

UNIVERSITY GRANTS COMMISSION**Education****Code:9****UNIT – 6: RESEARCH IN EDUCATION****SYLLABUS****Sub Unit – 1:**

SL. NO.	TOPICS
1	6.1.1 Research: Concept
2	6.1.2 Educational Research
3	6.1.3 Characteristics Educational Research
4	6.1.4 Principles of Educational Research
5	6.1.5 Scope of Educational Research
6	6.1.6 Meaning of Scientific Method
7	6.1.6.1 Steps of Scientific Method
8	6.1.6.2 Characteristics of scientific method
9	6.1.7 Types of scientific method
10	6.1.8 Aims of research as a scientific activity
11	6.1.9 Types of research
12	6.1.10 Approaches to educational research
13	6.1.11 Meaning of Research design
14	6.1.11.1 Descriptive Design
15	6.1.11.2 Experimental Design
16	6.1.11.3 Historical Design

Sub Unit- 2:

SL. NO.	TOPICS
17	6.2.1 Meaning of Variables
18	6.2.2 Meaning of Concepts
19	6.2.3 Meaning of Constructs
20	6.2.4 Types of Variables
21	6.2.5 Hypotheses – Concept
22	6.2.6 Sources of hypothesis
23	6.2.7 Types of hypothesis
24	6.2.8 Formulating Hypothesis
25	6.2.9 Characteristics of a good hypothesis
26	6.2.10 Steps of writing a research proposal
27	6.2.11 Concept of universe and Sample
28	6.2.12 Characteristics of a good sample
29	6.2.13 Techniques of Sampling
30	6.2.14 Tools of research
31	6.2.15 Standardization of a Tool
32	6.2.16 Types of Tools
33	6.2.16.1 Rating scale
34	6.2.16.2 Attitude scale
35	6.2.16.3 Questionnaire
36	6.2.16.4 Aptitude test
37	6.2.16.5 Achievement test
38	6.2.16.6 Inventory
39	6.2.17 Techniques of research
40	6.2.17.1 Observation
41	6.2.17.2 Interview
42	6.2.17.3 Projective Techniques

Sub Unit -3:

SL.NO.	TOPICS
43	6.3.1 Types of Measurement Scale (Nominal, Ordinal, Interval and Ratio)
44	6.3.2 Quantitative Data Analysis - Descriptive data analysis (Measures of central tendency, variability, fiduciary limits and graphical presentation of data)
45	6.3.3 Testing of Hypothesis (Type I and Type II Errors)
46	6.3.4 Levels of Significance
47	6.3.5 Power of a statistical test and effect size
48	6.3.6 Parametric Techniques
49	6.3.7 Non- Parametric Techniques
50	6.3.8 Conditions to be satisfied for using parametric techniques
51	6.3.9 Inferential data analysis
52	6.3.10 Use and Interpretation of statistical techniques
53	6.3.10.1 Correlation
54	6.3.10.2 t-test
55	6.3.10.3 z-test
56	6.3.10.4 ANOVA
57	6.3.10.5 chi-square
58	6.3.11 Qualitative Data Analysis - Data Reduction and Classification, Analytical Induction and Constant Comparison, Concept of Triangulation

Sub Unit- 4:

SL.NO.	TOPICS
59	6.4.1 Qualitative Research Designs
60	6.4.1.1 Grounded Theory Designs
61	6.4.1.2 Narrative Research Designs
62	6.4.1.3 Case Study
63	6.4.1.4 Ethnography
64	6.4.2 Mixed Method Designs

Section – 1: Unit at a Glance

Sub unit – 1

Educational Research:

Educational research refers to a systematic attempt to gain a better understanding of the educational process, generally with a view in improving its efficiency.

Educational Research is systematic application of scientific method for solving educational problems, purifies educative process and generates new knowledge.

Principles of Educational Research:

1. Precision in measurement
2. Replication
3. Validity
4. Reliability
5. Objectivity
6. Ethics

Scientific Method:

Scientific enquiry / Scientific method is happy blending of Inductive and deductive method. Initially it proceeds from part to whole to state meaningful hypothesis. Later on it proceeds from whole to part and hypothesis to logical conclusion.

Steps of Scientific Method:

1. Identification and definition of the problem
2. Formulation of hypothesis
3. Implication of hypothesis through deductive reasoning
4. Collection and analysis of evidence
5. Verification of the hypothesis

Characteristics of scientific method:

1. **Replicability:** It is possible when an independent group of researcher can copy the same process and arrive at the results as same as the original study.
2. **Precision:** It refers to theoretical concepts, which are often hard to measure, these must be defined with such precision that others can use those definitions to measure those concepts and test that theory.
3. **Falsifiability:** It means a theory must be stated in a way that it can be disproven. Theories that can not be tested or falsified are not scientific theories, any such knowledge is not scientific knowledge.
4. **Parsimony:** When there are numerous explanations of a phenomena, scientist must always accepts the simplest one. Phenomena should be explained in as economic a manner as possible.

The purpose of exploratory research: to gain background information, to define terms, to clarify the problems, to develop hypothesis, to establish research priorities and objectives, and to develop questions to be answered.

Explanatory Research is conducted for a problem which was not well researched before, demands priorities, generates operational definitions and provides a better-researched model.

Descriptive research may be quantitative or qualitative and use research methods accordingly. It aims to describe what is , by describing, recording, analysing, interpreting conditions that exists. It cannot be used as the basis of a causal relationship.

Fundamental research is not concerned with day to day problems. Basic research is primarily concerned with the **formulation** of a theory or a contribution to the existing body of knowledge. Its major aim is to obtain and use the empirical data to formulate, expand or evaluate theory. The main aim of basic research is the discovery of knowledge solely for the sake of knowledge.

Applied research is concerned with the solution of immediate, specific and practical problems. The applied research also uses the scientific method of inquiry. It has most of the characteristics of basic research. Moreover, its findings are to be evaluated in terms of local applicability and not in terms of universal validity.

Action Research: Action research designs are systematic procedures used by teachers (or other individuals in an educational setting) to gather quantitative and qualitative data to give immediate solution to the problem, to address improvements in their educational setting, their teaching, and the learning of their students.

Quantitative Research: Quantitative research emphasize objective measurements and the statistical, mathematical, or numerical analysis of data collected through polls, questionnaires, and surveys, or by manipulating pre-existing statistical data using computational techniques. Quantitative research focuses on gathering numerical data and generalizing it across groups of people or to explain a particular phenomenon. Quantitative research is a research involving the use and analyses of numerical data using statistical techniques. These researches create questions of who, what, when, where, how much, how many, and how.

Qualitative Research: Qualitative Research is mainly exploratory research. It is used to achieve an understanding of underlying reasons, opinions, and motivations. It provides insights into the problem or helps to build up ideas or premises for probable quantitative research. It provides textual data.

Research design:

The research design is an overall formulation/ strategy of a research problem. It is framework or blueprint or general plan for conducting the research. A good research design should satisfy the following four conditions namely objectivity, reliability, validity and generalization of the findings. Decisions regarding what, where, when, how much, by what means concerning an inquiry or a research study constitute a research design. Research purposes may be grouped into four categories: (i) Exploration, (ii) Description, (iii) Diagnosis and (iv) Experimentation.



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Sub unit – 2**Variables:**

A variable is “a thing that is changeable” or “a quantity that may have a number of different values.” IQ, sex, level of anxiety, different degree of illumination are the examples of variables that are commonly employed in psychological research.

Concepts:

Concept represents objectives of activities, ideas or living organism. Concept also represents properties, abstraction and relations between the features. ‘achievement’, ‘Intelligence’, ‘aggressiveness,’ ‘conformity’, ‘honesty’ are all concepts used to express varieties of human behaviour of interest to behavioural scientists.

Constructs:

Constructs have two common characteristics. First, the construct is a part of a theoretical framework and is related in various ways to other constructs. Second, a construct usually operationally defined so as to allow its observation and measurement. An example of a commonly employed psychological construct would be reinforcement.

Hypotheses:

The term hypothesis is made up of two words ‘hypo’ and ‘thesis’ which means less then or ‘less certain’ than a ‘thesis’. Hypothesis is a reasonable guess, an assumption, "educated guess", proposition or statement based upon the available evidence, which the researcher seeks to prove through the study.

Sources of hypothesis:

- Experience and Creativity of the Researcher
- Background Knowledge
- Versatile Intellect
- Analogies
- Scientific Theory
- Published studies, abstracts research journals, hand books, seminars on the issue, current trends on the research area.
- Instructional programs persuaded.
- Extension of the investigation.
- Offshoots of research studies in the field.

Directional hypothesis: The hypotheses which stipulate the direction of the expected differences, relationships are termed as directional hypotheses. They specify the expected direction of the relationship between variables.

Non-directional hypothesis: A research hypothesis, which does not specify the direction of expected differences or relationships, is a non-directional research hypothesis. This form of hypothesis is used in studies where there is no sufficient past research on which to base a prediction. Do not stipulate the direction of the relationship.

The relationship between research hypothesis (H_1) and the null hypothesis (H_0) is that, if null hypothesis (H_0) is rejected then research hypothesis (H_1) is accepted.

Characteristics of a good hypothesis:

- It must be testable.
- It must state relationship between the variables.
- It must be clear and precise.
- It must be consistent with known facts.
- The variables should be defined operationally, tested empirically.
- It must be based on some relevant theory or discovered truth.

SAMPLING: Sampling is a tool that enables us to draw conclusions about the characteristics of the populations. A finite subset of the population, selected from it with the objective of investigating its properties is called sample and the number of unites in the sample is known as the sample size.

PROBABILITY SAMPLING: A probability sample is a sample in which every unit in the population has a chance (greater than zero) of being selected in the sample, and this probability can be accurately determined.

NON PROBABILITY SAMPLING: Non probability sampling is any sampling method where some elements of the population have no chance of selection or where the probability of selection can't be accurately determined.

