Lecture 02: Research Question and Hypothesis

A research problem is the area of concern addressed by the study; it emanates from a gap which points to the need for further investigation.

1. **Classical Literature Gap:** When there is a new concept or phenomenon that has not been studied much or at all.
2. **Contextual Gap:** There is a fair deal of research about a certain topic, but there is a lack of studies within a specific context (population, geography, period of time, etc.).
3. **Methodological Gap:** It emerges if the methodology or the research design of existing studies is lacking in some way.
4. **Disagreement Gap:** It emerges when there are contrasting or contradictory findings in the existing research regarding a specific research question.

A research study has to begin with identifying and stating the problem in a clear way to delimit the task of the researcher by isolating the specific problem before carrying out the research. Singh (2006) sees that there are three criteria that a research statement needs to satisfy. He avows that " Meeting these criteria in his problem statement will result, on the researcher's part, in a clear and concise idea of what he wants to do, this sets the stage for further planning." (p.29). These criteria are :

1. A problem should be concerned with relation between two or more variables.
2. It should be stated "clearly and unambiguously in question form."
3. It should be amenable to empirical testing.

1. Research Question

A problem statement is persuasive in nature with the primary goal to convince the reader that the problem is relevant and worth considering. It is written in a general way for better understanding, an attribute that goes against the principles of writing a scientific paper in which specificity is a key element. Hence, it is

imperative for the researcher to narrow the scope of the problem and limit the purpose of the study to arrive at specific questions that the research will address.

A research question has to be researchable, precise and concise, original, interesting, ethical, and relevant.

1. A researchable question would be one for which data could be collected for analysis either qualitatively or quantitatively. The inability to do that would render the question non-researchable.
2. A precise question is that which has an exact and accurate meaning which is not open to interpretation. Concise question is stated succinctly, thus, in a brief and clearly expressed manner with few words.
3. Originality is rather a debatable criterion when it comes to a research question as it is open to discussion and argument. In this lecture, the idea of originality is linked with the production of new knowledge. However, the latter has to be clarified. A new knowledge in science does not always come as new ground breaking theory but even the smallest contribution to an existing knowledge is important. For instance, originality can be attained by a simple change in the sample, a slight change in the methodology to yield better result, or even an attempt to test previous findings.
4. Ethicality is to be minded when raising questions, even with no answer, a provocative question can have unwanted repercussion and the mere asking may call forth unethical topics.
5. An interesting question in academia has to be a one that tackles contemporary, urgent, problems that pose issues in first the community of the researcher.
6. Relevance of the question lies in the ability of the researcher to arrive at answers to the problem he/she seeks to address.

A research question is of a paramount importance in any study, and a researcher has to mind and be scrupulously careful when asking questions since the latter dictate methodology of the study. Thus, every step of the research is related to the research questions from the way data will be collected and analysed to the final conclusion. In fact, an alignment between all the elements in a study and the research question raised has to be established without which a research will lack coherence.

As mentioned earlier, the research process begins with a problem. What is a research problem? Kerlinger (1986) describes a problem as "… an interrogative sentence or statement that asks: 'What relation exists

between two or more variables?'" (p. 16). Kerlinger suggests that prior to the problem statement, "… the scientist usually experiences an obstacle to understanding, a vague unrest about observed and unobserved phenomena, a curiosity as to 'why something is as it is'" (p. 11). For example, Harmon et al. (1984) investigated the problem of whether the motivation to master new skills or challenging tasks could be measured in infants and, if so, what factors seemed to influence the amount of such mastery motivation. The general problem might have been stated as: What variables are related to an infant's mastery motivation?

1.1.Research Variables

A variable must be able to vary or have different values. For example, gender is a variable because it has two values, female or male. Age is a variable that has a large number of values. Mastery motivation is a variable like age that can have many ordered levels. However, if we are studying only girls, gender is not a variable; it is a constant. Thus, we can define the term variable as a characteristic of the participants or situation that has different values in a study.

Operational Definitions of Variables

An operational definition describes or defines a variable in terms of the operations used to produce it or techniques used to measure it.

1.1.1. Independent Variables

An active independent variable (Kerlinger, 1986) is also called a manipulated variable. It is the cause supposed to be responsible for bringing about change(s) in a phenomenon or situation

1.1.2. Dependent Variables

The dependent variable is the outcome or change(s) brought about by introduction of an independent variable.

