UNIT 1 INTRODUCTION TO RESEARCH IN GENERAL

Contents

1.0 OBJECTIVES

- To introduce the students to the basics of research methodology.
- To provide them with the basic conceptual tools for scientific research.

1.1 INTRODUCTION

M S Sridhar understands research as "systematic, controlled, empirical, critical and self-correcting investigation of hypothetical propositions about the presumed relations among natural phenomena,": i.e., Systematic & controlled empirical self-correcting research is a combination of both experience & reasoning and must be regarded as the most successful approach to the discovery of truth (particularly in natural sciences). Since it involves experience and critical reasoning, it may be regarded as the "most successful approach" to the discovery of truth. Further, we can claim that in a general way, everyone does research, but they do not write it down. Without trustworthy and tested published research available we are dangerously lost in the experience, opinions and hearsay and such a data cannot be used for further study.

In short research methodology may be defined as the "science of studying how research is done scientifically (Sridhar)." It is a way to systematically solve the research problem by logically adopting various steps. Proper methodology, employed in research, helps to understand not only the products of scientific inquiry but the process itself. Such a research methodology aims to describe and analyze methods, throw light on their limitations and resources, clarify their presuppositions and consequences, relating their potentialities to the twilight zone at the 'frontiers of knowledge.' Thus research methodology provides the tools for conducting serious and useful research. It is applicable to all fields of science, including humanities and philosophy. In this unit we study further about research

in general, the tools used for it and the methods employed for doing research. In the concluding part, we focus on the outcome of the research in terms of report or paper, which further advances the useful human knowledge.

1.2 RESEARCH IN GENERAL

It may be proper to begin by saying what research is not. Definitely it is not mere information gathering. It is not even mere shifting of facts from one source to another. Further it is not merely rummaging for information, which cannot be properly made use of. Positively stated, research is the systematic process of collecting and analysed information to increase our understanding of the phenomenon under study. It is the function of the researcher to contribute to the understanding of the phenomenon and to communicate that understanding to others (Venkataram 2010).

Research is thus about understanding an issue or asking and answering a complex question or solving a problem. So, to start with, we need to identify an issue, question, or problem. Then we need to discuss with people who want or need your study. Listening to their suggestions and problems will help us. Further, we need to find out what's already known about it. For this talk with experts and/or read their reviews and the other original research on the topic by different scholars. Then we need to plan, budget and proceed with our study accordingly. Do not exceed the time limit and the budget of our planned study. Then we need to conduct research, record our findings in writing and submit it for assessment. Publication in quality journals enhances the worth of the study and makes it available to larger audience. In academic circles the slogan "publish or perish" still dominates.

It helps to have a good supervisor, good colleagues, and/or knowledge or practical experience of and affinity for a topic (See Hopkins 2010). It is essential to read journal articles to find out what's already known. Many authors also often point out topics for future research. This prevents doing research on an area already explored and thus prevents wasting valuable time and effort. It may be emphasized that most serious research projects are supposed to be original investigations. Either you obtain new data or information about a phenomenon. Or you reach a novel conclusion and try to publish it. Briefly we can say that the distinct characteristics of research is that it originates with a concrete question; requires clear articulation of a goal and a specific plan for proceeding. Usually research divides a principal problem into more manageable sub-problems.

Benefits of Research Methodology

Sridhar (2010) formulates the following benefits of adequate research methodology both for the researcher and for the body of useful knowledge.

1. Advancement of wealth of human knowledge in any field.
2. Provides tools of research to look at life objectively.
3. Develops a critical and scientific attitude, disciplined thinking or a bent of mind to observe objectively (scientific deduction & inductive thinking); Skills of research will pay-off in the long term particularly in the μage of information (or too often of misinformation)

4. Enriches investigators and their practices; it provides opportunity to study a subject in depth; Enable us to make intelligent decisions; Understand the problem which no other kind of work can match

5. As consumers, research output helps to inculcate the ability to evaluate and use results of earlier research with reasonable confidence and take rational decisions

6. Doing research is the best way to learn to read and think critically and creatively.

Check Your Progress I

Note: Use the space provided for your answer

1. What do you mean by research?

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2. Give any three benefits of research methodology.

