] Availability of adequate information and possession of sufficient familiarity with it, however, are not one and the same thing. Availability of adequate information about educational thought and research does not by itself result in possession of its knowledge by the researcher. The researcher must apply him keenly to the task. On the other hand a research worker may be very keen to possess up-to-date information regarding his field, and may try hard to be posted up-to-date, and yet fail to get enough information due to the non-existence of sources of such information. In our country the research workers quite often come across the latter handicap.

Survey of related literature, besides forming one of the early chapters in research report for orienting the readers, serves some other purposes. Good, Barr and Scats analyze these purposes as:[3]

1. To show whether the evidence already available solves the problem adequately without further investigation, and thus to avoid the risk of duplication;
2. To provide ideas, theories, explanations or hypotheses valuable in formulating the problem;
3. To suggest methods of research appropriate to the problem; to locate comparative data useful in the interpretation of results, and
4. To contribute to the general scholarship of the investigator.

"There are, in general two types of data—primary and secondary. Primary data are those that are obtained at the places of beginning or

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2 Carter V. Good, A. S. Barr D. E. Scates. Op. chi., pp. 167-68.

3 Loc. cuff.

origins, or all new data which have been gathered, or are in the process of being gathered (W. C. Schulter, How to do Research work, Englewood Cuffs, Prentice-Hall, 1926, pp 58-59). Secondary data are those that have been collected previously and reported by some individual other than the present researcher. They usually consist of some sort of publication which reports primary data."[4]

Sources of information, existing in any field of research, found in the library may be of two types: direct and indirect. In the field of education, the direct sources of information are available in the form of educational literature of the following types:

1. Periodical literature found in Journals,
2. Books, monographs, yearbooks and bulletins,
3. Graduate, doctoral and other theses, and
4. Certain miscellaneous sources—like Government publications on Education.

The indirect sources of information—or guides to educational literature—are available in the form of:

1. Encyclopedia of education.
2. Education Indexes.
3. Education Abstracts.
4. Bibliographies and Directories.
5. Biographical References.
6. Quotation Sources.
7. Miscellaneous other sources.

The following will be found valuable as library guides to educational literature of all kinds:

1. Alexander, Carter and Burk, A. J. How to locate Educational Information and Data, 4th ed. Bureau of Publications, Teachers College, Columbia University, NY 1956. 419 pp.

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[4] J. Francis Rummel, op. cit., p. 58.

2. Aids to Educational Research—comprising bibliographies and plan of Research. Scottish Council for Research in Education, Moray House, Edinburgh

We would do well to discuss first the Guides to Educational Literature, and then the Literature in Educational Research itself.

A. GUIDES TO EDUCATIOAL LTTERATURE

A research worker needs some guides to relevant related literature—some convenient handles which will draw out all the material he needs, and also tell him what the material available exactly is.

1: Encyclopedias of Education

Encyclopedias, as we know, imply a huge or multi-volume work containing articles of both biographical and general character. So also in education, encyclopedias are the work of a group of experts in the various fields of education. Organization of all the content of educational encyclopedias is usually alphabetic, but sometimes dual too—(i) general topic arrangement in one alphabetic sequence and (ii) biographical arrangement in another alphabetic sequence. A complete and finely detailed index, extensive cross-references or short entries and various symbols are invariably included. The spirit of articles in a good encyclopedia on education is scholarly, and the over-all pattern determines the nature and form of individual article, which must conform to that pattern in style manner and tone. Another mark of a good educational encyclopedia is that a balanced selection of topics included should accurately represent education at all stages—in its various aspects.

(i) Among encyclopedias of education, Walter S. Monroe's *Encyclopedia of Educational Research* must hold the pride of place. It was issued by the American Educational Research Association, New York, published first in 1941, and then revised in 1950. It contains 241 critical articles by-various authors on practically every aspect of education with over 12,200 bibliographical references to significant research studies. It cites outstanding researches on educational problems carried out in U. S. A. Each article is written by a specialist. The new edition of

1960, included reports of educational research not only in America, but in other countries as well.

(ii) Another American encyclopedia that needs mention here is the *Encyclopedia of Modern Education*, prepared by Henry D. Rivlin, and H. Schueller, published at New York in 1943 by the Philosophical Library. It is the work of over 200 contributors. It covers the entire field of education and also gives the biographies of important educationists.

(iii)There is another old but useful encyclopedia by Paul Monroe published at New York by the Macmillan Co. (1911-13) in 5 Volumes. It contains basic educational information of a historical nature and covers all countries and periods.

(iv)Encyclopedia of Child Guidance, New York: Philosophical Library, 1943, by Ralph B. Winn, and (v) Encyclopedia of Vocational Guidance, New York: Philosophical Library, 1948, by Oscar J. Kaplan, are examples of encyclopedias in specialized felids of education.

(vi)Encyclopedia of the Social Sciences—1930-34, 15 Vols. (Reissued in 8 vols. in 1937). The basic reference work for the social sciences and social aspects of other subjects. Very strong in both biographical and bibliographical information.

In our country, so far, there is no encyclopedia of educational research. More than ten years ago, Shri J. P. Naik had initiated a move towards preparing an Encyclopedia of Indian Education. Through the Journal of Indian Education, requests were reached to all quarters where educational research had taken place in the country for submitting relevant information for the purpose. But, as is evident, such steps as were taken did not bring about satisfactory response with the result that the intended publication of the encyclopedia remained just a dream. That there is urgent need for such a work in our country for purposes of reference and guidance in further research goes without saying. The earlier an encyclopedia is compiled in our country, the better for the future research workers in education.

2. Education Index

Index as a guide to literature serves the same purpose as the index of a book or the card file of the library. It identifies the source of the article or of the book cited by listing the titles alphabetically, under subject and author headings. Most indexes provide complete directions for locating the article of book mentioned.

Indexes may be general or specialized. Among specialized indexes stands the Education Index, New York: H. W. Wilson Co. 1929-data. It is issued monthly (September through June), annually and again every three years. It is the most valuable single source or guide to periodic literature in education, having served as a comprehensive index of practically all publications in education. It lists:

i. All books on professional education.
ii. Yearbooks and other publications of professional so cities and associations.
iii. Publications of the U. S. Office of Education.
iv. Publications of N.E.A. and its branches.
v. Bulletins, monographs and reports on education.
vi. Articles in about 175 educational periodicals.
vii. Articles on education in non-professional publications.
viii. Book reviews and Book lists.
ix. Bibliographies published.
x. Courses of study published.
xi. Resources and teaching units.
xii. Tools of research and evaluation.
xiii. Reference books.
xiv. Names of foundations and associations.
xv. Meeting dates of' professional education associations.

References are not carried from one three year book to the next. Among the general indexes published in America the following are of long standing.

i. Readers' Guide to Periodic Literature, New York:

ii. M. W. Wilson Co., 1900—date.

iii. International Index to Periodic Literature, New York:

iv. M. W. Wilson Co., 1913—date.

v. Cumulative Book Index to Periodic Literature, New York: M. W. Wilson Co., 1923—date.

These general indexes have been of considerable help to educational workers.

In England the educational indexing project is carried out by the librarians of the various Institutes of Education.

(i) *Index to Selected British Educational* Periodicals.(Leeds), Librarians of Institutes of Education, 1954, dates, thrice per year. The index covers 41 educational periodicals excluding the periodicals on fundamental and adult education which are indexed elsewhere. There are two parts to the index: Part I—Subject Index, and Part II—Author Index. The subject index is wide and includes cross reference by countries.

(ii) *National Institute of Adult Education.* A select bibliography of adult education in Great Britain, including works published to the end of the year 1950, London, 1952, with some supplements. It is an annotated bibliography of the most important books, pamphlets and articles appearing on the subject in the U. K. The entries in each issue are classified under different headings. It lists articles from twelve periodicals.

(iii) *British Education Index.* Vol. I, August 1954 to November 1958. Compiled by the Librarians of Institutes of Education, The Library Association, 1961. 122 pp. The work includes references to articles of educational interest which have been published in more than fifty periodicals during the period of four years. Further volumes on the same lines are promised at intervals in the future. The volume has been widely welcomed.

Besides the above specialized indexes, there is an important general index in the U.K., which proves of great help to the educational researchers too.

(iv) *Subject Index to Periodicals, London*. The Library Association, 1919-date, Quarterly with annual cumulation. It includes select articles from over 300 periodicals of U.K. Among them are included about 10-15 educational journals, grouped under various headings. The articles on education appear under the sub-headings of: education and museums, education of adults, education of' women and educational psychology.

In our country indexing service in education is of recent growth. It started with the publication of the Education Quarterly, Delhi, Ministry of Education, in 1949. Each issue of this Quarterly Journal carried a section entitled 'Index to Articles' which provided an Author and Subject Index to articles selected from the principal Indian educational periodicals. Each issue contained from 100 to 400 entries, which were cumulated periodically. In the place of this Index, we have now IEI—Indian Education Index—a monthly bulletin issued by the Central Secretariat Education Library, which indexes articles of important Indian educational journals.

'Index India' published by the Rajasthan University Library, Japur, India is useful quarterly documentation list on India of material in English combining in one sequence Indian Newspaper Index, Index to Indian periodicals, to Foreign Periodicals. to Composite Publications, to biographical profiles, with separate author and subject indexes.

3. Educational Abstracts

The reference guides literature known as abstract, digest, or review provide not only a systematized list of reference sources, but also include a summary of the contents of each article. Usually the summaries are brief. Such strictly and efficiently utilitarian literature has become current in many branches of knowledge. In many advanced countries educationists have their special 'Educational Abstracts' to serve them.

In America the most useful of these references are the following:

i. *Review of Educational Research*, Washington, American Educational Research Association (N.E.A.) 1931-date.

Published five times each year, it briefly summarizes research findings in education under eleven major areas in three-year cycles—Administration, Curriculum, Educational Measurement. Educational Psychology, Guidance. Mental and Physical Development, Language Arts, Research Methods, Special Programmes and Teacher Personnel.

ii. *Education Digest*, Ann Arbor, Michigan, 1935-date, monthly, September to May. It publishes select articles reduced to digest form, from various U. S. educational periodicals and reports. About 200 articles selected for their current educational interest in U. S. education are digested per year. An author index is included in each issue.

iii. *Psychological Abstracts*, Monthly publication by the American Psychological Association, Washington, DC.

iv. *University Microfilms*. Dissertation Abstracts, a guide to dissertations and monographs available in micro films (monthly).

A useful publication by the Institute for Scientific Co-operation, Federal Republic of Germany is the following:

Education: a Biannual collection of recent German Contributions to the field of educational research, edited in conjunction with numerous members of German universities and research institutions by the Institute for Scientific Co-operation.

In India, the Ministry of Education, since 1955, has been issuing Indian Education Abstracts every three months. It confines itself to books and periodicals on education published in India or pertaining to Indian Education in English and Hindi. Over 50 Indian Journals are indexed in the various issues. Subject headings under which the abstracts appear are varied—e.g., philosophy of education, educational psychology, tests and measurements, examinations, students and students'" organizations, educational and vocational guidance, teachers and teacher training, curriculum, basic education, health and physical education, elementary, secondary, vocational and technical education, higher education, social education and educational ex-tension etc.

Each entry includes the usual bibliographical details and gives an idea of the special features like graphs, tables and bibliographies, etc. together with a synopsis of the articles indicating "the purpose of the author and or the conclusions he arrives at."

Each issue comprises about 125-150 entries and contains about 50 pages. An annual cumulative author index is given to each volume in the last issue of the Volume.

Available in the field of Basic Education in India are the Basic Education Abstracts published by the National Institute of Basic Education, first in a mimeographed edition, 'intended to be a record, not a collection of critical reviews of the literature in the field.' The first issue covered books in Basic Education and articles, comments, and editorials, etc. published in journals and periodicals in English and Hindi. The second issue has included work in Hindi, Marathi, Gujarati and Bengali also. The B. E. A's cover,

(i) Philosophy and Theory,

(ii) Curriculum,

(iii) Teaching Techniques,

(iv) Craft,

(v) Teachers and their Training,

(vi) Health and Hygiene,

(vii) Social Service,

(viii) Reports of State Departments,

(ix) Reports of Conferences and Workshops,

(x) History and Surveys,

(xi) Abstracts of research projects and other publications, and

(xii) Short Comments, Notes, etc.

Indian Institute of Education, Bombay, Educational Studies and Investigations, Bombay: Asia Publishing House, Vol. I, 1957, is a series of synopses of educational research in various fields of education. Micmillan Pamphlets are also the Institute's publications which issue abstracts of educational research work. Many University

Education Departments in India publish every year brief summaries of some of the researches in education undertaken by their M.A., M.Ed. and Ph.D. students and members of staff. Chief among these are those issued by Department of Education, University of Allah bad; Central Institute of Education, Delhi; Education Department, Teachers' College, Diaper; and Prantiya Shikshan Maha Vidyalaya, Jabalpur. Educational Fieldwork and Research published in 1953 by the Lucknow University for T. C. E: Journals Publications Ltd., was also of the nature of educational research abstracts. The National Council of Educational Research and Training, publishes reports of its research work under the title 'Research Studies and Monographs.

Some international abstracts devoted to education must not remain without mention. They are:

1. *Foreign Education Digest*, *Berkeley*, California, 1936-date is a Quarterly divided in two parts. Part I contains, in English, about 35 digests, classified under distinct headings. Part II is an annotated bibliography of foreign education comprising about 75 items including 45 articles. Over half of the entries in both the parts are Journal entries. About 50 educational journals from 15 countries and from several international organizations, and about 25 reports are the subject of this digest.

2. *A monthly Bulletin published at Brussels since 1956* which contains a descriptive bibliography of studies and articles on vocational guidance.

3. *Education Abstracts*, *Paris*, UNESCO, 1940-date: monthly, except in July and August. Each introductory essay devoted to a particular aspect of education, is followed by abstracts of books and documents selected from various countries dealing with the topic under consideration.

4. Bibliographies and Directories

Devoted to educational research, serving as useful guides for educational workers, are some bibliographies and Directories. A few examples of these in America are:

i. *Association of Research Libraries. Doctoral Dissertations*

Accepted by American Universities, published yearly since 1934, organized by subject areas.

ii. *Lanke, T. A. & Silvery, Herbert M., Masters' Theses in* Education, 1951

iii. *Lyda, Mary Louise and Brown, Stanley B., Research* Studies in Education, a subject index of doctoral dissertations, reports and field studies, 1941-51.

iv. *U. S. Office of Education, Bibliography of Research* Studies in Education 1928-41.

v. *U. S. Office of Education. Record of Current Educational* Publications, 1912-1932.

vi. *Young, Raymond J., A Directory of Educational Research* Agencies and Studies, Bloomington, Indiana, Phi Delta Kappa 1959.

vii. *Research Studies in Education, Phi Delta Kappa, publ*ished annually.

In the U. K., examples of such, bibliographical guides to educational research are:

i. *Kelly, Thomas, ed., A Select Bibliography of Adult Educ*ation in Great Britain. National Institute of Adult Education, 1952.

ii. *National Foundation for Educational Research in* England and Wales. A List of Researches in Educational Psychology presented for higher degrees in the Universities of the United Kingdom and the Irish Republic from 1918, by A. M. Blackwell, London: Newnes Educational Publishing Co., 1950. Four such lists have appeared from 1918-1954.

iii. *Scottish Council for Research in Education, Aid to* Educational Research, Revised edition, London, University of London Press, 1954,

iv. *Association of Special Libraries and Information Bureau,* Index to Theses accepted for higher degree in the Universities Of Great Britain and Ireland, Vol. I, 1950/51, London, Aslib. 1953, Annual, classified by subject including education.

v. *Blackwell, A. M., A List of Researches in Education and* Educational Psychology, London, Newnes Educational Publishing Co., 1950, 173 pp.

In our country there have appeared very few bibliographical guides to educational research on a national basis covering the whole of India.

Uttara Bharati, Journal of Research of the Universities of the Uttar Prudish, published Quarterly, since 1954, at the University of Lucknow, lists subjects of research undertaken in various fields for post-graduate degrees' in U.P. only. Register of Educational Research in India, featured in Vol. II of C.E.L. Notes (Ministry of Education, Government of India) presented a bibliography of educational research undertaken in various parts of the country.

Bibliography of Doctorate Theses in Science and Arts accepted by the Indian Universities for 1946-48, and 1948-50 has been published recently by the Inter-University Board of India. Theses are listed under University, with subject subheadings including education.

There are, however, some bibliographical guides to educational research being issued by the students and staff of institutions or Departments of Education, like those issued from time to time by the Central Institute of Education, e.g. in some issues of 'Studies in Education and Psychology'. The Department of Education, University of Allah bad, Vidya Bhawan Teachers' College and some other institutions publish a complete list of the dissertations undertaken every year by their students and staff in their own annual publications.

The National Council of Educational Research and Training proposes to publish a list of Theses and Dissertations approved for the Doctorate and Masters Degree in Education of the Indian Universities. This list was brought out in August 1963 in mimeographed form entitled Educational Investigations in Indian Universities (1939-61). It also has two indices according to authors and subjects. It is planned that an annual list on the same line will be brought out in future. Another list of investigations, done during 1962-66 was brought out later. Steps are also being taken to get brief synopses of all these theses and dissertations prepared and these would be published in a series of volumes in the near future.

Among the international bibliographies and directories of educational literature and research arranged alphabetically, countrywide, one may mention the following:

i. *Research in Education*, a directory of organizations, . bibliographical materials and periodicals. Educational Abstracts (Paris, Unesco). Vol. I, No. 2, February 1957.

ii. *Educational Research*, selected reports, books on methodology, bibliographies and journals. Education Abstracts (Paris, Unesco), Vol. XII, No. 5-6, May and June I960.

iii. *Sources of Educational* Publications of an Official Nature (Paris, Unesco), Education Abstracts, Vol. VIII, No. 10, December 1956

iv. Access to current literature on education through periodical indexes (Paris, Unesco), Education Abstracts, Vol. IX, No. 1, January 1957.

v. An Intentional List of Educational Publications (Paris, Unesco), Educational Studies, and Documents, No. 23.

B. Educational Literature

Guides to educational literature discussed above are but the keys which give access to the educational literature—the primary source of information—itself. We will discuss now the direct sources of educational literature available to students and researchers in education.

1. Periodical Literature Found in Journals

A periodical is defined as a publication issued in successive parts, usually at regular intervals. Included in this definition are not only journals, newspapers and magazines but also almanacs, yearbooks, directories, hand-books, government documents, publications of societies and associations, etc. But we will consider at present only the periodical educational literature found in journals, which is of immense value in furnishing the most recent literature on the subject. Articles on new developments in education often appear in periodicals before books on the particular topics are published. Sometimes authorities on particular subjects do not write books at all and contribute only to periodicals. Educational periodicals thus become the most important direct source of current educational literature. Such educational journals may be general or devoted to special fields of education. An International List of Educational Publications issued by the UNESCO, (Educational Studies and Documents. No. 23) lists almost all educational periodicals-general and specific—found in various countries of the world including India. For such journals in other countries the readers may refer to the source of information mentioned above.

It lists such journals under the following heads:

General, research, primary, secondary, vocational and technical, special, adult, and workers, fundamental, audio-visual, special subjects.

Though somewhat out-dated, it is still a valuable guide to periodical journals and may be referred to with advantage by educational research workers.

2. Some Books on Methodology of Educational Research

There are a number of books in the English language available on educational research found useful by the research workers in education. Some of them are the following:

i. Barnes, John B., Educational Research for Classroom Teachers. The Putnam series in Education: Arizona State University, I960, 299 pp.

The author introduces the reader to a kind of research that is teacher-oriented and to a kind of teaching that is research-oriented. Illustrating with real cases, he shows three large areas in which research may be profitably applied; the study of individuals, the study of classroom groups and sub-groups, and the study of teaching and learning problems. Beginning with a discussion on ‘The Nature of Educational Research' the book includes in its main body actual case-studies of individual pupils, particular groups of pupils and of particular teaching and learning problems. The appendices include worthwhile material on 'Research and the Administrator' and

'Research and the Educational Consultant'.

ii. Barr, Avril S., Robert A. Davis, Palmer 0. Johnson, *Educational Research and Appraisal*, *Chicago*, J. B. Lippincott, 1953, 362 pp.

This book provides a survey of the major methods of problem solving and evaluation in education as well as a basis for both field practice and instruction in methods of thesis writing. It stresses research that may be conducted in school settings as a basis for action. It includes two appendices: one dealing with the writing of a thesis and the other with references for further analysis and study.

iii. Best, John W. Research in Education, Englewood Cliffs, New Jersey, Prentice-Hall, 1959, 320 pp.

Written for the graduate students as well as the graduate teacher students, the book concerns itself with the meaning, characteristics, and definitions of research of various kinds, with the processes of educational research—the selection and evaluation of the problem, the use of reference materials, the carrying out of historical, descriptive and experimental research, with the tools of research—questionnaires, interviews, tests,. etc., the interpretation of the data collected and their statistical analysis. The book ends with advice on how to write a research report. It also reports upon three significant research studies—their planning and execution.

iv. Corey, Stephen M., Action Research to Improve School Practices, New York. Bureau of Publications, Teachers College, Columbia University, 1953, 161 pp.

In the first chapter, the author defines action research, differentiating it from traditional educational research. In the following chapters, the process of action research is described and illustrated; two action research studies are reproduced; the relativity of research quality is considered and some of the conditions favorable to action-oriented educational experimentation are described. Then, there is a report of a seminar in which action research was employed a method of learning. The book finally discusses and explains some simple statistical procedures and sampling problems useful in action research. The final chapter is a brief summary and concluding statement.

v. Good, Carter V., Introduction to Educational Research, New York, Appleton-Century-Crofts, 1959, 4-24 pp.

An introductory book on research methods for field workers, graduate students and seniors in the undergraduate colleges, it is intended to serve the purpose of both producers and consumers of research discussing concepts, principles and procedures. The series of chapters follows the steps of reflective thinking beginning from the formulation of hypotheses and ending with the preparation of the research report. Analysis and interpretation of data are presented in the functional setting of the chapters rather than as separate discussion.

vi. Good, Carter V., Douglas E. Scates, Methods of Research, Educational, Psychological, Sociological, New York, Appleton-Century-Crofts, 1954, 920. pp.

Divided into ten long chapters on different aspects of research not merely educational but psychological and sociological too, this book discusses concepts, principles, and procedures rather than being a 'recipe book', 'rule book' or a series of 'lesson plans' for problem solving, reflective thinking and research. The presentation of a common pattern of research methodology in education, psychology and sociology has been possible because of the increasing interdependence of problems and procedures in these areas. In many instances the discussion of a particular problem of technique, in this book, is in the form of a series of questions for students to think through, with attention directed to the available literature, because the answer may not be yet known.

vii. Good, Carter V., A. S. Barr, and Douglas E. Scates, Methodology of Educational Research, New York: Appleton-Century-Crofts, Inc., 1941, 890 pp.

A relatively older publication than the other books listed here, it is yet considered by most educational workers as the Bible of educational research, masterful as its treatment of the subject is. Addressed to field workers and graduate students in education, this volume is a sound, systematic, coherently organized treatment of the techniques of scientific research. A number of troublesome items were treated in this book for the first time. All later writers are indebted to this book in some respect or the other. Graduate students have been particularly aided by it through suggestions for finding problems and starting research.

viii. Rummle, J. Francis, An Introduction to Research Procedure in Education, New York, Harper, 1958, 413 pp.

Presented as an orientation to research procedures, this book is intended for both the consumers and producers of educational research. Basic considerations in research methodology are accompanied by suggested references for more intensive study. The book is organized to follow substantially the steps of problem-solving. It deals with the nature of the scientific method of research and the selection of research problems. It discusses the development of a research proposal, with illustrative examples, an important but seldom presented feature in other publications. The techniques of data collection, the basic problems involved in planning for the analysis and interpretation of data, the basic concepts of statistics, experimental designs; and scaling problems and techniques are presented in sufficient detail. Electromechanical techniques of sorting, classification and computation of data—an important part of research procedures these days—receives a much needed consideration in this book. Appendices A and B present several short-cut methods for statistical calculations and examples of questionnaires and covering letters respectively.

ix. Travers, Robert M. W., An Introduction to Educational Research, New York, Macmillan, 1958. 466 pp.

Planned for use in the training of educational research workers, this book also provides interpretation of the aims and methods of educational research for others connected with education in various capacities. The topics discussed in the book are: ground-work for research; conducting research within a framework of theory; the content of educational research; selecting the problem; measurement in research, the use of multiple observations in measurement, validity of measurement; the nature of observation and some direct approaches; observation, more complex procedures, and indirect approaches; survey methods; prediction studies; studies of development; experimentation in education; problems of research design; data processing and reporting. A useful bibliography of background materials is included.

x. Van Dalen Deobold B., Understanding Educational Research. An Introduction, New York, McGraw-Hill Book Co., 1962, 432 pp.

The book is expressly written for education students. It seeks to imbue students with a respect for scientific spirit of inquiry and to acquaint them with problem-solving techniques. The discussion is designed to help readers understand the difficulties investigators encounter, the importance of promoting sound research projects and the need for applying the findings of significant studies in the classroom.

xi. Varma, M., An Introduction to Educational and Psychological Research, Asia Publishing House, Bombay.

The book deals with the nature of research in education and psychology, the historical and philosophical types of research, the statistical methods of research, statistical analysis and scaling, testing and factor-analysis, prediction and decision processes and the role of experimental and clinical methods in research. Its main strength is the good guidance it provides in statistical analysis and inference.

xii. Wiseman, Stephen, Reporting Research in Education, Manchester (England) Manchester University Press, 1952,21 pp.

Divided into two main parts, this book discusses, in Part I, major considerations in the preparation of a thesis on experimental education—its form and length, its general pattern, stating and outlining the problem, reviewing relevant literature, describing the design and measurement techniques, stating, discussing and interpreting the results of the experiment, summarizing and drawing conclusions, and the accepted bibliographical presentation. Part II, treating the problem of preparing a research paper for publication, distinguishes the latter from the former and advises the author of published papers about how to mould his materials.

xiii. Whitney, Frederick L., *The Elements of Research*, New York, Prentice-Hall, Inc., 3rd ed., 1954, 539 pp.

The book consists of sixteen chapters and five appendices. It deals with all the aspects of research—reflective thinking, science and research; research traits and abilities; the research problem; the evaluation of previous research; the agendum of procedures; the collection of evidence; the descriptive, historical and experimental methods, the philosophical, prognostic, sociological and creative types of research, research in curriculum-making; the classification of research material and the research report. The appendices give samples of reports of 'Doctoral and Masters' studies from institutions of higher education, lists of representative educational research problems, educational research sources, and representative federal surveys of education in the United States and agenda for eight types of research studies.

3. Monographs, Yearbooks, Bulletins and Survey Reports

A broad field of periodical educational publications is represented by bound volumes in the form of monographs, yearbooks, bulletins and reports. In America larger schools of education publish many research studies in Education in the form of monographs. There are many series of monographs thus issued by the Universities and Teachers' Colleges of the USA (e.g. Supplementary Educational Monographs, Educational Research Monographs, Lincoln School Monographs). Similarly there are issued, every year other publications entitled Bulletins, which report on educational activities and researches, carried out on various topics of current interesting England too, the various Institutes of Education publish monographs and bulletins from time to time. In India, only a limited number of comparable literary sources exist at present

Yearbooks of Education are bound volumes appearing once a year, containing educational papers by eminent educationists. Among yearbooks of Education the following deserve special mention:

i. Lauwerys and others, eds, Yearbook of Education, London, Evans Bros. Ltd., 1953-date.

Prepared under the joint editorial responsibility of the

Universities of London, Institute of Education, and the Teachers' College, Columbia University, each of its issues is devoted to some particular aspect of education, which is described at length by more than fifty eminently qualified persons from all over the world. "(It was published under the responsibility of only the London Institute of Education from 1932 to 1952). The different aspects of education treated so far in this Yearbook are:

1953 Status and Position of Teachers

1954 Educational and Technological Development

1955 Educational Counseling

1998 Education and Economics

1987 Education and Philosophy

1939 The Secondary School Curriculum

1989 Higher Education

1960 Impact of Mass Media of Communication on Education

1961 Concepts of Excellence in Education

1962 Teacher Education

1963 Education of the Gifted

1964 Education and International life

ii. Jeffery. G. B., ed., Yearbook of Education, University of London, Institute of Education, Evans Bros. Ltd, 1932-40, 1948-date.

This yearbook contains signed articles on all phases of educational development in all English-speaking and major European countries.

iii. Kindle I. L., ed., Educational Yearbook of the International institute of Teacher's College, New York: Bureau of publication, Columbia University, 1928-44, 20 volumes.

This is an excellent reference, for comparative education describing various national systems of education. Most of the volumes are devoted to some particular aspect of education e.g. adult education and rural education.

iv. Yearbook of Education, National Council of Educational research and Training, New Delhi, 1961, 1962. They are useful sources of information on Indian Education.

1962 A view of Education in India 1947-61. (Revised Edition in two parts)

1964, Elementary Education in India pp. xix+ 752

1968 Educational Research pp. xxvi+318

The council has also published First Mental Measurement Yearbook in 1966.

Another kind of educational year book is represented by the international Yearbook of Education, published by the UNESCO ever since 1948, which presents a review of educational development for the previous year in more than forty-five countries. In such yearbooks the emphasis is upon a great number of current detailed facts, rather than on written articles of a background nature. Almanaes, directories Handbooks and Survey Reports are allied to this kind of yearbook. These are available on a national, regional, state as well as local level and supply concise factual information of statistical or identifying character.

4. The International Sources of educational publications of an official nature are:

i. Bulletin of the International Bureau of Education Geneva. 1927-date, Quarterly, having both English and French editions.

ii. Education Abstracts. Paris, UNESCO. 1940-date Monthly except July and August.

iii. Educational Studies and Documents. Paris, UNESCO 1930, irregular.

iv. International Review of Education. UNESCO Institute of Education, 1955-date, Quarterly.

v. World Survey of Education. Handbook of Educational Organizations and Statistics. Paris, 1956.

~~i.~~vi. Bibliography of Education in non-alef-governing territories. United Nations. Lake Success, N. Y., 1949.

Collection of Useful Data

Once the proper keys 'to educational literature are secured and utilized for the purpose of opening the locks of knowledge stored in books and journals etc., the research worker has to engage himself actively in reading and studying the letter and in sorting, sifting out and noting what is relevant to and significant for his purposes. This stage is thus divisible into the following steps:

a. Compiling a bibliography,

b. Preliminary reading,

c. Critical reading, and

d. Note-taking.

Compiling a Bibliography

One of the fundamental activities connected with any scientific investigation is the compilation of a good tentative bibliography. Such a bibliography of relevant sources of information, although tentative should be:

i. accurate in every detail,

ii. complete but not padded,

iii. consistent in form, i.e., following a uniform classification.

The following should appear in each complete bibliographical item:

i. the author's name—arranged thus: last name—first name—middle name.

ii. the title, given in full as it appears on the title page of the publication.

iii. Additional data: (a) of books—name of series and Vol. No. (if in series), place of publication, name of publisher, copyright date of edition and number of pages (b) of periodicals—name, volume and number, month and year of publication.

Preliminary Reading

Preliminary reading, called scouting or rapid investigation, is done with the object of ascertaining whether the reference has any bearing on the topic under study for this purpose one is guided by the table of contents, index, chapter headings and illustrations. In case these sources fail to give necessary information, one has to resort to skimming. The quickest and most effective way of skimming through some material is to read the first and the last lines of a paragraph and evaluate rapidly what is contained in it.

Critical Reading

As a result of preliminary reading, a note can be made of suitable reference materials intended for thoughtful readings, which involves reflective thinking and serious evaluation. It is on the basis of this that references found useful are to be listed in a bibliography.

Note-taking

It is an extremely important research activity to collect materials in a form that can be easily recalled and used in the future. There are various ways of note taking used by students and research workers. The most common ones are:

i. Using the publication itself by writing in the margin and by underlining words, phrases, sentences or paragraphs.

ii. Using notebooks or loose sheets for taking down significant points and quotations.

iii. Using the card-system for the purpose.

The criteria considered Important for good note taking are:

i. Convenience or ease of handling.

ii. Flexibility,

iii. Uniformity,

iv. Accuracy and fitness of data, and

v. Ease of assembling.

The common errors observed in note taking which a researcher should guard against, are:

i. Failure to provide for systematic organization of material, which results in much duplication of effort when material, is required in usable form.

ii. Lack of bibliographical reference resulting in waste of time if the reference has to be located again or if the bibliographical note has to be given in the report. It may be helpful to classify notes in four categories:

    i. Quotation,

    ii. Paraphrase,

    iii. Summary, and

    iv. Evaluation.