2. Hypothesis

Two important functions that hypotheses serve in scientific inquiry are the development of theory and the statement of parts of an existing theory in testable form. Snow (1973) describes six levels of theory, with the first level being hypothesis formation. At this initial level, the theory developer has a hunch based on theory, past experience, observations, and/or information gained from others. A hypothesis is formulated in

such a way that this hunch can be tested. Based on the findings of the subsequent research, the hypothesis is supported or rejected and more hypotheses are formulated to continue the process of building a cohesive theory. The most common use of hypotheses is to test whether an existing theory can be used to solve a problem. In everyday situations, those who confront problems often propose informal hypotheses that can be tested directly. For example, when a lamp fails to light when the switch is turned on, several hypotheses come to mind, based on our understanding of electricity and on our past experiences with lamps:.

1. The plug is not properly connected to the wall outlet.
2. The bulb is burned out.
3. The fuse is burned out or the circuit breaker has been tripped.
4. There has been a power failure in the neighbourhood.

Each of these speculations can be tested directly by checking the plug connection, substituting a bulb known to be in working condition, inspecting the fuse or circuit breaker, or noting whether other lights in the house, or in neighbours' houses, are on.

2.1.The Research Hypothesis

The research or scientific hypothesis is a formal affirmative statement predicting a single research outcome, a tentative explanation of the relationship between two or more variables. For the hypothesis to be testable, the variables must be operationally defined. That is, the researcher specifies what operations were conducted, or tests used, to measure each variable. Thus, the hypothesis focuses the investigation on a definite target and determines what observations, or measures, are to be used. A number of years ago the hypothesis was formulated that there is a positive causal relationship between cigarette smoking and the incidence of coronary heart disease. This hypothesis proposed a tentative explanation that led to many studies comparing the incidence of heart disease among cigarette smokers and non-smokers. Due to these extensive studies, the medical profession now generally accepts that this relationship has been established.

In the behavioural sciences the variables may be abstractions that cannot be observed. These variables must be defined operationally by describing some samples of actual behaviour that are concrete enough to be observed directly. The relationship between these observable incidents may be deduced as consistent or inconsistent with the consequences of the hypothesis. Thus, the hypothesis may be judged to be probably true

or probably false. For example, one might propose the hypothesis that third-grade children taught the Chisanbop, a hand-calculating process, would learn to perform the basic arithmetic processes more effectively (that is, score higher on a specified measure or test of arithmetic processing) than those using the conventional method. Children would be randomly assigned to two groups, one taught the Chisanbop system (experimental group) and the other using the conventional method (control group). The experiment would be carried on for a period of 9 months. If the hypothesis were true, the experimental group's mean scores on a standardized arithmetic achievement test would be significantly higher than those of the control group.

2.2. The Null Hypothesis (H0)

At the beginning of their study, researchers state an affirmative scientific or research hypothesis as a prediction of the outcome that they propose to test. Most often this research hypothesis suggests that a difference of some kind (e.g., one group will do better than another) will occur. Later, at the stage of the statistical analysis of the observed data, they restate this hypothesis in negative, or null, form. For instance, the previously stated hypothesis, that third-grade children taught the Chisanbop method would score higher on a specified test of arithmetic than those using the conventional method, would be restated: There is no significant difference between the arithmetic achievements of the two groups. Some authors have argued that the null hypothesis cannot possibly be correct (e.g., Cohen, 1990; Murphy, 1990). Frick (1995), on the other hand, argues that if a good faith effort is made to reject the null hypothesis and fails, the null hypothesis can be accepted. Thus, in rare cases the research hypothesis could be the same as the null hypothesis. For instance, Kahn (1985) hypothesized that children with mild mental retardation and children of average intelligence, equated for mental age, would perform similarly on Piagetian tests. The null hypothesis relates to a statistical method of interpreting conclusions about population characteristics that are inferred from the variable relationships observed in samples. The null hypothesis asserts that observed differences or relationships result merely from chance errors inherent in the sampling process. Most hypotheses are the opposite of the null hypothesis. In such a case if the researcher rejects the null hypothesis, he or she accepts the research hypothesis, concluding that the magnitude of the observed variable relationship is probably too great to attribute to sampling error.