



Quantitative, Qualitative or Mixed Research: Which Research Paradigm to Use?

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Abstract

Research students usually encounter great difficulties in setting up a viable research project mainly because, on the one hand they lack familiarity with the philosophical underpinnings of major paradigms used in educational research: quantitative, qualitative or mixed, and on the other hand, they do not associate the corresponding research types with these paradigms: experimental, non experimental for the former, and interactive or non interactive for the second and the for the latter whether it is explanatory or exploratory, in addition to the importance of triangulation in any research study. These paradigms determine not only the formulation of the problem chosen for research and the associated research questions or hypothesis but also and more importantly, the sampling procedure as well as the selection of the appropriate research tools and the way the collected data is analysed and discussed. This survey of the major paradigms in educational research and their implications for the design of any research study will hopefully provide them with the necessary guidance to approach their research project with more confidence et more efficiency.

Keywords: educational research; quantitative; qualitative; mixed methods; triangulation

1. Introduction

The aim of this paper is to discuss the philosophical tenets of the major research frameworks which postgraduate students in educational research work with but which they are often confused about. Such a clarification is important inasmuch as it determines not only the research methodology which will be followed but also the choice of the appropriate research methods and the procedure used for the analysis of the collected data. The various research schemes and their corresponding philosophical background will be discussed and concrete examples will be provided to help research students better understand the issues at stake.

Educational research has been defined differently by various researchers. For Travers quoted in Koul (1984:5) it is

an activity directed towards the development of an organized body of scientific knowledge about the events with which educators are concerned.

while Ary et. al. (1972:21) define it as

the way in which one acquires dependable and useful information about the educative process.

These definitions of educational research point at some important issues: First and foremost, the research procedure must answer the canons of 'science' then, the information provided must be reliable, and finally, what is being investigated should be of interest to educators who may carry out their research within or outside the educational institution. Also implicit in these definitions is the fact that educational research must use the same methods as those used in natural sciences in order to come up with answers aimed at improving teaching and learning as well as identifying the conditions for testing and verifying this knowledge and the conditions under which it should occur.

The scientific method is defined by Bhattacharjee, (2012:15) as a

standardized set of techniques for building scientific knowledge, such as how to make valid observations, how to interpret results, and how to generalize those results. The scientific method allows researchers to independently and impartially test pre-existing theories and prior findings, and subject them to open debate, modifications, or enhancements

It is thus of paramount importance for research students to grasp the fundamentals of these issues since they determine the choices they have to make at all stages of their research which invariably include the following: the choice of a research framework, the selection of the appropriate research tools for the collection of the data, the procedure(s) to be followed for their analysis, and ultimately, the nature of the conclusions they will have to draw. They must be aware that all existing research frameworks reflect shifts in scientific thought which can be traced back to the debate among leading Greek philosophers as to how new *knowledge* is acquired. These philosophers challenged earlier explanations based on theological tenets and argued that a better and more systematic understanding of the world could be obtained either through our senses as the *empiricist* school claimed, or through logical reasoning as the *rationalist* school believed. Subsequent shifts in scientific thought, as we shall see, will lead to new perceptions as to how knowledge can be derived from, leading thus to new research paradigms.

A clear understanding of the philosophical foundations of research will undoubtedly help research students opt for and justify the choice of a particular framework or paradigm. The latter is defined by Chalmers (1982:11) as being "*made up of the general theoretical assumptions and laws, and techniques for their application that the members of a particular scientific community adopt*", and by Willis (2007:8) as "*a comprehensive belief system, world view, or framework that guides research and practice in a field*"

Such understanding will hopefully help them make the appropriate choices about :

- (1) Their research question(s) or hypothesis
- (2) the type of the research instruments to be used,
- (3) the steps involved in the collection of the data, and ultimately
- (4) the procedure used for the analysis and discussion of the collected data

We shall briefly explain how these shifts in scientific thought have occurred and how they have led to the major shifts in research paradigms and then, we shall show how these shifts had an impact on research methods and methodologies. It will be reminded that the term '*method*' is used to refer to the research instruments used to collect and analyse data, e.g. a questionnaire, interview, checklist, data analysis software etc., whereas '*methodology*', according to Willis (2007:14)

the term methodology generally is used to describe several aspects of a study: the design, the procedures for data collection, methods for data analysis, selection of subjects, and details of the specific treatments

2. Research Philosophy: Historical Background

The type of research methodology the researcher chooses is determined by the research philosophy which the researcher adheres to and this choice will determine the research objective(s) and the research instruments developed and used as well as the quest for the solution to the problem he is investigating.