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1.3 RESEARCH CIRCLE

Research is guided by the specific research problem, question or hypothesis. It accepts certain critical assumptions. It definitely requires the collection and interpretation of data in an attempt to resolve the problem that initiated the research. This leads to further clarification of the question and the proposed solutions. Thus research is, by its nature, cyclical or, more exactly, spiral or helical. Research originates with a question: Examples: Are philosophers accepted well in the society? What do street children eat in a day? Why do poor people appear happier? What is the relationship between belief in God and good moral life? It requires clear articulation of a goal: What problem do you want to solve? Moral degradation? Deepening of faith in God? Change of behaviour? Praying more often? Building up an adequate world-view?

Further, good research requires a specific plan. It is not about groping in the dark to find a solution. In fact, it is a planned discovery with outlined steps for tackling the problem. It requires a design of study to obtain the relevant data. In a good research we need to divide problem into sub-problems. The main problem is divided into more manageable problems that can help in answering the main problem. ("Manage the unavoidable and avoid the manageable"). Example: Main problem: "How do you go from Pune to Delhi?" Sub-problems: What are the ways to go there? What is the most convenient

transportation? How much will it cost to travel by these routes? How long will the trip last? This, in turn, is guided by specific research problems, questions and hypothesis. A hypothesis is a logical supposition, a reasonable guess, an informed conjecture that provides a tentative explanation for the phenomenon under investigation. It can also provide information in resolving the specific problem and in the process, the main research problem. Eg. If you switch on the lamp and it does light what is your reasonable guess as to the reason why it does not light?

A good research accepts certain critical assumptions. Assumptions are similar to axioms in geometry – self –evident truths -the *sine qua non* of research. They must be valid for the research to be meaningful. For example, if a research wants to evaluate the knowledge gained from a nutrition education class, one assumption would be regular attendance in the class by the participants. A good research requires collection and interpretation of data to resolve problem initiated. Data collected based on objectives or research questions. Data collected becomes meaningful when it is interpreted correctly. Methodology of the project controls how data are to be collected, arranged, synthesized and interpreted. A good research by nature is cyclical, or spiral or helical. It follows logical developmental steps as follows: Questioning mind asks "why?" One such question becomes the problem. Later, the problem is divided into simpler sub-problems. Then the preliminary data is gathered. It is even possible that the data collected may indicate unforeseen conclusions. In such situations further data is collected more systematically. Then the data is analysed to arrive at the possible supporting conclusions. At this stage the researcher will get to see if the hypothesis is supported or not. If the hypothesis is proved wrong, modifications are made to it and the research process is repeated, till a satisfactory hypothesis is formulated.

Remark on the credibility of materials used in research: It is important for us to know the reliability of the materials on which we base the data or information used in our research. Every materials we get should not be used, since they may be prejudiced or motivated. Some significant questions to find out the reliability of the already existing research material are: In what source did you find the article? Was it reviewed by experts in the field before publication? Does the article have a stated research question or problem? Or, can you determine the focus of the work? Does the article indicate collection of data, or does it synthesize other studies in which data were collected? Is the article logically organized and easy to follow? Does the article review previous studies? In what way is this relevant to the research problem? Are the procedures clear enough that you could repeat the work and get similar results? How were the data collected and how were they analyzed? Do you agree with what was done? Do you agree with the interpretation of results? Reflect on the entire article. What, for you is most important? What are interesting? What are the strengths and weaknesses? Will you remember the article in the future?

1.4 TOOLS OF RESEARCH

A tool is a specific mechanism or strategy that researchers use to collect, manipulate or interpret data. Tools of research should not be equated with methodology. A methodology is the general approach that a researcher takes in carrying out the research process. Six general tools of research are: Library and its resources (most useful for philosophy students), Computer and software,

Techniques of measurement, Statistics (The program SPSS is recommended for research based on statistics), The human mind (this is the strength of philosophy students), Language.