An effective method of note taking is the one, which is based not only on skimming, but also in which the source is skimmed through before taking down any notes, and thus the most significant material is selected. One would benefit by following the advice given below in this connection:

i. Use cards or slips of paper instead of notebooks or foolscap sheets." x 6 is a convenient size to carry and easy to arrange topic-wise.

ii. File each note-card under a definite topic or heading marked at the top of the card. At the bottom of the Card note down complete bibliographical reference.

iii. Include only one topic on one card. Organization of notes will thus be flexible. In cue notes are lengthy use more than one card, consecutively numbered and pin ovrag them together.

iv. Notes must be complete and clearly understandable.

v. Distinguish clearly between a summary, a direct quotaton, a reference to the author's source and an evaluative statement

vi. Don't plan to recopy or type your notes. Copy the notes correctly the first time.

~~i.~~vii. Keep the notes carefully filed lest they get lost or misplaced.

Summary

1. Both the availability and utilization of adequate sources of related information are essential for a proper research activity.
2. Survey of related literature does not only form one of the early chapters of the thesis, but also serves other useful purposes.
3. Sources of information may broadly be divided into direct and indirect sources. Direct sources consist of periodical literature, books, monographs, yearbooks and bulletins, etc. dissertations and theses, and government publications, etc. Indirect sources include encyclopedias, indexes, abstracts, bibliographies, etc.
4. Among foreign encyclopedias of education, Walter S. Monroe's *Encyclopedia of Educational Research* holds the pride of place. Henry D. Revlin and H. Schucllcr's Encyclopedia of Modern Education is also a comprehensive work. No educational encyclopedia has yet been prepared in our country.
5. The American *Education Index* and the Index to Selected British Educational Periodicals are the major foreign indexes of Education. In India, Indian Education Index is being issued by the C.S.E.L. every month for some time now.
6. Among outstanding education abstracts America has Review of Educational research, *Education Digest and Dissertation* Abstracts (in microfilm form). Indian Education Abstracts is issued every three months, since 1955. Basic Education Abstracts are also useful periodical guides. Some minor but important abstracts are available through the institutions that carry on research in education. Some International abstracts (Foreign Education Digest and Education Abstracts) are published regularly.
7. Systematic and regular bibliographies and directories, such as are available in U.S.A. and U.K. are hard to find in India. The Inter-University Board of India, the Ministry of Education and the National Council of Educational Research and

Training are trying to fill the gap in this respect.

8. Among the direct sources of educational literature stands periodical literature found in journals—general and specific. The journals on special aspects of education may be classified into educational research, primary, secondary, vocational and technical and special education; adult education, fundamental education, audio-visual education and special subject. Current in our country are periodicals, old and new, general and specific, dealing with different aspects of education.

9. Books on methodology of educational research are essential reference sources for investigators. Foreign in their origin, as all available books so far are, they help the Indian research worker but partially.

10. Monographs, yearbooks and bulletins issued by various agencies in U.S.A. and U.K., and also by some international agencies, supply useful data to the educational researcher. Survey reports of an official nature are available on state, national, as well as international levels.

11. Once adequate sources of information are secured, the researcher has to get engaged in collecting useful material for his purpose. Compiling a bibliography, preliminary reading, critical reading, and note taking are important steps, which have to be very carefully undertaken to get maximum utility out of the whole process of surveying related information.

Questions and Problems

1. Why is it essential for an educational research worker to possess up-to-date information about what has already been thought and done in the field from which he intend to take up a problem? Discuss fully mentioning the difficulties he may come across in the process of acquiring necessary information.

2. Specify in some detail what library sources you would like to refer to in working out a reasonably complete bibliography for the purpose of a preliminary survey of literature in connection with the problem of educational research you have

chosen.

3. Select any broad field of Indian education and locate as many references as you can, from the education indexes available in India, which have a direct bearing on the subject chosen. Arrange your selected references in proper alphabetic order. .

4. Work out a brief working bibliography on the particular topic you have selected for research, stressing on the literature of the two immediately preceding years.

Selected References

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Cole. Arthur H., Karl W. Bigelow, A Manual of Thesis Writing. New York; John Wiley and Sons, Inc., 1951. 51 pp. Read pp. 4-16.

Good, Carter V., Introduction to Educational Research. U.S.A.: Appleton Century Crofts, Inc, 1959. 424 pp. Read Chap. III, pp. 93-110.

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Coode, William J., Paul K. Hatt, Methods in Social Research, New York: McGraw Hill Co. Inc., 1952. 386 pp. Read Chap. 9. pp. 102-118.

Pugh. Griffith Thomson, Guide to Research Writing, U.S.A.: Houghton Miffin Co., 1955. 62 pp. Read Chap. III & IV, pp. 7-30.

Rummel, J. Francis; An Introduction to Research Procedures in Educations, Harper Brothers. New York, 1958.

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Whitney, F. L., The Elements of Research, New York: Prentice-Hall, Inc., 1956. 539 pp. Read Chap. IV, pp. 97-108.

Gay L. R. (1987)	**Educational Research:** Competencies for Analysis and Application. 3rd ed. London Merill Publishing Company. pp. 38-53	7-2

Having formulated your problem, and acquainted yourself with the library, there is one more thing you need to do before you go marching merrily off into the library-make a list of key words to guide your literature search. Most of the sources you will consult will have alphabetical subject indexes to help you locate specific references. You will look in these indexes under the key words you have selected. For example, if your problem concerned the effects of microcomputer-assisted instruction on the math achievement of elementary students, the logical key words would be microcomputers and mathematics. You will also need to think of alternative words under which your topic might be listed. For example, references related to the above problem might be found using the key word computers, rather than microcomputers. Usually, the key words will be obvious; sometimes you may have to play detective. Some years ago, a student of mine was interested in the effect of artificial turf on knee injuries in football. He looked under every key word he could think of such as surface, playing surface, turf, and artificial turf. He could find nothing. Since we both knew that studies had been done, he kept trying. When he finally did find a reference it was listed under, of all things, lawns! Identifying key words is usually not such a big deal. In looking in initial sources you may identify additional key words that will help you in succeeding sources. However, giving some thought initially to possible key words should facilitate an efficient beginning to a task that requires organization. After you have identified your key words, you will finally be ready to begin to consult appropriate sources.

Sources

There are usually many sources of literature that might be related to a given problem. In general, however, there are a number of major sources commonly used by educational researchers. Some of these sources are primary sources and some are secondary; as with historical research, primary sources are preferable preferable. In historical research, a primary source is an eyewitness or an original document or relic. In the literature, a primary source is a description of a study when by the person who conducted it. A secondary source in the literature is generally a much briefer description of a study written by someone other than the original researcher. The Review of Educational Research, for example, summarizes many research studies conducted on a given topic.[5] Since secondary sources usually give complete bibliographic Information on references cited, they direct the researcher to relevant primary sources. You should not be satisfied with only the information contained in secondary sources; the corresponding primary sources will be considerably more detailed and will give you information "straight from the horse's mouth," as they say.

The number of Individual references that could be consulted for a given problem is staggering; fortunately there are indexes, abstracts, and other retrieval mechanisms that facilitate identification of relevant references. In this section we will discuss the ones most often used in educational research. You should check the library for sources in your area of specialization.

Education Index

The Education Index is a major source of educational periodicals.[6] Educational periodicals (as other periodicals) typically are published at regular intervals (monthly or bimonthly, for example) and include such things as reports of research efforts, reviews of related research, and opinion articles on contemporary educational issues. The term periodical includes professional journals as well as yearbooks, bulletins, and other educational reports. The Education Index lists bibliographical information on references appearing in literally hundreds of educational periodicals. The Education Index is used much the same way as any other index; entries are listed alphabetically under subject, author, and title

[5] See footnote 1.

[6] Education index. (1929 to date) New York: H. W. Wilson.

headings. Since the procedure for using the Index is similar to the procedure followed for other indexes, it will be described in detail:

1. Start with the most recent issue of the Index and look under the key words you have already identified, microcomputers for example.
~~1.~~2. Under the key words you will find a list of references presented alphabetically by title, or you will be directed to other key words. For example, if you looked under Mathematics in the 1985 Index (volume 57, number 1), under the subheading Computer aids you would find the following entries (among others):

   The impact of computers on the teaching of mathematics to engineers. G.W. Rowe. Int J Math Educ Sci Technol 16:181-5Mr/Ap'85.
   The effect of the locus of control of CAI control strategies on the learning of mathematical rules. L Goetzfried and M. J. Hannafin. Am Educ Res J 22:273-8 Summ 85.
   The compleat tutor? K. Ruthven. Math Teaching 110:22-3 Mr'85.

3. Decide whether each reference is related to your problem or not. For example, assume your problem was concerned with the effects of microcomputer-assisted instruction on the math achievement of elementary students. The first entry above, dealing with teaching mathematics to engineers, would probably not be related. The second entry, concerned with the learning of mathematics rules, probably would be related. The third entry might or might not be related.
4. If the reference is probably related or might be related, copy the complete reference.
5. If you are not familiar with abbreviations used by the index, look in the front of the volume. Where you have written the reference, replace each abbreviation with the complete term. In the entry form the Index concerned with the learning of mathematics rules, for example, Am Educ Res J is the abbreviation for American Educational Research Journal, and Summ is the abbreviation for Summer.

6. Repeat steps 1 -5 for previous issues of the index.
7. Locate each of the references on the library shelves.

The *Education Index* is similar in purpose to Current Index to Journals in Education (CIJE), which will be discussed later.[7] It is less useful in that since the Index does not contain abstracts, time is often wasted locating 'might be related' references which turn out not to be related. Since CIJE was not available prior to 1969, however, the Education Index is the best source of educational periodicals published from 1929 to 1969. There are also a number of indexes similar to the Education Index available for specific fields such as business education.

Readers' Guide to Periodical Literature

Readers' Guide to Periodical Literature is an index very similar in format to the Education Index.[8] Instead of professional publications, however, it indexes articles in well over 100 widely read magazines. Articles located through the Guide will generally are non technical, opinion-type references. These can be very useful, however, particularly in documenting the significance of your problem. For example, many articles have been written in popular magazines expressing concern on the part of the American public over the Inability of many children to read adequately. Readers' Guide lists entries alphabetically by subject and author, and the procedures for its use are essentially the same as for using the Education /Index. In addition to Readers' Guide, there are several other sources of popular literature, such as International Index and *The New York Times Index.*[9]

Dissertation Abstracts International

Dissertation Abstracts International contains abstracts of doctoral dissertations conducted at hundreds of academic institutions.[10]

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7 Current index to Journals in education. (1969 to date). Phoenix: Oryx Press

8 Readers'guide to periodical literature. (1900 to date). New York: H.W. Wilson.

9 International Index. (1907 to date). New York: H. W. Wilson, and The New York Times Index. (1913 to date) New York: The New York Times Co.

10 Dissertation abstracts International. (1969 to date). Ann Arbor. Ml: University Microsoft International. (Prior to 1969. the title was Dissertation abstracts).

Abstracts are summaries, usually brief; Dissertation Abstracts International summarizes the main components of dissertation studies.

The advantage of having an abstract is that it usually allows you to classify all references as related to your problem or not related, and greatly reduces time spent looking up unrelated references with fuzzy titles. Dissertation Abstracts International classifies entries by subject, author, and institution. The procedure for using the Abstracts is similar to the procedure for using the Educational Index; the major difference is that once a related dissertation title is located, the next step is not to locate the dissertation but to locate and abstracts of the dissertation using the entry number given with the reference. For example reference. For example, if the entry number were 27/03B/3720, the abstract would be located in volume 27, issue number 3B, page number 3720. If after reading an abstract you wish to obtain a copy of the complete dissertation, check and see if it is available on microfiche in your library. If not, it can be obtained from University Microfilms International on Microfilm for a small fee. University Microfilms International also provides a computer retrieval service called DATRIX. By filling out a request form available at most libraries and indicating appropriate key words, you can receive a bibliography of related dissertations for a nominal fee.

Related dissertation may also be identified through the subject index of the Comprehensive Dissertation Index.[11] This index is indeed comprehensive, providing bibliographical data on hundreds of thousands of dissertation completed from 1861 to the present. Appropriate information for locating corresponding abstracts in Dissertation Abstracts International is also given for dissertations for which abstracts are available.

Psychological Abstracts

Psychological Abstracts presents summaries of completed

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[11] Comprehensive dissertation index (1861 to date). Ann Arbor, MI: University Microfilms International

psychological research studies.[12] Each issue contains 12 sections corresponding to[12] areas of psychology.

The sections on developmental psychology and educational psychology are generally the most useful to educational researchers. The December issue contains an annual cumulative author index and subject index. In addition, cumulative subject indexes and cumulative author indexes, which cover approximately 30 years, are available. The procedure for using Psychological Abstracts is similar to the procedure for the Education Index. The major difference is that the Psychological Abstracts index does not give bibliographic information; for a given topic, abstract numbers of related references are given. This number is located in Psychological Abstracts, which provides the complete reference as well as an abstract of the reference. If the abstract indicates that the study is related to the problem of interest, the original reference can than be located. In addition to the key words identified for a given problem, the word bibliographies should also be checked. A bibliography related to your problem may exist which might lead you to important reference that might otherwise be missed.

How fruitful Psychological Abstracts will be for you will depend upon the nature of your problem. If it is a non theoretical problem, such as the previously mentioned study concerned with in-class pencil-sharpening behavior, you probably will not find anything in Psychological Abstracts. If the problem does relate to some theory, such as a study on the effects of positive reinforcement, you more than likely will find useful references. In such cases, both Psychological Abstracts and the Education Index should be checked to make sure you do not miss anything. Since Psychological Abstracts does provide abstracts which help to determine the relevancy of a given reference, it makes sense to check it before going to the Education Index.

Another source of similar information is the Annual Review of Psychology: It includes reviews of psychological research that are

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12 American Psychological Association.(1927 to date). Psychological abstracts. Washington. DC: Author.

often of relevance to educational research.[13] There are also a number of journals of abstracts for specific areas such as Child Development Abstracts and Bibliography,[14] Educational Administration Abstracts,[15] Exceptional Child Education Resources,[16] and Language Teaching; The International Abstracting Journal for Language Teachers and Applied Linguists.[17]

Educational Resources Information Center (ERIC)

Established in the mid-sixties by the United States Office of Education, ERIC is a national information system currently supported and operated by the National Institute of Education (NIE). Its primary purpose is to collect and disseminate reports of current educational research, evaluation, and development activities. Many educators are not fully aware of the range of services offered by the ERIC network. Although there is some overlap in the references included in ERIC, the Education Index, and Psychological Abstracts, ERIC contains abstracts for many additional references. Research reports that would not typically be included in other sources (such as papers presented at professional meetings and studies conducted in school districts) are indexed and abstracted by ERIC. Another factor in favor of ERIC is the comparatively short time interval between collection of a document and its dissemination. Documents become part of ERIC much more quickly than if they are published by a professional journal. Thus for very current topics, ERIC is often a source of data not available through other sources. Manuscripts submitted for possible inclusion in the ERIC system undergo a review process similar to that associated with professional journals;

13 Annual review of psychology. (1950 to date). Palo Alto, CA: Annual Reviews.

14 National Research Council of the Society for Research in Child Development. (1927 to date). Child development abstracts and bibliography. Washington, DC: Author.

15 The University Council for Educational Administration and Washington Slate University. (1966 to dale). Educational administration abstracts,. Beverly Hills. CA: Sage.

16 The Council for Exceptional Children. (1969 to date). Exceptional child education resource. Reston. VA: Author.

17 The British Council & The Centre of Language Teaching and Research. (1968 to date). Language teaching: The international abstracting journal for language teachers and applied linguists. Cambridge: Cambridge University Press.(Formerly language teaching abstracts).

the overall acceptance rate is approximately 50%.[18] The usefulness of the ERIC system is supported by some statistics reported by NIE.[19]

In one year alone, ERIC products and services were used over 10 million times.

Students accounted for 62% of the users: teachers, 21%; school administration 11%; others, 6%.

90% of the users reported that they obtained information through ERIC that they probably would not have found using other sources.

70% of the users reported that the information they obtained through ERIC helped them professionally.

75% of the school-based users considered RIE (a major ERIC publication) very useful.

ERIC comprises a central office and a number of clearinghouses, each devoted to a different area (such as career education, early childhood education, handicapped and gifted children, reading and communication skills, and teacher education). Each clearinghouse collects, abstracts, stores, and disseminates documents specific to its area of specialization. Disseminated documents include information analysis products (books, monographs, and other publications), fact sheets, computer search reprints, and information bulletins.

Two major ERIC publications are Resources in Education (RIE) and Current Index to Journals in Education (CIJE).[20] Since they both use a common format, if you learn how to use one of them you know how to use the other. The first step in using ERIC resources is to become familiar with the terms, which ERIC uses to index references. The Thesaurus of ERIC Descriptors, available in most libraries, is a compilation of the key words used in Indexing ERIC

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18 Sellen. M.,.&Tauber,R. (1984). Selection criteria for ERIC: A survey of clearinghouse acquisition coordination. Behavioral & Social Science Librarian, 3(4), 25-31.

19 National Institute of Education. (1979). How to use ERIC Washington, DC: Author.

20 National Institute of Education. (1966 to date). Resources in education. Washington. DC: Author. See also footnote 7.

documents.[21] The Thesaurus indicates the various terms under which a given topic is indexed. If, for example, your research problem were "The Effects of Microcomputer-Assisted Instruction of the Math Achievement of Elementary Students you would find that microcomputers is a descriptor used in the ERIC system. Each issue of RIE and CIJE includes new additions to the pool of descriptors. After you have identified appropriate descriptors, the next logical step is to consult RIE.

RIE. *RIE* is published monthly, and semiannual indexes are available. RIE indexes over 1,000 documents per issue and for many entries provides an abstract prepared by one of the clearinghouses. If the title of an article sufficiently conveys its content, an abstract is not included; otherwise an abstract is included. Entries are indexed by subject, author, institution, and accession number. Using the accession numbers given in each index, abstracts are located in the Document Resume section. For example, in the 1985 semiannual index of RIE in the subject index under Microcomputers, the following entries are listed (among others):

Adapting Curriculum Materials for Microcomputer Use.

ED 251682

A Comparison of Third Grade Student Performance in Division of Whole Numbers Using a Microcomputer Drill Program and a Print Drill Program.

ED 253431

The second entry appears to be related to our problem. Using the accession number, ED 253 431, more complete information is located in the Document Resume section. This Information includes the author's name, the publication date, the cost of obtaining the complete document in microfiche and hard copy, descriptors under which this entry is listed, and an abstract of the contents. Since most libraries have the ERIC document collection in microfiche form, it is usually not necessary to order documents, although instructions are

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21 Houston., (Ed.). (1984) Thesaurus of ERIC descriptors (10^{th} ed.). Phoenix: Oryx Press.

given for doing so.

The next step in using ERIC is to consult the monthly and semiannual indexes of CIJE.

CIJE. CIJE, mentioned previously as an improvement on the Education Index, indexes articles in the periodical literature and covers close to 800 education and education-related publications. The procedure for using CIJE is very similar to the procedure for using R1E. Using the same descriptors, relevant entries are identified in one of the indexes. Using the accession numbers, additional information is located in the Main Entry section As with RIE, if the title of an article sufficiently conveys its content, an abstract is not included, otherwise an abstract is included. The addition of abstracts when needed makes CIJE more useful than the Education Index for those years for which it is available. Although CIJE was first published in 1969, abstracts were not included until 1970. After reading the abstract, the entire article maybe read by consulting the appropriate journal. As an example, in the subject index, under the descriptor Microcomputers the following entry is listed (among others):

Using Microcomputers With Fourth-Grade Students to Reinforce Arithmetic Skills. Journal for Research in Mathematics Education vl6 n1 p45-51 Jan 1985 EJ312693.

This entry tells us that in volume 16, issue number 1 of the publication Journal for Research in Mathematics Education, we will find an article entitled "Using Microcomputers With Fourth-Grade Students to Reinforce Arithmetic Skills." If we wish to know more about the contents of the article, we use the accession number, EJ 312 693, to locate the abstract and other information in the Main Entry section.

Obtaining ERIC Documents. In addition to those already mentioned, a number of other services are provided by ERIC. For example, the various clearinghouses prepare and disseminate annotated bibliographies in their particular area of specialization. Also, a variety of curriculum guides, teachers' guides, and instructional materials can be obtained from the clearinghouses. You should ask your librarian for an up-to-date listing of the clearinghouses and their addresses.

As mentioned, all ERIC documents are available in both hard copy and microfiche. Hard copy is more convenient but microfiche is considerably less expensive. Most libraries have the complete ERIC microfiche collection and microfiche readers. If they are not available, you can order any document directly from the ERIC Document Reproduction Service, P.O. Box 190. Arlington, Virginia 22210.

If you would like more information on the documents and services obtainable from ERIC, read *How to Use ERIC*. If your library does not have a copy, you can order one directly from the Superintendent of Documents, United States Government Printing Office, Washington, D.C. 20402. If you would like to submit a document (report, speech, or paper) for possible inclusion in the ERIC system, send two clear, legible copies to the ERIC Processing and Reference Facility, 4833 Rugby Avenue, Suite 303. Bethesda, Maryland 20014. Your contribution will be forwarded to, and screened by, the appropriate clearinghouse.

Review of Educational Research (RER)

The RER mentioned previously, reviews and briefly summarizes a number of related studies on given topics. For example, volume 55 contains reviews of research on direct observation measures of pupil classroom behavior,[22] nontraditional undergraduate student attrition,[23] and second language learning through immersion[24] although the RER is a secondary source, each article concludes with an extensive bibliography. By reading the review article, and using the bibliography, you can easily identify important primary sources. To use the RER, simply check the table of contents of each issue. If a listed review is relevant to your problem, read the review and note specific studies of interest. Finally, use the bibliography to obtain the complete reference on the selected studies. Up until 1970, the RER

[22] Hoge. R.D. (1985). The validity of direct observation measures of pupil Classroom behavior. Review of Educational Research. 55.469-483.

[23] Bean, J. P., & Metiner. B.S. (1985). A conceptual model of nontraditional undergraduate student attrition. Review of Educational Rearch,55, 485-540.

[24] Geneses, F. (1985). Second language learning through Immersion: A review of U.S. programs, Review of Educational Research, 55. 541-561.

was concerned with a limited number of general problem areas; however, the RER now accepts unsolicited reviews on a wide variety of topics.

Books

It is hard to imagine a graduate student who has never used the library card catalog to find books related to a given problem. However, without the data it would not be very "researchy" to say that there is no such graduate student, thus the inclusion of this discussion. Briefly, the card catalog alphabetically indexes (by author, subject, and title) all publications contained in the library, with the exception of the periodicals. Not infrequently, a comprehensive description of research in a given field will be compiled and published in book form. If such a book exists for your problem, it can be an invaluable reference.

Encyclopedias may also be useful, especially those in specialized areas such as educational research. General encyclopedias contain articles on a wide range of topics written by experts. Encyclopedias in specialized areas contain more detailed discussions on a restricted number of topics. A good example is the Encyclopedia of Educational Research, which contains critical reviews and summaries on a number of educational topics.[25] Like the RER. the Encyclopedia is a secondary source, which also follows each article with an extensive bibliography helpful in identifying pertinent primary sources. The Second Handbook of Research on Teaching is also a valuable resource for certain topics.[26]

Computer Searches

With relatively little effort, and for a relatively low cost (maybe even free), you can use a computer to identify related references for you. Searching that would take you days and days to do, a computer can do in a matter of minutes. No, a computer won't do your review of related literature for you. It will, however, search databases such as the ERIC system and provide you with a list of references and, if provided by the database, abstracts.

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25 See footnote 1.

26 Travers, R.M. (Ed.) (1973), Second handbook of research on teaching. Chicago: Rand McNally.

To initiate a computer search, you provide the key words, or descriptors. The computer then searches databases for references having those descriptors.[27] If you do not know the appropriate descriptors, typically a search analyst will translate your key words into appropriate descriptors. For example, the key words computer-assisted instruction might be changed to microcomputer-assisted instruction. If you are wilting to take less related references, not just those specifically on your topic, you have to use broader descriptors. Of course, whether this is necessary depends upon how many references there are that are directly related to your problem. If you conduct a search online, that is, actually at a computer terminal, you may or may not receive assistance in defining your search strategy. Either way, but especially if not, you should give your search strategy careful thought ahead of time. If your descriptors are too general, for example, you will spend unnecessary time on-line and this time may cost you money (not to mention the fact that you will have an unwieldy number of references to sort through).

As a result of the computer search you receive a computer printout listing the identified references and abstracts as they appear in CIJE or RIE (or Psychological Abstracts, or whatever). The printout is mailed to you within 7 to 10 days.

Data Sources

Computer searches are made possible by the fact that various databases, such as ERIC, Psychological Abstracts, and Exceptional Child Education Resources, are available on computer tapes. Information retrieval systems, such as the Lockheed DIALOG system, provide institutions with access to the tapes in their system. Some Institutions have some tapes themselves. It is safe to say, however, that virtually any institution that provides computer search services accesses the ERIC system.

ERIC searches can be obtained at hundreds of locations across

27 Full- text searching is an option at some locations Full- test searching does not Involve descriptors alone. Instead, each entry is searched for a particular words, word, or phrase. For example, we could request full-text search for the words peers and drugs, any entry containing those words (not necessarily next to each other), in the abstract, for example, would be tested.

the United States (and around the world). These locations are listed in the Directory of ERIC Search Services (to be discussed shortly).[28] Most state departments of education, for example, have the ERIC tapes and provide assistance and searches at no charge for members of the education community. Many universities provide computer searches of the ERIC system. And a number of them access a major information retrieval system such as the Lockheed DIALOG program. The advantage to access to a major system is the availability of multiple databases. The DIALOG program, for example, provides access to some 90 different databases. The costs associated with a computer search depend on a number of factors, the major one being the length of the search. There is usually a charge for on-line computer time and a fee for each entry on the printout. While it is impossible to quote exact amounts, since they are subject to change, on-line time is typically $30 per hour ($50. per minute), and a printout with 100 references and abstracts Is $14 ($.14 each). At these rates, a search taking 6 minutes of computer time and yielding 60 references would cost $11.40 ($3.00 + $8.40). Even though students may get a break on charges (there may be no charge at all), It is still to your advantage to plan your search strategy very carefully. Hundreds of more or less related abstracts take a long time to read and analyze.

The Directory of ERIC Search Services, referred to previously, lists and describes the organizations that provide computer searches of literature. The Directory is organized geographically. Organizations and institutions are presented by state and within state by city. A number of foreign Institutions are listed following the alphabetized state listings. Information presented In the Directory Includes:

1. The mailing address and phone number of each organization or institution and the person to contact for further information.

28 Pugh, E.. & Brandhorst. W. T.(1981). Directory of ERIC search services. Washington, DC: Educational resources information center. National institute of Education.

2. Populations to whom each organization provides services, e.g., "New York State residents." If there are no restrictions, this is indicated by the term Open."[29]

3. Data bases available, e .g.. "R1E, Lockheed files".

4. Directions for submitting a search request and the format for such a request, e.g., "Walk-in. Keywords";

5. Search outputs, e.g., “Abstracts."

6. Cost per search, e.g., "$30 per hour, plus $.14 per abstract.”

7. Turnaround time (time between the search request date and the delivery date), e.g., "1 week. On-line printout available immediately as an option,'"

8. The search system used, e.g.. "DIALOG, ORBIT."

9. Miscellaneous notes, e.g., "Microfiche duplication capability,"

10. The latest date on which the information about the organization's or institution's services was reviewed and is known to be valid, e.g., "10/27/78.”

How to Initiate a Computer Search

By now you may be thoroughly (or at least a little) confused by all the computer talk. The best thing to do is to march over to the library and ask the person at the information or reference desk, "How do I do a computer search?” Chances are very good that you'll find out everything you need to know. Until you feel secure, it is likely that there will be someone available to assist you in selecting your search words and planning your search strategy. At the very least, however, you have to have a specific statement of your problem. If multiple databases are available to you, you will next have to select the ones you wish searched. Databases are usually listed by area, for example, Social Sciences and Humanities, making it easy to select the ones of interest to you. Lastly, you need to specify your search strategy. Usually the best initial approach is to use search words that

29 This option, although attractive, is typically expensive since it requires more connect time, i.e., on-line time.

exactly match your problem. You can then test the adequacy of those search words by asking how many references there are for your selected combination of these words. If there are too few or too many references you can broaden or narrow your search accordingly. This adjusting is typically accomplished by use of the connectors *and or.*

The connector narrows the scope of the search, while the or connector broadens the search. For example, if your problem were "The Effects of Microcomputer-Assisted Instruction on the Math Achievement of Elementary Students.' your first choice descriptors and connectors would be microcomputers and moth achievement and elementary students. If this combination did not produce many references, you could expand your search by instructing the computer to search for related descriptors. Instead of requesting just microcomputers, you could give directions to search for entries under the descriptors microcomputers or computers. Or you could request that entries be searched under the descriptors math achievement or arithmetic achievement. Another approach to broadening the search would be to drop the descriptor elementary students. This strategy would result in references being included which deal with the problem at different levels, junior high school, for example.

When the number of references seems reasonable ("reasonable" will depend on the problem and the purpose of the search), you then make your request and wait for the printout. It must be emphasized that you will receive at most abstracts, not complete documents. Original sources will have to be located after the abstracts have been analyzed for relevance.

Abstracting

After you have identified the primary references related to your problem, using the appropriate indexes, abstracts, and reviews, you are ready to move on to the next phase of a review of related literature—abstracting the references. Basically, this involves locating, reviewing, summarizing, and classifying your references. Since the references you identified in each source are listed in reverse chronological order, starting with the most recent. The abstracting process will be conducted in the same order. The main advantage to beginning with the latest references on a given problem is that in terms of research strategy the most recent research is likely to have profited from previous research. Also, recent inferences may contain references to preceding studies you may not have identified. For each reference, a suggested procedure for abstracting is as follows:

1. If the article has an abstract or a summary, which most do, read it to determine the article's relevancy to your problem.
2. Skim the entire article, making mental note of the main points of the study.
3. On the top of an index card (4 x6 is a convenient size) write the complete bibliographic reference, including the library call number if it is a book. If you know that your final report must follow a particular style, put your bibliographic reference in that form. If not, use the format of the American Psychological Association (APA)[30] The APA format is becoming increasingly popular, primarily because it eliminates the need for formal footnotes. For a journal article, the APA bibliographic reference would be:

Snurd, B. J. (1988). The use of white versus yellow chalk in the teaching of advanced calculus. Journal of *Useless Findings*. 11, 1-99.

In the above example, 1988 refers to the date of publication, 11 to the volume, and 1-99 to the page numbers. If this reference were cited in a paper, then its description would be followed by (Snurd, 1988), and no other footnote (beyond the bibliographic references) would be required. What ever format you use, be certain the reference you copy accurate; you never know when you might have to go back and get additional information from an article. Besides, even if you do not have to find it again, it is very unscholarly to have an in correct reference in a research report. Also, put only one reference on each index card. The purpose of using index cards is that they allow easy sorting and facilitate organization of the articles

[30] American Psychological Association (1983) Publication manual of the American Psychological Association (3rd ed) Washington. DC: Author.

prior to writing the review of the literature.

4. Classify and code the article according to some system and place the code on the same index card in a conspicuous place, such as the upper right-or left-hand corner. For example, of your problem was concerned with semiarid paraprofessionals versus patent volunteers (discussed earlier), you might use a three-part coding system to describe each article,. The code might indicate whether the study was concerned with the use of paraprofessionals, parent volunteers, or both (PP versus PV versus B), whether it was an opinion article or a study (0 versus S), and the degree of its relevance to your study (say 1,2, or 3, with 3 meaning very relevant). Thus, PV/0/3 might be a code for an article describing the potential benefits to be derived from using parent volunteers. Any coding system that makes sense to you, given your problem, will facilitate your task later when you have to sort, organize, analyze, synthesize, and write your review of the literature.

5. On the same index card (under the bibliographic reference) abstract, or summaries, the reference. As neatly as you can (you're going to have to read them later!), write the essential points of the reference. If it is an opinion article write the main points of the author's position, for example, "Jones believes parent volunteers should be used because . . ." and list the "because." If It is a study, write the same kind of information you wrote for Task 1A, chapter 1: the problem, the procedures (including the sample and instruments), the method of analysis, and the major conclusions. Make special note of any particularly interesting or unique aspect of the study, such as a new measuring instrument that was utilized. Double-check the reference to make sure you have not omitted any pertinent information.