So far, Empiricism and Rationalism have been the most prevailing research philosophies. These can be traced back to the debate we mentioned earlier between the Empiricists who were inductivists and the Rationalists who were deductivists. These two opposing views will follow different ways in explaining how knowledge is acquired: either through inductive reasoning as the Empiricists believed or by reasoning as the Rationalists maintained. Therefore, the Inductive/Deductive distinction can be considered as the first major paradigm in science. The Inductive reasoning (or bottom-up process) starts from specific observations and moves towards a general conclusion or theory. For example, I observe that all the elephants I have seen (repeated observations) have a trunk, therefore I conclude that ALL existing elephants, even those I have not seen, HAVE a trunk (conclusion, or generalisation). Whereas deductive reasoning (also known as top-down process) proceeds differently. The starting point is a general statement (called the first premise, or theory) followed by a more specific statement inferred from this (the second premise, or the observed phenomenon) and, through logical reasoning, reaches a specific conclusion. As an illustration, I know that all planets orbit around the sun (first premise), a new planet is discovered (second premise), therefore I can conclude that this planet also orbits the sun.

In terms of research methodology, each will proceed differently. The inductive approach will go through the three following steps:

1. Observation.
2. Identification of patterns derived from these observations.
3. Drawing generalization on the basis of these patterns.

whereas the deductive approach will proceed in three different but opposite stages:

1. Put forward a hypothesis, based on an already existing theory or research literature.

2. Gather relevant data to test the hypothesis.
 3. Decide whether to accept or reject the initial hypothesis.
- This can be represented in the research wheel below: (Figure 1)

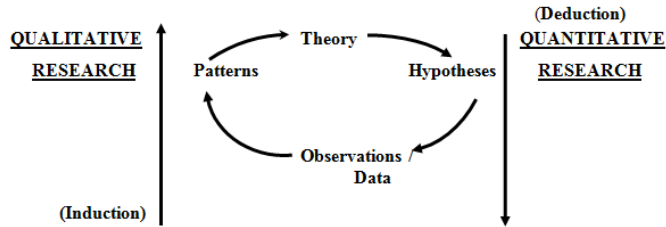


Figure 1: the research wheel¹

There are of course problems with both approaches. For the inductive approach for example, there are three major objections. First, the conclusions the research draws depend on observation and it is not clear how many observations are necessary before reasonably drawing conclusions which are pertinent enough to make generalisations; Second, the question is how much control on the situation(s) the researcher has and under which conditions these observations are carried out so that he can draw reliable conclusions, and third, even if our experiences are representative, we may interpret or remember them in a biased, thus subjective manner.

As for the deductive approach, the major problem resides in its reliance on theories which are speculative answers to a posited problem in the form of a hypothesis which is then tested by observation and experimentation but which, by definition, is falsifiable, thus opening the door to the possibility of a total rejection of the theory on which it was built, requiring therefore a revision of the initial hypothesis. In addition, when adopting a deductive process it is vital that the premise be valid so that the conclusion on which it is based be valid as well. For example, in the past, many conclusions about the movement of the planets were incorrect due to the premise that the earth was the centre of the universe.

This debate was revisited after the Renaissance and witnessed a heated dispute between the *Rationalists* represented by the French philosopher René Descartes (1596–1650) who argued that Reason was the only mode through which one could arrive at truth and assumed thus, that knowledge could only be acquired if the appropriate reasoning procedure was used, and the *Empiricists* represented by the British philosophers John Locke (1632–1704) and David Hume (1711–1776) who argued that **experience** was the basis for acquiring all new knowledge. It was Locke who put forward the well known formula that each person is born as a blank slate upon which the environment writes. For these philosophers our knowledge derives from our senses (sight, hearing, touch, smell, and taste) which then imprint ideas in our brain which are further worked upon through cognitive processes. However, it must be stressed that both trends were primarily concerned with *natural* sciences since at that time social sciences had no place as they were considered as being subjective and thus, not treated as *real* sciences.

