E-CONTENT

EDU-C-301 Methodology of Educational Research-I

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Unit-II: Research Problem and Hypothesis

- **Criteria and Sources for Identifying the Research Problem;**
- **Delineating and Operationalizing Variables;**
- **Statement of the Problem**
- **Developing Research Questions, Assumptions and Hypotheses in various types of Research;**
- **Characteristics of a good Hypothesis;**

MEANING OF RESEARCH PROBLEM

The research problem is a statement regarding an area of concern, a situation to be enhanced upon, a complexity to be eradicated, or a worrying question that appears in scholarly previous research, in theory and in practice that points to the need for significant understanding and purposeful investigation. Defining a research problem is the energy that drives the scientific process, and is the base of any research method and experimental design, from accurate experiment to case study. It is one of the first statements made in any research paper and, as well as defining the research area, should include a rapid synopsis of how the premise was arrived at.

IDENTIFICATION OF RESEARCH TOPIC/ PROBLEM

The identification of research problem is the primary step that every researcher has to take on. At times, it becomes rather complicated for an inexperienced researcher or a beginner in research to conceptualize a research problem. In general, a research problem should be understood as some complexity, unclear condition which a researcher experiences in practical or theoretical background and wants to get a concrete description, explanation or proffer answer to it. For students, this problem may be as a result of theoretical encounter in the area of interest. As such, before boarding on any research, you should recognize and identify the major research area of your interest, mostly the area of your field. For instance from: Education, Social sciences, humanities, language, management and among others. Once you have the broad area, you narrow it down by selecting a certain topic. This should be done after reviewing the related literature in the area. The topic should further be narrowed down to a precise researchable problem. Following are some sources of identification of a research problem:

a) Careful investigation;
b) Case and effect relationship;
c) Keen observation;
d) Researcher's knowledge;

CHARACTERISTICS OF RESEARCH PROBLEM

1. **Clarity** is the most important quality of any research topic. The topic should be clear so that others can simply understand the nature of research. The research topic should have

a single explanation so that people cannot get diverted. The topic should have to be very obvious so that it can correctly be undertaken. The research topic should be free of any vagueness. Clarity also means that the research topic should be directional and it should set the whole research methodology in that direction.

2. **Well-stated** research topic is a half assurance of a successful research. Sometimes researchers phrase the research topic in such a way that it gives a double barrelled idea. The research topic should have to be well stated and it should be easy to interpret. It should carry a single meaning.

3. **The language** of the research topic should be easy. You should use technical terms only when it is needed, otherwise use simple language so that everyone can comprehend it. Keep the principles of writing in mind to avoid any unprincipled term. Do not bring in any sort of prejudice directly or indirectly, willingly or unwillingly in the research problem or in research topic.

4. **The titling** of the research problem should pursue the rules of titling. there are various already existed rules of titling. You can either use a sentence case or a title case but most of the titles follow title case. Read and follow the rules of titling titles before writing it down.

5. **Current importance** should also the consideration of the researcher while selecting a research topic. An out of date topic will not be helpful for anyone the topic should carry current importance. You should also measure how much the topic will provide help to the field in which you are conducting the study.

CRITERIA FOR RESEARCH PROBLEM

1. **Interest:** It is the leading criterion in selecting a research problem. The whole research course is normally time consuming and a lot of hard work is needed. If you decide a topic which does not greatly interest you, it would become complicated to keep up the motivation to write. Before choosing a research problem, you need to make sure that you met definite level of proficiency in the area you are proposing. Make use of the evidence you learned during the study and of course your research supervisors will provide a hand as well.

2. **Expertise:** Before selecting a research problem, you need to make sure that you met certain level of know-how in the area you are proposing. Make use of the particulars you learnt during the study and of course your research supervisors will provide a hand as well.

3. **Data availability:** If your research title needs compilation of information (journal, reports, proceedings, etc.,) before finalising the title, you need to make sure you have these materials available in the applicable format.

4. **Relevance:** Always choose a topic that fits your interest and line of work. Ensure that your study helps to add to the existing body of knowledge. Of course, this will help you to maintain interest throughout the research period.

5. **Ethics:** In formulating the research problem, you should think of certain ethical issues as well. Sometimes, during the research period, the study population might be adversely affected by some questions. In ICT, some situations might happen especially research related information safety, which might concern various authorities. Therefore, it is always good for you to spot ethics related issues during the research problem formulation itself.