6. Indicate on the index card any thoughts that come to your mind, such as points on which you disagree (make an X, for example) or components which you do not understand (put a? next to them). For example, if an author stated that he or she had used a double-blind procedure, and you were unfamiliar with that technique, you could indicate that with a?. Later,

you can seek out a knowledgeable person, such as your advisor, and quickly identify points on which you need clarification or explanation.

7. Indicate on the index card any statements that are direct quotations (plagiarism is a no-no) or personal reactions; if you do not put quotation marks around direct quotations on your index card, for example, you may not remember later which statements are, and which are not, direct quotations. Incidentally, direct quotations should be kept to a minimum in your research plan and report; both should be in your words, not other researchers'. Occasionally, however, a direct quotation may be quite appropriate.

An alternate strategy to making notes on index cards is to photocopy references whenever possible (you probably wouldn't want to copy a book!). If you copy the articles, you can take them with you and make your notes in the comfort of your home. The advantages of this approach are reduced time in the library and elimination of the possibility that you might have to go back and find a reference because you inadvertently left something out of your notes. The main disadvantage, of course, is the cost: photocopies cost a lot more than 4” X 6" index cards. Some researchers, however, feel that the approach is well worth the cost in terms of convenience. Whichever approach you use, guard your notes with your life. When you have completed your reviewing task, those notes will represent many hours of work. Students have been known to be literally in tears because they left their notes “on the bus" or “on a table in the cafeteria." Also, when the research report is completed, the index cards can be filed (photocopies can be placed in notebooks) and saved for future reference and future studies (nobody can do Just one!).

Analyzing, Organizing, and Reporting

For beginning researchers, the hardest part about writing the review of related literature is thinking about how hard it is going to be to write the review of related literature. More time is spent worrying about doing it than actually doing it. If you have efficiently abstracted the literature related to your problem, and if you approach the task in an equally systematic manner, then analyzing, organizing, and reporting it will be relatively painless. First, to get warmed up, read quickly through your notes. This will first of all refresh your memory and also you will more than likely identify some references which no longer seem sufficiently related. Do not force references into your review that do not really "fit"; the review forms the background and rationale for your hypothesis and should only contain references that serve this purpose. It may hurt a little to discard references representing work on your part, but your review will be better for it. The following guidelines and suggestions are based on experience acquired the hard way and should be helpful to you:

1. Make an outline. Don't groan: your eighth-grade teacher was right about the virtues of an outline. The time and thought you put into the outline will save your time in the long run and will increase your probability of having an organized review. The outline does not have to be excessively detailed. First, identify the main topics and the order in., which they should be presented. For example, the outline I formulated for this chapter started out as three main headings—Selection and Statement, Review of Related Literature, and Formulation and Statement of a Hypothesis. As another example, the outline of the review for the problem concerned with the effectiveness of salaried paraprofessionals versus parent volunteers might begin with the headings Literature on Salaried Paraprofessionals, Literature on Parent Volunteers, and Literature Comparing the Two. The next step is to differentiate each major heading into logical subheadings. In my outline, for example, Review of Related Literature was subdivided into the following:

    - Review of Related Literature
    - Definition, Purpose, and Scope
    - Preparation
    - Sources
    - Computer Searches

- Abstracting
- Analyzing Organizing, and Reporting

He need for further differentiation will be determined by your problem; the more complex it is the more subheadings will be required. When you have completed your outline you will invariably see topics that need rearranging. It is much easier, however, to reorganize an outline than it is to reorganize a document written in paragraph form.

2. Analyze each reference in terms of your outline; in other words, determine under which subheading each one fits. Then sort your references into appropriate piles. If you end up with one or more references without a home, there are three logical possibilities: (1) there is something wrong with your outline; (2) they do not belong in your review, and should be discarded; or (3) they do not belong in your review but do belong somewhere else in your introduction. For example, a reference concerned with the problem of school vandalism might state that school vandalism costs American taxpayers X thousands of dollars per year. Such a reference would belong in the significance section of the statement of the problem if the specific problem to be investigated were concerned with several alternative methods of reducing school vandalism. Opinion articles, or reports of descriptive research, will more often be useful in the problem statement portion of an introduction, whereas formal studies will almost always be included in the review of related literature portion.

3. Take all the references identified for a given subheading and analyze the relationships or differences between them. If three references say essentially the same thing, there is no need to describe each one; it is much better to make one summary statement followed by three references. For example:

   Several studies have found white chalk to be more effective than yellow chalk in the teaching of advanced mathematics (Snurd, 1988; Trivia, 1925; Ziggy, 1976).

   Do not present your references as a series of abstracts or annotations (Jones found X, Smith found Y, and Brown found Z). Your task is to organize and summarize the references in a meaningful way. Do not ignore studies, which are contradictory to most other studies or to your personal bias. Analyze and evaluate contradictory studies and try to determine a possible explanation. For example:

Contrary to these studies is the work of Rautenstudee (1970), who found yellow chalk to be more effective than white chalk in the teaching of trigonometry. However, the size of the treatment groups (two students per group) and the duration of the study (one class period) may have seriously affected the results.

4. The review should flow in such a way that the references least related to the problem are discussed first, and the most related references discussed last, just prior to the statement of the hypothesis. Think in terms of a big V. At the bottom of the V is your hypothesis; directly above your hypothesis are the studies most directly related to it, and so forth. For example, if your hypothesis stated that white chalk would be more effective than yellow chalk in teaching biology to tenth graders, immediately preceding It would be the studies indicating the effectiveness of white chalk in the teaching of Mathematics. Preceding those studies might be studies indicating that students prefer to read white chalk. At the top of the V (the beginning of the review), several references might be cited, written by well-known educators, expressing the belief that variables such as chalkboard color and color of chalk are important ones in the learning process, too often overlooked. These might be followed by similar references indicating that these variables might be even more critical in technical areas such as mathematics that entail a lot of chalkboard usage, and so forth. The idea is to organize and present your literature in such a way that it leads logically to a tentative, testable conclusion, namely your hypothesis. If your Problem has more than one major aspect, you may have two Vs or one V that logically leads to two tentative, testable conclusions.

5 The review should conclude with a brief summary of literature and its implications. How lengthy this summary needs to be depends upon the length of the review. It should be detailed enough to clearly the logic chain you have followed in arriving at your implications and tentative conclusion.

Having systematically developed and presented your rationale, you will be ready to state your hypothesis.

FORMULATION AND STATEMENT OF A HYPOTHESIS

Before you review the related literature, you have a tentative hypothesis, which guides your search. Following the review, and preceding the actual conduction of the study, the hypothesis refined and finalized.

Definition and Purpose

A hypothesis is a tentative explanation for certain behaviors, or events that have occurred or will occur. A hypothesis states the researcher's expectations concerning the relationship between the variables in the research problem, a hypothesis is the most specific statement of a problem. It states what the researcher thinks the outcome of the study will be. The researcher does not then set out to "prove" his or her hypothesis, but rather collects date that either support the hypothesis or do not support it: research studies do not "prove" anything. Hypotheses are essential to all research studies with the possible exception of some descriptive studies whose purpose is to answer certain specific questions.

The hypothesis is formulated following the review of related literature and prior to the execution of the study. It logically follows the review since it is based on the implication of previous research. The related literature leads one to expect a certain relationship. For example, studies finding white chalk to be more effective than yellow chalk in teaching mathematics would lead a researcher to expect it to be more effective in teaching physics, if there were no other finding to the contrary. Hypotheses precede the study proper because the entire study is determined by the hypothesis. Every aspect of the research is affected by the hypothesis. Including subject (samples), measuring instruments, design, procedures, data analysis techniques and conclusions. Although all hypotheses are based on previous knowledge and aimed at extending knowledge, they are not all of equal worth. There are a number of criteria that maybe, and should be, applied to a given hypothesis to determine its value.

UNIT—8

TOOLS OF RESEARCH

John W Best And James V. Kahn (1992)	**Research in Education** 6th ed. New Delhi, Prentice Hall of India Private Limited pp. 181-201	8-1

Methods and Tools of Research

Characteristics of Good Observation

Observation, as a research data-gathering process, demands rigorous adherence to the spirit of scientific inquiry. The following standards should characterize observers and their observations:

Observation is carefully planned, systematic, and perceptive. Observers know what they are looking for and what is irrelevant in a situation. They are not distracted by the dramatic or the spectacular.

Observers are aware of the wholeness of what is observed. Although they are alert to significant details, they know that the whole is often greater than the sum of its parts.

Observers are objective. They recognize their likely biases, and they strive to eliminate their influence upon what they see and report.

Observers separate the facts from the interpretation of the facts. They observe the facts and make their interpretation at a later time.

Observations are checked and verified, whenever possible by repetition, or by comparison with those of other competent observers.

Observations are carefully and expertly recorded. Observers use appropriate instruments to systematize, quantify, and preserve the results of their observations.

Observations are collected in such a way as to make sure that they are valid and reliable.

INQUIRY FORMS: THE QUESTIONNAIRE

The general category of inquiry forms includes data-gathering instruments through which respondents answer questions or respond to statements in writing. A questionnaire is used when factual information is desired. When opinions rather than facts are desired, an opinionnaire or attitude scale is used.

Questionnaires administered personally to groups of individuals have a number of advantages. The person administering the instrument has an opportunity to establish rapport, explain the purpose of the study, and explain the meaning of items that may not be clear. That availability of a number of respondents in one place makes possible an economy of time and expense and provides a high proportion of usable responses. It is likely that a principal would get completely usable responses from teachers in the building, or a teacher from students in the classroom. However, individuals who have the desired information cannot always be contacted personally without the expenditure of a great deal of time and money in travel. It is in such situations that the mailed questionnaire may be useful. The mailed questionnaire is one of the most used and probably most criticized data-gathering device. It has been referred to as the lazy person's way of gaining information, although the careful preparation of a good questionnaire takes a great deal of time, ingenuity, and hard work. There is little doubt that the poorly constructed questionnaires that flood the mails have created a certain amount of contempt. This is particularly true when the accompanying letter pleads that the sender needs the information to complete the requirements for a graduate course, thesis, or dissertation. The recipients reaction may be "Why" should. I go to all this trouble to help this person get a degree.

Filling out lengthy questionnaires takes a great deal of time and effort, a favor that few senders have any right to expect of strangers. The unfavorable reaction is intensified when the questionnaire is long the subject trivial, the items vaguely worded, and the form poorly organized. The poor quality of so many mailed questionnaires helps to explain why so small a proportion is returned. As a result of low response rates, often less than 40 percent, the data obtained are often of limited validity. The information in the unreturned questionnaires might have changed the results of the investigation materially. The very fact of no response might imply certain types of reactions, reactions that can never be included in the summary of data.

Unless one is dealing with a group of respondents who have a genuine interest in the problem under investigation, know the sender, or have some common bond of loyalty to a sponsoring institution or organization, the rate of returns is frequently disappointing and provides a flimsy basis for generalization.

Although the foregoing discussion may seem to discredit the questionnaire as a respectable research technique, we have tried to consider the abuse or misuse of the device. Actually the questionnaire has unique advantages, and properly constructed and administered, it may serve as a most appropriate and useful data-gathering device in a research project.

The Closed Form

Questionnaires that call for short, check-mark responses are known as the restricted or closed-form type. Here you mark a yes or no, write a short response, or check an item from a list of suggested, responses. The following example illustrates the closed-form item:

1. Why did you choose to do your graduate work at this university? Kindly indicate three reasons in order of importance, using the number 1 for the most important 2 for the second most important, and 3 for the third most important.

RANK

(a)	Convenience of transportation	________
(b)	Advice of a friend	________
(c)	Reputation of institution	________
(d)	Expense factor	________
(e)	Scholarship aid	________
(f)	Other	________
		(kindly indicate)

Even when using the closed form it is well 10 provide for unanticipated response. Providing an "other" category permits respondents to indicate what might be their most important reason, one that the questionnaire builder had not anticipated. Note the instruction to rank choices in order of importance, which enables the tabulator to properly classify all responses.

For certain types of information the closed-form questionnaire is entirely satisfactory. It is easy to fill out, takes little lime, keeps the respondent on the subject, is relatively objective, and is fairly easy to tabulate and analyze.

The Open Form

The *open-form or unrestricted* questionnaire calls for a free response in the respondent's own words. The following open-form item seeks the same type of information as did the closed-form item:

Why did you choose to do your graduate work at this university?

Note that no clues are given. The open form probably provides for greater depth of response. The respondents reveal their frame of reference and possibly the reasons for their responses. But because it requires greater effort on the part of the respondents, returns are often meager. Also, the open-form item can sometimes be difficult to interpret, tabulate, and summarize in the research report.

Many questionnaires include both open- and closed-type items. Each type has its merits and limitations, and the questionnaire builder must decide which type is more likely to supply the information wanted.

Improving Questionnaire Items

Inexperienced questionnaire makers are likely to be naive about the clarity of their questions. One author of this book recalls a brilliant graduate student who submitted a questionnaire for his approval. She was somewhat irritated by his subsequent questions and suggestions, remarking that anyone with any degree of intelligence should know what she meant. At the advisor's suggestion, she duplicated some copies and personally administered the questionnaire to a graduate class in research.

She was swamped with questions of interpretation, many of which she could not answer clearly. There was considerable evidence of confusion about what she wanted to know. After she had collected the completed copies and had trued to tabulate the responses she began to see the questionnaire's faults. Even her directions and explanation in class had failed to clarify the ambiguous intent of her questionnaire. Her second version was much improved.

Many beginning researchers are not really sure what they want to know. They use a shotgun approach, attempting to cover their field broadly in the hope that some of the responses will provide the answers for which they are groping. Unless researchers know exactly what they want, however, they are not likely to ask the right questions or to phrase them properly.

In addition to the problem of knowing what one wants, there is the difficulty of wording the questionnaire clearly. The limitations of words are particular hazards in the questionnaire. The same words mean different things to different people. After all, even questionnaire makers have their own interpretation, and the respondents may have many different interpretations. In the interview as in conversation, we are able to clear up misunderstandings by restating our question, by inflection of the voice, by suggestions, and by a number of other devices. But the written question stands by itself, often ambiguous and misunderstood.

A simple example illustrates the influence of voice inflection alone, consider the following question. Read it over, each time emphasizing the underlined word nothing how the change in inflection alters the meaning.

Were you there last night?

Were you there last night?

Were you there last night?

Were you there last night?

Were you there last night?

Questionnaire makers must depend on written language alone. Obviously they cannot be too careful in phrasing questions to insure their clarity of purpose. Although there are no certain ways of producing foolproof questions, certain principles can be employed to make questionnaire items more precise. A few are suggested here with the hope that students constructing questionnaires and opinionnaires will become critical of their first efforts and strive to make each item as clear as possible.

Define or qualify terms that could easily be misinterpreted.

What is the value of your house?

The meaning of the term value is not clear. It could imply several different meanings: the assessed value for tax purposes, what it would sell for on the present market, what you would be willing to sell it for, what it would cost to replace, or what you paid for it. These values may differ considerably. It is essential to frame questions specifically, such as," What is the present market value of your house?"

As simple a term as age is often misunderstood. When is an individual twenty-one? Most people would say that a person, is twenty-one from the day of the twenty-first birthday until the day of the twenty-second. But an insurance company considers a person twenty-one from age twenty and six months until age twenty-one and six months. Perhaps this question could be clarified by asking age to nearest *birthday or date of birth.*

Hundreds of words are ambiguous because of their many interpretations. One has only to think of such words and phrases as curriculum, democracy progressive education, cooperation, and integration—and even such simple words as how much and now. To the question, "What work are you doing now?" the respondent might be tempted to answer, "Filling out your foolish questionnaire."

Be careful in using descriptive *adjectives* and *adverbs* that have no agreed-upon meaning. This fault is frequently found in rating scales as well as in questionnaires. Frequently, occasionally, and rarely do not have the same meanings to different persons (HakeL, 1968). One respondent's occasionally may be another's rarely. Perhaps a stated frequency—fames per week or times per month—would make this classification more precise.

Beware of double negatives. Underline negatives for clarity.

Are you opposed to not requiring students to take showers after gym class?

Federal aid should not be granted to those states in which education is not equal regardless of race, creed, or color.

Be careful of inadequate alternatives.

Married? Yes__ No__

Does this question refer to present or former marital status? How would the person answer who is widowed, separated, or divorced?

How late at night do you permit your children to watch television?

There may be no established family policy. If there is a policy, it may differ for children of different ages. It may be different for school nights or for Friday and Saturday nights, when watching a late movie may be permitted.

Avoid the Double-Barreled Question.

Do you believe that gifted students should be placed in separate groups for instructional purposes and assigned to special schools?

One might agree on the advisability of separate groups for instructional purposes but be very much opposed to the assignment of gifted students to special schools. Two separate questions are needed.

Underline a word if you wish to indicate special emphasis.

A parent should not be told his child's IQ score.

Should all schools offer a modern foreign language?

When asking for ratings or comparisons, a point of reference is necessary.

How would you rate this student teacher's classroom teaching? Superior ------------ Average ———— Below average ----------With whom is the student teacher to be compared—an experienced teacher, other student teachers, former student teachers—or should the criterion be what a student teacher is expected to be able to do?

Avoid unwanted assumptions.

Are you satisfied with the salary raise that you received last year?

A *no* answer might mean either I did not get a raise or that I did get a raise but am not satisfied.

Do you feel that you benefited from the spankings that you received as a child?

A *no* response could mean either that the spankings did not help me or that my parents did not administer corporal punishment. These unwarranted assumptions are nearly as bad as the classic, "Have you stopped beating your wife?"

Phrase questions so that they are appropriate for all respondents.

What is your monthly teaching salary?

Some teachers are paid on a nine-month basis, some on ten. Some on eleven and some on twelve Three questions would be needed.

Your salary per month? ________________

Number of months in school term? __________________

Number of salary payments per year? __________________

Design questions that will give a complete response .___

Do you read the Indianapolis Star? Yes__ No__________

A yes or no answer would not reveal much information about the rending habits of the respondent. The question might be followed with an additional item, as in Figure 7—1.

Provide for the systematic quantification of responses. The type of question that asks respondents to check a number of items from a list is difficult to summarize, especially if not all respondents check the same number. One solution is to ask respondents to rank, in order of preference, a specific number of responses.

What are your favorite television programs? Rank in order of preference your first, second, third, fourth, and fifth choices.

FIGURE 7—1 Sample questionnaire item.

If your answer is Yes kindly check; how often and what sections of the Star you read.

Section	Always	Us	Seldo	Never
National and international news				
State and local news				
Editorial				
Sports				
Comic				
Society				
Financial				
Advertising				
Wanted				
Syndicated features				
Special features				
Other (specify)				

The items can then be tabulated by inverse weightings.

1st choice 5 points
2nd choice 4 points
3rd choice 3 points
4th choice 2 points
5th choice 1 point

The relative popularity of the programs could be described for a group it terms of total weighted scores, the most popular having the largest total.

Consider the *possibility of classifying the responses yourself*, rather than having the respondent choose categories. If students were asked to classify their father's occupation in one of the following categories, the results might be quite unsatisfactory.

Unskilled labor ________
Skilled labor ________
Clerical work ________
Managerial work ________
Profession ____________
Proprietorship ____________

It is likely that by asking the children one or two short questions about their father's work, it could be classified more accurately.

1. At what place does your father work?
2. What kind of work does he do?

Very often, a researcher wants to gather information (facts) and attitudes (opinions). This allows later analyses that can determine if attitudes are related to personal characteristics such as age sex, or race. Figure 7-2 is an example of just such a combination. This questionnaire/opinionnaire collects information about the individual and then asks for the opinion of the person regarding factors that contribute to teacher morale

(FIGURE 7-2 Teacher Morale Questionnaire Opinionire
1. Male _ Female _
2. Age __
3. Marital status: single __ married __. divorced/separated.
4. Number of dependent children __; their ages____
5. Number of other dependents__
6. Highest degree held __
7. Years of teaching experience ____
8. Years of teaching at present school __
9. Teaching level: Primary_____intermediate___upper grades__Jr H.S._________Sr. H.s_________: If secondary, your major teaching area ________
10. Enrollment of your school_______
11. Your average class size _________
~~10.~~12. Population of your community or school district

13. Your principal is: male____female_____

In the following questions kindly check the appropriate column:

a. excellent b. good c. fair d. Poor

	a	b	c	d
Competence				
friendliness				
helpfulnes				
ability to inspire				
encourage creativity				
availability				
relaxation				
preparation				
lunch				
conferences				
books				
periodicals				
references				
textbooks				
references				
AV aids				
supplies				
reports				
meetings				
hails				
lunchroom				
playground				
study hall				
extra-class organizations				

14. How does your salary scheduler compare with those of similar school districts?
15. How would you rate your principal on these rates.
16. How would you rate the consulting or advisory services that you receive?
17. Provision made for teacher free time.
18. How would you rate your faculty lounge?
19. How would you rate your faculty professional library?

20.How would you evaluate the adequacy of teaching materials and supplies?

21.How would you evaluate the assignment of your no teaching duties? (leave blank if item does not apply)

20. How would you rate the compatibility of your faculty?
21. How would you rate the parent support of your school?
22. How would you rate your morale as a teacher?
23. Kindly rank in *order of importance to you* at least five factors that you would consider most important in increasing your morale or satisfaction with your working conditions: Rank 1, most important. 2 next in importance, etc.

__a. higher salary

__b. smaller class size

__c. more free time

__d. more adequate faculty lounge

__e. more compatible faculty

__f. more adequate teaching materials

__g, more effective principal

__h. better consulting services

__I. more effective faculty meetings

__j. assistance of a teacher aide

__k. more attractive classroom/building
__L. fewer reports to make out
__m. fewer no teaching duties
__n. better provision for atypical students
__o. more participation in policy making
__P. fewer committee meetings
__q. teaching in a higher socioeconomic area
__ r. teaching in a lower socioeconomic area
__s. other (kindly specify)

On the back of this sheet kindly add any comments that you believe would more adequately express your feelings of satisfaction or dissatisfaction with teaching.

FIGURE 7-2 (Concluded)

Characteristics of a Good Questionnaire

1. It deals with a significant topic, one the respondent will recognize as important enough to warrant spending his or her time on. The significance should be clearly and carefully scaled on the questionnaire, or in the letter that accompanies it.
2. It seeks only that information which cannot be obtained from other sources such as school reports or census data.
3. It is as short as possible, and only long enough to get the essential data. Long questionnaires frequently find their way into the waste-basket.
4. It is attractive in appearance, neatly arranged, and clearly duplicated or primed.
5. Directions for a good questionnaire are clear and complete. Important terms are defined. Each question deals with a single idea and is worded as simply and clearly as possible. The categories provide an opportunity for easy, accurate, and unambiguous responses.
6. The questions are objective, with no leading suggestions as to the responses desired. Leading questions are just as inappropriate on a questionnaire as they are in a court of law.
7. Questions are presented in good psychological order, proceeding from general to more specific responses. This

order helps respondents to organize their own thinking so that their answers are logical and objective. It may be well to present questions that create a favorable attitude before proceeding to those that may be a bit delicate or intimate. If possible, annoying or embarrassing questions should be avoided.

8. It is easy to tabulate and interpret. It is advisable to reconstruct a tabulation sheet, anticipating how the data will be tabulated and interpreted, before the final form of the questionnaire is decided upon. This working backward from a visualization of the final analysis of data is an important step for avoiding ambiguity in questionnaire form. If computer tabulation is to be used, it is important to designate code numbers for all possible responses to permit easy transference to a computer program's format.

Preparing and Administering the Questionnaire

Get all the help you can in planning and constructing your questionnaire. Study other questionnaires, and submit your items for criticism to other members of your class or your faculty, especially those who have had experience in questionnaire construction.

In designing an inquiry form (questionnaire or opinionnaire), it is advisable to use a separate card or slip for each item. As the instrument is being developed, items can be refined, revised, or replaced by better items without recopying the entire instrument. This procedure also provides flexibility in arranging items in the most appropriate psychological order before the instrument is put into its final form.

Try out your questionnaire on a few friends and acquaintances. When you do this personally, you may find that a number of your items are ambiguous. What may seem perfectly clear to you may be confusing to a person who does not have the frame of reference that you have gained from living with and thinking about an idea over a long period. It is also a good idea to "pilot test" the instrument with a small group of persons similar to those who will be used in the study.

These dry runs will be well worth the time and effort. They may reveal defects that can be corrected before the final form is primed, and committed to the mails. Once the instrument has been sent out, it is too late to remedy its defects.

Choose respondents carefully. It is important that questionnaires be sent only to those who possess the desired information and are likely to be sufficiently interested to respond conscientiously and objectively. A preliminary card, asking whether the individual would be willing to participate in the proposed study, is recommended by some research authorities. This is not only a courteous approach but a practical way of discovering those who will cooperate in furnishing the desired information.

In a study on questionnaire returns, see (1957) discovered that a better return was obtained when the original request was sent to the administrative head of an organization rather than directly to the person who had the desired information. It is likely that when a superior officer gives a staff member a questionnaire to fill out, there is an implied feeling of obligation.

Getting permission, if the questionnaire is to be used in a public school it is essential that approval of the project be secured from the principal, who may then wish to secure approval from the superintendent of schools. Schools are understandably sensitive to public relations. One can imagine the unfavorable publicity that might result from certain types of studies made by individuals not officially designated to conduct the research. School officials may also want to prevent the exploitation of teachers and pupils by amateur researchers; whose activities require an excessive amount of time and effort in activities, no related to the purposes of the school.

Parental permission may also need to be secured Students should be informed that participation is voluntary. Particularly if sensitive questions (e.g., about drug use) are to be asked, parental and student consent is essential.

If the desired information is delicate or intimate in nature, consider the possibility of providing for anonymous responses. The anonymous instrument is most likely to produce objective and honest response. There are occasions, however, for purposes of classification or for a possible follow-up meeting, when it might be necessary to identify the respondents, if identification is needed, it is essential to convince the respondents that their responses will be held in strict confidence and that their answers will in no way jeopardize the status and security of their position.

Try to get the aid of sponsorship. Recipients are more likely to answer if a person, organization, or institution of prestige has endorsed the project. Of course, it is unethical to claim sponsorship unless, it has been expressly given.

The cover letter. Be sure to include a courteous, carefully constructed cover letter to explain the purpose of the study. The letter should promise some sort of inducement to the respondent for compliance with the request. Commercial agencies furnish rewards in goods or money. In educational circles, a summary, of Questionnaire results is considered an appropriate reward, a promise that should be scrupulously honored after the study has been completed.

The cover letter should assure the respondent that all information will be held in strict confidence or that the questionnaire is anonymous. And the matter of sponsorship might well be mentioned. Of course, a stamped, addressed return envelopes should be included. To omit this would virtually guarantee that many of the questionnaires would go into the wastebasket. Some researchers suggest that two copies of the questionnaire be sent one to be returned when completed and the other for the respondent's own file.

Follow-up procedures. Recipients are often slow to return completed questionnaires. To increase the number of returns, a vigorous follow-up procedure may be necessary. A courteous postcard reminding the recipient that the completed questionnaire has not been received may bring in some additional responses. This reminder will be effective with those who have just put off filling out the document or have forgotten to mail it. A further step in the follow-up process may involve a personal letter of reminder. In extreme cases a telegram, phone call, or personal visit may bring additional responses. In some cases it may be appropriate to send another copy of the questionnaire with the follow-up letter. However, the researcher must know who has already responded so as not to receive potential duplicates,

It is difficult to estimates, in the abstract, what percentage of questionnaire responses is to be considered adequate. The importance of the project, the quality of the questionnaire, the care used in selecting recipients, the time of year, and many other factors may be significant in determining the proportion of responses. In general, the smaller the percentage of responses, the smaller the degree of confidence one may place in the data collected. 0f course, objectivity of reporting requires that the proportion of responses received should always be included in the research report. Babbie (1973) suggests that a response rate of 50 percent is adequate, 60 percent good, and 70 percent very good.

Validity and Reliability of Questionnaires

All too rarely do questionnaire designers deal consciously with the degree of validity or reliability of their instrument. Perhaps this is one reason why so many questionnaires are lacking in these qualities. It must be recognized, however, that questionnaires, unlike psychological tests and inventories, have a very limited purpose. They are often one-time data-gathering devices with a very short life, administered to a limited population. There are ways, however, to improve both validity and reliability of questionnaires. Basic to the validity of a questionnaire is asking the right questions, phrased in the least ambiguous way. In other words, do the items sample a significant aspect of the purpose of the investigation?

The meaning of all terms must be clearly defined so that they have the same meaning to all respondents. Researchers need all the help they can get; suggestions from colleague’s and. experts in the field of inquiry may reveal ambiguities that can be removed or items that do not contribute to a questionnaire's purpose. The panel of experts may rate the instrument in terms of how effectively it samples significant aspects of its purpose, providing estimates of content validity.

It is possible to estimate the predictive validity of some types of questionnaires by follow-up observations of respondent behavior at the present time or at some time in the future. In some situations, overt behavior can be observed without invading the privacy of respondents. A comparison of questionnaire responses with voting data on a campus or community election may provide a basis for estimating predictive validity.

Reliability of questionnaires may be inferred by a second administration of the instrument, comparing the responses with those of the first. Reliability may also be estimated by comparing responses of an alternate form with the original form.

Inquiry Forms: the Opinionnaire

An information form that attempts to measure the attitude or belief of an individual is known as an opinionnaire, or attitude scale. Because the terms opinion and attitude are not synonymous, clarification is necessary.

How people feel, or what they believe, is their attitude. But it is difficult, if not impossible, to describe and measure attitude. Researchers must depend upon what people say are their beliefs and feelings. This is the area of opinion. Through the use of questions, or by getting people's expressed reaction to statements, a sample of their opinions is obtained. From this statement of opinion, one may infer or estimate their attitude—whey they realty believe.

Inferring attitude from expressed opinion has many limitations. People may conceal their attitudes and express socially acceptable opinions. They may not really know how they feel about a social issue, never having given the idea serious consideration. People may be unaware of their attitude about a situation in the abstract; until confronted with a real situation, they may be unable to predict their reaction or behavior.

Even behavior itself is not always a true indication of attitude. When politician kiss babies, their behavior may not be a true expression of affection toward infants. Social custom or the desire for social approval makes many overt expressions of behavior mere formalities, quite unrelated to people's inward feelings. Even though there is no sure method of describing and measuring attitude, the description and measurement of opinion may, in many instances, be closely related to people's real feelings or attitudes.

With these limitations in mind, psychologists and sociologists have explored an interesting area of research, basing their data upon people's expressed opinions. Several methods have been employed:

1. Asking people directly how they feel about a subject. This technique may employ a schedule or questionnaire of the open or closed form. It may employ the interview process, in which the respondents express their opinions orally.

2. Asking people to check in a list the statements with which they agree.

3. Asking people to indicate their degree of agreement or disagreement with a series of statements about a controversial subject.

4. Inferring their attitudes from reactions to projective devices, through which they may reveal attitudes unconsciously. (A projective device is a data-gathering instrument that conceals its purpose so that the subjects cannot guess how they should respond to appear in their best light. Thus their real characteristics are revealed.)

Three procedures for eliciting opinions and attitudes have been used extensively in opinion research, and they warrant a brief description.

Thurstone Technique

The first method of attitude assessment is known as the Thurston Technique of Scaled Values (Thurston & Chave, 1929). A number of statements, usually twenty or more, are gathered that express various points of view toward a group, institution, idea, or practice. They are then submitted to a panel of judges, each of whom arranges them in eleven groups ranging from one extreme to another in position. This sorting by each judge yields a composite position for each of the items. When there has been marked disagreement among the judges in assigning a position to an item, that item is discarded. For items that are retained, each is given its median scale value (see Chapter 8) between one and eleven as established by the panel.

The list of statements is then given to the subjects, who are asked to check the statements with which they agree. The median value of the statements that they check establishes their score, or quantifies their opinion.

Likert Method

The second method—the Likert Method of Summated Ratings—can be performed without a PANEL OF judges and has yielded scores very similar to those obtained by the Thurstone method. The coefficient of correlation (See Chapter 8) between the two scales was reported as high as + .92 in one study (Edwards & Kenney, 1946). Since the Likert-type scale takes much less time to construct, it offers an interesting possibility for the student of opinion research.

The first step in constructing a Likert-type scale is to collect a number of statements about a subject. The correctness of the statements is not important, as long as they express opinions held by a substantial number of people. It is important that they express definite favorableness or unfavorable ness to a particular point of view and that the number of favorable and unfavorable statements is approximately equal.

After the statements have been gathered, a trial test should be administered to a number of subjects. Only those items that correlate with the total test should be retained. This testing for internal consistency will help to eliminate statements that are ambiguous or that are not of the same type as the rest of the scale.