SIMPLE RANDOM SAMPLING: It is the techniques in which sample is so drawn that each and every unit in the population has an equal and independent chance of being included in the sample.

SYSTEMATIC SAMPLING: Systematic sampling is slight variation of the simple random sampling in which only the first sample unit is selected at random and the remaining units are automatically selected in a definite sequence at equal spacing from one another.

STRATIFIED SAMPLING: Population is heterogeneous in nature with respect to the variable or characteristic.

CLUSTER SAMPLING: Total population is divided into some recognizable subdivisions depending on the problem under study and a simple random sample of these clusters is drawn, are termed as clusters.

QUOTA SAMPLING: The population is first segmented into mutually exclusive sub-groups, just as in stratified sampling, and then judgment is used to select the subjects or units from each segment based on a specified proportion.

MULTISTAGE SAMPLING: Multistage sampling refers to a sampling technique which is carried out in various stages.

PURPOSIVE SAMPLING: A sample which is selected on the basis of individual judgment of the sampler is called purposive Sampling.

Snowball Sampling: Snowball sampling involves finding a small group of initial respondents and using them to recruit more respondents. It is particularly useful in cases where the population is hidden or difficult to enumerate.

VALIDITY: Validity is about the accuracy of a measure. Validity refers to how accurately a method measures what it is intended to measure.

Reliability of a Measure: Reliability is about the consistency of a measure. The extent to which the results can be reproduced when the research is repeated under the same conditions. If the same result can be consistently achieved by using the same methods under the same circumstances, the measurement is considered reliable.

Rating scale: A rating scale is a set of categories designed to draw out information about a quantitative or a qualitative attribute. In rating scale a catalogue of some properties in which before all some digit is written.

Observation: It is the process of gathering open-ended, firsthand information by observing people and places at a research site. The observations are made without disturbing, influencing or altering the environment or the participants in any way. Researchers simply use all of their senses to observe participants in either a natural setting or a naturally occurring situation.

Advantage and Disadvantage of observation method: Advantages include the opportunity to record information as it occurs in a setting, to study actual behaviour, and to study individuals who have difficulty verbalizing their ideas (e.g., preschool children). Disadvantages of observations are that you will be limited to those sites and situations where you can gain access, and in those sites, you may have difficulty developing rapport with individuals.

Sub unit – 3

Nominal scale is also called categorical variable scale. Nominal scale is the most simple of the four measurement scales. Nominal scale is a naming scale. Here variables are simply labelled or “named”, with no specific order.

Ordinal scale has all its variables in a specific order, with naming them. It simply depicts the order of variables and not the difference between the variables. These scales are generally used to depict non-mathematical ideas like happiness, a degree of pain, satisfaction, frequency etc.

Ratio scale contains all the characteristics of an interval scale. It has a value of true zero. It is a measurement scale that not only produces the order of variables but also makes the difference between variables on the basis of true zero.

Measures of central tendency or averages: These are used to conclude the data to specify a single most representative value to describe the data set. There are several statistical measures of central tendency or “averages”. The three most commonly used averages are: Arithmetic Mean, Median, Mode.

Arithmetic mean is the most frequently used average. It is simple to calculate. It is based on all the observations. But it is affected by the presence of extreme items. **Median** is much better summary for such data. **Mode** is often used to describe the qualitative data. Median and mode can easily be computed graphically. Even in open-ended distribution they can also be easily computed.

Range: The range is the difference between the largest and smallest values of a data distribution.

ADVANTAGE OF MEDIAN:

- Easy to understand and calculate
- Not affected by extreme values
- Even if unknown extreme values median can be calculated
- Not much affected by sampling fluctuation
- Can calculate data based on ordinal scale

DISADVANTAGE OF MEDIAN:

- Not based on all values of the given data
- Arrangement of data for larger data size is a difficult process
- Not capable of further mathematical treatment

ADVANTAGE OF MODE:

- Easy to find and calculate
- Even if extreme values are not known mode can be calculated
- Uninfluenced by extreme values
- Can be used for non-numerical data

DISADVANTAGE OF MODE:

- Do not take every value into account
- Few instability found in the measure
- Not capable of further mathematical treatment

Estimation: (Fiduciary Limits)

- The limits of the confidence intervals of parameters are called fiduciary limits. They are calculated for mean at 0.95 levels of confidence and for standard deviation at 0.99 levels of confidence respectively.

Advantages of histogram:

- It is very easy to draw and simple to understand.
- Helps to understand the distribution easily and quickly.
- It is more accurate than the polygon.

Uses of histogram:

- Represents the data in graphic form.
- Provides the information about the distribution of the scores in the group. It provides information, If the scores are piled up at the lower or higher end of the distribution or are evenly and regularly distributed throughout the scale.

Advantage of frequency polygon:

- Easy to draw and simple to understand.
- It is possible to make it smooth.
- Comparison of two distributions can be made through frequency polygon.
- It is possible to plot two distributions at a time on the same axes.

Uses of frequency polygon:

- Frequency polygon is used when two or more distributions are to be compared.
- The data is represented in graphic form.
- It provides information about how the scores in one or more group are distributed. It provides information, if the scores are piled up at the lower or higher end of the distribution or are evenly and regularly distributed throughout the scale.

Uses of Ogive:

- It is useful to determine the number of students below and above a particular score.
- By plotting the scores of two groups on a same scale comparison can be made on both the groups.
- It is useful when the median as a measure of central tendency is wanted.
- It is useful when the quartiles, deciles and percentiles are wanted.

Type I Error: A type I error occurs when the null hypothesis (H_0) is rejected, when it is true. A type I error may be compared with a so-called false positive.

Type II Error: A type II error occurs when the null hypothesis is false, but erroneously fails to be rejected and eventually accept it. A type II error may be compared with a so-called false negative.

Parametric Techniques:

- Student's t test ,
- z test,
- F ratio,
- Pearson r

Non- Parametric Techniques:

- Chi-square Test,
- Mann-Whitney U Test,
- Rank –difference Methods,
- Coefficient of Concordance (W),
- Median Test,
- Kruskal-Wallis H Test,
- Friedman Test.

Inferential statistics has two goals. They are:

- To determine what might be happening in a population, based on a sample drawn from the population.
- To determine what might happen in the future.

Correlation:

Correlation is a statistical tool that helps to measure and analyze the degree of relationship between two variables. Correlation analysis deals with the association between two or more variables. The measure of correlation called the correlation coefficient. The degree of relationship is expressed by coefficient which range from correlation ($-1 \leq r \leq +1$)

Positive correlation: the correlation is said to be positive correlation if the values of two variables changing with same direction. Example: height and weight. Water consumption and temperature.

Negative correlation: the correlation is said to be negative correlation when the values of variables change with opposite direction. Example: price and quantity demanded. Alcohol consumption and driving ability.

Simple correlation: under simple correlation problem, there are only two variables are studied.

Multiple correlation: under multiple correlation three or more than three variables are studied.

Partial correlation: analysis recognizes more than two variables but considers only two variables keeping the other constant.

Total correlation: it is based on all the relevant variables, which is normally not feasible.

Linear correlation: it happens when the amount of change in one variable tends to bear a constant ratio to the amount of change in the other.

Non linear correlation: it happens if the amount of change in one variable does not bear a constant ratio to the amount of change in the other variable.

Methods of studying correlation:

- Scatter diagram
- Correlation graph
- Product moment coefficient of correlation
- Rank difference correlation method
- Method of least square
- Karl Pearson's coefficient of correlation

Uses of correlation:

- To make predictions.
- In the technique of factor analysis
- In the technique of path analysis
- To evaluate the degree of reliability and validity of psychological tests and inventories.

Chi-Square Test:

- The Chi-Square test is a statistical procedure used by researchers to examine the differences between categorical variables in the same population. It is also called a "goodness of fit" statistic, because it measures how well the observed distribution of data fits with the distribution that is expected if the variables are independent.

Data reduction is the transformation of numerical or alphabetical digital information derived empirically into a more simplified, ordered and corrected form. Data reduction is the process of reducing the amount of capacity required to store data. Data reduction can increase storage efficiency and reduce costs. Principal component analysis (PCA) and factor analysis (FA) methods are popular techniques. Data reduction can be achieved in several ways. The main types are:

- Data deduplication
- Compression
- Single-instance storage.

Analytical Induction: Analytic induction is a qualitative research method which uses inductive reasoning, as opposed to deductive reasoning.

Analytic induction was first introduced in 1934 by Florian Znaniecki. After that, Donald Cressey summarized Znaniecki's complex description of Analytic Induction (AI)

Advantages of analytical induction:

- Analytic induction is inductive rather than deductive
- Analytic induction is well suited from an ethnographic viewpoint (good fit with the ethnographic narrative)
- Analytic induction is orients observations towards developing a better hypothesis by allowing revision
- Analytic induction allows redefining what is studied to better exclude exceptions

Triangulation: Triangulation refers to the use of multiple methods or data sources in qualitative research to develop a comprehensive understanding of phenomena. Triangulation also has been viewed as a qualitative research strategy to test validity through the collection of data through multiple sources to include interviews, observations and document analysis. The purpose of triangulation in qualitative study is to increase the credibility and validity of the results.



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Sub unit – 4

Grounded theory design: A grounded theory design is a systematic, qualitative procedure used to generate a theory that explains, at a broad conceptual level, a process, an action, or an interaction about a substantive topic. Two sociologists, Barney G. Glaser and the late Anselm L. Strauss, developed grounded theory in the late 1960s. Grounded theory designs are systematic, qualitative procedures that researchers use to generate a general explanation (grounded in the views of participants, called a grounded theory) that explains a process, action, or interaction among people.