OPERATIONALIZATION OF VARIABLES

Operationalization is the process of firmly defining variables into measurable factors. The process defines unclear concepts and allows them to be measured, experientially and quantitatively.

Operationalizing a variable means finding a measurable, quantifiable, and valid index for your variable (independent and dependent variables), and sometimes deciding a way to manoeuvre that variable in such a way as to have two or more levels.

In the process of defining a term, we also need to think about how we are going to evaluate the concept. Operationalization refers to the process of figuring out how to measure the concepts that interest us. Many of the common concepts are not concrete. We cannot really point them directly. Instead, we have to find a way to measure them, often indirectly. Consider the concept of religiosity. This is not something we can directly observe. We cannot look in someone's brain and see how much time they spend thinking about God.

The diagram below illustrates what I am talking about. The concept here is to measure religiosity: is enclosed in a circle. We cannot measure what is in the circle directly. What we can observe through survey questions is enclosed in the rectangles. Through surveys, we can inquire how often people attend religious services, how often they pray, and whether they tell us that religion is important to them. People's answers to these questions can then be used to help define whether someone is religious or not.
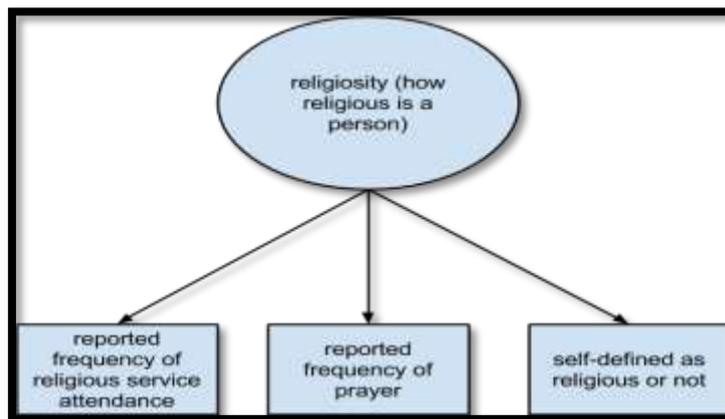
Often, for expediency, we are dependent on operational definitions of concepts. An operational definition of a concept is a definition of the concept terms of how it is measured. So an operational definition of religiousness here would be whether a person reports high levels of religious service attendance, prayer or religious importance.

DELINEATING THE RESEARCH PROBLEM

Delineation means to spot, shape, or demonstrate the outline or border. Research starts with delineating the research problem, i.e. what we want to solve and what questions we want to answer. It is not only to form the problem but also its selection which presupposes experience and overview in the given area is important. The research problem should be developed and appear gradually. The final form of the problem must be preceded by studying literature and mapping what has already been found out and how.

It is advisable to form the research problem as a question. It helps to decide about the way of research. The whole research then presents an answer to the question. After the problem has been delineated, it is necessary to define basic terms. Encyclopaedias and

dictionaries are used to define terms to be used in the research. Terms must be defined in such a way so that they are authorized to be found and measured. They are operation/process term definitions such family, quality of life, school maturity or indirect learning strategies. For instance, family is a very broad term; everyone imagines a different meaning. It is necessary to define the term in such a way to be able to work with it.

STATEMENT OF THE PROBLEM

A problem statement is a brief piece of writing that usually comes at the beginning of a report or proposal to explain the problem or issue the document is addressing to the reader. In general, a problem statement will draw round the basic facts of the problem, explain why the problem matters, and identify a solution as rapidly and directly as possible. Problem statements are often used in the world of business for planning purposes but can also be required in academic situations as part of a proposal style report or writing research.

A good problem statement should answer these questions:

1. What is the area or problem of research? This should explain why the term is needed.
2. Who has the problem? This should give details who needs the solution and who will decide the problem has been solved.
3. What form can the resolution be? What is the scope and limitations (in time, money, resources, technologies) that can be used to solve the problem? What should be the tools to be used?

The benefit of writing a statement of the problem is that it can help us to centre on research and form a more solid and guided project. In education or other areas of research, it is easy to get unfocused by the wealth of knowledge and information that is accessible. By writing a problem statement, we can force ourselves to remain focused on answering a specific question at hand. This allows us to eventually achieve well again results and not to waste time pursuing unnecessary opportunities or diversions from your main goal.