The attitude or opinion scale may be analyzed in several ways. The simplest way to describe opinion is to indicate percentage responses for each individual statement. For this type of analysis by item, three responses—agree, undecided, and disagree—are preferable to the usual five. If a Likert-type scale is used, it may be possible to report percentage responses by combining the two outside categories: "strongly agree" and "agree"; "disagree" and "strongly disagree."

strongly agree ___ undecided ___ disagree

___ agree ___ strongly disagree

For example, 70 percent of the male respondents agree with the statement, "Merit rating will tend to encourage conformity and discourage initiative."

The Liker scaling technique assigns a scale value to each of the five responses. Thus the instrument yields a total score for each respondent, and a discussion of each individual item, although possible, is not necessary. Starting with a particular point of view, all statements favoring the above position are scored:

	SCALE VALUE
a. strongly agree	5
b. agree	4
c. undecided	3
d. disagree	2
e. strongly disagree	1

For statements opposing this point of view, the items are scored in the opposite order:

	SCALE VALUE
a. strongly agree	1
b. agree	2
c. undecided	3
d. disagree	4
e. strongly disagree	5

The opinionnaire illustrated in Figure 7-3 attempts to measure Christian religious orthodoxy or conservatism. It is apparent that this type of instrument could be used to measure opinion in many controversial areas: racial integration, merit rating of teachers, universal military training, and many others. The test scores obtained on all the items would then measure the respondent's favorableness toward the given point of view.

Figure 7-4 illustrates an instrument that was used to seek the opinions of a group of classroom teachers toward merit rating.

If an opinionnaire consisted of 30 statements or items, the following score values would be revealing:

30 x 5 = 150 Most favorable response possible

30 x 3 = 90 A neutral altitude
30 x 1 = 30 Most unfavorable attitude

The scores for any individual would fall between 30 and 150—above 90 if opinions tended to be favorable to the given point of view, and below 90 if opinions tended to be unfavorable.

It would be wise to conclude this discussion with a recognition of the limitations of this type of opinion measure. Obviously it is somewhat inexact and fails to measure opinion with the precision one would desire. There is no basis for belief that the five positions indicated on the scale are equally spaced. The interval between "strongly agree" and "agree" may not be equal to the interval between "agree" and "undecided." It is also unlikely that the statements are of equal value in "for-ness" or "against-ness" It is unlikely that the respondent can validly react to a short statement on a printed form in the absence of real-life qualifying situations. It is doubtful whether equal scores obtained by several individuals indicate equal favorableness toward the given position: Actually, different combinations of positions can yield equal score values without necessarily indicating equivalent positions of attitude or opinion.

The following statement represent opinions, and your agreement or disagreement will be determined on the basis of your particular beliefs. Kindly check your position on the scale, as the statement first impresses you. Indicate what you believe, rather than what you think you should believe.

a. I strongly agree
b. I agree
c. I an undecided
d. I disagree
~~a.~~e. I strongly disagree

	Statement	a	b	c	d	e
1.	Heaven does not exist as an actual place or location.________________					
2.	God sometimes sets aside natural law, performing miracles. ____________________________					
3.	Jesus was born of a virgin, without a human father.__________					
4.	Hell does not exist as an actual place or location. ________________________					
5.	The inspiration that resulted in the writing of the Bible was no different from that of any other great religious literature. ________________________					
6.	There is a final day of judgment for all who have lived on earth. ___________________					
7.	The devil exists as an actual person. ______________					
8.	Prayer directly affects the lives of persons whether or not they know that such prayer has been offered. ____________________					
9.	There is another life after the end of organic life on earth. ______________________					
10.	When on earth, Jesus possessed and used the power to restore the dead to life. __________					
11.	God is a cosmic force, rather than an actual person					
12.	Prayer does not have the power to change such conditions as a drought. __________					
13.	The creation of the world did not literally occur in the way described in the Old Testament. ________					
14.	After Jesus was dead and buried, he actually rose from the dead, leaving an empty tomb. __________					
15.	Everything in the Bible should be interpreted as literally true. _____________________________					

FIGURE 7-3 A Likert-type opinionaire

Answer according to what they think they should feel rather than how they do feel.

Semantic Differential

The third method of attitude assessment was developed by Osgood, Suci and Tannenbaum (1957). The semantic differential is similar to the Likert.

Male ____ Female ______ Age ______

Teaching level; elementary ______ secondary _______

Marital status: single ____ married ____ divorced/separated ____ widowed ____

Years of teaching experience __. years.

The following statements represent opinions, and your agreement or disagreement will be determined on the basis of your particular convictions. Kindly check your position on the scale as the statement first impresses you. Indicate what you believe, rather than what you think you should believe.

(a) I strongly agree
(b) I agree
(c) I am undecided
(d) I disagree.
~~(a)~~(e) I strongly disgrace

		a	b	c	d	e
1.	It is possible to determine what constitutes merit, or effective teaching.					
2.	A valid and reliable instrument can be developed to measure varying degree of teaching effectiveness.					
3.	Additional remuneration will not result in improved teaching.					
4.	Merit rating destroys the morale of the teaching force by creating Jealousy, suspicion, and distrust.					
5.	Mutual confidence between teachers and administrators is impossible if administrators rate teachers for salary purposes.					
6.	Merit salary schedules will attract more high quality young people to the teaching profusion.					
7.	Merit salary schedules will hold quality teachers in the profession.					
8.	Partner will object to having their children taught by nonmerit teachers.					
9.	Merit rating can be as successful in teaching as it is in industry.					
10.	The hidden purpose of merit rating is to hold down salaries paid to most teacher by paying only a few teachers well.					
11.	There is no justification for paying poor teachers as well as good teachers are paid.					
12.	Apple-polishers will profit more than superior teacher from merit rating.					
13.	Merit rating will encourage conformity and discourage initiative.					
14.	The way to make teaching attractive is to reward excellence in the classroom.					
15.	Most administrators do not know enough about teaching to rate their faculty members fairly.					
16.	Salary schedule based on education and experience only encourage mediocre teaching.					

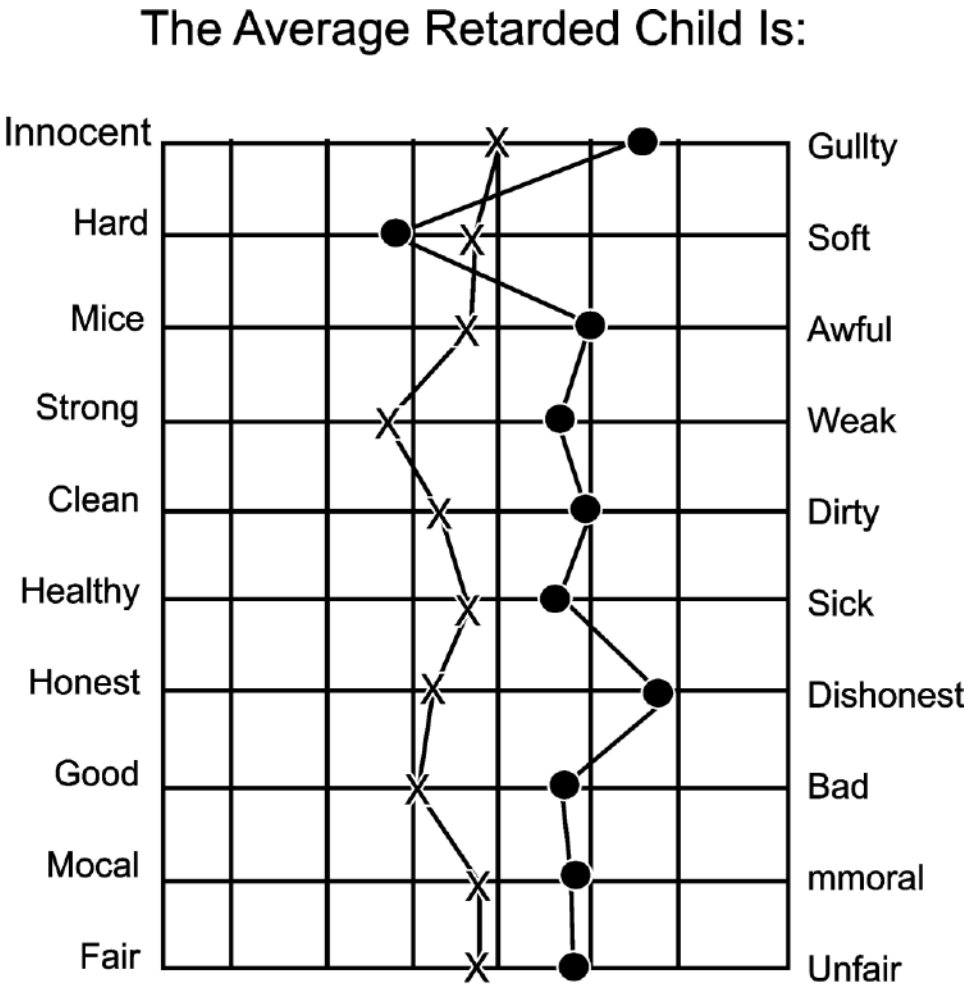
FIGURE 7-4 A Likert-type openionnaire on merit rating

method in that the respondent indicates an attitude or opinion between two extreme choices. This method usually provides the individual with a seven-point scale with two adjectives at either end of the scale, such as good-bad, unhealthy-healthy, clean-dirty. The respondent is asked to rate a group, individual, or object on each of these bipolar scales.

One author of this book had a student who used the semantic differential method to compare the attitudes of regular teachers and special-education teachers toward mentally retarded, learning-disabled, and behavior-disordered children. The results of the semantic differential can be graphically displayed as profiles. Figure 7-5 shows a partial profile of the regular and special-education teachers when asked about mentally retarded children.

The semantic differential has limitations similar to those of the Thursyone and Likert approaches. In spite of these limitations, however, the process of opinion measurement has merit. Until more precise measures of attitude are developed, these techniques can serve a useful purpose in social research.

FIGURE 7-5 Semantic profiles for regular class and special class teachers.(Dots represent regular class teachers and Xs represent special class teachers.)



The Interview

The interview is in a sense an oral questionnaire instead of writing the response, the subject or interviewee gives the needed information orally and face-to-face.

With a skillful interviewer, the interview is often superior to other data-gathering devices. One reason is that people are usually more willing to talk than to write. After the interviewer gains rapport or establishes a friendly, secure relationship with the subject, certain types of confidential information may be obtained that an individual might be reluctant to put in writing. (In order to establish sufficient rapport, however, it may be necessary to consider the sex, race, and possibly other characteristics of the interviewer in relation to the interviewee. For instance, a woman should probably interview rape victims, and a black person should interview other blacks regarding instances of discrimination that they have experienced.)

Another advantage of interviewing is that the interviewer can explain more explicitly the investigation's purpose and just what information he or she wants. If the subject misinterprets the question, the interviewer may follow it with a clarifying question. At the same time, he or she may evaluate the sincerity and insight of the interviewee. It is also possible to seek the same information in several ways at various stages of the interview thus checking the truthfulness of the responses. And through the interview technique the researcher may stimulate the subject's insight into his or her own experiences, thereby exploring significant areas not anticipated in the original plan of investigation.

The interview is also particularly appropriate when dealing with young children "If one were to study what junior high school students like and dislike in teachers, some sort of written schedule would probably be satisfactory. But in order to conduct a similar study with first-grade pupils, the interview would be the only feasible method of getting responses the interview is also well suited for illiterates and those with language difficulties

Preparation for the interview is a critical step in the procedure Interviewers must have a clear conception of just what information they need. They must clearly outline the best sequence of questions and stimulating comments that will systematically bring out the desired responses. A written outline, schedule, or checklist will provide a set plan for the interview precluding the possibility that the interviewer will fail to get important and needed data.

An open-form question in which the subject is encouraged to answer in his or her own words at some length, is likely so provide greater depth of response. In fact, this penetration exploits the advantage of the interview in getting beneath-the-surface reactions. However, distilling the essence of the reaction is difficult, and interviewer bias may be a hazard. The closed determine whether his specimen is better or poorer than a certain sample in the scale.

Kulbir Singh Sindhu (1987)	**Methodology of Research in Education,** 2nd ed. New Delhi: Sterling Publishing Private Limited pp. 175-177	8-2

When he finds the approximate position, which his specimen would occupy on the scale, he assigns the appropriate scale value to it. This requires less judgment than rating without the scale. The scaled specimens also afford an objective representation of values, which aid in preventing undue variation in judgment from time to time.

Scaling Specimens for later use to serve as standards of judgment is done through a systematic procedure. The technique of constructing attitude scales utilizes the same fundamental principle, which has been described later on.

Some of the data-gathering techniques, which are based on appraisal procedures are being discussed below.

Underlying Assumptions. Two principles, on which appraisal instruments are based, represent fundamental assumptions. First, it is assumed that better judgment can be secured on the significant aspect of an object (or situation) by centering attention on one aspect at a time. The second, fundamental assumption involved in all of the instruments, which yield a general total or composite rating, is that general value can be approximated by a summation of the value of parts.

CHECK LISTS

The checklists consist of a list of items with a place to check, or to mark yes or no. The chief purpose of the checklist is to call attention to various aspects of an object or situation, to see that nothing of importance is overlooked. It is a simple laundry-list type of device, consisting of a prepared list of items. It is a type of questionnaire in the form of a set of categories for the respondent to check. It systematizes and facilitates the recording of observations and helps to ensure the consideration of the important aspects of the object or act observed. It ensures the completeness of details of the data. Responses to the checklist items are largely a matter of fact, not of judgment.

Its Uses. The checklist is an important tool in gathering facts for educational surveys. It may also be used as a form for recording in observational studies of behavior. When used as a sort of scale to yield a score, it is an instrument often used in educational appraisal studies-of school buildings, properly, plan, textbooks, instructional procedures and outcomes, etc. For example, one check-list contains the points one should look for when checking over plans, details, and specifications of the architect, including such aspects as healing, ventilation, plumbing, design, materials, electrical work and other special features. There are check-lists designed for possible economies in a school, the purchase of school supplies, appraising for the superintendent's report, and the organization of high schools.

Check-lists are also applied to classroom instructional activities, the studying of the working habits of students, the supervision of classroom instruction, and the teacher-pupil relationships. The check-list which were built up in the Commonwealth Teacher Training Study may be used in a number of ways both for analysis and for evaluation. The extensive list of teacher activities, particularly with the frequency and ratings attached to each activity, provides an important means of checking courses of study for the training of teachers. Another use of the list is the checking of textbooks, which deal with topics related to teaching. One may also go farther in analyzing textbooks by noting the depth of treatment of each topic.

Personality is also sometimes rated by means of a check-list. It would be possible, for example, to use the list of traits and traits actions derived in the Commonwealth Teacher-Training Study as a check-list for the personality trails of a school worker. Hartshorne and others have made use of check-lists in the Character Education Inquiry. A comprehensive list of items pertaining to all the possible personality or character traits is prepared and the statement are checked by the subject himself. The response of each statement will reflect some aspect of his personality/character. Check list is used for knowing the interest of the subject also, Kuder’s Interest Inventory and Strong’s Interest Blank are essentially checklists.

Hints on Constructing and Using a Checklist

1. The list of items in the checklist may be continuous or divided into groups of related items.
2. These lists are formulated on the basis of the judgment of experts and then each item is evaluated in respect of the number of favorable and unfavorable responses.
3. The items are arranged in categories and the categories in a logical or psychological order. Related items are grouped together.
4. Terms used in the items are clearly defined.
5. An intensive survey of the literature is made to determine the type of checklists to be used in an investigation.
6. Items are arranged in such a way that they are discriminative in quality i.e. to secure the required information and details.
7. Check lists have the quality of completeness and comprehensiveness. A pilot study is quite helpful in this direction.

Four Common Styles of Constructing Checklists. Check list items can be arranged in several ways. However Kempfer suggests the following four common styles of arrangement:

1. In one of the arrangements, all items found in a situation are to be checked. For example, a subject may be asked to check ( ) in the blank beside each activity undertaken in a school.

—Games and Sports
—Morning Assembly
—Mass Drill
—Scouting,
—Dramatics
—N.C.C. Training, and so on,

~~1.~~2. In the second form, the respondent is asked to check with a yes or no or asked to encircle or underline the response lo the given item, for example:

i. Does your school have a house system ? yes/no
~~i.~~ii. Do your have open shelf system in your school library? yes/no
~~ii.~~iii. Does your school have a separate common room for girl students? yes/no.

3. This is the form in which all the items are positive statements with checks ( ) to be marked in a column on the right, for example,
   i. Half of the students in the school belong to scheduled castes. ( )
   ii. The school functions as a community centre. ( )
   iii. The parent-teacher association of the school is an active organization. ( )
4. In the fourth form, the items are presented in sentences and the appropriate response out of the supplied responses is checked, underlined or encircled, for example,
   i. The student's union organizes various student activities — weekly, fortnightly, monthly, irregularly..
   ii. The staff meeting is held—fortnightly, monthly, yearly, irregularly
   ~~i.~~iii. The periodical tests are held—fortnightly, monthly, quarterly, irregularly.

The investigator has to select the style appropriate to his problem and queries. He may use a number of the above forms or all of the above forms in combination.

Analysis and Interpretation of Checklist Data. The tabulation and quantification of check-list data is done in the same way as of the questionnaire responses. Frequencies are counted percentages and averages calculated central tendencies measures of variability and coefficients of correlation computed as and when required. In long check lists, where related items are grouped together category-wise, the checks are added up to give total scores for the categories in question such category-wise total scores can be compared between themselves or with similar scores secured through other studies.

The conclusions from checklist data should be arrived at carefully and judiciously keeping in view the limitations of the tool as well as those of the respondents.

RATING SCALES

It is probably the most commonly used instrument for making appraise is. Many of the variables with which research is concerned cannot be measured directly the degree of their existence has to be estimated on the basis of subjective judgment. The variables are of such a nature that they can be ranked or rated only in crude categories along a certain continuum in each case. Rating differs from measurement in the refinement with which classification can be made. Rating implies the ability to estimate the states of a phenomenon or trait—that is, to make a subjective judgment of is status. Rating is a term applied to expression of opinion or judgment regarding some situation, object or character. An individual, for example, may be rated with respect to various aspects of efficiency. Opinions are usually expressed on a scale of values. Rating techniques are devices by which such judgments, may be quantified.

Kulbir Singh Sidhu (1987)	**Methodology of Research in Education,** 2nd ed. New Delhi, Sterling Publishing Private Limited. pp. 177-182.	8-3

Suppose it is intended to measure an individual's loyalty. There are no foot rule methods, which apply to such a trait. After a large number of specific characteristics or traits bearing upon loyalty have been formulated, ratings may be made from several points of view and combined into a single score.

Ratings can be obtained through one of three major approaches:

1. paired comparison, 2. ranking, and 3. rating scales. The first attempt; at rating personality characteristics was the man-to-man technique devised during World War I. This technique calls for a panel of raters to rate every individual in comparison to a standard person. A similar approach is to compare every single individual in a group with every other individual, and to arrange the judgments so derived in the form of a scale. The more common and more practical method of rating is based on the rating scale, a procedure, which consist of assigning to each trait being rated a scale value giving a valid estimate of its status, and then combining the separate ratings into an overall score. It is assumed that a more valid appraisal of a phenomenon can be obtained by the summation of the separate ratings of some of its critical components than by a general overall judgment:

According to Goode and Hatt, the design of rating technique must always take into account the existence of three elements; the judges who will do the rating, the phenomena to be rated, and the continuum along which they will be rated. The scale may take any of a number of different forms, it may be simply a series of numbers, or a graduated line, or quantitative terms such as 'good', 'poor', etc. or a series of named attributes peculiar to each scale, or a series of carefully worded descriptions of states representing different degrees of each aspect to be rated. The procedure may consist simply of statements which describe various forms of individual's behavior, such as talks too much, Accurate but very deliberate, Works well without supervision, etc. Some-times specimens of work i.e.

handwriting representing various levels of merit, for example, may be placed on a continuum according to values determined by a jury.

Uses of Rating Scale. A simple form of rating scale is commonly employed in Judging contests of various kinds such as speaking, declamation contests and music competitions.

Rating scales have been put to extensive uses in the field of rating teaching and teachers. This process extends to the selection of teachers and the prediction of teaching success. Closely related to the field of teacher rating is the general area of personality and character rating. These fields constitute the chief application of rating scales and instruments of many varieties have been constructed. There are scales with various degrees of refinement in the description of traits and of different levels of each trait. There are also a number of self-rating scales. Two rating scales should receive separate mention here. The first is Scott's Army Rating Scale, commonly known as the Man-to-Man Scale. One thinks of persons has knows who represent the highest degree, the lowest degree, etc. of each quality as it is described on the scale. He then compares the individual to be rated with these selected scale persons. The great difficulty lies in the first step, namely, the selection of appropriate men to represent the scale. Another form of identifying persons with given traits is found in the Character Education Inquiry,' Guess who test', in which a series of character or personality descriptions is given for hypothetical individuals, and the pupils in a class are asked to write under each description the name of any classmate who seems to them to represent such a type of person.

"Rating scale; are also used for testing the validity of many objective instruments like paper-pencil inventories of personality.

They are also employed for school appraisal including appraisal of courses, practices and programmes.

The rating scales are advantageous in several other ways that is they are:

i. helpful in writing reports to parents.
ii. helpful in filling out admission blanks for colleges.
iii. helpful in finding out student needs.
iv. helpful in making recommendations to employers.

v. helpful in supplementing other sources of understanding about the child, and

vi. helpful in their stimulating effect upon the individuals who are rated.

Types of Rating Scales

1. Descriptive Rating. The rater puts a check (✓) in the blank before the characteristic or trait which is described in a phrase. In order to judge the pupil's initiative, for example, the rater may be asked to tick mark the most befitting description out of the following:———Shows marked originality

———Willing to take initiative.

— ———Quite inventive,

———On the whole unenterprising.

———Very on others.

2. Numerical Scale. Here numbers are assigned along a continuum or a straight line to judge the intensity of any trait. If it is a seven-point scale, the number 7 represents the maximum amount of that trait in the individual being rated, 4 represents the average amount and so on.

3. The Graphic Scale. This is similar to the descriptive scale, except that it is written in a different way. It is also called "Behavioral Statement Scale.' It may be arranged in two ways. One is the Simple Scale, like, for example:

Responsibility for duty

Very High   High   Average   Low   Very Low

The second is like this,

Social Attitude

Anti Social   Self-Centered   Has no positive attitude   Usually considerate of others   Strongly altruistic

4. **The Percentage of Group Scale**. Here the rater is asked to give the percentage of the group that possesses the trait on which the individual is rated. For example, for rating the honesty of an

individual, the rater may check one of the following:

———Falls in the top 1 per cent

———Falls in the top 10% but not in the top 1%

———Falls in the top 25% but not in the top 10%

———Falls in the top 50% but not in the top 25%

———Falls in the lower half, but not in the bottom 25%

——— Falls in the bottom 25%, but not in the bottom 10%

———Fall ion the bottom 10% but not in the bottom 1%

———Falls in the bottom 1%.

5 **Man to Man Scale**. The rater is asked to rate the ratee by comparing him to the person mentioned on the scale and assign the ratee his position. For example A, B, C, D and E are the persons who have been already rated as very persistent, not easily stopped, works quite steadily, somewhat changeable, gives up easily and for example, the rate is persistent like

A B C D E

Hints on the construction and use of Rating Scales

1. Define several points on each scale with as great precision as possible.
2. The specific trait or mode of behavior must be defined properly. The traits like honesty, initiative, originality need to be defined.
3. The usual way to get qualitative-cum-quantitative judgments on the selected aspects of a thing or person is to set up three to seven categories. The rater should clearly know that he is rating at a three, four, five or seven point scale.
4. The trait to be rated should be readily observable.
5. Avoid words such as average in the middle range of the scale. The rater who does not wish to give too much effort to the rating procedure is likely to class too many as average.
6. The number of characteristics to be rated should be limited.
7. The directions should be clear and comprehensive. Also

indicate the need for honest rating.

8. Items may be arranged in ascending or descending order from left to right.
9. Well informed and experienced persons should be selected for rating. Their number should be large to the reliability of any scale.
10. In the rating scale cards some space may be provided for the rater to write some supplementary material.

Limitations of Rating Scale

The rating scales suffer from many errors and limitations:

1. *Generosity Error.* The raters would not like to run down their own people by giving them low ratings. The result is that high ratings are given in almost all cases. It has been verified that 60% to 80% of an unselected group tend to receive above-average ratings in all traits. The raters are also inclined to be unduly generous in rating aspects which they have had no opportunity to observe.

2. *The Halo Error.* It is difficult for rater to get rid of the halo effect, which causes him to carry qualitative judgment from one aspect to another. For example, one tends to rate a person with a pleasing personality high on traits like initiative, loyalty also. Halo effect appears frequently when the rater has to rate a number of factors on some of which he has no evidence for judgment.

3. *The Error of Central Tendency*. There is a tendency in some. The rating scale involves qualitative description of a limited number of aspects of a thing or of traits of a person. The-classifications may be set up in five to seven categories in such terms as:

John.w. Best and James V.Kahn(1992)	**Research in Education,** 6th ed. New Delhi, Prentice Hall of India Private Limited. pp. 179-180	8-4

1. superior	above average	average	fair	inferior
2. excellent	good	average	below average	poor
3. always	frequently	occasionally	rarely	never

Another procedure establishes positions in terms of behavioral or situational descriptions. These statements may be much more specific and enable the judge to identify more clearly the characteristic to be rated. Instead of deciding whether the individual's leadership qualities are superior or above average, it may be easier to decide between "Always exerts a strong influence on his associates." and "Sometimes is able to move others to action."

One of the problems of constructing a rating scale is conveying to the rater exactly which quality one wishes evaluated. It is likely that a brief behavioral statement is more objective than an adjective that may have no universal meaning in the abstract. For this to be considered an effective method in observational research, the traits and categories must be very carefully defined in observable (behavioral) terms.

Rating scales have several limitations. In addition to the difficulty of clearly defining the trait or characteristic to be evaluated, the halo effect causes raters to carry qualitative judgment from one aspect to another. Thus there is a tendency to rate a person who has a pleasing personality high on other traits such as intelligence or professional interest. This halo effect is likely to appear when the rater is asked to rate many factors, on a number of which he has no evidence for judgment. This suggests the advisability of keeping at a minimum the number of characteristics to be rated.

Another limitation of rating is the raters' tendency to be too generous. A number of studies have verified the tendency to rate 60 to 80 percent of an unselected group above average in all traits. Rating scales should carry the suggestion that raters omit the rating of characteristics that they have had no opportunity to observe.

Score Card

The score-card, similar in some respects to both the checklist and the rating scale, usually provides for the appraisal of a relatively large number of aspects. In addition, the presence of each characteristic or aspect, or the rating assigned to each has a predetermined point value. Thus the score-card rating may yield a total weighted score that can be used in the evaluation of the object observed. Score-cards are frequently used in evaluating communities, building sites, schools, or textbooks. Accrediting agencies sometimes use the score card in arriving at an overall evaluation of a school.

Score-cards have been designed to help estimate the socioeconomic status of a family. Such aspects as type of neighborhood, home ownership, number of rooms, ownership of a piano, number of books in the library, number and type of periodicals subscribed to, presence of a telephone, occupations of parents, and organizational membership of the adults are all considered significant and have appropriate point values assigned.

The limitations of the score card are similar to those of the rating scale. In addition to the difficulty of choosing, identifying, and quantifying the significant aspects of the factor to be observed, there is the suspicion that the whole of a thing may be greater than the sum of its parts.

Colleges and universities are frequently evaluated in terms of such elements as size of endowment, proportion of faculty members holding the earned doctoral degree, pupil-teacher ratio, and number of volumes in the library. Although these aspects are important, the effectiveness of an in situation may not be accurately appraised by their summation, for certain important intangibles do not lend themselves to score-card ratings:

The Scaled Specimen

The scale specimen, although not frequently encountered in behavioral research, provides a method for evaluating certain observed levels of per- romance or measures of a quality in question.

Testing a solution for acidity in a chemistry laboratory involves a pH test. A drop of color indicator is introduced into a sample of the solution. The resulting color of the solution is matched with the color of one of a set of display vials, indicating the percentage of acidity in the solution.

One of the early scaled specimens developed in the field of education was the handwriting scale developed by Thorndike. From a large sample of handwriting exhibits taken at different ages and grade levels, norms were established. The handwriting to be evaluated was then mached with the exhibit sample, yielding a measure of handwriting quality.

The Good enough-Harris Drawing Test (Harris, 1963) provides a 71-point scale with examples for comparing various details of a child's drawing of a man, a woman, or a self-portrait. Each point is scored + or 0, indicating the presence or absence of a part of body detail in the figure drawn. The total of + scores is equated with separate age norms, established for boys and girls. The scale is based on the assumption that as individuals mature intellectually, they perceive greater detail in the human figure that they reveal in their drawings. Variations of the test include Draw a Man, Draw a Woman, and Draw Yourself. Studies have reported correlations as high as +.60 to +.72 with the Stanford-Binet Intelligence Scale.

Kulbir Singh Sindhu(1987)	**Methodology of Research in Education,** 2nd ed. New Delhi. Sterling Publishing Private Limited. pp. 182-188	8-5

METHODOLOGY OF RESEARCH

Attitude Scales

Attitude scales have been designed to measure attitudes of a subject or group of subjects towards issues, institutions and groups of people.

The term attitude has been defined in various ways, such as:

L.L. Bernard—"The behavior which we define as attitudinal or attitude is a certain observable' set' organism or relative tendency preparatory to and indicative of more complete adjustment."

Barr, David, and Johnson—"An attitude may be defined as a learned emotional response set for or against something.

Attitude is a bipolar dispositional complex which, for the purposes of measurement, may be regarded as located on an intensity gradient ranging from extreme disapprobation to hearty approval in respect of a particular object, social institution or practice or a corresponding proposition, e.g. regarding tobacco or alcohol, the dowry system, begging, communism, the U.N.O., teacher training, caste system, religion, capital punishment.

An attitude is spoken of as a tendency of an individual to react in a certain way towards a particular object, stimulus, situation, process or phenomenon.

Attitude is what a person feels or believes in. It is the inner feeling of an individual. It may be either positive, neutral or negative.

Attitude-objects may be extremely general, as in the case of an attitude relating to conservatism or liberalism, or extremely specific as in the case of one's attitude concerning vaccination.

Opinion and attitude are used in a more or less synonymous manner by many writers. But there is some subtle difference between the two. An opinion is just an expressed attitude. An opinion may not lead to any kind of activity in a particular direction. But an attitude compels the individuals to act either favorably or unfavorably according to what they perceive to be correct. How people feel or what they believe is their attitude. But it is difficult to specify and describe and ultimately measure the feeling or belief known as attitude. Researchers must depend upon what people say are their beliefs and feelings. This is the area of opinion. Through the use of questions or by getting people's reactions to statements, a sample of their opinions is obtained. From this statement of opinion, one may infer or estimate their attitudes.

The process of inferring attitude from expressed opinion has many limitations. People may conceal their attitude and express only socially acceptable opinions. They may not really know how they feel about an issue, they may never have given the idea serious consideration. People may be unaware of their attitudes about a situation in the abstract. Until confronted with a real situation, they may be unable to predict their reaction or behavior. Even behavior itself is not always a true indication of attitude. When politicians kiss babies, their behavior may not be a true expression of affection towards infants. Social custom or desire for social approval makes many overt expressions of behavior mere formalities, quite unrelated to people's inward feelings. Even though there is no sure method of describing and measuring attitude, the description and measurement of opinion may be closely related to people's real feelings or attitudes. Real attitude may still remain concealed and the people may provide expressions of socially acceptable opinions only. Expressed opinions or even overt behavior may be quite unrelated or even opposite to the real attitude.

Under the assumption that description and measurement of opinion is closely related, to the real feelings or attitude, some methods have been devised and used to measure attitudes. Some of these methods are:

1. Asking the individual directly how he feels about a subject through the use of a schedule, questionnaire or interview.

2. Asking the individual to check the statements in a list with which he is in agreement.

3. Asking the individual to indicate the degree of his agreement or disagreement with a series of statements about a controversial subject.

4. Inferring an individual's attitude from his reaction to projective devices through which he may reveal his attitude unconsciously.

One approach to the evaluation of attitudes has been through the use of questionnaires. Lists of operational statements are assembled, and the individual whose attitude is being evaluated is asked to record his probable reaction towards the various types of behaviors proposed. Each statement is pointed to one extreme or the other of the attitude that is being appraised. A wide variety of situations may be presented. It is possible in many cases to prevent the individual from detecting the nature of the attitude, which is being evaluated. A 'yes' or 'no' response, however, may afford little opportunity for the individual to record the intensity of his beliefs. The questionnaire is no doubt relatively easy to construct but is ill adapted for scaling accurately the intensity of an attitude.