The next major shift will occur during the same period with the French philosopher Auguste Comte (1798–1857) who initiated the positivist movement which is a philosophy that combines the tenets of rationalism and claims that despite the fact that theories may rely on reasoning, they are only authentic if they can be verified through observations and measurements. His views were expanded by the sociologist Emile Durkheim (1858-1917) who elaborated the principles of social science positivism which put social sciences in the realm of ‘scientific’ research. He stated that ‘*the social scientist must study social phenomena in the same state of mind as the physicist, chemist or physiologist when he probes into a still unexplored region of the scientific domain*’ (Durkheim 1964: xiv). He maintained that the social scientist can adopt the same objectivity in the study of social life as the natural scientist studying natural phenomena. As Strauss & Corbin (1998) point out, this approach stresses the importance of carrying out social science research by focussing rigorously on causal relationships between behaviours and other measurable and directly observable social phenomena. Thus, the importance of objectivity which requires the researcher to be unbiased and detached from the phenomenon under study.

¹ Adapted from Burke, R and Christensen, L. B.(2015), *Educational Research: Quantitative, Qualitative, and Mixed Approaches*, Sage publications, 4th Edition.

As Donatella (2008:21) points out, for the positivists:

The world exists as an objective entity, outside of the mind of the observer, and in principle it is knowable in its entirety. The task of the researcher is to describe and analyse this reality. Positivist approaches share the assumption that, in natural as in social sciences, the researcher can be separated from the object of his/her research and therefore observe it in a neutral way and without affecting the observed object.

Such assumptions reflected the strong version of positivism which was exclusively interested with natural sciences excluding thereby all social sciences from their concern.

Not all researchers, however agree with this *strong* form of positivism. Many advocated an alternative version known as the *weak* version or the *post-positivism* view which Phillips (1990:33) sums up as follows:

... although the object of our inquiry exists outside and independent of the human mind, it cannot be perceived with total accuracy by our observations; in other words, complete objectivity is nearly impossible to achieve, but still pursues it as an ideal to regulate our search for knowledge.

The key assumptions of this position are summed up by Phillips & Burbules (2000:121):

1. Knowledge is conjectural : absolute truth can never be found. Thus, evidence established in research is always imperfect and fallible. It is for this reason that researchers state that they do not prove a hypothesis; instead, they indicate a failure to reject the hypothesis.
2. Research is the process of making claims and then refining or abandoning some of them for other claims more strongly warranted.
3. Data, evidence, and rational considerations shape knowledge.
4. Research seeks to develop relevant, true statements, ones that can serve to explain the situation of concern or that describe the causal relationships of interest.
5. Being objective is an essential aspect of competent inquiry; researchers must examine methods and conclusions for bias.

The post positivists paved the way for the inclusion of social sciences in the realm of science and see research in social sciences similar to natural science research; They assume that social reality is composed of measurable objective facts which can be precisely measured by the researcher who can use statistics to test causal relationships. However, while the positivists will favour a hypothetico-deductive procedure which advocates quantitative measurement, the post positivists will follow an inductive procedure advocating qualitative assessment. These two research frameworks will establish the two major paradigms in research, i.e. **quantitative**, usually associated with natural sciences, and **qualitative**, mostly associated with social sciences .

In addition to these two major paradigms, one must also mention a third one, mostly used in social sciences and particularly in educational research, which blends the characteristics of both paradigms, i.e. the mixed method research which will be discussed in more details later.

It must be kept in mind however, that irrespective of the nature of the research (qualitative, quantitative or mixed) for a research study to qualify as '*scientific research*', it must obey the canons of the *scientific method* which involves the following steps:

- (1) Definition of the research problem and the research constructs
- (2) Review concepts and theories and previous findings
- (3) Statement of the Hypothesis or the Research Question(s)
- (4) Description of the research framework in terms of research tools, sampling procedure etc.
- (5) Collection the relevant data
- (6) Analysis of the data
- (7) Discussion of the results and testing of the hypothesis (or answer the research question(s))

3. Research Paradigms and Types of Studies

We shall now turn to discussing the implications that each paradigm has for the design of the various types of research studies in educational research. This is summarised in Figure 2 below, while Figure 3 lists the criteria to be used for identifying the various types of research, and Figure 4 lists all the research instruments which can be used in all three paradigms and for ensuring triangulation.