The library

For a philosophical research the library is always the starting point. Here the following will be very beneficial: Referring to the Card catalogue, Browsing through Indexes and abstracts, Consulting the Reference librarian, if s/he is accessible. Browsing the shelves gives a first hand knowledge of the books and journals available on the topic of research.

Computer and Software

In today's context, good research cannot be done without adequate computer facilities. Computer facilitates the collection of data through the internet, online journals, online libraries, etc., and their processing as well as in the writing of the thesis / research paper. Some software packages for qualitative searches are NVivo, Q-Method, WEFT. For quantitative research, some of the softwares used are: Excel, XLSTAT, SAS and SPSS.

Techniques of Measurement

Measurement may be done in the laboratory or in the world outside. Interviews serve a useful function. Measurement is limiting the data of any phenomenon-substantial or insubstantial – so that those data may be interpreted and compared to acceptable qualitative or quantitative standard. So the techniques used in measurement are of vital importance for the result we arrive at. Validity and reliability of measurement instrument is to be tested. Validity – extent to which the instrument measures what it is supposed to measure. Reliability – the consistency with which a measuring instrument yields a certain result when the entity being measured has not changed. Both validity and reliability reflect the degree to which we may have error in measurements.

Statistics

In order to process the result from data collected, statistical processing & analysis are to be done, especially in cases of large sample. Statistical methods are helpful infesting the accuracy of the results obtained. Today we can do it better by using statistical softwares. So a basic knowledge of statistics is necessary for any researcher.

The human mind

Truly, the strategies used by the human mind to discover the unknown helps us in testing the hypothesis, which could become the answer to the question to be answered. Deductive logic: Reasoning that begins with a premise (assumptions, widely accepted "truths") then to the conclusion; useful for generating hypothesis and testing theories. Critical thinking: Involves evaluating information or argument in terms of accuracy and worth; it may involve: Inductive reasoning: It begins with an observation from where conclusions are drawn; observe sample and draw generalization to the population. Scientific method: Method where insight into the unknown is made by 1) identifying a problem that defines the goal, 2) states the hypothesis that when confirmed, resolves the problem, 3) gathering data relevant to the hypothesis, 4) analyzing and

interpreting data to see if data supported the hypothesis nor not; also uses both deductive and inductive reasoning.

Language for adequate expression

Proper use of language enables us not only to communicate but also to think more effectively. Clear and concise use of language in writing is important in research. Writing down ideas helps the investigator to get clarity of mind. This, in turn, is useful to organize thoughts systematically to indicate the proposed answer to the readers. Writing down the answer is helpful in detecting gaps and logical flaws in thinking in formulating the final answer.

Check Your Progress II

Note: Use the space provided for your answer.

1. Name six tools of research.

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2. What are some softwares used in research today.

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1.5 METHODS: QUANTITATIVE OR QUALITATIVE

The method used in research may be quantitative or qualitative. Qualitative methods are more often used. It may be remembered that often you arrive at an answer by applying logic (= common sense?) and skepticism to your knowledge and to the information you gather. So let us be wary of conventional wisdom and your own prejudices.

Quantitative method in Research that is centred around with the quantities of things and that involve the measurement of quantity or amount. With quantitative method we gather data with an instrument, such as a stopwatch, a blood test, a video analysis package, or a structured questionnaire. Here we derive measures or variables from the data, then investigate relationships among the variables. Testing of hypotheses becomes easy here. The error of measurement are crucial since we know that almost all measures have the possibility of errors. Such errors affect the relationship between measure, leading to errors in validity and reliability of the final result. So a pilot study to investigate error can be carried out first.

Qualitative research deals with the quality, type, or components of a group. It is usually exploratory in nature and uses procedures such as in-depth interviews

and focus group interviews to gain insights and propose solutions to problems posed by the investigator. With qualitative methods we gather information or themes from texts, conversations or loosely structured interviews, then we try to articulate a coherent story. The open-ended nature of these methods allows for more flexibility and serendipity in identifying factors and practical strategies than the formal structured quantitative approach. It is possible that in qualitative research, the direction of the research may change mid-stream. Softwares such as NVivo, Q-Method or WEFT can be of help in qualitative analysis.