The scale-type instrument attempt to minimize this difficulty by defining the attitude in terms of a single attitude-object. All, therefore, may be constructed with gradations of favor or disfavor, thus enabling the individual to register the extent of his attitude. Each item is evaluated by consensus of opinion as to its bearing upon the attitude and is assigned a score value.

Several other types of scales have been constructed. One of these makes possible the measurement of intensity by use of items referring specifically to the degree to which an attitude is accepted or rejected. An individual may check items giving his strong, average or weak approvals. Indirect methods of evaluating attitude tend, .however, to be more accurate than direct methods in determining the direction and intensity of an attitude. Techniques, which disguise the attitude object and thus illicit spontaneous reactions are preferable to direct questions. Determination of scientifically usable scale values based on psychophysical methods has been found helpful. Chief characteristics, of a good attitude scale are given below:

Characteristics

1. It provides for quantitative measure on a unit-dimensional scale of continuum.
2. It uses statements from the extreme positive position to extreme negative position
3. It generally uses a five-point scale as

   Strongly Agree (SA), Agree (A), Undecided (U), Disagree (D) and Strongly Disagree (SD). The individual gets the score as the sum of item credits.
4. Or, it may require the judges to pile up the given statements and compute the scale values according to the percentage of judges who place each statement in the different categories. It gives the individual a score on the basis of the median scale values of the statements he has endorsed.
5. It is usually standardized and norms are worked out.
6. It disguises the attitude object rather than directly asking about the attitude on the subject.

Purposes

It will be useful at this stage to know the purposes of attitude scales. In educational research, these scales are used especially for finding the attitudes of persons on issues like co-education, religious education, corporal punishment, democracy in schools, linguistic prejudices, international cooperation, etc. depending upon the need of the situation.

SOME ATTITUDE SCALES

Two popular and useful methods of measuring attitudes indirectly, commonly used for research purposes are the Thurston *Technique of Scaled Values and Likert's Method of Summated Ratings*. Some others are Guttman's Scale Analysis, Coomb's Unfolding Technique and Lazarsfeld's Latent Structure. A brief description of these is given below:

Thurston Technique

If attitude is accepted as a uni-dimensional linear continuum, then Thurston's proposal to measure it by statements scaled by the method of equal-appealing intervals would apply. The procedure is fairly simple. A large number of statements of various shades of favorable and unfavorable opinions on the issue under investigation are written down on slips of paper, which a large number of judges exercising complete detachment sort out into *eleven* piles ranging from the most hostile statements to the most favorable ones. The opinions are carefully worded so as to be clear and unequivocal. The judges are asked not to express their opinion but to sort them at their face value. The items, which bring out a marked disagreement between the judges in assigning a position are discarded. Tabulations are made which indicate the number of Judges who placed each item in each category. The next step consists of calculating cumulated proportions for each item and ogives are constructed. Scale values of each item are read from the ogives, the values of each item being that point along the base line in terms of scale value units above and below which 50% of the judges placed the item. It will be the median of the frequency distribution in which the scores range from 0 to 11.

Sample Items from Thurstone Type Scales

Statement	**Scaled Value**
I think this company treats its employees better than any other company does.	10.4
If I had to do it over again I'd still work for this Company.	9.5
The workers put as much over on the company as the company puts over on them.	5.1
You've got to have pull with certain people around here to get ahead.	2.1
An honest man fails in this company.	0.8

The respondent is to give his reaction to each statement by endorsing or rejecting it. The median values of the statements that he checks establish his score, or quantifies his opinion. He wins a score as an average of the sum of the values of the statements he endorses.

Thurston's technique is also known as the technique of equal appearing intervals.

The Likert Scale

The Likert scale uses items worded for or against the proposition, with five-point rating response indicating the strength of the respondent's approval or disapproval of the statement. This method removes the necessity of submitting items to the judges for working out scaled values for each item. It yields scores very similar to those obtained from the Thurston scale. It is considered an improvement over the Thurston method.

The first step is the collection of a number of statements about the subject in question. Statements may or may not be correct but they must be representative of opinion held by a substantial number of people. They must express definite favorableness or unfavorableness to a particular point of view. The number of favorable and unfavorable statements should be approximately equal. A trial test may be administered to a number of subjects. Only those items that correlate with the total test should be retained.

The Likert scaling technique assigns a scale value to early of the five responses. All favorable statements are scored from the maximum to minimum, i.e. from a score of 5 to a score of one or 5 for strongly agree and so on 1 for strongly disagree. The statements opposing the proposition would be scored in the opposite order i.e. from a score of 1 to a score of 5 or 1 for strongly agree and so on 5 for strongly disagree.

The total of these scores on all the items measures a respondent's favorableness towards the subject in question. If a scale consists of 30 items, say, the following score values will be of interest.

30x5=150 Most favorable responses possible.
30x3= 90 A neutral attitude.
30x1==30 Most unfavorable attitude.

It is thus known as a method of summated ratings. The summed up score of any individual would fall between 30 and 150. Scores above 90 will indicate a favorable and scores below 90 an unfavorable attitude.

Sample Items from Likert Type Minnesota Scale on Morale

Responses	***Items***
SA A U D SD	Times are getting better
SA A U D SD	Any man with ability and willingness to work hard has a good chance of being successful.
SA A U D SD	Life is just a series of disappointments.
SA A U D SD	It is great to be living in these exciting times.
SA A U D SD	Success is more dependent on luck than on real ability.

Guttman's Scale Analysis

Guttman, an extremely original worker offered a criticism of the above type of scales from which he educed certain original principles of scaling. The scales so far considered, permit a person to endorse a severe opinion and refrain from endorsing a mild one. Is it logical for a person to agree with 'Prohibition is the greatest single promoter of happiness in a civilized society" and withhold agreement with 'Prohibition will prevent the break-up of many a family? If the first statement occupies a higher scale status than the second, should it not contain, assent to the first as a precondition of its endorsement? Is it a logical scale of distance that a yard does not include a foot? Guttman brought up this pertinent criticism in 1942 and subsequently proposed a form of scaling known as scale analysis which really is a procedure for devising a scale calculated to be uni-dimensional and such as would lead us back from the total value to the pattern of responses. The index of reproducibility shows to what extent the principle of a stronger opinion including and lying beyond the weaker is honored by any ordered string of statements. If reproducibility is low and there is reversal of endorsements on statements of low and high value, many of the conditions of scalability of the area are not met. The technique of scalogram analysis sorts out statements, which yield a reproducible scale, and has been described completely by him. It is felt that the logical foundations of the Guttman technique are correct and unbiased scientific effort should be directed to use the Guttman rationale for future developments of a constructive nature in the field of attitude measurement.

Coomb's Unfolding Technique

Under the Thurstone method judges are required to allocate statements into 11 piles from the point of view of their strength. The personal attitude on the question is not allowed to affect the judgment. That much detachment is possible is a demonstrable fact. It has however been contended that one's own status on the attitude scale is likely to color one's judgments. It would be more natural to judge every statement for its severity or favorableness from one's habitual status on the attitude continuum. Coombs has developed the rationale of and unfolding techniques which, bestows on the respondent the central status in the process of judging. Every person is required under this method to rank the statements in the order of their distance from his point of view. A median status person will give a low rank to extreme statements irrespective of directions. Thus he becomes the hinge and the scale extending on both sides of him a folding tape.

Lazarsfeld's Latent Structure

His latent structure analysis is a general mathematical formulation, which incorporates within itself Guttman's idea of unidimensionality and relates it to the theory of factor analytic extraction of underlying uniformity, which constitutes a genuinely scalable variable. In factorizing tests we derive common factors, which explain the intercorrelation of tests. Lazarsfeld is also interested in interrelations or items of attitude scales. THC-Superman view of factors holds that tests correlate because of an underlying common clement called g. In this conceptual frame the actual test it a man of heterogeneous elements and the g the pure, une-dimensional and scalable variable. Lazarsfeld applies these factorial criteria to the attitude area.

The research student will have now appreciated how varied are the approaches to the single problem of scaling of stimuli. All .the methods briefly summarized here are of the utmost importance in the scientific type of research.

Limitations of Attitude Scales

1. As already slated, an individual may express socially acceptable opinions and conceal his real attitude.
2. An individual may not be a good judge of himself and may not be clearly aware of his real attitude,
3. He may not have been confronted with a real situation to discover what his real attitude towards a specific phenomenon was.
4. There is no basis for believing that the five positions indicated in the Likert scale e.g. are equally spaced.
5. It is unlikely that the statements arc of equal value in 'forness' or 'against ness'.
6. It is doubtful whether equal scores obtained by several individual would indicate equal favorableness towards a given position. Different combinations of position can yield equal score values without necessarily indicating equivalent positions of attitude or opinion.
7. It is unlikely that a respondent can validly react to a short statement on a printed form in the absence of real life-qualifying situation.
8. Inspire of an anonymity of response, individuals tend to respond according to what they should feel rather than what they really feel.

However, until more precise measures are developed/the altitude scales, remain the best devices for the purpose of measuring attitudes and beliefs in social research. They determine the direction and intensity of it person's feelings for or against some belief or practice. They are used to measure any changes in altitude which may result from factors Introduced purposely or occurring independently.

SCORE CARDS

Scorecard is the most elaborate form of rating instrument often called a numerical rating scale. There is no sharp dividing line between ruling scales and scorecards. In scorecard the items are evaluated usually in numerical terms.

John. W. Best and James V. Kahn(1992)	**Research in Education,** 6th ed. New Delhi, Prentice Hall of India Private pp.174-179	8-6

OBSERVATION

From the earliest history of scientific activity, observation has been the prevailing method of inquiry. Observation of natural phenomena, aided by systematic classification and measurement, led to the development of theories and laws of nature's forces. Observation continues to characterize all research: experimental, descriptive, and historical. The use of the technique of participant observation in ethnological research was described in Chapter 4. The importance of observational techniques for single-subject research, and some aspects of the methodology involved in using them, was discussed in Chapter 6.

A reason why observation is most often used in single subject capermental research is that it is very costly to observe a sufficient sample of behavior for a large number of subjects. Observation must occur during a number of baseline and intervention sessions in this type of research. In a study described in Chapter 6, Fantuzzo and Clement (1981) observed the attending behavior of their subjects. This is an example of the type of observation technique known as time sampling (see Chapter 6 for a description). Every 60 seconds, the subjects were observed to see if they were attending to their task.

In Chapter 5, a study by Hall, et al. (1973) was used as an example of an equivalent time-samples design. Observation was used to collect the data in this study, also. The observers counted the number of occurrences of aggressive behavior, the technique known as frequency count (described in Chapter 6) in experimental research, observation is most frequently the method of choice for behavior modification studies that frequently use single-subject research designs (e.g., Fantuzzo & Clement, 1981). It is rare to see observation used in group designs (those described in Chapter 5). unfortunately more because, of the cost than because it is less appropriate than the other measures used in its place.

As a data-gathering device, direct observation may also make an important contribution to descriptive research. Certain, types of information, can best be obtained through direct examination by the researcher. When the information concerns aspects of material objects or specimens, the process is relatively simple, and may consist of classifying, measuring, or counting. But when the process involves the study of a human subject in action, it is much more complex.

One may study the characteristics of a school building by observing and recording such aspects as materials of construction, number of rooms for various purposes, size of rooms, amount of furniture and equipment presence or absence of certain facilities, and other relevant aspects. Adequacy could then be determined by comparing these facilities with reasonable standards previously determined by expert judgment and research.

In university athletic departments or professional football organizations, observation has been used effectively to scout the performance of opposing football teams. Careful observation and recording of the skills and procedures of both team and individual players are made, and defenses and offenses are planned to cope with them. What formations or patterns of attack or defense are employed? Who carries the ball? Who does the passing, and where and with what hand does he pass? Who are the likely receivers, and how do they pivot and cut?

During a game a coaching assistant may sit high in the stands, relaying strategic observations by phone to the coach on the bench. At the same time, every minute of play is being recorded on film for careful study by the coaching staff and players. Who missed his tackle when that play went through for 20 yards? Who missed his block when play number two lost 6 yards? Careful study of these films provides valuable data on weaknesses to be corrected before the following game. Through the use of binoculars, the phone, the motion picture camera, and the video tape recorder, observations can be carefully made and recorded.

Although this example may seem inappropriate in a discussion for observation as a research technique, improving the performance of a foot ball team is not altogether different from analyzing learning behavior in a classroom. The difference is one of degree of complexity. The objectives of the football team are more concretely identifiable than are the more complex purposes of the classroom. Yet some of the procedures of observation so effective in football coaching may also be systematically employed in studying classroom performance. In some schools, teachers make short periodic classroom or playground observations of pupil behavior, which are filed in the cumulative folder. These recorded observations, known as *anecdotal reports*, may provide useful data for research studies.

Laboratory experimentation seeks to describe action or behavior that will take place under carefully arranged and controlled conditions. But many important aspects of human behavior cannot be observed under the contrived conditions of the laboratory. Educational research seeks to describe behavior under less rigid controls and more natural conditions. The behavior of children in a classroom situation cannot be effectively analyzed by observing their behavior in a laboratory. It is necessary to observe what they actually do in a real classroom.

This does not suggest that observation is haphazard or unplanned. On the contrary, observation as a research technique must always be systematic, directed by a specific purpose, carefully focused, and thoroughly recorded. Like other research procedures, it must be subject to the usual checks for accuracy, validity, and reliability.

The observer must know just what to look for. He or she must be able to distinguish between the significant and insignificant aspects of the situation. Of course, objectivity is essential, and careful and accurate methods of measuring and recording must be employed.

Because human behavior is complex, and many important traits and characteristics are difficult or impossible to observe directly, they must be carefully defined in precise operational form. Perhaps a subject's interest can be operationally defined by the number of times a student volunteers to participate in discussion by raising his or her hand within a time sample period. Lack of concentration during a study period can be operationally defined by the number of times the student looks around, talks to another student, fiddles with a book, pen, or paper, or engages in other distracting acts within a time sample period. These examples of operational definitions may be unsatisfactory, but they do illustrate the kinds of behavior that can be directly observed.

Behaviors that might mean different things to different observers music also be carefully defined. Acting-out behavior may mean very disruptive acts such as fighting or at the other extreme, any behavior for which the child did not first obtain permission, such as sharpening a pencil. In defining which behaviors meet the meaning of acting out, the researcher would need first to determine the class rules to avoid labeling permissible behavior as "acting out."

Instruments such as the stopwatch, mechanical counter, camera, audiometer, audio and videotape recordings, and other devices make possible observations that are more precise than mere sense observations. Having a permanent record on videotape also permits the researcher to start and slop the action for more accurate recording of data (especially, when more than one subject is to be observed), to collect inter-observer reliability data (see next section) without having two or more observers at the observation site, and to reexamine his or her ideas and decide on a new format for coding behaviors. Where feasible, we recommend the video recording of the behaviors under study.

Systematic observation of human behavior in natural settings (e.g.. classrooms) is to some degree an intrusion into the dynamics of the situation. This intrusion may be reactive, that is, affect the behavior of the pennon(s) being observed. These potential confounding effects cannot be ignored. It is widely believed that individuals do not behave naturally when they know that they are being observed. The situation may become too artificial, too unnatural, to provide for a valid series of observations.

Concealing the observer has been used to minimize this reactive effect. Cameras and one-way screens were used by Gesell (1948) to make unobtrusive observations of infant behavior. One-way glass and concealed microphones and videotape recorders have been used in observing the behavior of children in natural group activities so that the observers could see and hear without being seen and heard.

Some authorities believe that the presence of an outside observer in the classroom over a period of time will be taken for granted, viewed as a part of the natural setting, and have little effect on the behavior observed. Others feel that introducing observers as active participants in the activities of the group will minimize the reactive effect more efficiently.

Should the participant observers make their purposes known to that members of the group observed? Some feel that concealing the intentions of the participant observers raises ethical questions of invasion of privacy and establishes a false, hypocritical, interpersonal relationship with the individuals in the group. Do this ends of science justify the means of deception? In a society that increasingly questions the ethics of science, this issue must be confronted.

Validity and Reliability of Observation

For the researcher's observations to achieve satisfactory degree of content validity, the truly significant incidents of behavior must be identified and sampled. Supplementing the knowledge and skill of the researcher, the judgment of experts in the field may help in selecting a limited number of observable incidents whose relationship to the qualities of interest is based upon sound, established theories.

Criterion-related and construct validity may also be necessary depending on the purpose of the study and inferences made regarding behaviors. For instance, if certain behaviors were considered to be evidence of a person being shy, construct validity is needed to demonstrate a relationship between the behaviors and the underlying construct.

The reactive effect of the intrusion of the observer as a threat to the reliability of the process has been mentioned. In addition, when researchers are sole observers, they unconsciously tend to see what they expect to see and to overlook those incidents that do not fit their theory. Their own values, feelings, and attitudes, based upon past experience, may distort their observations. It may be desirable to engage others who are then well-prepared as observers, restricting the researchers' role to that of interpreter of the observations. Kazdin (1982) recommends that the researcher not be the observer. To further reduce the possibility of bias, the observers should be kept as ignorant as possible regarding the purposes and hypotheses of the study. This is called a blind. If the persons being observed also are unaware that they are participants in an experiment, thereby reducing the chances of a placebo effect, this becomes a double-blind.

Independent observers should be prepared by participation in

1. The development of the procedures for observing and recording observation.
2. The try-out or dry run phase of the procedure
3. The critique of the results of the try-out phase.

If more than one observer is necessary (as is usually the case), reliability among the observers should be demonstrated. This is done by having each participant observe with at least one other participant for a period of time and compare their recorded observations. Percent of agreement among observers should be quite high (usually 90% or higher) if the observations are to be considered reliable. High inter-observer reliability is most likely when the behaviors to be observed are well defined and the observers well trained.

Recording Observations

If it does no distract or create a barrier between observer and those observed, simultaneous recording of observations is recommended. This practice minimizes the errors that result from faulty memory. There are other occasions when recording would more appropriately be done afire observation. The recording of observations should be done as soon as possible, while the details are still fresh in the mind of the observer. But many authorities agree that objectivity is more likely when the interpretation of the meaning of the behavior described is deferred until a later time, for simultaneous recording and interpretation often interfere with objectivity. Obviously, a video record permits later recording and coding of the observed behaviors.

Systematizing Data Collection

To aid in the recording of information gained through observation, a number of devices have been extensively used. Checklists, rating scales, score cards, and scaled specimens provide systematic means of summarizing or quantifying data collected by observation or examination.

Checklist

The checklist, the simplest of the devices, is a prepared list of behaviors or items. The presence or absence of the behavior may be indicated by checking yes or no, or the type or number of items may be indicated by inserting the appropriate word or number. This simple "laundry-list" type of device systematizes and facilitates the recording of observations and helps to ensure the consideration of the important aspects of the object, or act observed. Readers are familiar with checklists prepared to help buyers purchase a used car, choose a home site, or buy an insurance policy, which indicate characteristics or features that one should bear in mind before making a decision. Appendix G illustrates a checklist of this type for the evaluation of a research report.

Checklists also can be used to count the number of behaviors occurring in a given time period. In Chapter 6, we described a study by Fantuzzo and Clement (1981) in which they observed whether each child was attentive every 60 seconds during a class period. They most likely used a checklist to mark and later count, the number of times each child was and was no attending to the task.

Rating Scale

The rating scale involves qualitative description of a limited number of aspects of a thing or of traits of a person. The classifications may be set up in five to seven categories in such terms as:

1. superior	above average	average	fair	inferior
2. excellent	good	average	below average	poor
3. always	frequently	occasionally	rarely	never

Another procedure establishes positions in terms of behavioral or situational descriptions. These statements may be much more specific and enable the judge to identify more clearly the characteristic to be rated. Instead of deciding whether the individual's leadership qualities are superior or above average, it may be easier to decide between "Always exerts a strong influence on his associates." and "Sometimes is able to move others to action."

One of the problems of constructing a rating scale is conveying to the rater exactly which quality one wishes evaluated. It is likely that a brief behavioral statement is more objective than an adjective that may have no universal meaning in the abstract. For this to be considered an effective method in observational research, the traits and categories must be very carefully defined in observable (behavioral) terms.

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Carter V.Good And Douglas E. Scates(1992)	**Methods of Research in Education,** Psychological Sociological, New York. Appleton- Century Crofts. Inc. pp-635	8-7

QUESTIONNAIRE AND INTERVIEW TECHNIQUES

INTERVIEW TECHNIQUES AND STUDIES[111]

The treatment of the interview in this section is considerably briefer than the preceding section dealing with the questionnaire, since many of the concepts and techniques presented in discussing questionnaire procedure are applicable to interviewing. Skillful interviewing, however, is not to be regarded as an oral questionnaire.

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43; Summer 1947 On depth interviewing.

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Robert I. Watson, The clinical Method in Psychology. New York: Harper and Bros.: 951. p. 83-100.

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Pauline V. Young, Scientific Social . Surveys and Research, op. cit, p. 243-64.

Nature and Value of the Interview

When the interview is used for research purposes, the investigator is gathering data directly from others in face-to-face contacts, in contrast to certain other data-gathering procedures, such as the questionnaire. Certain types of information can be secured only by direct contacts with people; for example, intimate facts of personal history,[112] of personal habits and characteristics, of family life, and opinions and beliefs. While certain of this information can be obtained through use of a questionnaire, check list, or test distributed to groups of respondents, there are unique characteristics of the interview that render it much more than an "oral questionnaire." The special values of the interview, in comparison with the questionnaire, are these:

1. The interviewees may provide personal and confidential information which they would not ordinarily place in writing on paper; they may wish to see the investigator who is securing the information and to receive guarantees as to how the facts will be used; they may need the stimulation of personal contacts in order to be "drawn out"; and some interviewees may be too ignorant to read and write.
2. The interview enables the investigator to follow up leads and to take advantage of small clues; in dealing with complex topics and questions, the development or trend of the conversation is likely to proceed in any direction, and no instrument prepared in advance can fully meet the situation.
3. The interview permits the investigator to form an impression of the person who is giving the information, to arrive at some judgment of the truth of the answers, and to 'read between the lines" things that may not have been sad in words.

[112] A. C Kinsey and Others, Sexual; Behavior in the Human Male. Philadelphia: W. B, Saunders Co,1948 xvi+804p.
W A Wallis "Statistics of the Kinsey Report, " Journal of life American Statistical Association 44463-84 December 1949
Paul Wallin "An Appraisal of Some Methodological Aspects of the Kinsey Report.," American Sociological Review 14 197 210 April 1949
A C Kinsey and Others. Sexual Behavior in the Human female. Philadelphia: W. B, Saunders Co.. 1953. xxx + 842 p.

4. The interview provides an opportunity for interviewer to give information and to develop certain attitudes on the part of the respondent, a procedure that is not possible in using a questionnaire or a test. This opportunity for "give and take" is especially important in the "treatment" or "therapeutic" interview, used extensively in case work. In this way the interview permits an exchange of ideas and information; it is not necessarily a one-way street.

Application of the Interview Technique

The interview is used in many practical situations for purposes other than research. In an employment interview, information is usually gathered concerning the applicant's training and experience, although such facts could readily be obtained by use of application blanks. The principal purpose of the face-to-face contact is to give the employer an opportunity to observe the reactions of the interviewee, to secure some basis for judging the quality of the individual's mental responses, and to note the social aspects of his behavior. Employment interviews, as a rule, are for practical purposes rather than systematic investigation.

Interviews are used extensively in education and in personnel work, including the teacher in his contacts with pupils and parents, visiting teachers, attendance officers, vocational counselors, deans, and school principals. Although these uses of the interview may be largely routine in the majority of such cases, and should not be considered as research, it may prove significant to note the practical applications of research techniques. There are conditions under which such practical applications of interviewing and of other techniques may become research, if the investigator will integrate his experiences into careful observations growing out of his regular work, so as to afford verified insights that increase one's understanding of the field represented.

The interview is an essential technique in social case study and in psychiatric work, and also in many diagnostic and therapeutic areas of education, psychology, and sociology, as illustrated extensively in the chapter on clinical and case studies.

The interview is a major tool for gathering evidence in the field, including censuses and similar enumerations, social and economic status of families, standards of living, family budgets, and family purchases and buying preferences.

Interviewing is helpful in certain types of analysis and appraisal. Many persons who are notably successful in their professional or occupational activities have certain methods of work, are guided by given standards, and react in particular ways, with the result that their performance is more successful than that of the average person. This information is important as a basis for training others. By skillful interviewing (and observation) the investigator can note the essential differences between successful; and unsuccessful workers. The interview has been used to discover the traits and duties of good citizenship, secretarial duties and traits, and the characteristics or traits most essential for success in teaching. Data secured for such purposes through the interview technique involve four important limitations relating to the respondent: his experience, his judgment, his accessibility and willingness to divulge the information, and his ability to express himself clearly.

Bingham and Moore have provided an extensive discussion of interviewing, techniques, as applied to a variety of fields: student counseling, occupational adjustment, applying for a position, employment offices, and civil-service agencies, employer-employee relationships, public opinion, polls, commercial surveys and market studies, social casework, mental clinics, journalism, and law. The volume includes fifty-five rules or recommendations for interviewing, in relation to preliminary preparation, the interviewing process itself, and fact-finding purposes and procedures.[113]

Much of the consumer and opinion research utilizes questionnaire and interview techniques; for example, surveys reported to business and industry (market and consumer studies, industrial surveys, advertising, public relations, radio broadcasting, editorial problems and preferences of readers, and attitudes of employees); surveys reported to government (studies relating to the Office of War Information, census work, consumer requirements,

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[113] Walter V. Bingham and Bruce V. Moore, op. cit.

and attitudes in the field of agriculture); and surveys reported to the public, relating to public opinion, including the various polls."[114]

The citizens of an Indiana city were interviewed to determine the characteristics they preferred in the local school board members. The conversations took place at lunch counters, card games, billiard tables, barbershops, dentists' offices, ball games, and on buses and streetcars. "The interviews were conducted so subtly that the one thousand subjects never suspected that they were being interviewed. The interviewer engaged his subject in off-hand or social conversation, but all the while knew what he was after, and recorded his data immediately afterward."[115]

The interview is valuable as a supplement to experimentation. To cite an illustration, studies of attitude, in the usual experimental form, may reveal no average change in the attitude of groups, but the interview may provide significant explanations: [116]

The controlled experiment will not tell us why there is no change. Its results show only the net effect of the propaganda on this attitude and not the more intricate dynamics of response which led to this net effect.... Failure of the film may be due to the fact that two themes, each of which was effective, produced responses, which cancelled each other out. The interview material thus enables us to provide a psychological explanation of responses, which may not be registered in the experimental results.... This type of case, not only illustrates a type of boomerang-response, but also shows how the focused interview enables us to supplement and enrich the value of the traditional controlled experiment.

Types of Interviews

In the psychological and sociological literature of interviewing[117] may be found several classifications of interviewing techniques of

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114 A. B. Blankenship, op. cit.

115 John R. Shannon, "What One Thousand Terre Haute Citizens Look For in Voting for School Board Members" American School Board Journal 114:29.30: February 1947.

116 Quoted from Paul S. Lazarsfeid and Robert K. Merron. "Studies in Radio and Film Propaganda" The New York Academy of Sciences, Series 11, 6;58-79; November 1943.

117 Pauline V. Young. Scientific Social Surveys and Rrsear...op. cit p. '247-49

data-gathering. (As pointed out earlier in this section, interviewing is used in many practical situations for purposes other than research.)

1. According to function (diagnostic, treatment, and research)

2. Number of persons participating (individual, group)

3. Length of contact (short contact, prolonged contact)

4. According to the roles assumed by the interviewer and interviewee, in relation to the socio-psychological process of interaction. Non-directive (uncontrolled, unguided, unstructured). [Non-directive or client-centered interviewing[118] as a technique or medium of counseling and therapy has been presented briefly, together with appropriate references, in the chapter on case and clinical studies.]

Focused [as discussed in another part of this section.]

Repeated, in order to trace the development of a social or socio-psychological process, as in following the progressive reactions of a voter in making up his-mind in a presidential campaign.

An extensive treatment of counseling techniques in secondary schools and colleges outlines the following kinds of interviews:[119]

1. Intake interview, as the initial stage in clinic and guidance centers

2. Brief-talk contacts, as in schools and recreation centers.

3. Single-hour interviews, a common type in schools and colleges, as compared with the much less frequent long series of interviews.

4. Clinical psychological interviews, emphasizing psychotherapeutic counseling and utilizing case-history data and active participation by the counselor in the re-education of the client

5. Psychiatric interviews, similar to psychological counseling, but varying with the personality and philosophical orientation of the individual worker and with the setting in which used

118 Carl R. Rogers Client-Certerted Therapy-Boston: Hourton Mifflin Co. 1951. xii +
119 Ruth strong, pp. 107-1 12.

6. Psychoanalytic interviews

7. The interview form of test, as illustrated by the Stanford-Binet Intelligence Test and sometimes in the form of a disguised intelligence test

8. Group interviews, as in selecting. Applicants for admission to college, trainees for special courses, or candidates for positions, or student opinion on particular topics

9. Research interviews (not a major type in the, field of counseling).

The Focused or Depth Interview

The focused (or depth) interview is described as significantly different from other types of research interviews that might appear superficially similar.[120]

1. The persons interviewed are known to have been involved in a particular concrete situation, such as viewing a film or hearing a radio program.

2. The hypothetically significant elements, patterns, and total structure of the particular situation have been previously analyzed (content analysis) by the investigator, and he has arrived at a set of significant hypotheses concerning the meaning and effects of determinate aspects of the situation.

3. On the basis of this analysis, the investigator has developed an interview guide, outlining the major areas of inquiry and the hypotheses which locate the pertinence of the data to be obtained in the interview.

4. The interview itself is focused on the subjective experiences of the persons exposed to the pry-analyzed situation; these reported responses enable the investigator to test the validity of his hypotheses and to ascertain unanticipated responses to

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[120] 'Robert K. Merton and Patricia L. Kendall, "The focused Interview." American journal of sociology 51; 541-57, May 1946.

Robert K. Merton and others, op. cit. Also a later version in 1954.

the situation, thus giving rise to fresh hypotheses.

The depth of reports of an interview varies, since not everything reported is on the same psychological level, but may be thought of as varying along a continuum. At the lower end of the scale are mere descriptive accounts of reaction that permit little more than a tabulation of "positive" or "negative" responses, and at the upper end are reports setting forth varied psychological dimensions of the experience (symbolisms, anxieties, fears; sentiments, and cognitive ideas). The major problem of the interviewer is "to diagnose the level of depth on which his subjects are operating at any given moment and to shift that level toward whichever end of the 'depth-continuum' he finds appropriate to the given case.

Depth psychology or depth interviewing seeks to get at the structure of motivation, that is, the dynamic structure of the individual. What makes him do certain things? Why do adults take courses of instruction? What do they seek? What factors motivate them to study on their own time? Are these flimsy hopes, in the case of persons who do not stay with the courses? Do other persons see the courses through to the end, because the process of instruction, including the associations, is pleasurable, or a variation and relief from one's occupation? Are the motivating factors different for varying courses related to an occupation, a recreation, or hobby, or a humanistic or cultural purpose?

Such studies of depth require insight and care. Superficial reasons will not give any depth. Reasons (or motivations) are complex and rich, with varied structure, and with different components and weights for these elements. The investigator needs the depth interview first, then other types of interviews or skillful questionnaires. Persons usually do not know their real reasons; they have not explored their motivations fully; they are not experts in self-analysis, and probably do not know the proper terms to use in describing the elements in their motivation. Even if the subjects should know their real motives, they are likely to be embarrassed at telling the truth, at lying bare their own motives, hopes, and frustrations. They are habituated to giving socially approved reasons and excuses; they may have been taught not to complain, even when their reason may be a legitimate complaint; they may feel reluctant to disclose family needs for financial aid. Many persons are generally confused as to life goals, purposes, and directions for themselves; for example, leaving school may grow out of this confusion, out of a lack of purpose adequate to keep the individual in school, and not because of any more specific reasons. Therefore, the investigator should not force the individual to name a reason, if the cause is lack of a specific reason.