A grounded theory design is a systematic, qualitative procedure used to generate a theory that explains, at a broad conceptual level, a process, an action, or an interaction about a substantive topic. However, three dominant designs are discernible:

1. The systematic design
2. The emerging design
3. The constructivist designs

Strengths of GT:

- Grounded Theory is helpful to develop an understanding of phenomena that can not be explained with existing theories and paradigms.
- This methodology offers a systematic and rigorous process of data collection and data analysis. So research problem can be studied in a great level of depth.
- Application of this methodology in practice fosters critical thinking and creativity.
- It is an effective approach to build new theories and understanding of new phenomenon.
- It deals with detailed and systematic procedures for data collection, analysis and theorizing.

Weakness of GT:

- Grounded theory methodology is time consuming and difficult to conduct.
- There is a great scope for researcher induced biases.
- Presentation of research findings is not straight forward.
- It is not possible to start a research study without some pre-existing theoretical ideas and assumptions.

Narrative Research Designs:

Narrative research designs are qualitative procedures in which researchers describe the lives of individuals, collect and tell stories about these individuals' lives, and write narratives about their experiences.

The term narrative comes from the verb “to narrate” or “to tell (as a story) in detail”. In narrative research designs, researchers describe the lives of individuals, collect and tell stories about people's lives, and write narratives of individual experiences.

Case Study:

A case study is an in-depth exploration of a bounded system (e.g., activity, event, process, or individuals) based on extensive data collection. The case is separated out for research in terms of time, place, or some physical boundaries.

The “case” may be a single individual, several individuals separately or in a group, a program, events, or activities (e.g., a teacher, several teachers, or the implementation of a new math program).

The “case” may represent a process consisting of a series of steps (e.g., a college curriculum process) that form a sequence of activities.

Characteristics of a Good Case Study:

- It should be based on adequate and complete data.
- Its data should be valid.
- It should have continuity about it.
- Its records should be kept confidential.
- Its data should be specifically synthesized and this synthesis should be as much prognostic as diagnostic.
- Its follow up work should be undertaken.

Ethnography:

The term ethnography literally means “writing about groups of people.” Ethnographic designs are qualitative research procedures for describing, analyzing, and interpreting a culture-sharing group’s shared patterns of behavior, beliefs, and language that develop over time. Central focus is culture. A culture is “everything having to do with human behavior and belief”. It can include language, rituals, economic and political structures, life stages, interactions, and communication styles. To understand the patterns of a culture sharing group, the ethnographer typically spends considerable time “in the field” interviewing, observing, and gathering documents about the group to understand their culture-sharing behaviors, beliefs, and language.

Mixed Method Designs:

Mixed methods designs are procedures for collecting, analysing, and mixing both quantitative and qualitative data in a single study or in a multiphase series of studies.

Mixed methods research offers an option that actually tries to take advantage of the similarities and differences in qualitative and quantitative methods. It represents a pragmatic alternative—showing how research can proceed without resolving the potential conflicts in worldviews. As a result, contemporary supporters of mixed methods research have made an intense effort to define, document, and classify it (e.g., Creswell, 2009; Greene, 2008; Johnson, 2006; Tashakkori & Teddlie, 1998, 2003, 2009).

Section – 2 : Key Statements

Every candidate appearing for NET/SET examination should follow these key (main) points these can help them for better understanding regarding this unit very quickly.

Basic Key Statements: Research:

Concept (6.1.1) , Educational Research (6.1.2) , Characteristics Educational Research (6.1.3) , Principles of Educational Research (6.1.4) , Scope of Educational Research (6.1.5) , Meaning of Scientific Method (6.1.6) , Approaches to educational research (6.1.10) , Meaning of Research design (6.1.11) , Descriptive Design (6.1.11.1) , Experimental Design (6.1.11.2) , Historical Design (6.1.11.3) , Meaning of Variables (6.2.1) , Meaning of Concepts (6.2.2) , Meaning of Constructs (6.2.3) , Hypotheses – Concept (6.2.5) , Sources of hypothesis (6.2.6) , Characteristics of a good hypothesis (6.2.9) , Steps of writing a research proposal (6.2.10) , Concept of universe and Sample (6.2.11) , Characteristics of a good sample (6.2.12) , Types of Measurement Scale (Nominal, Ordinal, Interval and Ratio) (6.3.1) , Testing of Hypothesis (Type I and Type II Errors) (6.3.3) , Levels of Significance (6.3.40) , Parametric Techniques (6.3.60) , Non-Parametric Techniques (6.3.7) , Conditions to be satisfied for using parametric techniques (6.3.8)

Standard Key Statements:

Steps of Scientific Method (6.1.6.1) , Characteristics of scientific method (6.1.6.2) , Types of research (6.1.9) , Types of Variables (6.2.4) , Types of hypothesis (6.2.7) , Techniques of Sampling (6.2.13) , Tools of research (6.2.14) , Types of Tools (6.2.16) , Techniques of research (6.2.17) , Quantitative Data Analysis - Descriptive data analysis (Measures of central tendency, variability, fiduciary limits and graphical presentation of data) (6.3.2) , Inferential data analysis (6.3.9) , Qualitative Research Designs (6.4.1)

Advanced Key Statements:

Types of scientific method (6.1.7) , Aims of research as a scientific activity (6.1.8) , Formulating Hypothesis (6.2.8) , Standardization of a Tool (6.2.15) , Power of a statistical test and effect size (6.3.5) , Use and Interpretation of statistical techniques (6.3.10) , Qualitative Data Analysis - Data Reduction and Classification, Analytical Induction and Constant Comparison, Concept of Triangulation (6.3.11)

Section – 3 : Key Facts and Figures

Sub Unit – 1:

6.1.1 Research: Concept

The word 'research' means the systematic and scientific investigation into the phenomenon and study of materials and sources in order to establish facts and reach new conclusion.

The term 'Research' consists of two words –

Research = Re + Search

'Re' means again and again and 'Search' means to find out/search for something new. Research is a process in which a person observes the phenomena again and again and collects the data and on the basis of collected data he/she draws some conclusions.

Definitions of Research

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

6.1.2 Educational Research

Meaning:

Educational research refers to a systematic attempt to gain a better understanding of the educational process, generally with a view in improving its efficiency.

It is a systematic application of scientific method for solving educational problems, which attempts towards purification of educative process and generates new knowledge.

Definitions of Educational Research

According to **Good**, Educational research is the study and investigation in the field of education.

According to **Mulay**, Any systematic study designed to promote the development of education as a science can be considered educational research.

According to **W. M. Traverse**, Educational research is that activity which is directed towards the development of science of behaviour in educational situations.

According to **Crawford**, Educational research is a systematic and refined technique of thinking, using special tools in order to obtain a mere adequate solution of a problem.

Thus, we can conclude that Educational Research is a systematic and scientific approach to solve educational problem in a logical, progressive way and also to understand, explain, predict and control human behaviour.

6.1.3 Educational Research Characterizes as follows:

- Educational Research is highly purposeful.
- It is purely objective, systematic, scientific and critical process of investigation into a phenomenon which aims at interpreting and explaining the phenomenon.
- Educational Research is based on empirical evidences and observable experience.
- It attempts to organize quantitative and qualitative data to arrive at statistical inferences.
- It discovers new facts in new perspective.
- It is based on some philosophic principle.
- It generates new knowledge.
- It depends on the researchers ability, ingenuity, expertise and experience for its interpretation and conclusions.
- It follows interdisciplinary approach for solving educational problem.
- It results towards generalized principles or theories.
- It involves subjective interpretation and deductive reasoning in some cases.

6.1.4 Principles of Educational Research:

Modern research is expected to comply with certain standards, in order to make more generalized and acceptable findings.

- Precision: Effort should be made to measure phenomenon accurately.
- Replication: Other independent researchers should be able to reflect similar findings.
- Validity: measurement is supposed to be valid and authentic.
- Reliability: Measuring instruments and procedure should produce consistent/stable results.
- Objectivity: Research should be conducted without bias, prejudice. Data should be presented as it is.
- Ethics: Ethical considerations should be adhered to in the research process.

6.1.5 Scope of Educational Research:

- Education has strong roots in the fields like philosophy, psychology, sociology, history, economics etc.
- Because of the changing concept of education, there is a need for educational research in this field. In the report of The International Commission on the Development of Education, named “Learning To Be” (UNESCO 1972, p. 143) emphasized the following:

‘Education from now-on can no longer be defined in relation to a fixed content ... through his various experiences and increasingly – all the time – to fulfil himself. It has strong roots, not only in economics and sociology but also in the findings from psychological research ... If this is so, then education takes place at all ages of life, in all situations and circumstances of existence. It returns to its true nature, ... and transcends the limits of institutions, programmes and methods imposed on it down the centuries.’

In the context of above nature of education, the limits of educational research have to be extended from the conventional modes of education to the innovative systems based on ecological and cybernetic models.

Again, in 1975 the following problems on scope of education were highlighted in an N.C.E.R.T book named “Educational research and innovation”.

- To solve the problem of imparting education to the poor students.
- Interdisciplinary research.
- Hunt of talent and problem related to their development.
- Compulsory and free education up to 14 year-children whose provision in Indian constitution section 45, study related to that problem.
- Education related problem’s study of schedule caste and schedule tribes’ children’s.

The fields of educational research contains a vast area. As it is a scientific and systematic study of educational process, it involves individuals (Student, teachers, educational experts, parents, mentors.) and institutions (Schools, colleges, universities, research – institutes). It discovers facts and relationship in order to make educational process more effective, more fruitful. It relates social sciences like education, history, philosophy etc. It includes process like investigation, planning (design), data collecting, processing of data, their analysis, interpretation and drawing inferences or conclusions. It covers areas from formal and non-formal education as well. Some fields are classified in terms of following content areas:

- Comparative Education
- Curriculum construction and Textbooks
- Economics of Education
- Educational Psychology
- Educational Technology
- Guidance and counselling
- Philosophy of Education
- Sociology of Education
- Educational Administration
- Educational Measurement and Test development
- Teacher education and teaching behaviour
- Education and politics
- Moral education
- Leadership in education
- Education and social change
- Education and law
- Philosophy of Education
- Sociology of Education
- Educational Measurement and Evaluation

As the education is self-motivated and changing in nature, its related problems are also dynamic in nature. We can conduct study in every field that are related to education.