RESEARCH QUESTION

Specifying the research question is the procedural point of exit of scholarly research in both the natural and social sciences. The research will answer the question posed.

After choosing a topic and gathering background information, add focus with a research question. Explore questions. and ask open ended how and why questions about your general topic. Consider the so what of your topic. Why does this topic matter to you? Why should it matter to others? Reflect on the questions you have considered. Identify one or two questions you find engaging and which could be revealed further through research. Decide and evaluate your research question. What portion of the more general topic you will explore? Is your research question clear? Is your research question focused? Research questions should be precise enough to be well covered in the space available. Is your research question complex? Questions should not have a simple yes/no answer and should need research and analysis. After you have come up with a question, consider the path your answer might take. If you are making any argument, what will you say? Why does your argument matter? How might others confront your argument? What kind of sources will you need to support your argument? These are some of the areas the research must look upon and develop questions accordingly. All questions need to be answered in your research in due course of time.

ASSUMPTION

An assumption is a belief that forms one of the bases for the research. This belief is not to be tested or supported with experimental data. Very often belief is not stated in a research proposal and instead of it hypothesis is stated. A hypothesis is a tentative answer to a research question. Very often belief is not stated in a research proposal.

HYPOTHESIS

The hypothesis is a specific statement of guess. It describes in concrete rather than theoretical terms what you anticipate will happen in your study. Not all studies have hypotheses. Sometimes a study is conducted to be exploratory. There is no formal hypothesis, and perhaps the purpose of the study is to discover some areas more carefully in order to develop some exact hypothesis or prediction that can be tested in future research. A single study may have one or many hypothesis.

TYPES

Non-directional Hypothesis

Various hypothesis statements suggest a relationship between the variables that the researcher compares, but do not specify the precise nature of this relationship. This form of hypothesis is used in studies where there is not enough review available on which to formulate a prediction. Continuing with the same example, a non-directional hypothesis would read, *The academic performance of high school students is related to their participation in extracurricular activities.*

Directional Hypothesis

This type of hypothesis proposes the result the investigator expects at the end of the study. Scientific journal articles generally use this form of hypothesis. The investigator bases this hypothesis on the trends obvious from earlier research conducted on this topic. Allowing for the previous example, a researcher may state the hypothesis as, *'High school students who participate in extracurricular activities have a lower GPA than those who do not participate in such activities.'* Such hypotheses provide a specific direction to the guess.

Causal Hypothesis

Some studies engage an amount of the degree of influence of one variable on another. In such cases, the researcher states the hypothesis in terms of the effect of variations of a particular factor on another one. This causal hypothesis is said to be vicariate because it identifies two aspects: the cause and the effect. For the example mentioned, the causal hypothesis will state, *'High school students who participate in extracurricular activities spend less time studying which leads to a lower GPA.'* When validating such hypotheses, the researcher needs to use statistical techniques to show the occurrence of a relationship between the cause and effect. Such hypotheses also need the researcher to rule out the option that the effect is a result of a cause other than what the study has revealed.

Statistical Hypothesis

A statistical hypothesis is an supposition about a population parameter. This postulation may or may not be true. Hypothesis testing refers to the formal measures used by statisticians to accept or reject statistical hypotheses. There are two types of statistical hypotheses.

- *Null hypothesis.* The null hypothesis, denoted by H_0, is usually the hypothesis that sample observations result purely from chance.

- *Alternative hypothesis.* The alternative hypothesis, denoted by H_1 or H_a, is the hypothesis that sample observations are influenced by some non-random cause.

Actually, whenever we talk about an hypothesis, we actually thinking concurrently about two hypotheses. For example you guess that there will be a relationship between two variables in your study. The way we would formally set up the hypothesis test is to formulate two hypothesis statements, one that explains your forecast and one that describes all the other possible outcomes regarding the hypothesized relationship. Your forecast is that variable A and variable B will be related (you do not care whether it is a positive or negative relationship). Then the only other probable result would be that variable A and variable B are not related. Usually, we call the hypothesis that you support the alternative hypothesis, and we call the hypothesis that describes the remaining possible outcomes the null hypothesis. Sometimes we use a notation like H_A or H_1 to represent the alternative hypothesis or your forecast, and H_O or H_0 to represent the null case. In some studies, your guess might very well be that there will be no difference or change. In this case, you are fundamentally trying to find support for the null hypothesis and you are contrasting to the alternative.