3.1 Quantitative research studies

Creswell (2003:4) defines quantitative research as

is a means for testing objective theories by examining the relationship among variables. These variables, in turn, can be measured, typically on instruments, so that numbered data can be analyzed using statistical procedures.

There are two types of quantitative studies: either *experimental or non experimental*

3.1.1 Experimental studies

Experimental studies can be either a *true experiment*, a *quasi experiment* or a *single case study*. The latter is very rarely used in educational research because it is concerned with only one subject. However, one must keep in mind that the single-subject study may be seen as a true experiment because it as a long and respected tradition in empirical research particularly in psychology.

According to Kazdin (2003:273), single-subject studies “can demonstrate causal relationships and can rule out or make implausible threats to validity with the same elegance of group research”. The single subject design has objectives similar to other experimental designs, in that (1) it looks at the changes in the dependent variable following the manipulation of the independent variable and (2) it tries to identify the causes of the differences brought about by the variations in the conditions of the study.

As far as the other two types are concerned, what differentiates a true experiment from a quasi experiment study is the fact that in the former, the researcher can manipulate the variables under stringent and controlled conditions to study the effect or the impact of one variable (the independent, also called predictor one) on the other variable (the dependent, or outcome variable) to make statements of causality. Furthermore, the participants in the study are randomly assigned (i.e. systematic sampling which is truly representative of the **whole** population) to an experimental group and a control group. This type of study offers a high level of control over the elements of the research and gives the possibility for other researchers to replicate the study in the same circumstances whereas in the latter, although the research is carried out under the same experimental conditions, it nevertheless lacks two important characteristics of the experimental type: First, the sampling procedure is random, i.e. the participants are chosen randomly within the targeted population without any specific criteria, opening thus the possibility of ending up with an unrepresentative sample and second, there is no control group for comparison. Furthermore, in non experimental studies the researcher cannot manipulate variables, he can only observe and interpret what he is looking at.