Other formal procedures that enhance trustworthiness of the result are: Triangulation – Triple checking of a hypothesis that aims for congruence of information from various sources. Respondent validation: Here the respondent is asked to check the researcher's hypothesis in a scale of strongly agree to strongly disagree. Peer debriefing: colleagues of the investigator or experts can be asked to check the analysis. Hybrid or mixed method: Here we may analyze a sample of cases first qualitatively. Then we may code information into values of variables to make inferences about a population quantitatively.

Qualitative methods applied to a sample often result in a small sample size because (1) subjects are hard to get, the interviews are too time consuming, or (2) the researchers dislike the idea of large samples. But a study with a small sample can adequately characterize only strong associations (large effects) in a population. So, these small-scale qualitative studies are not definitive for a small or trivial effect, which may be actually important in the hypothesis formulated. Furthermore, open-ended inquiry is equivalent to assaying many variables, so there is a high risk of finding a spurious association. It may be emphasized that if the sample is small, the spurious association will be strong. Therefore, small-scale qualitative studies are not definitive even for a moderate or large effect. So based on our reasonable guess from qualitative methods, we may use quantitative methods or surveys to reinforce our answers. Such a combined method is more useful. The conclusion is: when using qualitative methods to generalize to a population, you need a large sample to characterize small effects. So a hybrid of qualitative and quantitative methods may be more profitable for some research.

Concluding Remarks

Qualitative research methods have been developed and refined through attempts to understand the patterns and associations in human behaviour and relationships in disciplines such as sociology, anthropology and educational psychology. However, they also formed the basis of the natural sciences where the natural world was initially described and chronicled by narrative researchers. Qualitative and quantitative methods are not mutually exclusive, rather, different degrees of mixing of the methods occur. Both qualitative and quantitative research is fundamentally concerned with discerning similarities and differences in what they choose to observe. New insights and models are suggested by the nature of these contrasts and approximations, whether they are measured in numbers or described in words. However, each mode of research, each way of looking at the world, creates different modes of knowing and understanding.

Adding qualitative research methods to the quantitative methods used in general practice research will allow the development of a research base for the discipline that matches its practice and its values and opens up new questions to research. Qualitative research often demands an examination of the assumptions behind

a research question and the influences on our thinking. This process increases our understanding of the forces shaping all our research including personal experience, political constraints and academic acceptability. This can clarify the limitations of research as well as leading to further research questions. (Griffiths and Marinker 1996)

1.6 THE PRODUCT: RESEARCH REPORT OR PAPERS

A major goal of research is to prepare several research papers based upon the studies undertaken. Written and oral communications skills are probably the most universal qualities sought in a good research.

General form of a research paper

An objective of organizing a research paper is to allow people to read your work selectively. When I research a topic, I may be interested in just the methods, a specific result, the interpretation, or perhaps I just want to see a summary of the paper to determine if it is relevant to my study. Some journals call for a combined results and discussion, for example, or include materials and methods after the body of the paper. The well known journal *Science* does away with separate sections altogether, except for the abstract. (Caprette) Your papers are to adhere to the form and style required for the Journal of Biological Chemistry, requirements that are shared by many journals in the life sciences. These general guidelines are to be followed in any written reports, except when the guides or editors give explicitly different instructions.

To make a paper readable:

- Print or type using a 12 point standard font, such as Times, Geneva, Bookman, Helvetica, etc.
- Text should be double spaced on 8 1/2" x 11" paper with 1 inch margins, single sided
- Number pages consecutively
- Start each new section on a new page
- Adhere to recommended page limits, set by the guide.