If your guess specifies a direction, and the null therefore is the no difference prediction and the prediction of the opposite direction, we call this a one-tailed hypothesis. For instance, lets imagine that you are investigating the effects of a MDM programme and that you believe one of the outcomes will be that there will be less student absenteeism. Your two hypotheses might be stated something like this:

THE NULL HYPOTHESIS FOR THIS STUDY IS:

H_O: As a result of the MDM program, there will either be no significant difference in student absenteeism or there will be a significant increase, which is tested against the alternative hypothesis:

H_A: As a result of the MDM programme, there will be a significant decrease in absenteeism.
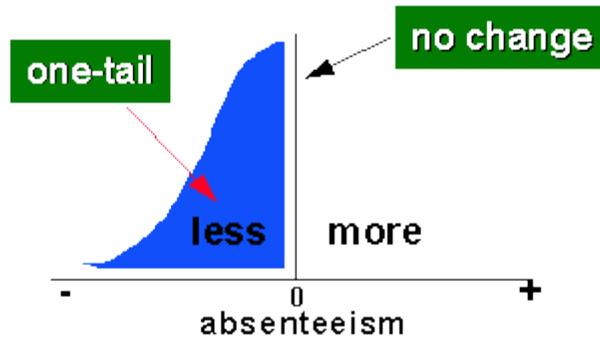
In this figure, we see this situation explained graphically. The alternative hypothesis: your prediction that the MDM program will decrease absenteeism is shown there. The null must account for the other two possible conditions: no difference, or an increase in absenteeism. The figure shows an hypothetical distribution of absenteeism differences. We can see that the term *one-tailed* refers to the tail of the distribution on the outcome variable.

When your guess does not specify a direction, we say you have a two-tailed hypothesis. For instance, suppose you are studying a new teaching method for students.

The method has gone through some initial trials, but has not yet been tested in real classroom situation. You believe (based on theory and the previous research) that the method will have an effect, but you are not confident enough to hypothesize a direction and say the method will increase the depression (after all, you have seen more than enough promising methods come along that eventually were shown to have severe other factors that in fact worsened depression). In this case, you might state the two hypotheses like this:

H_O: As a result of new method of teaching, there will be no significant difference in depression among student, which is tested against the alternative hypothesis:

H_A: As a result of new teaching method, there will be a significant difference in depression among student.
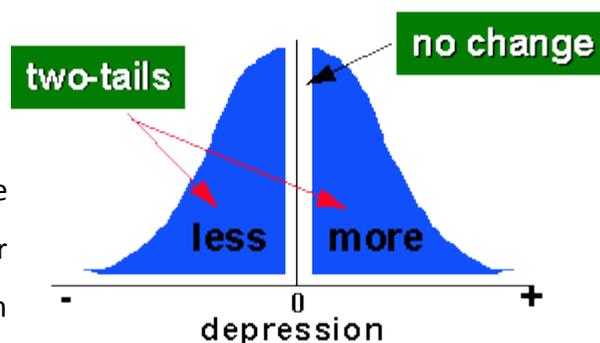
The above figure illustrates this two-tailed prediction for this research. Again, notice that the term *two-tailed* refers

to the tails of the distribution for your outcome variable.

The important thing to remember about stating hypotheses is that you formulate your guess (directional or non-directional), and then you formulate a second hypothesis that is equally exclusive of the first and incorporates all possible alternative outcomes for that case. When your analysis is completed, the idea is that you will have to choose between the two hypotheses. If your guess was correct, then you would (usually) reject the null hypothesis and accept the alternative. If your original prediction was not supported in the data, then you will accept the null hypothesis and reject the alternative. The logic of hypothesis testing is based on these two basic principles: the formulation of two mutually exclusive hypothesis statements that, together, exhaust all possible outcomes; the testing of these so that one is necessarily accepted and the other rejected.