The following item from a depth essay questionnaire, under the heading of, "What would further education do for you?" is similar to the probing that would be done in a depth interview: "[121]

It is probably true that most of us have some long-range plans or ideals concerning our work. Perhaps we wish to do our present job better; maybe we want a promotion to higher levels along the line of work we are now engaged in; or our ultimate goal may be to work toward some objective not connected with our present Job. Some employees perform their job duties well and get along with satisfaction to everyone without taking any more education after they start work; others want to take courses off and on in the hope that these will help them to realize their plans. In the light of such considerations, will you comment on your own attitude toward the desirability of further courses (on-the-job or out-of-hours) in connection with your vocational desires and plans? [It may be noted that this particular question was found to have little validity; virtually all people think they would like more education. The item was retained, however, simply as an introduction, to "warm up" thinking in this particular area.]

Depth analysis or depth interviewing is of major importance in discovering the sources of one's willingness to make radical changes in his behavior, particularly as illustrated in public-opinion studies: "We must reach down into the deep matrix of American attitudes,

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[121] Quoted from Douglas E. Scates and Alice V. Yeomans, Developing a Depth essay Questionnaire to assess the Marked for Further Education Among Employed Scientists and engineers op. cit.
Also see Douglas E. Scates and Alice Yeomans Scates. "Developing a Depth Questionnaire to Explore Motivation and likelihood of Action. Educational and Psychological Measurement 12:620-31: \Minter 1952. Includes thirteen references on depth interviewing.

probing those half-conscious emotionally loaded dispositions from which the day-by-day verbally expressed attitudes on specific issues proceed."[122]

Lewin points out that, prior to the mid 1940's, fact finding in the area of inter-group relations was largely dominated by surveys, which were open to criticism because of rather superficial methods of poll taking and lack of the deeper searching of the interview type (intended to provide some insight into the motivations behind the sentiments expressed).[123]

In investigating public opinion, a questionnaire and depth analysis (or depth interview) were used effectively for supplementary purposes.[124] The questionnaire was more than a simple attitude scale, since it included questions concerning family and social background, group membership, sentiments and values, personality, and projective items. The depth interview and certain other clinical techniques, applied to selected individuals, provided a depth of insight and a picture of dynamic interrelationships that questionnaires alone could never give. Case studies of individuals provided fresh hypotheses concerning the personality traits, attitudes, social background, and group membership of the prejudiced and unprejudiced person.

Preparation for the Interview

Interviewing is an art that requires careful study of the pertinent literature, appropriate training, and guided experience for satisfactory performance. While the extensive literature on interviewing technique is helpful, it cannot take the place of actual practice and guidance in acquiring the necessary skills of interviewing.

In discussing the questionnaire and other schedules in the

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122 Gardner Murphy, "Psychological Prerequisites for a Sound Foreign Policy." Journal of Social Issues 2:15-;26: November 1946.

123 Kurt Lewin, "Action Research and Minority Problems." Journal of Social Issues 2: 34-46; November 1946.

124 Donald W. MacKinnon, "The Use of Clinical Method in Social Psychology." Journal of Social issues:,2:34-46, November 1946.

preceding section, major emphasis was given to the importance of careful planning of questions. The preparation of questions for the interview is an equally painstaking task. While the interview should be pleasant and to some extent informal, it is not just a pleasant meeting or a haphazard series of questions and answers. It is necessary that a thread of questions provide for the interviewer the answers he is seeking, without gaps and doubtful interpretations. As a rule, the interviewer has a set of carefully prepared questions, to be introduced into the conversation at appropriate points, although he may vary these queries to adapt to individual circumstances. He can amplify the questions by following up leads as the opportunity may present itself. To avoid a meaningless or miscellaneous array of material after the interviewer has gathered his facts, careful planning must be done in advance of the interview, outlining the information necessary as a basis for conclusions that will satisfy the principal purpose of the investigation. This characterization of interviewing procedure applies particularly to data-gathering studies, with recognition of the fact that nondirective or client-centered counseling or therapy employs a contrasting type of interviewing technique.

The interview is both a challenge and an opportunity for the use of tact Data of a factual or objective nature usually can be secured by direct questions, but information or attitudes of a personal or confidential nature may have to be obtained indirectly. The interviewee may recall from the thought of revealing certain types of information or attitudes too openly or directly, and frequently does not know the significance of certain details that may have been omitted. It should be noted that children usually lack sufficiently mature concepts to give a complete account of experiences, ideas, or attitudes. If the interviewer is to sample thoroughly the knowledge, attitudes, and beliefs of the respondent, through skillfully drawing out responses representing various elements in the person's thinking and experience, appropriate tact and technique are the necessary tools.

As background for understanding and working effectively with people, interviewing draws heavily on knowledge provided by the social sciences, particularly concepts dealing with the makeup of the individual and his reaction to environment.[125] The interviewer must understand the respondent as a person, and at the same time must understand himself as a person, dealing with an individual (the interviewee) who differs from the interviewer in many ways.

Further Details of Interview Technique

The present discussion of the interview emphasizes the basic psychological and social principles of interviewing, rather than the details of technique enumerated below. These particulars are treated at length in the references listed at the beginning of this section. Many of the concepts, procedures, and references presented in the section on the questionnaire apply to the preparation of questions and schedules for successful interviewing. The individual who wishes to do successful interviewing will need appropriate training and reading covering at least some of the following topics:

1. Preparation for the interview, and try-out procedures
2. Methods of beginning the interview (indirect social approach, spontaneous reaction to controlled stimuli, distribution of forms prior to the interview, directs frank approach)
3. Factors in the success or failure of the interview (number and length of interviews, rapport and sensitivity to the interviewee, physical setting, interviewer's reputation and knowledge of problems under consideration)
4. Reliability of the information obtained (subject's desire to make a good impression, kind of information sought, relationship between the interviewer and interviewee)
5. Recording the interview. In the literature of education, psychology, and sociology may be found many extensive extracts from records of interviews,[126] especially the reports of case studies. Many of the references in the chapter on case and clinical techniques include illustrative interviews as a

[125] Anne F. Fenlason, op. Cit.

[126] Stanley G. Law, op. Cit
Helen L. Witmer, op. cit.
Pauline V. Young. Interviewing in Social Work, op. cit.
Anne F. Fenlason, op. cit

vital part of data-gathering, diagnosis, and therapy in case study and case work.

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Fred. N. Kerlinger (1983)	**Foundation of Behavioral Research,** Delhi, Surjeet Publication pp. 556-565	8.8

Chapter *32*

SOCIOMETRY

Sociometry: A Definition

Sociometry is a broad term indicating a number of methods of gathering and analyzing data on the choice, communication, and interaction patterns of individuals in groups. One might say that sociometry is the study and measurement of social choice. It has also been called a means of studying the attractions and repulsions of members of groups.

A person is asked to choose one or more other persons according to one or more criteria supplied by the researcher. With whom would you like to work? With whom would you like to play? He then makes one, two, three, or more choices among the members of his own group (usually) or of other groups. What could be simpler and more natural? The method works well for kindergartners and for atomic scientists.

Types of Sociometric Choice

Sociometric choice should be rather broadly understood: it not only means "choice of people"; it may mean "choice of lines of communication," "choice of lines of influence." or "choice of minority groups." The choices depend upon the instructions and questions given to individuals. Here is a list of sociometric questions and instructions:

With whom would you like to work (play, sit next to, and so on)?

Which two members of this group (age group, class, club, for instance) do you like the most (the least)?

Who are the three best (worst) pupils in your class?

Whom would you choose to represent you on a committee to improve faculty welfare? What four individuals have the greatest prestige in your organization (class, company, and team)?

What two groups of people are the most acceptable (least acceptable) to you as neighbors (friends, business associates, professional associates)?

Obviously, there are many possibilities[1]. In addition; these can be multiplied simply by asking: Who do you think would choose you to…..? and whom do you think the group would choose to……? Subjects can also be asked to rank others using sociometric criteria, providing there are not too many to rank. Or rating scales can be used. Members of a group or organization can be asked to rate each other using one or more criteria. For example, we can phrase the sociometric instructions something like this: "Here is a list of the members of your group. Rate each according to whether you would like to work with him on a committee to draft a set of bylaws. Use the numbers 4, 3, 2, 1, 0—4 meaning you would like to work with him very much, you would not want to work with him at all, and the other numbers representing intermediate degrees of liking to work with him." Clearly, any of the methods of measurement, including forced-choice methods, can be used. The main difference is that sociometry always has such ideas as social choice, interaction, communication, and influence behind it.

Methods of Sociometric Analysis

There are three forms of sociometric analysis: sociometric matrices, sociograms, and sociometric indices. Of all methods of sociometric analysis, sociometric matrices, to be defined presently, perhaps contain the most important possibilities and implications for the behavioral researcher. Sociograms are diagrams or charts of the choices made in groups. We shall discuss sociograms very little, since they are used more frequently for practical than for research purposes.[2] Sociometric indices are single numbers calculated from two or more numbers yielded by sociometric date. They indicate

2 See M. Northway A Prime of sociometric Toronto University of Toronto Press, 1952 Grondund of cit. pp.68-78.

sociometric characteristics of individuals and groups.

Sociometric Matrices

We learned earlier that a matrix is a rectangular array of numbers or other symbols. In sociometry we are usually concerned only with square, or *n x n* matrices, *n* being equal to the number of persons in a group. Rows of the matrix are labeled I: columns are labeled. J: i and j of course, can stand for any number and any person in the group. If we write this means the entry in the row and Jth.

For further discussion, See. N. Gronluad. Sociometry in the Classroom. New York Harper & Row. 1959. Chap.2. This is an elementary reference. Reference for the researcher is: G Lindsey and D. Byrne. Measurement of Social Choice and Interpersonal attractiveness. In G. Lindzev and E. Aronson eds. The Handbook of social psychology.2nd ed. Reading. Mass: Addison-Weslev. 1968. Vol ii. Chap. 14: G. proctor and G. Loomis "Anatisis of Sociometric Data." In M. Jahoda. M. Deutsch and Cook. Research Methods in social Relations. New York: Holt. Rinehart and Winston. 1951.pt chap.17.

Column of the matrix, or more simply, any entry in the matrix. It is convenient to write sociometric matrices. These are matrices of numbers expressing all the choices of group members in any group.

Suppose a group of five members has responded to the sociometric question, "With whom would you like to work on such-and-such a project during the next two months? Choose two individuals." The responses to the sociometric question are, of course, choices. If a group member chooses another group member, the choice is represented by 1. If a group member does not choose another, the lack of choice is represented by 0. (If rejection had been called for—1 could have been used.) The sociometric matrix of choices, C, of this hypothetical group situation is given in Table 32.1.

TABLE 32.1 SOCIOMETRIC CHOICE MATRIX: FIVE-MEMBER GROUP, TWO CHOICE QUESTION

			i		
I	a	b	c	d	e
a	0	1	0	0	1
b	1	0	0	0	1
c	0	0	0	1	1
d	0	1	0	0	1
e	1	1	0	0	0
	2	3	0	1	4
			C		

Individual I chooses individual j. That is, the table can be read by rows: b chooses a and e. It can also be read by columns be is chosen by a, d, and e. The sums at the bottom indicate the number of choices each individual receives.

It is possible to analyze C in a number of ways. But first let us be sure we know how to read the matrix. It is probably easier to read from left to right, from i to j. Member i chooses (or does not choose) member j. For example, a chooses b and e; c chooses d and e. Sometimes it is convenient to speak passively, "b was chosen by a, d, and e," or "c was chosen by no one."

The analysis of a matrix usually begins by studying it to see who chose whom. With a simple matrix like C this is easy. There are three kinds of choice: simple or one-way, mutual or two-way, and no choice. We look first at simple choices. (This was discussed in the preceding paragraph.) A simple one-way choice is where i chooses j, but does not choose i. In Table 32.1, c chose d. but did not choose c. We write: i → j, or c → d. A mutual choice is where i choose j and j also chooses i. In the table, a chose b and b chose a. We write: i ↔ j, or a ↔ b. We might count mutual choices in Table 32.1: a ↔ b, a ↔ e, b ↔ e.

The extent to which any member is chosen is easily seen by adding the columns of the matrix. Obviously, e is "popular": he was chosen by all the other group members; a and b received 2 and 3 choices, respectively. Evidently c is not at all popular: no one chose him; d is not popular either: he received only 1 choice. If individuals are allowed unlimited choices, that is, if they are instructed to choose any number of other individuals, then the row sums take on meaning.[3] we might call these sums indices of, say, gregariousness.

There are other methods of matrix analysis that are potentially useful to researchers. For example, by relatively simple matrix operations one can determine cliques and chains of influence in small and large groups. These matters, however, are beyond the scope of this book.[4]

Sociograms or Directed Graphs

The simplest analyses are like those just discussed. But with a matrix larger than C it is almost impossible to digest the complexities of the choice relations. Here sociograms are helpful, provided the group is not too large. We now change the name "sociogram" to "directed graph." This is a more general mathematical term that can be applied to any situation in which i and j are in some relation R. Instead of saying "i choose j," it is quite, possible to say "i influences J," or "i communicates to j," or "i is a friend of j," or "i dominates j." In symbolic shorthand, we can write, generally: iRj. Specifically, we can write for the examples just given: iCj (i chooses j), iIj (i influences j), iCj (i communicates to j), iFj (i is a friend of j), iDj (i dominates j). Any of these interpretations can be depicted by a matrix such as C and by a directed graph. A directed graph of C is given in Fig. 32.1.

We see at a glance that e is the center of choice. We might call him a leader. Or we might call him either a likeable or a competent person. More important, notice that a, b, and e choose each other. This is a clique. We define a clique as three or more individuals who

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3 Subjects can be told to choose one, two, three, or more other persons. Three seems to be a common number of choices. The number allowed should be dictated by the research purposes. See Gronlund, op, cit., pp. 48-49; Lindzey and Byrne, op. cit., pp. 455-456.

4 See ibid., pp. 470-473. A good explanation of elementary matrix operations and sociometric matrices can be found in: J. Kemeny, J. Snell, and C. Thompson, Instruction to Finite Mathematics, 2nd ed. Englewood Cliffs. N.J.: Prentice-Hall. 1966, pp.217-250, 384-.406

mutually choose each other.[5] Looking for more

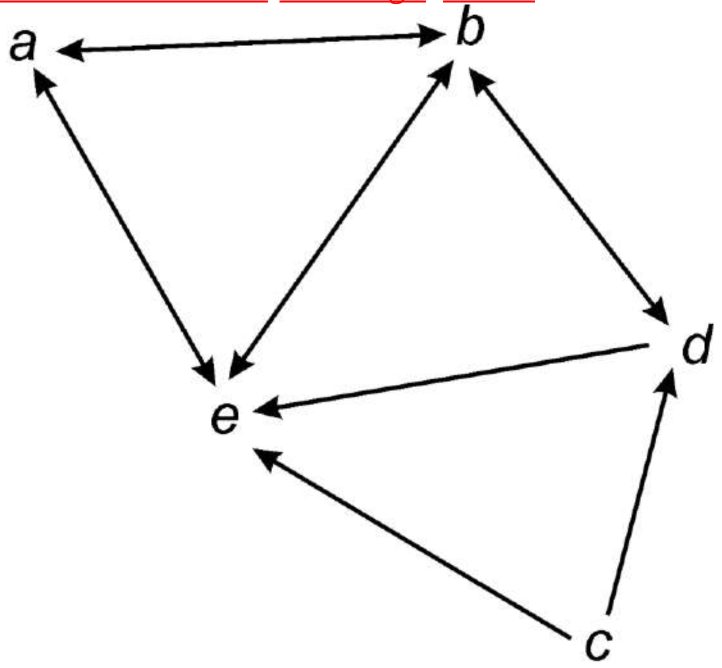

FIG. 32.1

double-headed arrows, we find none. Now we might look for individuals with no arrowheads pointing at them: c is one such individual. We might say that c is not chosen or neglected.

Note that directed graphs and matrices say the same thing. We look at the number of choices a receives by adding the its in the column of the matrix. We get the same information by adding the number of arrowheads pointing at a in the graph. For small and medium-size groups and for descriptive purposes, graphs are excellent means of summarizing group relations. For larger groups (larger than 20 members?) and more analytic purposes, they are not as suitable. They become difficult to construct and difficult to interpret. Moreover, different individuals can draw different graphs with the same data. Matrices are general, and, if handled properly,

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5 L. Festinger, S. Schachterf, and K. Back, Social Pressure in Informal Groups. New York: Harper & Row; 1950. p. 144.

not too difficult to interpret. Different individuals must, with the same data, write exactly the same matrices.

Sociometric Indices[6]

In sociometry, a large number of indices are possible. Three are given below. The student will find others in the literature.

A simple but useful index is:

$$CS_j = \frac{\sum c_j}{n-1} \qquad (32.1)$$

where Cs_j=the choice status of Person j; $\sum c_j$= the sum of choices in Column j; and n = the number of individuals in the group (n— 1 is used because one cannot count the individual himself). For C of Table 32.1, CS_e, == 4/4= 1.00 and CS_a, = 2/4 == .50. How well or how poorly chosen an individual is revealed by CS. It is, in short, his choice status.

It is of course possible to have a choice rejection index. Simply put the number of 0's in any column in the numerator of Eq. 32.1.

Group sociometric measures are perhaps more interesting. A measure of the cohesiveness of a group is:

$$Co = \frac{\sum (i \leftrightarrow j)}{\frac{n(n-1)}{2}} \qquad (32.2)$$

Group cohesiveness is represented by Co and $\sum (i \leftrightarrow j)$ = sum of mutual choices (or mutual pairs). This useful index is the proportion of mutual choices to the total number of possible pairs. In a five-member group, the total number of possible pairs is 5 things taken 2 at a time:

$$\binom{5}{2} = \frac{5(5-1)}{2} = 10$$

[6] The discussion that follows is for the most part based on proctor and Loomis, op. cit. Some symbols are the author

If, in an unlimited choice situation, there were 2 mutual choices, then Co= 2/10 = 20, a rather low degree of cohesiveness. In the case of limited choice, the formula is:

$$C_o = \frac{\sum (i \leftrightarrow j)}{dN/2}$$

where d = the number of choices each individual is permitted. For C of Table 32.1, Co = 3/(2 x 5/2) == 3/5 = .60. a substantial degree of cohesiveness.

Research Applications of Sociometry

Because the data of sociometry seem so different from other kinds of data, students find it difficult to think of sociomctric measurement as measurement. There is no doubt that sociometric data are different. But they are the result of observation and they are *measures.*[7.] They are useful, for example, in classifying individuals and groups. In the Bennington College study, summarized in Chapter 23, Newcomb measured individual prestige by asking students to name five students they would choose as most worthy to represent Bennington College at an important gathering of students from all types of American colleges[8.] He then grouped students by frequency of choice and related this measure of *sociometric prestige to political* and *economic conservatism.* In reading the examples of this section, chosen for their variety of application of the sociometric idea as well as for their importance as research studies, the student should clearly realize that sociometry is a method of observation and data collection that, like any other method of observation, obtains measures of variables.

Prejudice in Schools

In studying the manifestation of prejudice against blacks and Jews in schools, Smith used the simple procedure of asking all the

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7 For a discussion of the basics measurement aspects of sociometric measures, especially their reliability and validity, see Lindsey and Byrne, op. Cit. Pp. 475-483. See, also Gronlund. Op.cit,. chaps. 5and 6:

8 T, Newcomb, Personality and social change. New York: Holt. Rinchart and Winston, 1943 pp54-55.

students of entire grades of high schools to name their five best friends.[9] (Smith calls it "a straightforward approach that has been dignified by the label of sociometric method'....''). He then collated the responses with the responses of the students named to determine ethnic and religious group membership.[10]The students tended to choose their friends from their own racial and religious groups-hardly surprising. More important, Jews and Negroes were not chosen as friends by members of other ethnic and religious groups. White students hardly chose black students at all. While Smith specifically says that he does not want to ascribe his findings to prejudice, it seems clear that "the virtually un-penetrated barrier" between black and white students reflects prejudice. It is evident that a sociometric approach in the study of prejudice can yield important data.

Praise and Sociometric Choice

Most Sociometric studies have been ex post facto in nature. Some few have been experimental. One of the latter is Flaners and Havumaki's study of the effects of praise on sociometric choice.[11] The hypothesis was that praise of a student by a prestige figure would increase the student's "choice value." Tenth-grade pupils were divided into 33 groups of 10 subjects each. In 17 of the groups certain individuals were praised for their contributions to discussions about quiz program participation. In the other 16 groups, the subjects were not praised individually; the groups were handled as groups. After the experimental manipulation, the group members were asked to list five members of their groups who would be good quiz program participants. These choices constituted a measure of the dependent variable.

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9 M. Smith "the schools and prejudice; Findings," In C. Clock and E. Siegelman, eds, Prejudice U.S.A. New York: Prager 1969. Chaps.5.

10 Smith says that this procedure because students had to name names, shed their own anonymity, and respond to personal questions, and because considerable school time was used- stretched the tolerance of administrator are school boards. In fact, one school system ejected the researchers;

11 N Flanders and S. Havumaki. "The Effect of Teacher-Pupil Contacts Involving Praise on the Sociometric Choices of students" journal of educational psychology LI (1960). 65-68.

Animal Sociometry

That the sociometric idea is not necessarily limited to human choices is nicely shown in a study of the effects of rearing conditions on the social preferences of rhesus monkeys.[12]

Three groups of monkeys were reared from birth to nine months in individual closed cages (A), in a large nursery room in individual bare wire cages (B), and in wire cages in peer groups (C). At 18 months of age, the animals were given social behavior tests in a "selection circus," which was a sociometric choice situation. The "circus" was a circular set of compartments with the test monkey in the center and A, B, and C stimulus monkeys in the compartments in full vision of the test animal. The situation was so arranged that the test animal, after a period of visual orientation, could enter the choice compartments (could select A, B, or C monkeys to be with). As predicted, A Animals tended to choose compartments with A animals, B animals compartments with B animals, and C animals compartments with C animals:

Race, Belief, and Sociometric Choice

In a field experiment designed to test Rokeach's controversial hypothesis that differences in beliefs are more influential in determining prejudice than differences in race, Rokeach and Mezei used a realistic employment situation and an ingenious sociometric task.[13] White and black male applicants for various jobs in two mental hospitals were involved individually with four confederates of the experimenters in discussions of rule-oriented and permissive ways of handling patient problems. Two of the confederates were white, two were black; one white and one black confederate espoused the rule-oriented position; the other white and black confederates espoused the permissive position. This arrangement, then, constituted the race and belief conditions. After about 12 minutes of discussion, the experimenter came into the room and

[12] C Pratt and G. Sackett. "Selection of Social Partners as a Function of Peer Contact during Rearing," Science C IV (1967), 1133-1135

[13] M.Rokeach and L.Mezei. "Race and Shared Belief as Factors in Social Chice," Science CLI (1996). 167 – 172.

asked the five individuals including the experimental subject, of course to write down the names of two of the four individuals with whom he would most prefer to work. This was, of course, a sociometric task whose purpose was to test the prediction that the subjects would express more preference for those individuals whose opinions they shared than for those of the same race. In general, the prediction was supported.

Sociometric Measurement in Social Scientific and Educational Research

Sociometry is a simple, economical, and naturalistic method of observation and data collection. Whenever such human actions as choosing, influencing, dominating and communicating, especially in group situations, are involved, sociometric methods can usually be used. Sociometry has considerable flexibility. If defined broadly, it can be adapted to a wide variety of research in the laboratory and in the field. Its quantification and analysis possibilities, though not generally realized in the literature, are rewarding. The ability to use the simple assignment of 1's and 0's is particularly fortunate, because powerful mathematical methods can be applied to the data with uniquely interpretable and meaningful results. Matrix methods are the outstanding example. With them, one can discover cliques in groups, communication and influence channels, patterns of cohesiveness, connectedness, hierarchization, and so on.

The student who contemplates using sociometry, however, should study its rationale, its statistical limitations, and, most important for the future, its possibilities of mathematical analysis. (See Study Suggestion 1.) If one considers both matrix algebra and Monte Carlo methods, these possibilities are intriguing and potentially powerful and rewarding to researchers. The student must also be aware that he can use criteria other than those of simple choice based on liking to work with, play with, friendship, and so on. Whenever a conceptual arrow can be drawn between individuals, groups, even objects—the arrow indicating "communicates with," "interacts with," "influences," "dominates," "lead's," "accepts," "likes."" "is friendly to," "perceives as good," "is like me" and so on-sociometric methods can be used.

Study Suggestions

1. Four useful references on sociometry were cited in the chapter: Gronlund's book, Lindzey and Byrne's chapter, the Proctor and Loomis chapter, and the Northway manual. As the importance and analytic usefulness of sociometric techniques become better known and appreciated, and as computer programs are written to handle the large amounts of data generated, mathematical and Monte Carlo methods of sociometric and related data analysis will probably exert a strong influence en behavioral research. The student is therefore encouraged to explore mathematical treatments of sociometric data. The Kemeny, Snell, and Thompson reference (footnote 4) is a good introduction, though the student needs knowledge of elementary matrix algebra (which, fortunately, is not difficult). Here are two more references, especially for the advanced student.

Coleman. J. *Introduction to Mathematical Sociology*. New York: Free Press.1964 pp. 14-16-444- 455. Coleman gives a good example from his own research: pp. 449-454.

Glanzer, M., and Glaser, R. "Techniques for the Study of Group Structure and Behavior: I. Analysis of Structure." Psychological Bulletin LVI (1959) 317-332. This invaluable article reviews a number of matrix operations sociometric indices, and other methods of studying, and analyzing group structure.

Let C mean "communicates with." In a four-man group, aCc. bCa, cCa, and dCb.

(a) Write the matrix expressing these relations.

(b) Draw a directed graph of the situation. Who would be likely to receive most communications?

(c) Are there mutual choices? What are they?

(d) A relation is a set of ordered pairs. Can the present situation be called a relation?

An investigator, studying the influence patterns of boards of education, obtained the following matrix from one board of education. (Note that this is like an unlimited choice situation because each individual can influence all or none of the members of the group.) Read the matrix: I influence j.

(a) What conclusions can you reach from study of this matrix? Is the board divided? Is there likely to be conflict?
(b) Draw a graph of the influence situation. Interpret the graph.
(c) Is there a clique on the board? (Define clique as given in the text.) If so who are its members?
(d) What members have the least number of influence channels? Are they then, much less influential than the other members, other things being equal?

[Answers: (c) Yes: a, c, d; (d) b and e.]

For the situation in Study Suggestion 3. Calculate the cohesiveness of the group using Eq. 32. 2. [Answer: Co = .40]

Suppose that you are studying hierarchies in groups and _the different influences on group cohesiveness and group decisions of different kinds of hierarchies. One of your research questions is: How do highly centralized group hierarchies influence group cohesiveness in contrast to more diffuse hierarchies? Two of the groups you are studying have sharply differing indices of cohesiveness say 71 and 32 for groups A and B. respectively. Here are the matrices of influence patterns of the two groups, where i influence j:

				J		
		a	b	c	d	e
	a	0	0	1	1	0
i	b	0	0	0	0	1
	c	1	0	0	1	0
	d	1	0	1	0	0
	e	0	1	0	0	0

A:

$$\begin{array}{cc|ccccc}
 & & & & j & & \\
 & & 1 & 2 & 3 & 4 & 5 \\
\hline
 & 1 & 0 & 1 & 0 & 0 & 0 \\
 & 2 & 1 & 0 & 0 & 0 & 0 \\
i & 3 & 1 & 1 & 0 & 1 & 1 \\
 & 4 & 0 & 0 & 0 & 0 & 0 \\
 & 5 & 0 & 0 & 0 & 1 & 0
\end{array}$$

B:

$$\begin{array}{cc|ccccc}
 & & & & j & & \\
 & & 1 & 2 & 3 & 4 & 5 \\
\hline
 & 1 & 0 & 0 & 0 & 1 & 1 \\
 & 2 & 1 & 0 & 0 & 0 & 0 \\
i & 3 & 0 & 1 & 0 & 0 & 1 \\
 & 4 & 0 & 0 & 1 & 0 & 0 \\
 & 5 & 1 & 0 & 0 & 1 & 0
\end{array}$$

(a) Is there a substantial relation between group hierarchy and group cohesiveness?
(b) Which group is highly centralized?
(c) Who probably controls group A? group B?
(d) Draw sociograms for A and B. Do the hierarchical structures become apparent?

[Note: Except for the diagonal entries, which are conventionally zero, the entries of B were selected at random.]

[Answers: (a) Yes; (b) A; (c) A: no. 3; B:?]

S.P.S. Sukhia P.V. Mehrotra R.N Mehrotra (1991)	**Elements of Educational Research.** 7th ed. New Delhi, Allied Publishers Limited. pp. 166-174	8-9

ELEMENTS OF EDUCATIONAL RESEARCH

Social choices (and rejections) made by members of a group. A common form is one in which a choice is represented by a pointed arrow, and a mutual choice by an arrow pointing in opposite directions. Different symbols (A, 0) may be used for boys and girls, and their identifying initials placed within the symbols. The symbols of those chosen most often (called the stars) are placed nearest the center of the diagram, the ones chosen less often progressively outward. Those not chosen by others (referred to as isolates) are literally on the outside. (Fig. 2.).

"These and other variants of sociometric techniques offer rather simple methods of ranking individuals on a continuum of "acceptability" or "outgoingness" on the part of group members. Where their use is justified they may be powerful research tools, since they meet the general problems of scaling very well.

"Sociograms are often used for measuring changes resulting over a period of time from special efforts to bring isolates into closer group relationships or from some natural circumstances. Sociometric studies have been made of many types of social groups including classroom groups. Being peer-rating rather than rating by superiors, sociometry adds another dimension to the understanding of social relationships.[11]

Psychological Tests

Among the most useful and most frequently employed tools of educational research psychological tests occupy a very significant position PSYCHOLOGICAL tests are instruments designed to describe and measure a sample of certain aspects of human behavior or inner qualities. They yield objective descriptions of some psychological

[11] William J. Goode and Paul K Fiatt op. cit, p.255

aspects of an individual's personality and translate them in quantitative terms.

Psychological tests are of various kinds depending on the different phenomena or traits they are devised to describe and measure. Chief among these are achievement tests, intelligence tests, aptitude tests, interest inventories, and personality measures. The common characteristic of all these tests is that they are used to describe status or to measure changes in status produced by certain factors, or to predict future behavior on the basis of present performance. As such, psychological tests are frequently used as tools in school surveys, school appraisal programmes, experimental investigations, complex casual relationship studies and prognostic research.

Among the many ways of classifying psychological tests are the ones which distinguish between

(i) performance tests and paper and pencil tests;
(ii) individual tests and group tests;
~~(ii)~~(iii) power tests and speed tests; and
~~(iii)~~(iv) standardized tests and non-standardized or teacher-made tests.

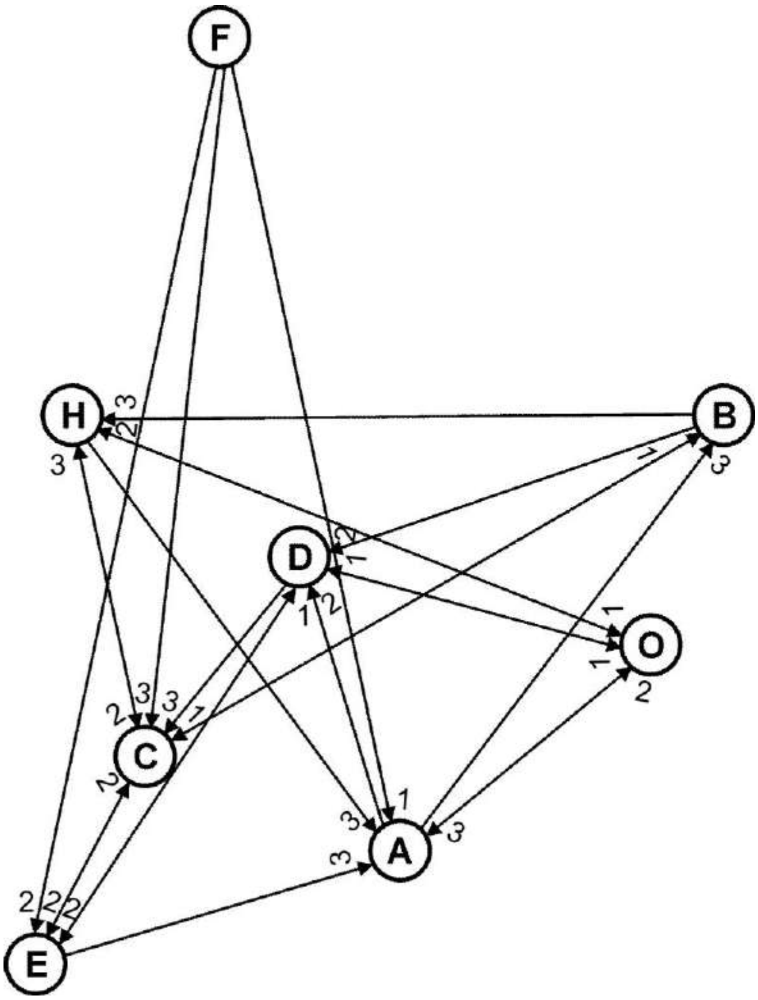

Fig.2 Sociogram showing first, second and third choices as tabulated in the sociometric matrix above Fig.1

As the names indicate, *performance tests* require the manipulation of objects or mechanical apparatus while paper and pencil tests require the subjects to record their responses on a prepared sheet. Similarly, while individual tests are administered to the subjects individually, group tests are meant to be administered to individuals in a group. Power tests observe no time limit and the subjects attempt progressively more difficult tasks as long as they can, while speed tests though involving the element of power also, observe time limit. The non-standardized or teacher-made tests are not so expertly designed as the standardized or professional tests; however, carefully they are constructed. The former are usually designed for a particular group of individuals while the latter are designed for more general use and are considered ready for use only after (i) a careful analysis of each item, (ii) a careful analysis of total scores, (iii) the establishment of their validity, reliability and norms, and (iv) the setting up of uniform and objective patterns of administration, scoring and interpretation. For purposes of educational research, tests of all the above categories are used in accordance with the problem in hand. Standardized tests (of any of the above three categories) are the most commonly used ones because they are considered more reliable, more valid and more objective than the teacher made tests standardized tests may not be equally fool-proof but they are usually made as sound as. All possible in the light of the knowledge and experience of experts in test-construction, administration and interpretation.