Mistakes to avoid:

- Placing a heading at the bottom of a page with the following text on the next page (insert a page break!)
- Dividing a table or figure - confine each figure/table to a single page
- Submitting a paper with pages out of order

In all sections of your paper:

- Use normal prose including articles (“a”, “the,” etc.)
- Stay focused on the research topic of the paper
- Use paragraphs to separate each important point (except for the abstract)

- Indent the first line of each paragraph
- Present your points in logical order
- Use present tense to report well accepted facts - for example, 'the sky is blue.'
- Use past tense to describe specific results - for example, "In 1783 Kant wrote the Prolegomena to any Future Metaphysics to summarise his main views."
- Avoid informal wording, don't address the reader directly, and don't use jargon, slang terms, or superlatives
- Avoid use of superfluous pictures - include only those figures necessary to presenting results

In any written report or paper the following divisions are to be made scrupulously.

Title Page: Select an informative title as illustrated in the examples in your writing portfolio example package. Include the Full name(s) and address(es) of all authors, the name(s) of guide(s) and date submitted.

Abstract: The summary should be two hundred words or less. And normally it should be limited to one paragraph. The purpose of abstract is to introduce the main findings of the report very briefly to an interested reader.

Introduction: The purpose of an introduction is to acquaint the reader with the rationale behind the work, with the intention of defending it. It places the work in a theoretical context, and enables the reader to understand and appreciate your objectives.

Materials and Methods: There is no specific page limit, but a key concept is to keep this section as concise as you possibly can. People will want to read this material selectively. The reader may only be interested in one formula or part of a procedure. Materials and methods may be reported under separate subheadings. The objective of this section is to document all specialized materials and general procedures, so that another individual may use some or all of the methods in another study or judge the scientific merit of the work. It is not to be a step by step description of everything the investigator did, nor is a methods section a set of instructions.

Results: The page length of this section is set by the amount and types of data to be reported. Continue to be concise, using figures and tables, if appropriate, to present results most effectively. See recommendations for content, below. The purpose of a results section is to present and illustrate the findings. Make this section a completely objective report of the results, and save all interpretation for the discussion.

Discussion: The objective in this section is to provide an interpretation of the results and support for all the conclusions, using evidence from the experiment and generally accepted knowledge, if appropriate. The significance of findings should be clearly described. Interpret the data in the discussion in appropriate depth. This means that when we explain a phenomenon we must describe mechanisms that may account for the observation. If the results differ from the original expectations, explain why that may have happened. If the results agree, then describe the theory that the evidence supported. It is never appropriate

to simply state that the data agreed with expectations. We need to elaborate. Decide if each hypothesis is supported, rejected, or if we cannot make a decision with confidence. Do not simply dismiss a study or part of a study as "inconclusive." Normally, an inconclusive study is not really a scientific study.

Bibliography or Literature Cited: List all literature cited in the paper, in alphabetical order, by first author. In a proper research paper, only primary literature is used (original research articles authored by the original investigators). Be cautious about using web sites as references - anyone can put just about anything on a web site, and we have no sure way of knowing if it is truth or fiction. If we are citing an on line journal, use the journal citation (name, volume, year, page numbers). Sometimes some of the papers may not require references, and if that is the case simply state that "no references were consulted."

Writing to communicate: Say what we mean to say clearly and consciously. Keep primary objective in writing and focus discussion accordingly. Provide overview of what will be discussed. Organize ideas from general to specific using headings and subheadings. Provide transitional phrase, sentences or paragraphs to help readers follow the flow of thought. Use concrete examples to make abstract ideas understandable. Use appropriate punctuation. Use tables and figures to present findings more adequately. Summarize what was said at the conclusion of the paper. Anticipate revision of draft of the report.

Check Your Progress III

Note: Use the space provided for your answer

1. What is triangulation?

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2. What is the fundamental concern of both qualitative and quantitative research?

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1.7 LET US SUM UP

In this unit we have seen the importance of research and research methodology in fostering knowledge. We dealt with the process of research and the tools of research. Then we saw how as a scientific technique, research methodology leads to scientifically verifiable results helping us to solve problems efficiently.

1.8 KEY WORDS

Triangulation : It is a triple checking of a hypothesis that aims for congruence of information from various sources.

Qualitative Method : Methods of social research that do not depend on comparing quantities. It involve the collection and analysis of information based on its quality and NOT quantity. They are methods in which the results are primarily conveyed in visual or verbal forms.

1.9 FURTHER READINGS AND REFERENCES

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