Areas of educational research according to fifth survey of Educational research are as follows:

1. Philosophy of Education.
2. Sociology of Education.
3. History of Education.
4. Economics of Education.
5. Psychology of Education.
6. Mental Health.
7. Cognitive Processes.
8. Social Processes.
9. Motivation.
10. Creativity and Innovations.
11. Guidance and Counselling.
12. Curriculum Development.
13. Pre-Primary Education.
14. Primary Education.
15. Secondary Education.
16. Higher Education.
17. Social Science Education.
18. Science Education.
19. Mathematics Education.

20. Physical and Health Education.
21. Moral, Art and Aesthetic Education.
22. Educational Technology.
23. Teaching Strategies.
24. Teacher Education – Pre-service and In-service.
25. Vocational and Technical Education.
26. Special Education.
27. Open and Distance Education.
28. Adult, Continuing and Non-Formal Education.
29. Education of Tribes and Minorities.
30. Education of Girls and Women.
31. Demographic studies in Education and population Education.
32. Ecological and Environmental studies in Education.
33. Comparative Education.
34. Educational Assessment and Evaluation.
35. Educational Planning and Policy Research.
36. Organization, Administration and Management of Education.
37. Correlates of Achievement.

6.1.6 Meaning of Scientific Method:

Bacon's inductive method or Aristotle's deductive method contributes to human knowledge. It is difficult to solve many problems through inductive or deductive method. So Charles Darwin, in his scientific method, seeks happy blending of inductive and deductive method. In this method, knowledge gained from previous knowledge, experience, reflective thinking and observation is unorganized. Later on it proceeds inductively through part to whole and particular to general and ultimately to meaningful hypothesis. Thereafter, it proceeds deductively through the process of whole to part, general to particular and hypothesis to logical conclusion.

Scientific enquiry/Scientific method is happy blending of Inductive and deductive methods. At first, it proceeds from part to whole to state meaningful hypothesis. After that, it proceeds from whole to part and hypothesis to logical conclusion.

6.1.6.1 Steps of Scientific Method:

Scientific method follows five steps as under:

6. Problem Identification and definition of the problem: The researcher states the identified problem in such a manner that it can be solved through experimentation or observation.
7. Formulation of hypothesis: It allows to have an intelligent guess for the solution of the problem.
8. Implication of hypothesis through deductive reasoning: Here, the researcher deduces the implications of suggested hypothesis, which may be true.

9. Collection and analysis of evidence: The researcher is expected here to test the deduced implications of the hypothesis by collecting concerned evidence related to them through experimentation and observation.
10. Verification of the hypothesis: Later on the researcher verifies whether the evidence support hypothesis. If the result is yes, then the hypothesis is accepted, if it doesn't the hypothesis is not accepted and later on it is modified if it is necessary.

A peculiar feature of this method is not to prove the hypothesis as an absolute truth but to conclude that the evidence does or doesn't support the hypothesis.

6.1.6.2 Characteristics of scientific method:

Replicability: It means research must be replicable or repeated. It is possible when an independent group of researcher can copy the same process and arrive at the results as same as the original study. When replicability is not found in a study, it suggests that there is a lack of knowledge and understanding in the study or our methods of testing are insufficient.

Precision: It refers to theoretical concepts, which are often hard to measure. These must be defined with such precision that others can use those definitions to measure those concepts and test that theory.

Falsifiability: It means a theory must be stated in a way that it can be disproven. Theories that can't be tested or falsified are not scientific theories. And any such knowledge is not scientific knowledge. For a hypothesis to be proved false, it must be logically possible to make an observation or do a physical experiment that would show that there is no support for the hypothesis. When a hypothesis can't be shown to be false, that does not necessarily mean it is not valid. Further testing may disprove the hypothesis. To determine whether a hypothesis is supported or not, psychological researchers must conduct hypothesis testing by using statistical measures.

Parsimony: When there are numerous explanations of a particular phenomena, scientist must always accepts the simplest one. Phenomena should be explained in as economic and easy way as possible. Needless complexity must be avoided. Scientists must aim to achieve the most elegant and simple theories. It prevents one from pursuing excessively complex theories with endless number of concepts. It also prevents one from relationships that may explain a little bit of everything but nothing in particular.

6.1.7 Types of scientific method:

Exploratory Research:

- It is generally done in the beginning of a research. It is undertaken to explore an area where little is known or to investigate the possibilities of undertaking a particular research study and is akin to feasibility study or pilot study.
- It attempts to clarify 'why' and 'how' there a relationship is between two or more aspects of a same situation or phenomenon.
- The purpose of exploratory research is to gain background information, to define terms, to clarify the problems, to develop hypothesis, to establish research priorities and objectives, and to develop questions to be answered.

Explanatory Research:

- Explanatory Research is conducted for a problem which was not well researched before in a particular field. It demands priorities, generates operational definitions and provides a better-researched model.
- It is basically a type of research design which focuses on explaining the aspects of your study in a detailed manner.
- Here the researcher begins with a general idea and uses research as a tool which could lead to the subjects that would be dealt with in the coming future.
- It is meant for providing details where a small amount of information exists for a certain product in mind of that researcher.
- It is conducted in order to help us find the problem that was not studied before in-depth.
- It is not used to give us some conclusive evidence but helps us in understanding the problem more efficiently. When conducting the research, the researcher should be able to adapt himself/herself to the new data and the new insight that he discovers as he/she studies the subject.

Descriptive Research:

- Descriptive research may be quantitative or qualitative and use research methods accordingly. It aims to describe what is , by describing, recording, analysing, interpreting conditions that exists.
- It is generally used to describe characteristics of a population or phenomenon being studied.
- Descriptive research does not answer questions about 'how', 'when', 'why' the characteristics occurred. Rather it addresses the 'what' type questions (what are the characteristics of the population or situation being studied?). The characteristics which are used to describe or explain the situation or population are usually some kind of descriptive categories.

- Descriptive research cannot be used as the basis of a causal relationship (situation where one variable affects another). This kind of research can be said to have a low requirement for internal validity.
- The description is used for averages, frequencies and other statistical calculations. Often the best approach is to conduct a survey investigation, prior to writing descriptive research. Qualitative research often aims at description or explanation of a phenomena and researchers may follow-up with examinations of why the observations exist and what are the implications of the findings.

6.1.8 Aims of research as a scientific activity:

Problem-solving: Research is often called as a problem-solving activity. It helps the learner in developing decision-making skills, critical thinking, personal autonomy, enhance communication, negotiations, team building etc. Problem-solving can be used for improving research skills, increasing the knowledge base, presentation skills. It is elaborately described in other sections of this unit.

Theory Building: We arrive at a scientific laws or theories through a process of logic and evidence. Logic (theory) and evidence (observation) are the two main pillars upon which scientific knowledge is based on. Theories provide meaning and significance to what we observe and observations help to validate or refine existing theory or construct a new theory. A theory describes the relationship among key variables for explaining present state or to predict future. It is elaborately described in other sections of this unit.

Prediction: The researchers make predictions about various phenomena. Predictions are sometimes made in the form of hypothesis, which are tentative, testable. Researchers also make predictions concerning the relationship between or among variables. It is elaborately described in other sections of this unit.

6.1.9 Types of research:

Basic or Fundamental Research:

Fundamental research is not concerned with day to day problems or real life problems. Basic research is designed to add some new to an organized body of scientific knowledge and does not necessarily produce results of immediate practical value. It is primarily concerned with the formulation of a theory or a contribution to the existing body of knowledge. Its major aim is to obtain and use the empirical data to formulate, expand or evaluate a theory. It is also called as pure or fundamental research. It draws its pattern and spirit from the physical sciences. It represents a rigorous and structured type of analysis. It engages careful sampling procedures in order to extend the findings beyond the group or situation. And for that develops theories by discovering proved generalizations or principles. The main aim of this research is the discovery of knowledge solely for the sake of knowledge. Fundamental research has little concern for the application of the findings or social usefulness of the findings.

Applied Research:

Applied research is concerned with application of theory in common practices.

Applied research aims at the solution of immediate, specific and practical problems. It is performed in relation to actual problems, under the conditions in which they are found in practice. The goal of this research in terms of adding to scientific knowledge acquires only a secondary position. It gives importance on a problem here and now. This research also uses the scientific method of inquiry. It has most of the characteristics as same as basic research. But its methodology, however, is not as rigorous as that of basic research. Its findings are to be evaluated in terms of local applicability and not on universal validity. It is mainly intended to improve school practices and to improve teacher effectiveness in a practical manner. Most of the problems faced by teachers, policymakers, and administrators are solved through applied researchers.

Action Research:

The action research focuses on practical issue of immediate concern to particular groups. According to Goof, Action research is research made by teachers, supervisors and administrators to improve the quality of their decisions and actions.

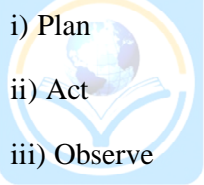
Action research designs are systematic procedures, used by teachers (or other individuals in an educational setting) to gather quantitative and qualitative data, to give immediate solution to the problem. It also aims at to address improvements in their educational setting, their teaching, and the learning of their students.

Action research mainly focuses on immediate application, not on the development of theory or on general application. Its findings are to be evaluated in terms of local applicability, not universal validity. Its purpose is to improve school practices and to improve those who try to improve the practices. It attempts to combine the research processes, habits of thinking, ability to work harmoniously with others and professional spirit.