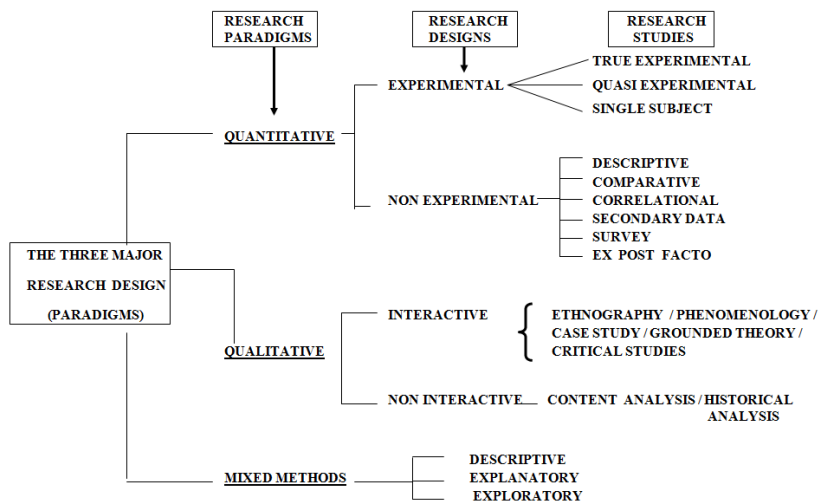


Figure 2 : Research Paradigms, research designs and research studies

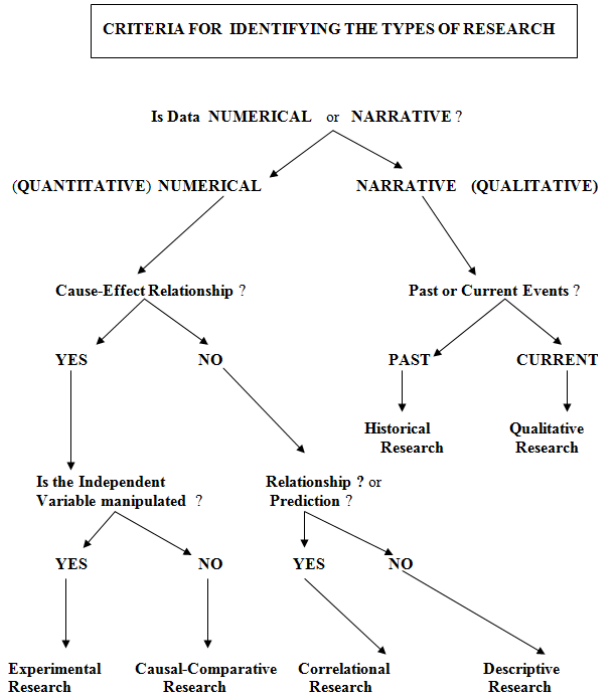


Figure 3: How to identify the various types of research

INSTRUMENTS USED IN EDUCATIONAL RESEARCH

- (1) **TESTS** : i.e., these can be either standardized thus, highly valid and reliable or constructed by researchers for specific purposes, skills tests, etc. They can either summative or formative
- (2) **QUESTIONNAIRES**: i.e. data collection instrument that are filled out by the targeted participants
- (3) **INTERVIEWS** : i.e. face to face interaction with the participants.
- (4) **FOCUS GROUPS**: i.e. a small group discussion with a group moderator present to keep the discussion focused.
- (5) **OBSERVATION** i.e. looking at what people actually do.
- (6) **EXISTING OR SECONDARY DATA** i.e., using data that are originally collected and then archived or any other kind of "data" that was simply left behind at an earlier time for some other purpose.

Figure 4: Research Instruments in educational research

This type of research has weaker validity and poor reliability because the researcher cannot establish cause-and-effect relationships and cannot manipulate the predictor variables. Here are some examples for each type of research:

- (i) True experimental :
 - a) *The effect of small classes on instruction*
 - b) *The use of intensive mentoring to help beginning teachers develop balanced instruction*
- (ii) Quasi Experiment
 - a) *Are lectures given in the morning memorized better than when given in the afternoon?*
 - b) *Do teachers' teaching styles play a role in students' motivation for learning?*

3.1.2 Non experimental studies

These are research studies in which there is no manipulation of the independent variable by the experimenter either for ethical reasons (for example the impact of smoking on health) or because of their abstract nature (for example age, gender, ethnicity opinions etc.). Non experimental research covers a wide variety of studies, such as (i) *descriptive*, (ii) *causal-comparative*, (iii) *correlational*, (iv) *ex post facto* research, and (v) *surveys*

- (i) **Descriptive research**, as the name suggests, helps the researcher to collect data about conditions, situations, and events that occur in the present. For example:
 - a) *Attitudes of parents toward introducing school outings on Sundays.*
 - b) *How do university teachers spend their time?*
 - c) *How do parents feel about a four day school schedule?*
- (ii) **Causal-comparative research** aims investigate the relation between the variables under study in order to identify possible causal relationships between them. For example :
 - a) *Effect of birth order on academic achievement*
 - b) *The effect of having a working mother on school achievements*
 - c) *The effect of age on achievements in learning a foreign language*
- (iii) **Correlational research** is concerned with establishing possible but not necessarily present relationships between variables. Examples of correlational studies:
 - a) *Do male students perform better than female in scientific subjects?*
 - b) *The relationship between parents' socio-economic status and their children's school achievements*
 - c) *The relationship between stress and achievement*
- (iv) **Ex post facto research**: Ex-post facto literally means "*from what is done afterwards*". It focuses first on the effect, then tries to determine possible causes and questions will remain about the effect following the cause, or vice versa. In this type of research, the researcher cannot control the variables; his role is limited to reporting the outcome of an action or what is happening.
Examples
 - a) *Why are some groups in the 1st Year more proficient than the other groups in the same year ?*
 - b) *Why are some students always late for lectures in the morning ?*
- (v) **Surveys** are used to describe the views of a large group of people at a given point in time. There is no attempt to establish a cause and effect relationship. Examples:
 - a) *'What are students' opinions regarding their relationship with their professors ?*
 - b) *'How do students view their ability to do research?'*

3.2 Qualitative research studies

Creswell (2003:4) defines qualitative research as

a means for exploring and understanding the meaning individuals or groups ascribe to a social or human problem. The process of research involves emerging questions and procedures. Data typically collected in the participant's setting. data analysis inductively building from particulars to general themes. and the researcher making interpretations of the meaning of the data.

This type of research relies primarily on collecting qualitative data (i.e., non-numerical or categorical data such as words and pictures etc.), and can be either interactive or non interactive (i.e. whether the researcher is personally

immersed in the research or not).