1. Achievement Tests

Among the various types of tests used in schools, achievement tests are the commonest. They propose to measure what and how much pupils have learnt as a result of formal or informal instruction. They measure the present level of performance of individuals or groups in academic learning. Achievement test scores are used in deciding which grade a student is suitable for or what his strengths and weaknesses are. Frequently, achievement tests are utilized for evaluating courses of study or efficiency of teachers and teaching methods, or other educational factors.

Achievement tests may be *traditional* or *essay-type* and *new-type or objective.* The shortcomings and faults of the traditional achievement tests have led to the development of objective tests. The salient features of the new-type tests of achievement are:

i. They consist of a large number of individual test items requiring short answers or responses which take very little time on the part of the students.
ii. The items are based on an extensive sampling of the course of study and are arranged sometimes in a logical, and sometimes in a random order.

iii. The items are phrased briefly in unambiguous terms and permit of only one correct response.

iv. The items are of various types—the main classifications being (a) recall type and (b) recognition type.

v. These tests bear clear objective instructions as to there administration, answering and scoring. Scoring keys are prepared in advance. Each correct response secures one core and wrong response a zero.

~~v.~~vi. These tests may be oral or written, performance or paper-pencil, speed or power, depending on the subject or purpose for which they are devised and administered. Achievement tests may be standardized or non-standardized. Many standardized tests of achievement in different school subjects are available for different grades or age groups in advanced foreign countries. In India too some standardized tests in specific subjects have been prepared, and are being prepared.

2. Intelligence Test

Conceived of as an inborn general ability which enters into performance of all activities and which differs in quantity from person to person, intelligence is a factor which determines a good deal of educational outcomes. In experimental designs intelligence is a significant variable which stands in need of being controlled. In studies of the casual relationship kind, intelligence or the subjects is a factor, which has often to be measured. In normative survey studies also, sometimes intelligence is described and measured. The tools that are used for the purpose of measuring intelligence are intelligence tests.

Intelligence tests may be classified into

i. Performance tests and Verbal tests;
ii. Oral tests and paper-pencil tests;
iii. Group tests and Individual tests;
~~i.~~iv. Omnibus tests and Battery of tests; and
v. Point-scales and Age-scales.

Whatever the type, an intelligence test is marked by the following characteristics;

i. It measures the quality termed intelligence only indirectly through testing the person's present performance in situations where intelligence operates.
ii. The items in any intelligence test are numerous and varied. They test many different abilities which are supposed to constitute intelligence.
iii. The items are, as far as possible, knowledge-free.
iv. The items are, as far as possible, culture-free.
v. Objective and unambiguous directions for administering, answering, scoring and interpreting the test invariably accompany it.
vi. The same test of intelligence supplies different norms for different age-levels and groups. Norms calculated for different ages and groups are essential factors in the use and interpretation of test scores.

Constructing and standardizing tests of intelligence of various types is a long and painstaking activity requiring besides expert planning, preparation and organization of work, steady application over a long period of time. It requires lots of statistical calculation and testing and retesting before such tests are finally available for use. Amounting to a complex research activity, construction and standardization of intelligence tests is not the work of individual researchers but requires team work and cooperation of many.

3. Aptitude Tests

Aptitude tests attempt to predict the capacities or the degree of achievement that may be expected from individuals in a particular activity.[12]

Intelligence tests are also a kind of aptitude test as they describe and measure the general ability, which enters into the performance of every activity, and thus predict the degree of achievement that may be expected from individuals in various activities. But the term aptitude test is more commonly reserved for the tools which measure

[12] John W. Best. op. cit, p. 172:

and describe special abilities, capacities or talents which are supposed to determine the level of achievement that can be expected from individuals in specific fields of study and activity.

Like intelligence, aptitude also cannot be measured directly. It can only be inferred on the basis of present performance. Aptitude tests are, therefore, so designed as to predict improved performance with further training in the area under question—mechanical and manipulative skills, literary or specific studies, musical and artistic pursuits. For constructing an aptitude test in Music, for example, one has to consider the factors which enter into good musical performance—ability to remember between differences in pitch, rhythm, pattern, intensity, etc.—and to include items which would measure an individual's present standing with regard to such factors. Present level of achievement in these tasks must provide a fair predictive index of his ability to profit from further training in Music.

Aptitude tests have proved useful in dividing students into fairly homogeneous groups in schools. They have been used to select individuals for particular courses of study and guide them into areas where the probability of their achieving success is the greatest. For research in educational and vocational guidance, for research in selection of candidates for particular courses of study or professional training, for research of the complex causal-relationship type, aptitude tests have proved of great value.

4. Interest Inventories

Persons differ in their interests, likes and dislikes. Interests are a significant element in the personality pattern of individuals and play an important role in their educational and professional careers. The tools used for describing and measuring interests of individuals are the interest inventories or interest blanks. They are self-report instruments in which the individuals note their own likes and dislikes. They are of the nature of standardized interviews in which the subject gives an introspective report of his feelings about certain situations and phenomena, which is then interpreted in terms of interests.

The use of interest inventories is most frequent in the areas of educational and vocational guidance and case studies. Distinctive patterns of interest that go with success have been discovered through research in a number of educational and vocational fields. Mechanical, computational, scientific, artistic literary, musical, service clerical and many other areas of interest have been analyzed in terms of activities. A person's stated likes and dislikes in terms of specific activities are sorted into various interest areas and percentile scores are calculated for each area. The area where a person's percentile scores are relatively higher is considered to be the area of his greatest interest, the area in which he would be the happiest and the most successful.

As a part of educational surveys of many kinds, children's interest in reading, in games, in dramatics, in other, extracurricular activities and in curricular work, etc. are studied.

Construction of interest inventories is yet in its developmental stage and not many definite rules and principles can be laid down for guidance in this technique. *Strong's Vocational Interest Inventory* and *Kuder's Preference Record* should, however, serve as standard specimens in the field.

5. Personality Measures

For the measurement of certain personality traits or tendencies various instruments have been devised in recent years. Personality testing, however, is yet in its formative years and more research is being carried out towards constructing and improving such tools.

Personality measures are mainly of two kinds: (i) direct or inventories and (ii) indirect or projective techniques. Personality inventories are like interest inventories requiring the subjects to self-report on their personality patterns. The individuals check responses to certain questions or statements designed to measure certain personality traits or tendencies. Possessing many of the characteristics of inquiry forms like questionnaire and rating-scale they can be considered tests only to the extent that they are carefully standardized and yield quantitative measures. An inventory which has often been used as research device to identify and describe certain personality trait among students is the Mooney Problem

Check List.[13] It is an inventory (in two forms) to be used by students in reporting their own problems of adjustment. This inventory lists a number of possible problems, classified in different categories from which the students have to check those which, from their own view point, trouble them. These responses yield not only a verbal picture of individual's adjustment problems but also quantitative scores—category-wise as well as total—which indicate the degree of difficulty he feels he is experiencing in his adjustment. The Mooney Problem Check List seems to have set the pattern for constructing more personality inventories by researchers in psychology and education.

The validity of these direct personality measures called inventories, however, is limited. Individuals are sometimes unable to report their own reactions accurately or objectively. Lack of insight into their own selves, the emotional involvement of an individual with his own problems and the tendency to withhold embarrassing responses—all these limit the effectiveness of such personal-adjustment scales.

Somewhat free from limitations of personality inventories are the negative tests of personality which disguise their purpose so completely that the individual unconsciously projects his personality through his responses to given situations. Rorschach's ink-blot test, *T. A. T. C. A. T.* Rosenzeweig's Picture-Frustration Study, are all projective techniques where, in reaction to vague visual pictures or symbols, individuals project their own personalities. Tautophone and Word-Association. Tests present various sounds and words respectively as stimuli for the purpose of recording reactions which are later interpreted according to a set scheme of interpretation, to get a picture of the individual's personality. Tests and techniques of this category, however, present problems of more or less developmental and promotional try-out. Sentence-completion, story-completion, argument-completion, etc. are other similar devices, which depend a good deal on subjective judgment and skill of

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13 Ross L. Mooney, problem Check List, Ohio: Bureau of Educational Research. Ohio State University, 1941.

interpretation.

The rationale of the projective method is to make the individual organize a series of unstructured situations, or objects in some way. Obviously there is no one 'right' set of responses. The investigator is interested in the pattern that develops from the respondent's responses. He then interprets this pattern according to valid and reliable categories that have been developed for the test.

For personality assessment the use of observation is also quite commonly made under pre-arranged conditions.

Many studies are on record in which various devices of personality assessment have been used. The relative newness of the field suggests that there are many opportunities for the researchers in this area.

Summary

1. For the purpose of collecting new relevant data for a research study, the investigator needs to select proper instruments, termed as tools, out of a variety of them.
2. The major tools of research can be classified into broad categories of inquiry forms, observation, interview, social measures and psychological tests.

UNIT—9

REPORT WRITING

Sr. No.	Contents	Page No.
9.1	J.C Aggarwal (1991).	
9.2	L. R Gay (1987).	

J.C. Aggarwal (1991)	**Education Research:** An Introduction, 4th ed. New Delhi, Arya Book Depot, pp. 288-308	9-1

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RESEARCH REPORT

The labour of writing is reduced if the thought is in condensed form.

—C.C. CRAWFERD

Contents of a Research Report—Their Importance

Writing about the importance of contents of 'Dissertation' Long writes: "It is a test of the student's scholarship, not so much in the direction of bus ability to reproduce as in the direction of his capacity to create. The student must not expect an institution to place on him the seal of higher scholarship as a reward for any amount of unimaginative plodding. Ambition, industry, perseverance and honesty of purpose are very commendable traits, but they are not enough; an advanced degree cannot be granted merely for prolonged effort. The dissertation must furnish evidence not only that the candidate is capable of sustained application in the solution of a problem, but also that he is a person of imaginations, that he possesses initiative and originality to a marked degree, that he is a master of those techniques appropriate for his problem's solution, that he is gifted with a capacity for objectivity in investigation and that he has the ability to report his study in an acceptable manner."

Monroe and Engelhart have observed, "The report of an investigation not only serves to record and communicate the procedure and the results but it also fulfils an important function in the process of research. In the act of writing, if it is well done, the research worker refines his thinking, and the detailed record facilitates the critical testing of the work done. If he is interested in communicating his work to others, the report must be well written in order to fulfill that purpose effectively."

Good and Halt State:

"The primary function of exposition, and of the technical or research report, is to communicate ideas in a manner understandable to and usable by a reader."

The purpose of the presentation of the report is '"to convey to the interested persons the whole result of the study, in sufficient detail and so arranged as to enable each reader to comprehend the data and to determine for himself the validity of the conclusions."

Clarity—Precision—Accuracy—Style

Long offers the following recommendations:

"Obviously, charm will be the first aim of those writers who are intent primarily on entertaining their readers, but in scientific writing the purpose is to inform, and all other considerations must be subordinated to clarity. The scientist must make his report with such precision as will give the reader no excuse for misinterpretation. He must leave no gaps in his presentation; he must use words in their generally accepted meanings. The use of technical terms should always be conditioned by the level of understanding of those whom the article will reach. In striving for scientific accuracy, the student runs the danger of falling into a style that is stilted and pedantic. Against this he should guard. True, he must avoid theorate; by the very nature of his material he is barred from flights of imagery; he must write simply and directly. But there is nothing in these restrictions to prevent him from adopting a style designed to please the reader, hold his interest, and win his respect."

According to Tyrus Hillway, the final outline must reflect what was actually done rather than what was originally planned.

Typical Form of the Research Report

Preliminary Materials

1. Title e page.
2. Acknowledgement.
3. Preface or Foreword.
4. Table of Contents.
5. List of Tables.
6. List of Figures.

Body of the Report

Chapter I: Introduction.

- (a) General statement of the problem. (What the study is about).
- (b) Significance of the problem. (Why the study was undertaken).
- (c) Statement of the hypotheses.
- (d) Assumptions underlying hypotheses.
- (e) Delimitation of the problem.
- (f) Definitions of the terms.

Chapter II: Review of the literature. (What was previously known about the problem).

- (a) Review of previous research.
- (b) Summary.

Chapter III: Design of the study.

- (a) Description of subjects.
- (b) Description of data gathering instruments employed.
- (c) Sampling.
- (d) Research design and proceedings.

Chapter IV: Presentation and analysis of data.

- (a) Analysis techniques.
- (b) Text.
- (c) Tables.
- (d) Figures.
- (e) Description of findings pertinent to each hypothesis.

Chapter V: Summary and conclusions and implications.

- (a) Summary of hypotheses.
- (b) Conclusions.
- (c) Implications.
- (d) Suggestions for further research.

Chapter VI: Reference Section.

Bibliography.
Appendix.
Index or Indices.

Format Required by the University—Most of the Universities prescribe certain rules on style and format that must be followed closely. Therefore, as soon as the student is ready to start writing his thesis, he should obtain from the Professor Incharge, specific information concerning, the format required at his university.

Examination of Outstanding Thesis—An examination of two or three outstanding thesis in education recently completed at the college will give the student most of the information he needs to meet the style and format requirements.

Preliminary Section

Title page—This usually includes:

1. The name of the topic.
2. The name of the author.
3. The relationship of the report to a course or degree required.
4. The name of the institution where the report is to be submitted
5. Data of presentation.

The title should be stated clearly.

Acknowledgement and Preface—A guide for the preparation of dissertation, thesis of the University of Cincinnate, Ohio, suggests:

"Bestowal of praise or expression of indebtedness is effusive, sentimental, or extravagant or the soundness of the study. The listing of well-known names, whether on the faculty of the local institution or elsewhere, to court favor or to enhance the value of the study by lending to it a fictitious authority, is a form of intellectual and professional dishonesty. Types of acknowledgement that have become stereotyped and may well be avoided are those referring to: the patience and tolerance of a spouse during the pursuit of the graduate degree, exaggerated tributes to the advisory committee, contributions of the graduate classes attended, librarians from whom books were borrowed or references secured, efforts of the typist, clerks assisting in the scoring of tests or tabulation of data, operators of calculating machines, and casual or occasional interviews or letter."

A good taste calls for acknowledgements to be expressed in a simple language.

Following points should be kept in view while writing preliminary section:

1. The title should be typed in capital letters, double spaced and centered between the right and left margins of the page.
2. In the table of contents, the relationship between principal and minor divisions would be indicated by capitalization of chapter numbers and titles, with sub-headings in small letters and with capitalized principal letters.
3. Page references for each topic should be indicated.
4. A separate page should be included for each list of the table and figures.
5. All pages of the preliminary section should be numbered with small Roman numerals (i, ii, iii, etc.)

The Introductory Chapter

The primary purpose of this chapter is to help the reader develop an appreciation for the problem, its place in education and its significance.

The statements of objectives and hypotheses should bring clarity and vividness to the problem in hand. Assumptions need to be made clear.

For a full understanding of the problem it is very essential that various terms are defined as clearly and comprehensively as possible.

The Review of the Literature—A well organized review of the literature gives the reader an understanding of the previous work that has been done in the area of the thesis in order that he will have the insight needed to understand the thesis and to fit its findings into the over all picture, Its preparation also greatly helps the research worker to develop his own understanding of the previous knowledge in his field.

Following points may be kept in view while reviewing the literature.

1. Best studies in the field should be picked but and described in detail.
2. The other supporting studies may be referred to in a footnote and dismissed merely by saying findings of the above studies have been largely supported by a number of other studies that have employed essentially the same approach.
3. All the findings should be combined together and interpreted properly.
4. Each study may not be presented in essentially the same way.
5. Excessive use of quotations should be avoided.

Design of the Study

This section explains the various aspects of the design of study in detail; it includes research procedures and data-gathering devices etc.

Research Procedures

This part of the thesis contains a description of the sample, the measures used and the steps taken in carrying out the project. A detailed description of the sample is needed in order for the reader to assess the generalizability of the research findings. This is also helpful to determine the degree to which the research sample is representative of the population. The population from which the sample was drawn should be defined clearly and a detailed description given of the procedure for selecting the sample.

The next part of this chapter should explain the research procedures adopted.

Presentation and Analysis of Data

Presentation and analysis of data may be called the heart of the research report. Sometimes separate chapters are devoted to presentation, analysis and interpretation of data: Analysis and interpretation of data should be done through text, tables and figures

Text—In the textual discussion of the data, important facts and relationships should be pointed out. Generalizations should be supported by the data. All explanations should be discussed thoroughly and objectively.

Use of Tables and Figures—Use of tables and figures enables the research worker to present the overall picture of the data more clearly and economically. Their use relieves the writer of the responsibility of presenting a tedious recitation of all findings obtained. The writer can emphasize those aspects of the result that seem to be most important or noteworthy.

The writer should be careful in discussing only the significant entry in the table. If every entry in the table is discussed it will result in a boring paper and defeat the very purpose of using tables and figures.

Tables should be relatively simple.

Summary, Conclusions and Implications

Summary

It is the most widely read part of a research study because it recapitulates the entire study. This part should be consistent with a clear presentation of all information concerning the problem, methods and findings. Summary should be as brief as possible but representative of the study.

Conclusions

Conclusions should be presented in somewhat more detail and care should be taken to draw all conclusions directly from the findings. Over-concluding must be avoided.

It is desirable to discuss possible implications and applications of the findings and conclusions.

Sometimes it may be desirable to combine all these sections into one integrated whole, which contains conclusions along with their possible implications.

Suggestions for Further Studies—On the basis of his own experience the research worker may suggest topics which may be taken up by other students.

Reference Materials—The bibliography must contain all references that have been referred to in footnotes or otherwise cited in the study. Some universities require that bibliography should form a separate chapter in the thesis. Following points should be kept in view while preparing bibliography:

1. The format of the bibliography should be decided upon as soon as the student starts reviewing the literature so that data on the bibliography cards is recorded in the correct format.
2. The method of referencing a particular type of source should be consistent down to last comma.

Appendices

Following type of materials may be incorporated:

1. Tables that are very long or that contain material not essential to understanding the study.
2. Copies of the data-gathering instruments in the study.
3. Scoring procedures.
4. Lengthy quotations.

Index or Indices. Index may be prepared alphabetically. There may be more than one index i.e. subject index and names index etc.

General Guidelines for Writing the Report

Organization of the Report as a Whole

1. The general purpose in writing the report must be decided.
2. A plan or outline of the materials indicating the order, in which ideas will be presented, must be prepared.
3. The main ideas should be classified into the main sections of the paper, subordinating the lesser ones into sub-sections.
4. Sections must be built carefully, than the paragraphs within sections.
5. A few paragraphs or pages may be written experimentally to see how effectively they express the thoughts.

Building of Strong Paragraphs

1. Elaborate and vague introductory remarks should be avoided. Opening paragraph must be to the point and straight.
2. In general, conjunctive adverbs and adverbial phrases should not be placed at the beginning of the sentence except when special emphasis is intended.
3. At the end of every section or subsection, summaries may be

provided.

Building of Strong Clear Sentences

1. Every sentence should express one distinct idea or fact. Overloading the sentence leads to confusion.
2. The use of active voice is more direct and interesting.
3. Incomplete sentences should be avoided as they hamper clear comprehension of meaning.
4. There should be a variety of sentence length and structure. Too much sameness can be monotonous.

Securing Power of Expression and Careful Choice of Words and Phrases

1. Make sure that words mean exactly what is intended. Consult dictionary, when in doubt.
2. Avoid hackneyed expressions.
3. Do not use slang, can't and professional jargon.
4. Use strong but precise words.
5. Use metaphors and similes carefully.
6. Spell words correctly.
7. Ordinarily write the report in the third person i.e., refer to yourself as the investigator, the present writer or something similar.

Using Numbers Properly

1. Write numbers containing fewer than three digits as words (five, twenty-five, etc.). Large numbers i.e., 100, 4,689 etc. are written in numerals.
2. Use Arabic numerals in a series or group of numbers containing some fewer than three digits and some with three or more digits.
3. Never begin a sentence with a numeral, no matter how large. Spell out the number even though numerals may appear later in the same sentence (e.g. Fifty thousand persons).
4. Use Arabic numerals (15 percent) when stating percentages, dates or decimals or when writing addresses and telephone numbers.
5. Do not use the percentage sign (%) except in tables.

Detailed sub-headings—Goode and Hatt feel:

"With detailed sub-headings however even the casual reader can see the organization, and a friendly critic can help the writer repair the damage before it is too late. Furthermore, the reader is not led to expect more than the report will give, if these headings fairly specific"

Figures

Following types of figures may be used:

1. The Cinegraph —Used in the form of:

(a) The frequency polygon.

(b)The ogive.

2. The bargraph—Its various forms are:

(i) Horizontal. (ii) Vertical. (iii) Dividing form.

3. The circle, pie or sector chart showing divisions of a unit into its component parts.

4 Maps showing geographical location or for identification purposes. Key should be used for guidance.

Characteristics of Good Figures

1. They are very clear and simple
2. They are "understandable" without the aid of textual description.
3. The title clearly indicates the data presented.
4. Figures that occupy more than a half page are placed on a separate page
5. Figures follow and never precede the related textual discussion.
6. They are numbered with Arabic rather than Roman numerals.
7. The title of a figure is placed below rather than about it.
8. They are used sparingly.
9. The color used is not very gaudy but of a durable nature.

Construction of Tables

1. The number and the title must he given to a table otherwise in the absence of title or number, both author and reader find it difficult in referring to or locating readily the desired data.
2. The table heading should express adequately in a continuous

title the nature of the data included. Such words as 'showing' table are superfluous.

3. The word TABLE (written in do caps as written here) together with the number of the table in ‘Roman numerals’ should be centered above the table, followed on the next line by the title in double caps.
4. A double ruling should appear below the title of the table.
5. A single ruling should appear at the end of the table.
6. Vertical ruling should be inserted as needed. Rulings are not necessary on the right and left margins of the table.
7. In general, abbreviations are to be avoided.
8. If possible, the table may be confined to a single page. Folded tables and graphs present difficulties in binding the report. They are easily lost or torn. When it becomes necessary that a table must be continued on a second page, the box headings should be repeated at the top of each column of data, so as to facilitate ready use of the material.
9. The table number but not the table title, should be repeated thus TABLE I (Continued).
10. The title of each table in the list of tables must correspond, exactly with the title on the page where the table appears.
11. Tables should be placed in the manuscript as near the point of first reference as possible.
12. It is not advisable to show too many groups or columns of data .in one table. The better course is to select for each table the data needed to establish clearly a limited number of points.

Interpretation of Results and the Use of Some Statistical Formulae

In interpreting the results we are interested to know the 'significance’ or 'otherwise' of the result. For answering this question we use the following forms of the ‘Probable errors':

1. Probable error of the mean.
2. Probable error of the median.
3. Probable error of the correlation, co-efficient.
4. Probable error of the difference between two means or other measures.

5. Chi-square test.
6. Tests of student’s and analysis of variance.

Foot-notes

According to Goode and Hat, "Foot-notes serve the primary function of giving credit to those who have preceded the writer in attacking a given problem. Every scientific advance is made on the basis of previous work, and in a real sense foot-notes are the deference we pay to our intellectual forbearers."

Footnotes serve the following purposes:

i. They enable the writer to substantiate his presentation by citing other authorities.
ii. They enable the writer to give credit to sources of material that he has made use of.
iii. They enable the reader to verify the authenticity, and accuracy of the material used.
iv. They enable the author to present explanatory statements that though important, would interfere with the logic and continuity of textual material.

Footnotes should be used very sparingly.

i. They are placed at the bottom of the page.
ii. They are separated from the text by a two-inch horizontal line drawn from the left margin, one double space below the last line of the text.
iii. Foot-notes are single-spaced with double spacing between citations.
iv. They are numbered consecutively within a chapter.

Use of Quotations

1. Short Quotations—Short prose quotations (up to about fifty words may be incorporated into the main body of the text in double quotation marks. A brief reference of the source may be given—e. g., As Dewey has said,"....."
2. Longer Quotations—They are usually set off from the text of the paper by single spacing and indenting a few spaces from the left margin of a page. No quotation marks are needed at the beginning or end when this kind of block arrangement is used.

3. *Omission of any part of a quotation*—This is indicated by three dots or leaders (........).
4. *Underlying or italicizing any part of a quotation*—When this is to be done for emphasizing any part of a quotation, reference to this may be made either in a foot-note or by the notation "italics mine" in brackets immediately following the underlined portion.
5. *Punctuation marks of a quotation*—Commas, question marks, exclamations, points and any other end punctuation found in the original are always placed inside the quotation marks, the exceptions are colons and semicolons, which go outside. A question mark or exclamation point or dash, which the writer supplies at the end of a question should be traced outside the quotation mark.
6. *Quotation within a quotation*—A quotation within a quotation should have single quotation mark if double quotation marks enclose the endure passage.

How to Write Bibliography and Foot-notes Single Author.

1. Bibliography

Best, John W., Research in Education. New Delhi, Prentice-Hall of India (PVT.) Ltd., 1963, 320pp.

Footnote Form

John W. Best, Research in Education.[New Delhi, Prentice-Hall of India (Pvt.) Ltd.. 1963]. p. 16.

Steps of Bibliography

i. Surname of the author first, followed by a comma and the initials or the fu 1 first and middle names, followed by & comma.
ii. The title of the book (underscored) followed by a full stop.
iii. Place of publication, followed by a comma.
iv. Year of publication, followed by a full stop.
v. Number of pages in the book followed by a comma.

Steps In Foot-Notes

i. The author's name (first name first), followed by a comma.
ii. The title of the book (underscored), followed by a full-stop.
iii. Place of publication followed by a colon and the name f the publisher and year of publication (in bracket), followed by a

comma.

iv. The page on which the reference is found is preceded by “p” if only one age is indicated and “pp” if it refers to more than one page. The page number is followed by a ‘Full-stop.

II. Joint Authors
Bibliography

Sukhia, S. P., P. V. Mehrotra, and R; N. Maria, Elements of Educational Research. New Delhi, Allied Publishers (Pvt.) Ltd., 1966, 361PP

More than three authors'.

S. P. Sukhia and others. Elements of Educational Research, New Delhi. Allied Publishers Pvt. Ltd., 1966, 361 pp.

Foot-note Form

S. P. Sukhia, P. V. Mortar, and R. N. Mehrotra, Elements of Educational Research [New Delhi- Allied publishers (Pvt.) Ltd., I966, p.50.

III. Periodical Article
Bibliography

Nail, J. P., "Progress of primary Education in India", *Indian Journal of Educational Administration and Research,* II: I—7, Summer, 1961.

Foot-note

J. P. Naik, "Progress of Primary Education in India". Indian Journal of Educational Administration and Research, II: .3, Summer, 1961.

IV. Newspaper Articles Bibliography

Bibliography

Editorial in *The Hindustan Times*, June 24, 1966.

Footnote Form

Editorial in The Hindustan Times, June 24, 1966.

Comparison of Bibliography and Foot note Form

	Bibliography	Foot-note
Indentation	Overhanging-first line flush with margin, second line indented five spaces.	Regular paragraph, indentation.
Name Order Placement	Last name first, end of body of report-listed alphabetically. .	First name? first. Bottom of Page.
Punctuation	Author Name, Title, Place of Publication, Publisher, Year of Publication.	Author, Title, (Place of Publication, Publisher, Year of Publication).
Page Reference	300 pp. i.e. total number of pages in the book or in article.	pp. 250, i.e. Specific number of page or pages of the reference.

Typing of the Report—General Points

1. The fundamental principle of getting the report typed is to present manuscript material to the professional typist in its proper form.
2. The typographical standards for the thesis or the dissertations arc more exacting. Even a professional typist needs guidance. It is, therefore, essential that both the author and the typist should be well acquainted with all the details of typography to be observed in a thesis or dissertation.
3. Only one side of the sheet is to be used in typewritten manuscript.
4. A medium-inked black ribbon should be used.
5. Medium weight black carbon paper should be used for the copies.
6. Carbon paper should be replaced often enough to ensure clear

and even copies.

7. An efficient typist should be engaged.
8. The author should carefully proofread the first few pages of the material as soon as they are typed and give incessant guidance to the typist.
9. When the typed report is ready, the investigator should he check very carefully that it is in accordance with the original manuscript.
10. All copies of the report must be legible.
11. All errors should be corrected by erasing neatly.
12. Corrections should be made in all the copies.
13. The right margin should be one inch, the top, the bottom and left margin I/2 inches.
14. All textual material should be double spaced, with triple spacing between the paragraphs.
15. An indent of seven spaces should be used throughout the manuscript at the beginning of paragraphs, quotations and footnotes.
16. Ditto mark should be avoided:
17. The pages of' the main body of the report are marked in Arabic numerals on ice upper right hand corner.
18. All pages of the preliminary section of the report are numbered with small Roman numerals (.i.ii.iii,) The title page, though not numbered, is counted as page i the page beginning chapter 1 is page I, but has no number typed on it.

Rules for Typing the Various Parts of a Report

Title Page—The title should be typed in capital letters, double-spaced and beginning six double spaces from the top of the page.

Acknowledgement Page—The heading "ACKNOWLEDGEMENT" should be centered.

The first line should begin three spaces below it.

Table of Contents—The caption should be written in capital letters "TABLE OF CONTENTS". It should be in the center, at the top of the page.

'Chapter' and 'Page'—These are typed two double spaces below the heading. They have only the initial letters in capital-form. Chapter numbers are listed in the column headed 'chapter' without

repeating this word.

Chapter Headings **-** These are typed in capital letters.

Capital Letters—The headings of main sections within chapters are typed in small letters, the first letters of important words being capitalized.

List of Tables—This is written as "LIST OF TABLES" in capitals in the center of the page. These should be written on a new page. The column headings—"Table" and "Page" is typed with only the initial letters capitalized.

List of Figures—All figures, i.e., diagrams, charts, maps etc. are included in this list. A new page after the list of tables should be given.

Different Chapters—Chapters forming the text of the report are typed in proper serial order bearing the word "CHAPTER" in capitals, each chapter beginning on a new page and in Roman numerals (I, II, III etc.).

Numbers should not be given to any major sub-heads within each chapter.

Abbreviations

The use of abbreviations, except some universally acceptable ones such as IQ, M.A., etc. should be avoided in the main text of the research report. In the footnotes, the tables and the bibliography, some standard abbreviations are used to conserve space. A researcher should be familiar and should master the following standard abbreviations:

Anon	anonymous
bk., bks.,	book,books
Chap., chaps.	Chapter, chapters
p., pp.	page, pages
cf.	compare
col., cols.	Column, columns
e.g.	for example
edn., edns	edition, editions
ed., eds.	editor, editors
et. al	and others
Ibid	same reference
Idem.	same person

illus.	illustrated
l. ll.	line, lines
f., ff.	and the following page (s) (pp. 5f, page 5 and the following page. pp. 5 ff., Page 5 and the following pages).
fig., figs.	figure, figures
Loc. Cit.	the place cited
Mimeo	mimeographed
MS, MSS	manuscript, manuscripts
n., nn	note, notes
N.B.	please note
n.d.	no date
n.n.	no name
n. p.	no place
N.S.	new series, new style
No., nos	number, numbers
Op. Cit.	previously cited
passim.	scattered
Supra	above
pt., pts.	part, parts
rev.	revised or revision
sec., secs.	section, sections
trans	translator or translated by
Vide	see
viz.	namely
vol., vols.	volume, volumes
vs., vss	verse, verses

Criteria for Judging Research Reports

Title

Is the title descriptive, reasonably short, and correctly worded?