Steps of Action Research:

- Identify a problem to be studied
- Collect data on the problem
- Organize, analyze, and interpret the data
- Develop a plan to address the problem
- Implement the plan
- Evaluate the results of the actions taken
- Identify a new problem
- Repeat the process

Thus in doing action research the usual sequence of steps are:

- 
- i) Plan
 - ii) Act
 - iii) Observe

iv) Reflect

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6.1.10 Approaches to educational research:

Quantitative Research: Quantitative research emphasize the statistical, mathematical, or numerical analysis of data collected through polls, questionnaires, and surveys, or by manipulating pre-existing statistical data using statistical techniques. This research focuses on gathering numerical data rather than textual data. And generalizing it across groups of people or to explain a particular phenomenon.

Quantitative research is a research involving the use and analyses of numerical data using statistical techniques. These researches create questions of who, what, when, where, how much, how many, and how.

Quantitative research methods are developed to construct statistically consistent data that shows how many people do or think something. Quantitative data characteristically is in numerical form such as averages, ratios or ranges. Quantitative research is precisely helpful when carrying out a large scale needs estimation or baseline survey. It is independent of the researcher and one should get alike results no matter who carries out the research. It can also be used to calculate trends.

Quantitative research should be used under following circumstances:

- When trying to measure a trend, such as, 'do youth talk to their teachers about issues important to them?'
- When data can be obtained in numerical forms such as 'number of children under 15 who participate in co-curricular activities'.
- When simple objective responses can be received such as 'yes' and 'no' type questions.
- You are trying to collect data in ratios, percentages and averages.

Characteristics:

- The data is usually gathered using structured research instruments/standardised tools.
- The sample is larger in size and is representative of the population.
- The research study can usually be replicated or repeated and its reliability is high.
- Researcher has a clearly defined hypothesis to which objective answers are sought.
- Before data collection, research design planning is must for all
- Data are collected in the form of numbers and statistics, often arranged in tables, charts, figures, or other non-textual forms.
- Project may be used to generalize concepts, predict future results, or investigate causal relationships.
- Researcher uses tools, such as questionnaires, rating scales, inventories or computer software, to collect numerical data.

Advantages of Quantitative Research:

- It can be used when large quantities of data need to be collected.
- The result is usually numerical (quantifiable).
- It is more objective.
- The data should be quantifiable and usually generalizable.

Disadvantages of Quantitative Research:

- Results need to be calculated manually or by using ready to use software like Excel, Access, or data analysis software (such as SPSS), which may not always be accessible to a country program.
- The analysis process is time consuming, as the researcher needs to enter, clean and then analyse the data.
- The larger the sample, the more time it takes to analyse and interpret it.
- The larger the sample, the more time it should take to collect data.
- The quantitative data ignores human elements.

Qualitative Research:

Qualitative Research is mainly exploratory research. Qualitative Research is used to achieve an understanding of underlying reasons, opinions, and motivations of a phenomena. It provides insights into the problem or helps to build up ideas or premises for probable quantitative research.

- Qualitative Research is primarily exploratory research.
- It is used to gain an understanding of underlying reasons, opinions, and motivations of a phenomena.
- It paves insights into the problem or helps to develop ideas or hypotheses for potential quantitative research.
- It is also used to uncover trends in thought, opinions, and dive deeper into the problem to collect ground level real data.
- Some common methods include focus groups (group discussions), individual interviews, participant observations etc.
- The sample size is typically small in comparison to quantitative research, and respondents are selected to fulfil a given quota.

Qualitative research is appropriate when:

- The intended/proposed research area is not well studied or understood.
- A subject needs to be studied in depth.
- A holistic perspective is needed.
- Behavioural aspects of people need to be studied.
- Management techniques like questionnaires are not considered suitable.
- A researcher is more interested in the process (how it works) and not the product (the outcome).

Advantage of Qualitative research:

- Problems and subjects covered can be evaluated in depth and in detail.
- Interviews are not limited to particular questions. It can be redirected or guided by researchers in real time.
- The framework of research can be revised quickly as soon as new information and results appear.
- The data in qualitative research depends on human experience and feelings. This is more forceful and influential than data gathered through quantitative research.
- Complexities and subtleties about the subjects of the research or the topic enclosed are usually missed by many positivistic inquiries.
- As sample size is small, so data is usually gathered from few individuals or cases, therefore findings and outcomes cannot be spread to larger populations. However, findings can be transferred to another setting.
- In this type of research, the researcher has an obvious vision on what to anticipate. They collect data in an authentic attempt of plugging data to bigger picture.

Disadvantages of Qualitative Research:

- The quality of research depends on the skills of the researcher and can be easily predisposed by personal idiosyncrasies and biases of researchers.
- Inflexibility is more difficult to measure, show and uphold.
- The amount of data makes understanding and analysis time overwhelming.
- Qualitative investigation is dynamic in nature. It changes it's from time to time and understood especially within scientific communities.
- The presence of researcher in the course of data gathering is inevitable. And therefore can influence or affect the responses of subjects.
- Issues like confidentiality and ambiguity can cause problems during presentation of findings.
- Findings may be time consuming and hard to present in optical ways.

6.1.11 Meaning of Research design:

The research design is an overall formulation/ strategy of a research problem. It is framework or blueprint or general plan for conducting the research. A good research design should fulfil the following four conditions namely objectivity, reliability, validity and generalization of the findings. Generally, the good research design minimises bias and maximises the reliability of the data collected and analysed. But how all these can be achieved depends mainly on the research purpose. Research purposes may be grouped into four categories:

- Exploration,
- Description,
- Diagnosis and
- Experimentation.

Research design should answer the following questions-

- What is the study about?
- Why is the study being made?
- Where will the study be carried out?
- What type of data is required?
- Where can the required data be found?
- When the study will be incorporated?
- What will be the sample design?
- What techniques of data collection will be used to collect data?
- How will the data be analysed?
- How will the report be prepared?

Consideration of Research Design:

- Objectives
- Methodology
- Sample design
- Tools for collecting the data
- Analysis of data

Purpose of Research Design:

- Efficiency
- Optimum utilization of resources
- Flexibility
- Unbiased (or minimization of bias)
- Reliability
- Objectivity

Definition of Research design:

Smith (1976) : A design is a carefully arranged scheme regarding how to conduct a experiment. The design of an experiment refers to the selection and arrangement of conditions.

Kerlinger : Research design is the plan, structure and strategy of investigation conceived so as to obtain answers to research questions and to control variance.

6.1.11.1 Descriptive Design:**Definition and Purpose:**

Descriptive research aims to describe what is, by describing, recording, analysing, interpreting conditions that exists. It may be quantitative or qualitative and use research methods accordingly.

Descriptive research designs generally provide answers to the questions of 'who', 'what', 'when', 'where', and 'how' associated with a particular research problem; a descriptive study cannot conclusively ascertain answers to 'why'. Descriptive research designs are often used to obtain information concerning the current status of the phenomena and to describe "what exists" with respect to variables or conditions in a situation.

What does these inform:

- The observation is made in a completely natural and unchanged natural environment. True experiments often adversely influence the normal behaviour of the subject.
- Descriptive research is often used as a pre-cursor to more quantitatively research designs, the general overview giving some valuable pointers as to what variables are worth testing quantitatively.
- If the limitations are understood, they can be a useful tool in developing a more focus study.
- Descriptive studies can capitulate rich data that lead to important recommendations.
- Descriptive studies collects a large amount of data for detailed analysis.

What these don't inform:

- The results can't be used to discover a definitive answer or to disprove a hypothesis.
- Because this research designs often utilize observational methods [as opposed to quantitative methods], the results cannot be replicated.

The descriptive function of research is highly dependent on instrumentation for measurement and observation.

6.1.11.2 Experimental Design:

Definition and Purpose :

Experimental research describes what will be when certain variables are carefully controlled or deliberately manipulated. Characteristics of experimental research are: Control, manipulation, observation, replication. Here, the researcher have to plan first for the experimental design. Experimental design is a blueprint of the procedure that enables the researcher to maintain control over all factors that may affect the result of an experiment. The researcher aims at determine or predict what may occur. Experimental research is often used where there is time priority in a causal relationship (cause precedes effect), there is consistency in a causal relationship (a cause that will always lead to the same effect), the magnitude of the correlation is high. Experimental research often deals with an experimental group and a control group. The independent variable is administered only to the experimental group and not to the control group, and both groups are measured on the same dependent variable. Experimental designs have used more groups and more measurements over a longer periods. True experiments must have control, randomization, and manipulation. Experimental design is most appropriate in controlled settings such as laboratories. It assumes random assignment of subjects and random assignment to groups. It attempts to explore cause-effect relationships where causes can be manipulated to produce different kinds of effects. Due to the requirement of random assignment, this design can be difficult to execute in the real world (non laboratory) setting. True Experimental Design; Double-Blind Experiment are frequently used in scientific research.

What does it inform:

- This research allows the researcher to control the situation. In doing so, it allows researchers to answer the question, “what causes something to occur?”
- Experimental research Permits the researcher to identify cause-effect relationships between variables and to distinguish placebo effects from treatment effects.
- This research designs support the ability to limit alternative explanations and to infer direct causal relationships in the study.
- Experimental design provides the highest level of evidence for single studies.

What it does not inform:

- Experimental design is artificial, and results may not generalize well to the real world.
- Artificial settings of experiments may alter subject behaviours or responses.
- This type of designs may be costly if special equipment or facilities are needed.
- Because of ethical or technical reasons, some research problems cannot be studied using an experiment.
- It is difficult to apply ethnographic and other qualitative methods to experimental designed research studies.

6.1.11.3 Historical Design:

Definition and Purpose:

Historical research describes what was by investigating, recording, analysis, interpreting past events to understand the past, present and to some extent in anticipating the future. The purpose of this design is to collect, verify, and synthesize evidence from the past, to establish facts that defend or refute the hypothesis. Historical research design uses secondary sources and a variety of primary documentary evidence, such as, logs, official records, reports, diaries, archives, and non-textual information [maps, pictures, audio and visual recordings]. It is to be remembered that the sources must be both authentic and valid. The main purpose is to collect, verify, synthesize evidence to establish facts that defend or refute the hypothesis. Historical research design uses primary sources, secondary sources, and lots of qualitative data sources such as logs, diaries, official records, reports, etc. The sources must be both authentic and valid.