3.2.1 Interactive

In educational research there is very little room for a personal involvement or immersion of the researcher with the participants of the study, as his role is mostly that of an observer. However, there may be instances where such research can be carried out.

The first of these is **phenomenology** which is the descriptive study of how individuals experience a phenomenon. In this type of research the researcher aims at understanding how individuals' lives are organised and structured. For example:

- a) *What are students' attitudes towards an uncaring teacher?*
- b) *What are teachers' attitudes and beliefs towards teaching?*

The second major approach to qualitative research is **ethnography** (i.e., the discovery and description of the culture of a group of people). Because it is deeply rooted in anthropology the concept of culture is of central importance in this type of research. In the case of educational research one can study the culture in a classroom. Examples of these would be :

- a) *How do learners react to cultural differences in foreign language classes?*
- b) *How do teachers deal with cultural conflicts in their classes?*

3.2.2 Non Interactive

Non interactive qualitative studies are mainly concerned with historical analysis or content analysis. In historical analysis the researcher aims at establishing descriptions, and coming up, whenever possible, with explanations, of what has occurred. For example, a study can document

- (i) *the changes in the assessment procedures in EFL classes over the past ten years, or*
- (ii) *the developments in the testing procedures of English in the Baccalaureate over the past twenty years.*

In content analysis the researcher analyzes written documents or other communication media (e.g., photographs, movies, advertisements) in a given topic in order to identify the information and symbols they contain . The researcher identifies a body of material to analyze (e.g., school textbooks, television programs, newspaper articles etc) and then posits a system for recording specific aspects of its content. Content analysis is a nonreactive method because the researcher didn't know about the content beforehand. For example a researcher might be interested in investigating *how school violence is reported in the media* or *how women are represented in school textbooks*.

3.3 Mixed Methods research

This research paradigm is used extensively in educational research for its many merits. Thus, in mixed methods researchers use both types of data because these combined provide the best understanding of a research problem.

It has been defined variously by many researchers. For Janice Morse (2003:191) it is

a plan for a scientifically rigorous research process comprised of a qualitative or quantitative core component that directs the theoretical drive, with qualitative or quantitative supplementary components. These components of the research fit together to enhance description, understanding and can either be conducted simultaneously or sequentially

Mixed research thus, obeys the criteria of scientific rigor and it has the advantage of using the combined strengths of quantitative and qualitative approaches while making up for the weaknesses of both approaches. This is summed up by Guba and Lincoln (2005:201)

Is it possible to blend elements of one paradigm into another, so that one is engaging in research that represents the best of both worldviews? The answer, from our perspective, has to be a cautious yes. This is especially so if the models (paradigms) share axiomatic elements that are similar, or that resonate strongly between them

The added advantage of the mixed method is the possibility it offers the research for the *triangulation* of the data, which is Denzin (1978:291) defines as "*the combination of methodologies in the study of the same phenomenon*", and he outlined four types of triangulation (Denzin: *ibid*)

- a. data triangulation (i.e., use of a variety of sources in a study),
- b. investigator triangulation (i.e., use of several different researchers),
- c. theory triangulation (i.e., use of multiple perspectives and theories to interpret the results of a study), and
- d. methodological triangulation (i.e., use of multiple methods to study a research problem).

It is therefore of vital importance that research students be aware that the use of a single methodology or the use of a single research instrument does not confer to their study neither great validity nor reliability. Only a multi pronged research design can offer such criteria.

4. Conclusion

Research is the acquisition of knowledge in a systematic and organised way. However, the routes leading to the discovery of this new knowledge varies according to the philosophical tenets to which the researcher adheres. This is why the research paradigms which determine the existing research methodologies cannot be fully grasped without a thorough understanding of the epistemological issues which underpin each of them . The inductive-deductive debate which will grow into the quantitative-qualitative methodologies is the direct result of evolving beliefs as to what constitutes the most efficient and most reliable way of carrying the research.

It is true however, that the nature of the data, either natural or social and psychological will direct the researcher to a great extent towards one or another methodology. The frontier between the two is becoming blurred and justifies the resort to a methodology which uses the strengths of the of the two major paradigms, i.e. a mixed method approach.

As far as educational research is concerned the choice of one or another methodology depends very much on the nature of the variables being investigated and the more the researcher is aware of the philosophical tenets of the methodology he intends to use the easier the choice of the appropriate research process will be.

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