Introduction and Analysis of the Problem

1. Does the introduction give a clear notion of the general scope of the research?
2. Is the problem analyzed into definite subordinate questions or issues?
3. Is the logic of the analysis of the problem sound?
4. Are important terms that are employed clearly defined?
5. Is the discussion of related research on the problem adequate?
6. Are the basic assumptions involved in the solution of the problem made clear?

Procedure Adopted and Methods of Measurement

1. Is the method of solution logically sound?
2. Are the chosen research methods adequate for the solution of the problem?
3. Are the reasons for their choice made clear?
4. Are the research methods chosen adequately explained?
5. Is the research free from specific weaknesses in research methodology?
6. Have all necessary variables been included?

Collection and Treatment of the Data

1. Is the kind of data chosen adequate to the solution of the problem?
2. Is there evidence of care and accuracy in the collection of the data?
3. Does the sample adequately describe the population?
4. Are any peculiar samplings of persons or materials involved adequately accounted for? Is irrelevant material excluded?
5. Do the data presented form an integral part of the logical solution of the problem rather than a mere encyclopedic enumeration?
6. Are the statements of important facts validated by references to their proof?
7. Are the statistical or speculative methods of organizing and

treating the data accurate?

8. Are they effective in leading toward the solution of the problem?

Conclusions and Recommendations

1. Are inferences and findings drawn from the data sound?
2. Are all the conclusions based essentially on data made known to the reader?
3. Do the summary and conclusions include inferences relative to all the significant data?
4. Are all the conclusions free from mere opinion?
5. Are the limitations or qualifications of the conclusions clearly and concisely expressed?
6. Are applications and recommendations, where included, judiciously made?
7. Are the conclusions consistent with the obtained results?
8. Do the conclusions really serve to answer questions of issues raised in the introduction?

General Tone

1. Does the tone of the report display an unbiased, impersonal and scientific attitude?
2. Does the report show evidence of a sound background in the field?

Arrangement

1. Is the report subdivided into sections?
2. Are the sections appropriately beaded?
3. Is the order of topics satisfactory?
4. Is the thesis free from unnecessary cross-reference?

Summary

Preparing and Writing Research Reports in Education

Development and Organization of Ideas—These points should be kept in view:

1. Encyclopedic enumeration of ideas or facts should be avoided.
2. The reader should be led from a clearly defined problem to a critical and scholarly answer by a route that is satisfying to him.
3. The writer should avoid leaving 'gaps' in his 'trend of thought'

for the reader to fill in.

4. Important ideas should be developed in such a way that the average reader will fully comprehend them.
5. Irrelevant ideas should be eliminated.
6. The ideas should be grouped properly with reference to their relative importance.
7. Statements should be worded in such a way as ambiguity of indefiniteness is avoided.

Details of Structure and Form

1. Appropriate words and phrases be used at all times.
2. Particular words and phrases should be used with a consistent meaning.
3. ‘Overworking’ of certain words are avoided.
4. Suitable vocabulary should be used for the intended audience.
5. Definite yet simple language may be used to express ideas.
6. Rhetorical rules relative to unity, coherence and emphasis in sentence and paragraph construction are properly observed.
7. Rules of grammar should be observed.
8. Words should be correctly spelled.
9. Consistency in the plan of punctuation is observed.
10. The captions of tables should be given at the top and those of graphs at the bottom.
11. Captions, base headings and other labels should be sufficiently complete so that a competent reader will be able to understand the table or graph without referring to the accompanying text.
12. The accompanying text should be complete so that it is unnecessary for the reader to refer to the table or diagram in order to follow the trend of thought.
13. The references to tables and graphs should be explicit so that the reader will have no difficulty in locating the correct table or graph.
14. Bibliographical references should be given for statements.
15. All references both in footnotes and in bibliographies should be given in an approved bibliographical form.
16. Conventional rules with reference to chapter, titles, tables of content, preface, title page, order of paging, spacing, kind of

paper and so forth should be observed.

17. Foot-notes may be used to give needed explanation.
18. Conventional rules with references to abbreviations, divisions, spelling, etc., should be complied with.

Problems for Discussion

1. What important considerations, would you bear in mind while preparing the report of a research study you have undertaken?
2. "While research reports may differ considerably in scope of treatment, they are expected to follow a similar pattern of style and form that has become conventional in academic circles." Elaborate upon this statement with special reference to the writing of a research report.
3. How should the following be presented in a typed research report? What are their uses?
   i. Foot-notes
   ii. Bibliography
   iii. Quotations
   iv. Tables.
4. Study a type-written research report and comment on its general structure and illustrations.
5. Suggest a few guidelines for writing the report.
6. Explain the criteria for judging a research report.

L.R. Gay (1987)	**Educational Research.** Competencies for Analysis and Application, 3rd ed. London, Merrill Publishing Company, pp. 455-467	9.2

16

Preparation of A Research Report

Enablers

After reading chapter 16. You should be able to:

1. List 10 general rules for writing and preparing a research report.
2. Identify and briefly describe the major sections and subsections of a research report.
3. List four major differences between a research report prepared as a thesis dissertation and a research report prepared as a manuscript for publication.
4. List two guidelines for presenting a paper at a professional meeting.

General Guidelines

If you carefully prepare a research plan before you conduct your study, you have a good head start on writing your research report, especially the Introduction section. While you are conducting your study, you can profitably utilize any free time you have by revising and refining the introduction and method sections of the report. The study may not be executed exactly as planned, but the procedures should not diverge drastically from the original plan. When the study is completed, the final draft of the method section can incorporate any final changes in procedures. After all the data are analyzed you are ready to write the final sections of the report. The major guideline previously described for analyzing, organizing, and reporting related literature is applicable to this task—make an outline. The chances of your results and conclusions being presented in an organized, logical manner are greatly increased if the sequence is thought through before anything is actually written. Formulation of an outline greatly facilitates the "thinking through" process. To review briefly, development of an outline involves identification and ordering of major topics followed by differentiation of each major heading into logical subheadings. The time spent in working on an outline is well worth it since it is much easier to reorganize an outline that is not quite right than to reorganize a document written in paragraph form. Of course, this does not mean that your first report draft will be your last. Two or three revisions of each section are to be expected. Each time you read a section you will see ways to improve its organization or clarity. Also, other persons who review your report for you will see areas in need of rethinking or rewording that you have not noticed.

While the research plan may have been written in the future tense (subjects will be randomly selected . . .") by the time you get to the research report the party is over and each section is written in the past tense ("subjects were randomly selected"). Further, in addition to conscientiously following a selected style and format, there are several general rules of good report writing which the researcher should be aware of and follow.

General Rules for Writing and Typing

Probably the foremost rule of research report writing is that the writer must be as objective as possible in reporting the study. A research report is a scientific document, not a novel or treatise. In other words, the report should not contain subjective statements (“clearly group instruction is no good"); overstatements ("wow what fantastic results!"), or emotional statements ("every year thousands of school children are the poor, innocent victims of an ineffective reading program"). Further, the report should not be written as if it were a legal brief intended to present arguments in favor of a position ("the purpose of this study was to prove . . .”). The research report should contain an objective, factual description of past research and the study upon which the report is based.[1] Consistent with the goal of objective reporting, personal Pronouns such as I, my, we, and our should be avoided like the plague. Instead, impersonal pronouns and the passive voice should be used. Phrases

[1]. A little more latitude is permitted the researcher in discussing Implications of the study and in making recommendations for future research or action.

such as 'It was determined' and "subjects were randomly selected" should be used instead of “I determined” and “I randomly selected subjects”.

The research report should be written in a clear, simple, straightforward style; you do not have to be boring, just concise. In other words, say what you have to say in the fewest number of words and using the simplest language. For example, instead of saying, "the population comprised all students who matriculated for the fall quarter at Egghead University”, it would be better to say "the population was all students enrolled for the fall quarter at Egghead University;" The research report should also reflect scholarship; correct spelling, grammatical construction, and punctuation are not too much to expect of a scientific report. And do not say that you are the world's worst speller; everyone has access to a dictionary. If there is any doubt in your mind concerning the correct spelling of a word, correct construction of a sentence, or correct punctuation, consult the appropriate reference bock. It is also a good idea to have someone you know; someone who is perhaps stronger in these areas, review your manuscript for you and indicate errors.

While different style manuals suggest different rules of writing, there are several which are common to most manuals. Use of abbreviations and contractions, for instance, is generally discouraged. Do not say, for example, 'the American Psychological Assn….," say "the American Psychological Association." Also, words like shouldn't, isn't, and won’t should be avoided. Exceptions to the abbreviation rule include commonly used and understood abbreviations (such as IQ and GPA) and abbreviations defined by the researcher to promote clarity, simplify presentation, or reduce repetition. If the same sequence of words is going to be used repeatedly, the researcher will often define an abbreviation in parentheses the first time the sequence is used and thereafter use only the abbreviation. In a study by Doughtie, Wakefield, Sampson, and Alston (1974), for example, the Illinois Test of Psycholinguistic Ability was referred to throughout the research report as the

1TPA.[2] Also, as the above sentence illustrates, authors of cited references are usually referred to by last name only in the main body of the report; first names, initials, and titles are not given, instead of saying "Professor Dudley Q. McStrudle (1976) concluded . . ." you normally would say "McStrudle (1976) concluded . . ." The above described guidelines, of course, hold only for the main body of the report. Tables, figures, footnotes, and references may include abbreviations; footnotes and references usually give at least the author's initials. Another convention followed by most style manuals is with respect to numbers. If the first word of a sentence is a number ("Six schools were contacted ..."), or if the number is nine or less ("a total of five lists . . ."), numbers are usually expressed as words. Otherwise, numbers are generally expressed as Arabic numerals ("a total of 500 questionnaires were sent to the various groups of interest").

The same standards of scholarship should be applied to the typing of the report as to the writing of the report. When you read a report full of typos you cannot help but wonder if the study was conducted in the same careless manner as the report was proofread. If you are not highly proficient in typing, find yourself a typist who is. Present the typist with a manuscript which is in final, correct form; the typist's job is to type, not to polish, your report. I once gave a paper to my secretary that 1 was going to read at a meeting. In the middle of page 7 I wrote a note, which said "see attached document" the attached document had a paragraph marked that I wanted included in the paper. While proofreading the typed paper, much to my chagrin, 1 discovered that she had typed "see attached document" right in the middle of a page. When 1 asked her about It she told me sweetly “I type what I see, not what you mean!" The point is that you should not expect your typist to "know” what you want. If you have any special instructions (such as not to split words at the end of a line), share them with your typist and be sure they are understood. It is also a good idea to give your typist a copy of the style manual you are following to ensure that required guidelines

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2 Doughtie, E.B. Wakefield, J.A., Jr., Sampson, R.N., & Alston, H.L. (1974). A statistical test of the theoretical model for the representational level of the Illinois Test of Psycholinguistic Ability. Journal of Educational psychology, 66, 410-415.

(such as size of margins) are followed. Finally, no matter how good your typist is, nobody is perfect. The final typed report should be proofread carefully at least twice. Reading the report silently to yourself will usually be sufficient to identify major typing errors. If you have a willing listener, however, reading the manuscript out loud often helps you to identify grammatical or constructional errors. Sometimes sentences do not make nearly as much sense when you hear them as when you write them; also, your listener will frequently be helpful in bringing to your attention sections that are unclear. Reading the report backwards, last sentence first, will also help you to identify poorly constructed or unclear sentences.

The process of preparing a research report has been greatly facilitated by the development of word processing software for micros. A word processor provides so many features not available with a typewriter that it is probably safe to say that the old electric typewriter can be added to the endangered species list. When using a word processing program, you type in your text and it is displayed on the screen; it is then stored and available for additions, deletions, and changes. A high-quality printer allows you to print out results, which are virtually identical to typed copy. While different programs have different capabilities, commonly available features include: automatic page numbering and heading centering; the ability to rearrange words, sentences, and paragraphs; and spelling checkers. Yes, alas, we may soon be adding Webster to our endangered species list! A word processing program of especial interest to researchers is “Manuscript Manager" APA Style.[3] This program not only is a high-capability word processor, it also automates all APA style rules. So, for example, it checks to see if each citation in the text has a corresponding reference and vice versa, counts the words in the abstract, and lists all stylistic errors in the text. A fringe benefit that comes with the program is the availability of a user support hotline should you have any questions regarding its use.

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[3] Stone, A. (1986). “Manuscript Manager" APA Style. Elmsford, NY: Pergamon Press.

Format and Style

Most research reports consistently follow a selected system for format and style. While many such systems are available, a given report usually strictly follows one of them. Format refers to the general pattern of organization and arrangement of the report. The number and types of headings and subheadings to be included in the report are determined by the format used. Style refers to the rules of spelling, capitalization, punctuation, and typing followed in preparing the report. While specific formats may vary in terms of specific headings included, all research reports follow a very similar format that parallels the steps involved in conducting a study. One format may call for a discussion section, for example, while another may require a summary, conclusions, and recommendations section (or both), but all formats for a research report entail a section in which the results of the study are discussed and interpreted. All research reports also include a condensed description of the study, whether it is a summary of a dissertation or an abstract of a journal article.

Most colleges, universities, and professional Journals either have developed their own, required style manual or have selected one that must be followed. One such manual, which is increasingly being adopted as the required guide for theses and dissertations, is the Publication Manual of the American Psychological Association.[4] This format is becoming increasingly popular, primarily because it eliminates the need for formal footnotes. If you are not bound by any particular format and style system, the APA manual is recommended. In addition to acquiring and studying a copy of the selected manual, it is also very helpful to study several reports that have been written following the same manual. Such reports serve as useful models and help the writer translate abstract guidelines into practice.

Types of Research Reports

Research reports usually take the form of a thesis, dissertation, journal article, or paper to be read at a professional meeting. In fact,

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4. American Psychological Association. (1983). Publication manual of the American Psychological Association (3rd ed. Washington. DC: Author

the same report may take several forms; dissertation studies are frequently described at professional meetings and prepared for publication. As mentioned previously, and as you probably noticed when you reviewed the literature related to your problem, the components of all research reports are very similar. Depending upon its form, the report may be divided into sections or chapters but these divisions are similar in content.

Theses and Dissertations

While, specifics will vary considerably, most research reports prepared for a degree requirement follow the same general format. Figure 16.1 presents an outline of the typical contents of such a report. As Figure 16.1 indicates, theses and dissertations include a set of fairly standard preliminary pages, components which directly parallel the research process, and supplementary information, which is included in appendices.

Preliminary Pages

The preliminary pages set the stage for the report to follow and indicate where in the report each component, table, and figure can be found.

The Title Page. The title page usually includes the title of the report, the author's name, the degree requirement being fulfilled, the name and location of the college or university awarding the degree, the date of submission of the report, and signatures of approving committee members. The title should be brief (15 words or less, as a rule of thumb), and at the same time it should describe the purpose of the study as clearly as possible. One way to reduce the size of the title is to omit unnecessary words such as "a study of. ..." "an investigation of ...," and "an experimental study to determine. . .” The title should, however, at least indicate the major independent and dependent variables, and sometimes it names the population studied. Volume 72, issue 1, of the Journal of Educational Psychology, for example, includes the following titles:

PRELIMINARY PAGES

Title pages
Acknowledgment pages
Table of Contents
List of Table

List of Figures
Abstract

MAIN BODY OF THE REPORT
Introduction
Statement of the Problem
Review of Related Literature
Statement of the Hypothesis
Method
Subject
Instruments
Design
Procedure
Results
Discussion (Conclusions and Recommendations)
Reference (Bibliography)

APPENDICES

Figure 16.1. Common components of a research report submitted for a degree requirement.

Test Anxiety and Academic Performance: The Effects of Study-Related Behaviors, Maternal Teaching Strategies and Cognitive Styles in Chicane Families.

Classroom Learning Style and Cooperative Behavior of Elementary School Children.

Do Teacher Standards for Assigning Grades Affect Student Evaluations of Instruction?

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5. Culler, R.E. & Holahan, C.J. (1980). Test anxiety and academic Performance: The effects of study related behaviors. Journal of Educational Psychology, 72 (1), 16-20
6. Laosa, L.M. (1980). Material teaching strategies and cognitive styles in Chicano families. Journal of Educational Psychology. 72 (1), 45-54.
7. Hertz - Lazarowitz, R.,Sharan, S,. & Steinberg, R, (1980). Classroom learning style and cooperative behavior of elementary school children Journal of Educational Psychology. 72 (1), 99-106.
8. Abrami, P.C., Dichens, W.J,. Perry.R.P, & Leventhal, L. (1980). Do teacher standards for assigning grades affect student evaluations of instruction? Journal of Educational Psychology 72 (1), 107-117.

Each one of these titles specifies the cause-effect relationship that was investigated. A good title should clearly communicate what the study was about. Recall that when you reviewed the literature and looked under key words in the various indexes, you made decisions based on titles listed concerning whether the articles were probably related or not related to your problem. When the titles were well constructed it was fairly easy to determine probable relationship or lack of relationship to your problem: when they were vaguely worded it was often difficult to determine without examining the report of the study. Thus, after you write your title apply the communication test: Would you know what the study was about if you read the title in an index?

The Acknowledgement Page. Most theses and dissertations include an acknowledgment page. This page permits the writer to express appreciation to persons who have contributed significantly to the completion of the report. Notice the word significant. Everyone who had anything to do with the study or the report cannot (and should not!) be mentioned. It is acceptable to thank your major professor for his or her guidance and assistance: it is not acceptable to thank your third-grade teacher for giving you confidence in your ability.

The Table of Contents, List of Tables, and List of Figures. The table of contents is basically an outline of your report which indicates on which page each major section (or chapter) and subsection begins. The list of tables, which is presented on a separate page, gives the number and title of each table and the page on which it can be found. As an example:

LIST OF TABLES

TABLE

Page

The list of figures, which is also presented on a new page, gives the number and title of each figure and the page on which it can be found:

LIST OF FIGURES

FIGURE

Entries listed in the table of contents should be identical to headings and subheadings in the report, and table titles and figure titles should be the same titles that are given for the actual tables and figures in the main body of the report.

Abstract. Some colleges and universities require an abstract, while others require a summary, and the current trend is in favor of abstracts. The content of abstracts and summaries is identical, only the positioning differs; whereas an abstract precedes the main body of the report, a summary follows the Discussion section. The size of the abstract will determine the amount of detail permitted and its emphasis. Abstracts are often required to be no more than a given maximum number of words, 'usually between 100 and 500. Shorter abstracts usually concentrate more on the problem and on the result than on the method. Since the abstract of a report is often the only partiers (remember when you did your review of the literature?) it should describe the most important aspects of the study, including the problem investigated, the type of subjects and instruments involved, the design, the procedures, and the major results and the major conclusions. A reader should be able to tell from an abstract exactly what a study was about and what it found. For example, a 100-word abstract for a study investigating the effectiveness of structured peer editing on the writing proficiency of twelfth-grade, college preparatory. English students might read as follows:

The purpose of this study was to determine the effectiveness of structured peer editing, as compared to teacher-only editing. Using a pretest-posttest control group design and applying at test for independent samples, it was found that after a 10-week period the structured peer editing group achieved significantly higher scores on the language skills portion of the lower tests of Basic Skills. Level 14. It was concluded that peer editing was more effective in promoting writing skills than editing done solely by the teacher.

The Main Body of the Report

With the exception of the section for Discussion, you are already quite familiar with the components of a research report. Therefore, we will review each of these components[9] briefly and will discuss the Discussion section in more depth.

Introduction. As mentioned previously, the introduction to a research report is already written and in pretty good shape if the researcher carefully developed a research plans prior to conducting the study. The introduction section includes a description of the problem, a review of related literature, a statement of hypotheses, and definition of terms. A well-written statement of a problem generally indicates the variables, and the specific relationship between those variables, investigated in the study. The statement of the problem should be accompanied by a presentation of the background of the problem, including a justification for the study in terms of the significance of the problem.

The review of related literature describes and analyzes what has already been done related to your problem. The review of related literature is not a series of abstracts or annotations but rather an analysis of the relationships and differences among related studies and reports. The review should flow in such a way that the least related references are discussed first and the most related references are discussed last, just prior to the statement of the hypothesis. The review should conclude with a brief summary of the literature and its implications.

A good hypothesis states as clearly and concisely as possible the expected relationship (or difference) between two variables and defines those variables in operational, measurable terms. The hypothesis (or hypotheses) logically follows the review of related literature and it is based upon the implications of previous research. A well-developed Hypothesis is testable, that is, can be confirmed or

[9] Based on a pars by A Ware. (19850. Florida International University Miami, FL. Used by permission.

disconfirmed.

The introduction also includes operational definition of terms used in the study which do not have a commonly known meaning. Some institutions require that one section of the introduction be devoted to defining all the terms in one place. Usually, however, it is better to define each term the first time it appears in the report.

Method. As with the introduction, the method section of the report is already written and included in the research plan. The procedure section may require some revision, but it should be in reasonably good shape. The method section includes a description of subjects, instruments, design, procedure, assumptions, and limitations. The description of subjects includes a definition and description of the population from which the sample was selected and may describe the method used in selecting the sample or samples (or the method of selection may be described in the procedure section). The description of the population should indicate its size and major characteristics such as age, grade level, ability level, and socioeconomic status. Information should be provided on any variables, which might be related to performance on the dependent variable. A good description of the population enables the reader of the report to determine how similar study subjects were to the population with which she or he is involved, and thus, how applicable results might be. If method of sample selection is presented here it should be very specific.

The description of instruments should identify and describe all instruments used to collect data pertinent to the study, be they tests, questionnaires, interview forms, or observation forms. The description of each instrument should relate the function of the instrument in the study (for example, selection of subjects or a measure of the dependent variable), what the instrument is intended to measure, and data related to validity and reliability. If an instrument has been developed by the researcher, the description needs to be more detailed and should also relate the manner in which it was developed, a description of pre-testing efforts and subsequent instrument revisions, steps involved in scoring, and guidelines for interpretation. A copy of the instrument itself, accompanying scoring keys, and other pertinent data related to a newly developed test are generally placed in the appendix of the thesis or dissertation.

The description of the design is especially important in an experimental study. In other types of research the description of the design may be combined with procedure. In an experimental study, the description of the basic design (or variation of a basic design) applied in the study should include a rationale for selection and a discussion of sources of invalidity associated with the design, and why they may have been minimized in the study being reported.

The procedure section should describe each step followed in conducting the study, in chronological order, in sufficient detail to permit the study to be replicated by another researcher. If not done so earlier, the method of subject selection should be described in detail. It should be clear exactly how subjects were assigned to groups and how treatments were assigned to groups. Time and conditions of pretest administration (if appropriate) should be described, followed by a detailed explanation of the study itself. The ways in which groups were different (treatment) should be clearly delineated as well as Ways in which they were similar (control procedures). Any unforeseen events which occurred which might have affected the results should be discussed in terms of their seriousness and probable consequences. Also, any insights regarding ways to improve procedures should be shared so that other researchers may profit from the investigator's experiences.

Results. The results section describes the statistical techniques that were applied to the data and the results of each analysis. For each hypothesis, the statistical test of significance selected and applied to the data is described, followed by a statement indicating whether the hypothesis was supported or not supported, tables and figures are used to present findings in summary or graph form and add clarity to the presentation. Tables present numerical data in rows and columns and usually include descriptive statistics, such as means and standard deviations, and the results of tests of significance, such as T and F Ratios. While a figure may be any non-tabular presentation of information (such as a diagram or chart), figures in the results sections are usually graphical presentations of data. Figures can often be used to show relationships not evident in tabular presentations of data. Interactions, for example, are clearer when illustrated in a figure. If figures are based on numerical data, that data should be presented in a table or in the figure itself. Good tables and figures are uncluttered and self-explanatory; it is better to use two tables (or figures) than one that is crowded. They should stand alone, that is, be interpretable without the aid of related textual material. Tables and figures follow their related textual discussion and are referred to by number, not name or location. In other words, the text should say "see Table 1," not "see the table with the means" or "see the table on the next page."

Figure 16.2 Illustrates appropriate use and format of tables and figures. It presents Table 3 and Figure 2 from a study by Winne and Marx which-appeared in a 1980 Issue of the Journal of Educational Psychology.[10] Table 3 includes descriptive statistics for the results (the means, M, and the standard deviations, SD). Figure 2 graphically presents the means from Table 3 and clearly depicts an interaction, which is not evident from an examination of Table 3.

Discussion. Every research report has a section that discusses and interprets the results, draws conclusions and implications, and makes recommendations. Interpretation of results may be presented in a separate

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10 Winne, P.H. & Marx. R.W. (1980). Matching students' cognitive responses to teaching skills. Journal of Educational Psychology. .72,257-264

Table 3

Means and Standard Deviations for Groups on
Mean of Post training Quizzes in Experiment 2

Group	Structural	Functional
Prose		
M	4.82	5.27
SD	1.19	.95
Prose plus		
video	6.07	5.39
M	.76	1.07
SD		
Placebo	5.19	
M	1.36	
SD		

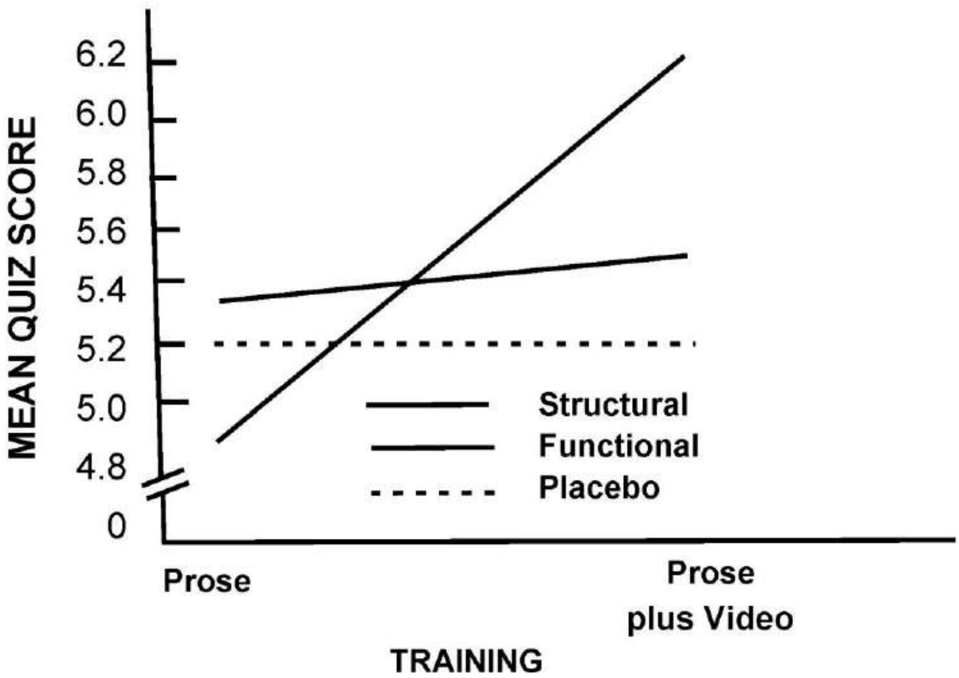

Figure 2. Mean achievement for trained and placebo groups in Experiment 2.

Figure 16.2. Example of a table and a figure illustrating appropriate use and format. (From Winne and Marx, 1980. Copyright 1980 by the American Psychological Association. Reprinted by permission.)

Section titled 'Discussion' or it may be included in the same section as the other analysis of results items. If only one hypothesis was tested, and (or) if the discussion is brief. It may be included in the results section. What this section (or sections) is called is unimportant; what is important is how well it is done. Each result is discussed in terms of the original hypothesis to which it relates and in terms of its agreement or disagreement with previous results obtained by other researchers in other studies. For example, in a study investigating the effectiveness of reviews in increasing retention of mathematical rules (Gay. 1973), It was hypothesized that"... for the mathematician task involved in this study. . . one review will significantly enhance retention . . ." and "temporal position of one review will not be a significant effect. . . ."[11] The results section of the research report stated that: "It was found that while review groups retained significantly more than the no-review group ($F = 6.96$, $df = 1/48$. $p < .05$) the effect of temporal position of the reviews was not significant.' And the Discussion section stated that "The results of experiment I indicate that the temporal position of one review are not an important factor in retention of mathematical rules. These findings are consistent with those of Peterson et al (1935), Sones and Stroud (1940), and Ausubel (1966) involving meaningful verbal learning."[12]

Two common errors committed by beginning researchers are to

11 Gay. L.R. (1973). Temporal position of reviews and its effect on the retention of mathematical rules, Journal of Educational Psychology, 64, 171-182. Temporal positions refers to when the review was received. In this study subjects received a review 1 day, 1 week, or 2 weeks following the day of original learning,

12 Peterson, H Ellis. M., Toohill, N.. & kloess, P. (1935). Some measurements of the effect of reviews. Journal of Educational Psychology, 26, 65-72: Sones, A. M., & Stroud, J.B. (1940). A of Review with special reference to temporal position. Journal of Educational Psychology, 31, 665-676; and D.P. (1966). Early versus delayed review in meaningful learning. Psychology in the Schools, 3, 195-198.

confuse results and conclusions and to over-generalize results. A result is the outcome of a test of significance, for example, the mean of group 1 is found to be significantly larger than the mean of group 2. The corresponding conclusion is that the original hypothesis was supported and that method A was more effective than method B. Overgeneralization refers to the statement of conclusions that are not warranted by the results. For example, if a group of first graders receiving individualized instruction were found to achieve significantly higher on a test of reading comprehension than a group receiving traditional instruction, it would be an overgeneralization to conclude that individualized instruction is a superior method of instruction for elementary students.

The researcher should also discuss the theoretical and practical implications of the findings and make recommendations for future research or future action. In this portion of the report the researcher is permitted more freedom in expressing opinions that are not necessarily direct outcomes of data analysis. The researcher is free to discuss any possible revisions or additions to existing theory and to encourage studies designed to test hypotheses suggested by the results. The researcher may also discuss implications of the findings for educational practice and suggest studies designed to replicate the study in other settings, with other subjects, and in other curricular areas, in order to increase the generalizability of the findings. The researcher may also suggest next-step studies designed to investigate another dimension of the problem investigated. For example, a study finding type of feedback to be a factor in retention might suggest that amount of feedback may also be a factor and recommend further research in that area.

References. The references or bibliography section of the report lists all the sources, alphabetically by authors' last names that were directly used in writing the report. Most of the references will, of course, appear in the introduction section of the report. Every source cited in the paper must be included in the references, and every entry listed in the references must appear in the paper; in other words, the sources in the paper and the sources in the references must correspond exactly. If the APA style manual is being followed, secondary sources are not included in the references. Citations in the text for such sources should indicate the primary source from which they were taken; the primary source should be included in the references. The Task 2 Example previously presented illustrates the correct procedure for secondary sources. In the introduction, the following appears:

Kalba (cited in Honig, 1983), for example, found that by high school age children . . .

The Honig source is listed in the references. Note that no year is given for the Kalba study. For thesis and dissertation studies, if sources were consulted that were not directly cited in the main body of the report, these may be included in an appendix (see Task 8 Example). Also, in thesis and dissertation studies, since the list of references is likely to be lengthy, references are often subdivided into sections such as Books, Articles, and Unpublished.

The style manual being followed will determine the form, which each reference must take. This form is usually different for journal articles and books. It is important that whatever form is used be followed consistently. If the style manual to be used is known while the review of related literature is being conducted, the researcher can save time by writing each reference in the proper form initially

Appendices

Appendices are usually necessary in thesis and dissertation reports. Appendices include information and data pertinent to the study, which either are not important enough to be included in the main body of the report, or are too lengthy. Appendices contain such entries as materials especially developed for the study (for example, tests, questionnaires, and cover letters), raw data, and data analysis sheets. Infrequently, an index may be required. An index alphabetically lists all items of importance or interest in the report and the page on which each can be found. The longer the document, the more useful an index will be. Also, a number of universities ask that a vita be included. A vita is a short autobiography describing professionally related activities and experiences of the author. Information typically included in a vita describes educational training and degrees earned, professional work experience, memberships in professional organizations, and publications, if any.

Journal Articles

Preparation of a research report for publication in a professional journal serves the interests of the professional community as well as those of the researcher. Progress in educational research requires that researchers share their efforts so that others may profit from and build upon them. Dissertations and theses are not read nearly as often as professional journals; thus, publication in a frequently read journal permits the largest possible audience to read about and use the findings of a research study.