What does it inform:

- The historical research design is unobtrusive. So the act of research does not affect the results of the study.
- This approach is well suited for trend analysis.
- Historical records can add important contextual background which is required to more fully understand and interpret a research problem.
- There is no possibility of researcher-subject interaction. So there is less possibility that it could affect the findings.
- Historical sources can be used over and over to study different research problems or to replicate a previously done research study.

What it does not inform:

- The ability to fulfil the aims of the research are directly related to the amount and quality of documentation available to understand the research problem.
- Since historical research depends on data from the past, there is no way to manipulate it to control for contemporary contexts.
- Interpreting historical sources can be time consuming.
- The sources of historical materials must be archived consistently/deliberately to ensure access.
- Original authors bring about their own perspectives and biases to the interpretation of past events. These types of biases are more difficult to ascertain in historical resources.
- Due to the lack of control over external variables, historical research is very weak with regard to internal validity.
- It is rare that the entirety of historical documentation needed to fully address a research problem available for interpretation, so, gaps need to be acknowledged.

Previous Year Question

JUNE - 2014

1. Which one of the following may be considered as the best source for the formulation of a research problem?

- (A) Consulting the research supervisor
- (B) Holding a discussion with liberation
- (C) Reflecting on research articles, reported in a journal
- (D) Reflecting on the problems of education



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Answer

SL NO	ANSWER
1	C



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December 2014

1. Some usual steps in conducting research are given below, identify the code which gives acceptable rational sequence.

- (1) Formulating hypothesis
- (2) Collecting data and its analysis
- (3) Identifying the research problem
- (4) Testing the hypothesis

Codes:

- (A) 1 3 2 and 4
- (B) 1 2 4 and 3
- (C) 3 1 2 and 4
- (D) 2 1 4 and 3



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Answer

SL NO	ANSWER
1	C



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June 2015

1. A teacher is studying the impact of his personal association with students on students' discipline in his/her class. This type of research may be called
(A) Fundamental and action research
(B) Action and applied research
(C) Descriptive and Fundamental research
(D) Analytical and action research
2. In a study, the effect of peer's learning is being studied in relation to students' achievement and motivation. What type of research label will be acceptable for this study?
(A) Fundamental research
(B) Evaluative research
(C) Applied research
(D) Descriptive research
3. A systematic, objective and deliberate effort at answering meaningful questions, pertaining to a field of enquiry or about phenomena is called
(A) Problem solving
(B) Research
(C) Theorising
(D) Invention
4. Which one is not a valid argument for conducting research in education?
(A) For advancement of Educational Theory
(B) For improvement of educational practices
(C) For improving social awareness of teaching
(D) For developing sound educational policies
5. Which type of research aims at explanation of the status and conditions exist at present?
(A) Applied research
(B) Analytical research
(C) Descriptive research
(D) Fundamental research

Answer

SL NO	ANSWER
1	B
2	C
3	B
4	C
5	C



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December 2015

1. Importance of the subject, feasibility and time needed for the study, have essentially be kept in mind at the time of

- (A) Collection of data
- (B) Selection of the problem**
- (C) Analysis of data
- (D) Writing the report

2. Questions like what data is to be collected? What characteristics of data are relevant and needed to be studied? And what techniques are to be used for the purpose? Can be answered, it

- (A) Related literature is studied adequately
- (B) Problem is defined properly**
- (C) Tools are constructed properly
- (D) Data are organised properly

3. A researcher is studying the effect of reinforcement on student's achievement with appropriate controls imposed in practical situation. What is the type of research in this situation?

- (A) Fundamental research
- (B) Applied research**
- (C) Action research
- (D) Both b) and c)

Answer

SL NO	ANSWER
1	B
2	B
3	B



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July 2016

1. In the formation of research problem for educational studies using quantitative paradigms, a sequence of logical steps has to be followed usually in a particular order.

From the list given below, select an appropriate sequence from the code.

1. Deciding the specific problem
2. Determining the field of study
3. Identifying the variable involved
4. Evaluating on the basis of personal and academic suitability of the problem

Codes:

- (A) 1 2 4 3
(B) 3 4 2 1
(C) 2 4 3 1
(D) **2 1 3 4**

2. For conducting action research, reviewing of related literature is done to

- (A) Classify the design of the study
(B) Ascertain the quantitative or qualitative nature of the situation
(C) Ensure the contribution of the study to existing literature
(D) **Identify the effective ideas and practices**

Answer

SL NO	ANSWER
1	D
2	D



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January 2017

1. In educational research, case study method given importance
- (A) Prediction
 - (B) Causal connections
 - (C) Generalisation
 - (D) Unique characteristics**



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Answer

SL NO	ANSWER
1	D



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July 2018**1. Match the following**

List 1 (Attribute Based Scientific Criteria's)	List 2 (Descriptions)
a. Parsimony	1. Knowledge should remain open to revision
b. Empiricism	2. Interpretation of research should not reflect personal basis
c. Precision	3. Knowledge should be as simple as possible
d. Objectivity	4. Explanations should be as simple as possible
	5. Research statement should be based on accurate measurements

Codes:

	A	B	C
(A)	1	2	4
(B)	2	1	4
(C)	3	2	1
(D)	4	1	2

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Answer

SL NO	ANSWER
1	B



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November 2017

1. An investigator uses two matched groups to compare effectiveness of two methods of teaching science. This study would come in the ambit of

- (A) **Experimental study**
 (B) Causal comparative study
 (C) Descriptive survey study
 (D) Phenomenological study

2. Which of the following type is most useful for the government in planning policies?

- (A) Correlation studies
 (B) **Descriptive studies**
 (C) Experimental studies
 (D) Historical studies

3. Match the following:

List 1 (Types of Researches)	List 2 (Intended Uses of Researches)
a. Fundamental research	1. Exploring applicability of research-based knowledge in a given field
b. Applied research	Advances scientific knowledge with addition of basic laws and principles
c. Evaluation research	Attempts to establish universal generation
	Explores research-based knowledge about a specific practice

Codes:

- | | | | |
|-----|----------|----------|----------|
| | a | b | c |
| (A) | 1 | 2 | 4 |
| (B) | 2 | 1 | 4 |
| (C) | 3 | 2 | 1 |
| (D) | 4 | 1 | 2 |

Answer

SL NO	ANSWER
1	A
2	B
3	B



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SUB UNIT 2

6.2.1 Meaning of Variable:

A variable is something that varies. According to Webster variable is “a thing that is changeable” or “a quantity that may have a number of different values.” Kerlinger (1986) defined variable ‘a property that taken as different values’. Postman and Egan (1949) viewed that a variable is a characteristic or attribute that can take on a number of values, for example, number of items that an individual solves on a particular test, the speed with which we respond to a signal, sex, IQ, level of anxiety, and different degree of illumination are the examples of variables that are commonly employed in psychological research.

6.2.2 Meaning of Concepts:

The terms ‘concept’ and ‘construct’ have similar meanings. Yet, there is an important distinction. Concept represents objectives of ideas, activities, or living organism. It also represents properties, abstraction and relations between the features. The various observed behaviours are put together and expressed in a word – ‘achievement’, ‘aggressiveness,’ ‘conformity’ ‘Intelligence’, and ‘honesty’ are all concepts used to express varieties of human behaviour of interest to behavioural scientists. Researcher often invents or constructs new concepts for special scientific purposes; these concepts are called constructs.

6.2.3 Meaning of Constructs:

Constructs are created and used for a wide variety of reasons. They generally have two common characteristics. Firstly, the construct is a part of a theoretical framework and is related in various ways to other constructs. Secondly, a construct usually operationally defined so as to allow its observation and measurement.

An example of a commonly used psychological construct would be reinforcement. On a theoretical level, reinforcement can be, and is, related to other constructs such as drive, association, motivation, and habit strength. As Mac-Corquodale & Meehl, (1948) Indicated that there are mainly two types of constructs which are often employed by psychologist and behavioural scientist:

- Intervening variables
- Hypothetical construct

6.2.4 Types of Variables:

Independent Variable: Independent variable is the variable that is controlled and manipulated by the experimenter/researcher for the study.

The independent variable is the condition manipulated or selected by the experimenter to determine its effect on behaviour. It is the stimulus of stimulus-response psychology.

Dependent Variable: A measure of the subject's behaviour that reflects that independent variable's effects.

Thus when an experiment is conducted, some variables are manipulated by the experimenter and others are measured from subjects. Which are manipulated by the experimenter are called independent variables. Which are measured from subjects are called dependent variables.

INDEPENDENT VARIABLE	DEPENDENT VARIABLE
PARTICULAR RESEARCH METHOD	ACHIEVEMENT SCORE, NUMBER OF ERRORS.

Extraneous Variable :

Variables not manipulated by examiner. Or uncontrolled variables that may have a significant influence upon the dependent variable. Variables that may 'mask'/hide the relationship between independent variable and dependent variable are known as extraneous variables. These variables may directly affect the dependent variable or may combine with the independent variable to produce an effect. So, extraneous variables must be controlled so that the experimenter can determine whether the dependent variable changes in relation to variation in the independent variable or not.

Extraneous variables are relevant in nature. In experimental studies, they belong to three major types: organismic variables, situational variables and sequential variables. The subject-related variables include age, sex, personality, intelligence etc. are organismic variables.

Intervening Variable :

Intervening variables are hypothetical concepts, which are assumed to be created by the treatment or arise during the treatment and may have an impact on outcome. This impact is invisible, but sometimes it becomes observable through intervention.

Thus intervening variables are those which are not controlled, extraneous and independent but might have a significant influence upon the results of a study. So unlike the other variables, the intervening variable is usually not stated as part of the hypothesis.

It links the independent and dependent variable.