Descriptive hypothesis

Descriptive hypothesis only related to only one variable thereby it is also called as univariate hypothesis. Descriptive hypotheses typically state the existence, size, form, or distribution of some variable. The first hypothesis contains only one variable. It only shows the distribution of the level of promise among the students which is higher than average. Such a hypothesis is an example of a Descriptive Hypothesis. Researchers usually use research questions rather than descriptive hypothesis. For example a question can be: What is the level of commitment of the teachers in your institution?

Relational Hypothesis

These are the propositions that explain a relationship between two variables. The relationship could be non-directional or directional, positive or negative, causal or simply correlation. While stating the relationship between the two variables, if the terms of positive, negative, more than, or less than are used then such hypotheses are directional because the direction of the relationship between the variables (positive/negative) has been indicated. These hypotheses are relational as well as directional. The directional hypothesis is the one in which the direction of the relationship has been specified. Non-directional hypothesis is the one in which the direction of the association has not been specified. The relationship may be very strong but whether it is positive or negative has not been hypothesize.

Correlation hypotheses

State merely that the variables happen together in some specified manner without implying that one causes the other. Such weak claims are often made when we believe that there are more basic causal forces that affect both variables. For example: Level of job commitment of the teachers is positively associated with their level of efficiency. Here we do not make any claim that one variable causes the other to change. That will be possible only if we have control on all other factors that could influence our dependent variable.

Explanatory (causal) hypotheses

Involve the existence of or a change in one variable causes or leads to a change in the other variable. This brings in the notions of independent and the dependent variables. Cause means to help *make happen.* So the independent variable may not be the sole reason for the existence of, or change in the dependent variable. The researcher may have to recognize the other possible causes, and control their effect in case the causal effect of independent variable has to be determined on the dependent variable. This may be possible in an experimental design of research.

THE ROLE OF THE HYPOTHESIS

In research, a hypothesis hands out various important functions:

1. It guides the course of the study: Very often one comes across a situation when the researcher tries to collect all possible information on which he could lay his hands on. Later on he may find that only part of it could be utilized. Therefore, there was an needless use of resources on unimportant concerns. In such a situation, hypothesis limits what shall be studied and what shall not be.

2. It recognizes facts that are related and those that are not: Who shall be studied, in what background they shall be studied, and what shall be studied.

3. It suggests which type of research design is likely to be the most suitable: Depending upon the type of hypothesis, a choice is made about the relative appropriateness of different research designs for the study under contemplation. The design could be a survey design, experimental design, content analysis, case study, participation observation study, and/or focus group discussions.

4. It provides a structure for organizing the conclusions of the findings.

THE CHARACTERISTICS OF A TESTABLE HYPOTHESIS

1. Hypothesis should be conceptually obvious. The concepts used in the hypothesis should be obviously and operationally defined if possible. Such definitions should be commonly established and easily communicable among the research scholars.

2. Hypothesis should have experimental referents. The variables contained in the hypothesis must have empirical realities. In case these are no empirical realities then it will not be possible to make the observations. Being handicapped by the data collection, it may not be possible to test the hypothesis.

3. Hypothesis must be precise. The hypothesis should not only be specific to a place and situation but also these should be narrowed down with respect to its process and operation. There should be no universal use of concepts whereby the researcher is using such ideas which may be inclusive and may not be able to tell anything. For example somebody may try to offer the relationship between urbanization and family size. Yes, urbanization influences in declining the size of families. But urbanization is such inclusive variable which hide the operation of so many other factors which appear as part of the urbanization course. These factors could be the rise in level of education, level of women education, their empowerment, emergence of dual earner families, decline in patriarchy, accessibility to health services, role of mass media, and much more. Therefore, the global use of the word urbanization may not tell much. Hence, it is suggested to that the hypothesis should be definite.

4. Hypothesis should be connected to available techniques of research. Hypothesis may have empirical authenticity; still we are looking for tools and techniques that could be used for the collection of data. If the techniques are not there then the researcher is handicapped. Therefore, either the techniques are already existing or the researcher is in a position to develop proper techniques for the study. Hypothesis should be related to a body of hypothesis.

5. Hypothesis has to be supported by theoretical argumentation. For this reason the researcher may widen his/her theoretical structure which may help in the making of relevant hypothesis. For the expansion of a framework the researcher shall depend on the existing body of knowledge. In such an attempt a association between the study in hand and the existing body of knowledge can be recognized. That is how the

study could help from the existing knowledge and later on through testing the hypothesis could add to the pool of knowledge.

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