Independent variable	Intervening variable	Dependent variable
Educational level	Occupation type	Income level

Moderator Variable:

Moderator variables are characteristics that influence the impact of the independent variable upon the dependent variable in different circumstances or contexts. Certain variables which cannot be controlled or measured directly may have an important effect upon outcome. Such variables are difficult to define in operational, observable terms but they cannot be ignored.

Examples are demographic variables such as age, gender, race, or socioeconomic level, a measured variable such as performance or attitude, or a manipulated variable such as classroom instruction.

6.2.5 Hypotheses – Concept:

The term hypothesis is made up of two words 'hypo' and 'thesis' which means less than or 'less certain' than a 'thesis'.

Hypothesis is a reasonable guess or statement based upon the available evidence, which the researcher seeks to prove through the study. Hypothesis is an assumption or proposition which is to be tested on the basis of the compatibility of its implications with empirical evidence with previous knowledge (Mouly, 1963). It can take either the 'declarative' form, the 'null form' or the 'question form'.

It is also a declarative statement in which the investigator makes a prediction or a conjecture about the outcome of the relationship. The conjecture or the prediction is not simply an "educated guess"; rather it is typically based on past researches, which investigators assembled/gathered as evidences to advance the hypothesized relationship between variables.

6.2.6 Sources of hypothesis:

The sources of hypothesis are as follows:

Experience and Creativity of the Researcher: Creativity and experience both are capable of deriving adequate hypothesis. While doing an environment, a researcher comes across many problems, some of which are serious enough and requires hard work to solve them.

Background Knowledge: Background Knowledge is necessary for a researcher to be thoroughly familiar with established facts, existing theories and previous researches relating to the problem. The related literature is an important source of hypothesis formulation.

Versatile Intellect: A researcher must possess a versatile intellect to understand a theory, to deduce a hypothesis from theories, to be able to spot very quickly the contributing variables in a study/research work, to creatively imagine the output or solution to the problem and to have an adventurous and heuristic attitude, all of which depend upon the expenditure of considerable time and effort along with the persistence of the researcher.

Analogies: Analogies are a potential source for the formulation of hypothesis and finding out solutions to the problem. Reasoning by analogy is based on similarities and differences between two situations in which a similar or the same phenomena or event takes place.

Scientific Theory: A systematic review and analysis of theories developed in field of psychology, sociology, political science and even in biological sciences may help the researcher to provide a suggestive base to formulate a hypothesis. For example, a researcher working on 'Modification of Student's Behaviour' may be benefited by the Skinnerian theory of behaviour shaping.

Authentic Knowledge: Since the hypothesis offers a solution to the problem, it must be formulated/constructed in consonance with authentic knowledge and irrefutable analysis available. For example, if the researcher is working on motivation, then Maslow's Hierarchy of Needs will provide an authentic source for hypothesis formulation.

Specialization of an educational field:

- Published studies, hand books, abstracts, research journals, seminars on the issue, current trends on the research area.
- Instructional programs persuaded.
- Analyze of the area studied.
- Considering existing practices and needs.
- Extension of the investigation.
- Offshoots of research studies in the field.

6.2.7 Types of hypothesis:

Directional hypothesis:

The hypotheses that stipulate/specify the direction of the expected differences or relationships are termed as directional hypotheses. Directional hypothesis specify the expected direction of the relationship between variables i.e. the researcher predicts the existence of a relationship and also its nature. For example, "There is positive relationship between the academic achievement and learning habit of students" is a directional hypothesis. This hypothesis stipulates that students with good learning habit will have high academic achievement. Again, the hypothesis: "Students with high test anxiety will score badly in the exam as compared to students with low test anxiety" is a directional research hypothesis because it stipulates the direction of the difference between the groups. 'High school students who participate in co-curricular activities have a lower GPA than those who do not participate in such activities.' Such hypotheses provide a definite direction to the prediction.

Non-directional hypothesis:

A research hypothesis, that does not specify the direction of expected differences or relationships, is a non-directional research hypothesis. This form of hypothesis is often used in studies where there is no sufficient past research on which to base a prediction. Do not stipulate the direction of the relationship. For example, 'The academic performance of high school students is related to their participation in extracurricular activities.' Again the hypothesis: "There is significant difference in the academic achievement of B.Ed. students enrolled in conventional and open universities" is a non-directional research hypothesis. Although these hypothesis stipulate that there is a difference in the academic achievement, the direction of the differences are not specified.

Alternate or Research Hypothesis: This hypothesis proposes a relationship between two or more variables, symbolized as H_a . The alternative hypothesis or Research Hypothesis (H_a) is a statement that contradicts the null hypothesis. The alternative hypothesis is accepted when the null hypothesis (our assumption) is proved false. The alternative hypothesis must not involve equality (\neq , $<$, $>$).

For example, if a researcher was intended to examine the relationship between music and emotion, he/she may believe that there is a relationship between music and emotion.

H_a (the research/alternate hypothesis): Music at a fast tempo is rated by participants as being happier than music at a slow tempo.

H_0 (the null hypothesis): Music at a slow tempo and at a fast tempo is rated the same in happiness by participants.

The two hypotheses we propose to test must be mutually exclusive; when one is true the other must be false. They must be exhaustive; they must include all possible occurrences.

Null hypothesis (H_0):

In the null form, the researcher makes a statement that no relationship or difference exists between two variables. The null hypothesis (H_0) is a statement involving equality ($=$, \leq , \geq) about a population parameter. For example the hypothesis: "There is no significant difference in the attitude of parents of urban and rural areas towards co-education at the upper-primary level", is a null hypothesis.

Again, 'There is no difference in the academic performance of high school students who participate in extracurricular activities and those who do not participate in such activities', is an example of null hypothesis.

Therefore, the relationship between research hypothesis (H_a) and the null hypothesis (H_0) is that, if null hypothesis (H_0) is rejected then research hypothesis (H_a) is accepted.

6.2.8 Formulating Hypothesis:

- **Level of Significance:**

It is the probability of rejecting a true null hypothesis that is the probability of "Type I error" and is denoted by α . The frequently used values of α are: 0.05; 0.01; 0.1 etc.

When, $\alpha = 0.05$ it means that the level of significance is 5%.

$\alpha = 0.01$ it means 1% level of significance.

$\alpha = 0.10$ it means 10% level of significance.

In fact α specifies the critical region. A computed value of the test statistic which falls in the critical region (CR) is said to be significant. So, α is called the level of significance.

- **Critical/ Rejection Region:**

The rejection region (RR) or critical region (CR) is the area under the curve beyond certain limits in which the population value is unlikely to fall by chance only when the null hypothesis is assumed to be true. If an observed value falls in this region H_0 is rejected and the observed value is said to be significant. In a word, the region for which H_0 is rejected is called critical region or rejection region.

- **Confidence Interval:**

Confidence interval is the interval marked by limits within which the population value lies by chance and the hypothesis is considered to be tenable. If an observed value falls in confidence interval H_0 is accepted.

- **Critical Values:**

The values of the test statistic that separates critical region from confidence region (acceptance region) are called critical values.

- **Standard Deviation:**

The standard deviation (SD) is the most frequently calculated measure of variability or dispersion in a set of data points. It represents the average distance of a set of scores from the average score or the mean. A smaller SD represents a data set where scores are very close to the mean score (a smaller range). A data set with a larger SD has scores with more variance (a larger range).

- **Standard Error:**

It error is an estimate of the standard deviation of a statistic. It is important because it is used to compute other measures, like confidence intervals and margins of error. The standard error is computed from known sample statistics, and it provides an unbiased estimate of the standard deviation of the statistic. Symbolically-

$$Se = SD / \sqrt{N}$$

Where, SD = Standard Deviation; N = Number of Samples; Se= Standard Error.

- **Degree of Freedom:**

Degree of freedom (*df*) refers to the number of values which are free to vary after we have given the number of restrictions imposed upon the data. It is commonly abbreviated by *df*. In statistics, '*df*' is the number of values in a study that are free to vary. Example, if you have to take ten different courses to graduate, and only ten different courses are offered, then you have nine degrees of freedom (*df*). Nine semesters you will be able to choose which class to take/select; the tenth semester, there will only be one class left to take/select - there is no choice, if you want to graduate. Degrees of freedom are commonly discussed in relation to chi-square (χ^2) and other forms of hypotheses testing statistics. It is very important to calculate the degree(s) of freedom when determining the significance of a chi-square statistic and the validity of the null hypothesis. In chi-square (χ^2) the number of degrees of freedom is described as the number of observations that are free to vary after certain restrictions have been imposed on the data. In a contingency table, the cell frequencies of all columns but one ($c-1$) and of all rows but one ($r-1$) can be assigned arbitrarily and so the number of degrees of freedom for all cell frequencies is $(c-1)(r-1)$, where ' c ' refers columns and ' r ' refers rows. Thus in a 2x2 table, the degrees of freedom (*df*) would be $(2-1)(2-1) = 1$ and in a 3x3 table, the *df* would be $(3-1)(3-1) = 4$.

- **One-tailed and Two-tailed Tests:**

One-tailed Test: One-tailed Test is a test in which the critical region is located in one tail of the distribution of test of statistic is called one-tailed test. There are two types of one-tailed test in the testing of hypothesis :

A) Right tailed test and B) Left tailed test.

A test in which critical region is located in right tail of the distribution of the test statistic is called right tailed test or upper one tailed test.

A test in which critical region is located in left tail of the distribution of the test statistic is called left tailed test or lower one tailed test.

One tailed alternative hypothesis leads to one tailed test. Hypotheses of one tailed tests are –

- A. $H_0: \theta \leq \theta_0$
 $H_1: \theta > \theta_0$
- B. $H_0: \theta \geq \theta_0$
 $H_1: \theta < \theta_0$

Two-tailed Test: A test in which the critical region is located in two tails of the distribution of test of statistic is called two-tailed test.

Two-sided alternative hypothesis leads to two-tailed test. The hypotheses are represented as –

$$H_0: \theta = \theta_0 ; H_1: \theta \neq \theta_0$$

- **Directional and Non-directional Tests:**

Non-directional Test: We may wish to test the null hypothesis $H_0: \mu_1 - \mu_2 = 0$ against the alternative

$H_1: \mu_1 - \mu_2 \neq 0$. This means that if H_0 is rejected, the decision is that a difference exists between the two means. Thus no assertion is made about the direction of the difference. Such a test is a non-directional test. A test of this kind is sometimes called a two-tailed or two-sided test.

Directional Test: Under certain circumstances we may wish to make a decision about the direction of the difference.

If concern with the direction of the difference, we may test the hypothesis $H_0: \mu_1 - \mu_2 \leq 0$ against the alternative $H_1: \mu_1 - \mu_2 > 0$ or the hypothesis $H_0: \mu_1 - \mu_2 \geq 0$ against the alternative $H_1: \mu_1 - \mu_2 < 0$.

The symbol H_0 has been used to denote three different hypotheses:

- A) a hypothesis of no difference,
- B) a hypothesis of equal to or less than, and
- C) a hypothesis of equal to or greater than.

Such tests are directional one-sided test.

To reject $H_0: \mu_1 - \mu_2 \leq 0$ and accept $H_1: \mu_1 - \mu_2 > 0$, using the normal distribution, a normal deviate greater than +1.64 is required for significant at the 0.05 level. Likewise to reject $H_0: \mu_1 - \mu_2 \geq 0$ and accept $H_1: \mu_1 - \mu_2 < 0$, the corresponding normal curve is less than -1.64. The fact that for a normal distribution 5 percent of the area of the curve falls beyond +1.64 standard deviation units above the mean, and 5% beyond -1.64 standard deviation units below the mean.

6.2.9 Characteristics of a good hypothesis:

- A good hypothesis has several basic characteristics:
- It must be testable.
- A good hypothesis must state the expected relationship between the variables.
- A hypothesis must suggest a tentative solution to the problem under study.
- A hypothesis must be clear and stated in a precise manner.
- The hypothesis should be limited in scope.
- It must be consistent with known facts.
- It must explain what it intends to explain.
- The variables should be defined operationally, tested empirically.
- A good hypothesis must be based on some relevant theory or discovered truth.
- A good hypothesis should be amenable to testing within a reasonable time.

6.2.10 Steps of writing a research proposal:

The exact format for a research proposal can vary slightly depending on the type of research being proposed and the specific demands of the institution. A research proposal describes what the investigator will investigate, why it is important, and how the investigator will do the research. There are a few basic concepts/steps that are almost always same.

A) Title page: It includes the following-

- The proposed title
- Researcher's name
- Supervisor's name
- Name of the institution and department

B) Introduction: It includes following important questions-

- Who has an interest in the topic (policymakers, scientists, practitioners, particular members of society)?
- How much is already known about the problem?
- What is missing from current knowledge?
- What new insights will the proposed research contribute?
- Why is this research important?

C) Literature review: It is important for the following reasons-

- Strong literature review convinces the reader that the project has a solid foundation in existing knowledge or theory.
- It shows that no repetition is done on what other people have already done or said.
- Compare and contrast the objectives, hypothesis/research questions, tools used, methodology, findings, statistical measure used in different studies.
- Critically find out the strengths and weaknesses of different studies.
- Show how the present research fits in existing knowledge.
- Find research gap.

D) Introduce the topic: It includes the following-

- Give background and context
- Outline of problem statement

E) Give the significance of the topic

F) Select objectives of the study

G) Formulate hypothesis or research question

H) Delimit the study area: Due to limited scope, time, resources the researcher will have to delimit his study (area, population, sample and others)

I) Research design: The research design or methodology section should describe the overall approach and practical steps to answer the research questions.

J) Presentation of data

K) Analysis and findings

L) Give reference

Tentative format of research proposal:

Introduction
Related Literature <ul style="list-style-type: none"> • STUDIES IN ABROAD • STUDIES IN INDIA
Research gap
Statement of Problem
Significance of the study
Objectives
Research Question/Hypothesis
Operational Definition of Important Terms
Delimitation of the study
Methodology <ul style="list-style-type: none"> • Tools • Research Method • Population • Sample • Sampling Technique
Presentation of data
Analyses and Finding <ul style="list-style-type: none"> • Use of statistical Procedure
Reference



6.2.11 Concept of universe and Sample:

Universe: The population or universe represents the entire group of units. The universe may be individual, group of people, organizations or even objects. Universe is the set of all experimental units from which a sample is to be drawn. Universe can be finite or infinite. It is said to be finite if it consists of a fixed number of elements so that it is possible to enumerate it in its totality. Whereas in infinite aspect it is impossible to observe all the elements. We can't have the idea about the total number of elements.

Sample: A finite subset (a part of a larger group of related things) of the population, selected from it with the objective of investigating its properties is called sample. The number of units in the sample is known as the sample size. Sampling is a tool which enables us to draw conclusions about the characteristics of the populations after studying only those objects or items that are included in the sample.

Main Objectives of the Sampling Theory:

- To obtain the optimum results, the maximum information about the characteristics of the population with the available sources at our disposal in terms of times, money and manpower by studying the sample values only.
- To set the best possible estimates of the population parameters.

6.2.12 Characteristics of a good sample:

- The sample must be representative of the population.
- The sample size must be selected, depending upon the research objectives.
- It should be flexible, so that it can be modified at any time.
- Sample should reflect all the members of the population of data.
- Sample should be able to provide sufficient precision.
- It should be unbiased.
- A good sample is an objective one; it refers objectivity in selecting procedure or absence of subjective elements from the situation.
- A good sample maintains accuracy. It yields an accurate estimates or statistics and does not involve errors.
- A good sample is comprehensive in nature.
- A good sample has the practicability for research.

6.2.13 Techniques of Sampling:

Probability sampling:

A probability sampling is a sampling technique in which every unit of the population has a chance (greater than zero) of being selected in the sample, and this probability can be accurately determined. The combination/amalgamation of these traits make it possible to produce unbiased estimates of the population, by weighting sampled units according to their probability of selection.

Example:

We want to estimate the total income of adults living in a given colony. We visit each household in that colony, identify all adults living there, and randomly select one adult from each household. We can assign each person a random number, generated from a uniform distribution between 0 and 1, and select the person with the highest number in each household. Then we take interview the selected person and get their income.

People living on their own (unaccompanied by others; alone or unaided) are certain to be selected. Therefore, we simply add their income to our estimate of the total. But a person living in a household of two adults has a one-in-two chance of selection. In that case, we would count the selected person's income twice towards the total. (The person who is selected from that household can be loosely viewed as also representing the person who is not selected.)

In the above example, not everyone has the same probability of selection. It is called probability sample because the fact that each person's probability is known to us. When each and every element in the population do have the same probability of selection, this is known as an 'equal probability of selection' (EPS) design. Such designs are also referred to as 'self-weighting' because all sampled units are given the same weightage.

Probability sampling includes the following:

- Simple Random Sampling
- Systematic Sampling
- Stratified Sampling
- Probability Proportional to Size Sampling
- Multistage Sampling
- Cluster Sampling

These different ways of probability sampling have two things in common:

- i) Every element has a known non-zero probability of being sampled.
- ii) Involves random selection at some point.

Non Probability Sampling:

Non probability sampling is any sampling where some elements of the population have no chance of being selected or where the probability of selection can not be accurately determined. It involves the selection of elements based on assumptions regarding the population of interest, which forms/shapes the criteria of selection. Because of the selection of elements is non-random, non-probability sampling does not allow the estimation of sampling errors. These conditions give birth to exclusion bias, placing limits on how much information a sample can provide about the population. Information regarding the relationship between sample and population is limited, making it difficult to extrapolate from the sample to the population.

Example:

We visit every household in a given colony, and interview the first person to answer the door. In any household with more than one occupant, is a non-probability sample, because some people are more likely to answer the door (e.g. an unemployed person who spends most of their time at home is more likely to answer than an employed housemate, who might be at work when the interviewer visits) and it is not practical towards calculating these probabilities.

Non-probability sampling methods include the following:

- Convenience sampling,
- Quota sampling
- Purposive sampling

Simple Random Sampling:

Simple random sampling is the techniques in which “sample is so drawn that each and every unit in the population has an equal and independent chance of being included in the sample”.

Whether the unit selected in any draw is not replaced in the population before making the next draw, then it is known as simple random sampling without replacement. Whether it is replaced back before making the next draw, then the sampling plan is called simple random sampling with replacement.

A very important and interesting feature of simple random sampling without replacement is that “the probability of selection a specified unit of population at any given draw is equal to the probability of being selected at the first draw”. This implies that in this case from a population of size N , the probability that any sampling unit is included in the sample is $1/N$ and this probability remains constant throughout the drawing.

Systematic Sampling:

Systematic sampling is slightly vary from the simple random sampling in which only the first sample unit is selected at random and the remaining units are automatically selected in a definite sequence at equal spacing from one another. This technique of drawing samples is usually recommended if the complete and up-to-date list of the sample units, i.e., the frame is available and the units are arranged in some systematic order such as chronological, alphabetical, geographical order etc. This sampling technique is generally followed when the population is finite in nature.

Stratified Sampling:

When the population is heterogeneous with respect to the variable or characteristic under study, then the technique of stratified random sampling is used to obtain more efficient results. Stratification means division into layers or groups.

The criterion/factors used for the stratification of the universe into various strata is known as stratifying factor. Some of the commonly used stratifying factors are age, sex, income, economic status, etc. In many fields of highly skewed distributions, stratification is very effective and valuable tools.

A stratified sampling approach is most effective when three conditions are fulfilled:

1. Variability between strata are maximized
2. Variability within strata are minimized
3. The variables/factors upon which the population is stratified are strongly correlated with the desired dependent variable.

Advantages over other sampling methods:

- Stratified Sampling focuses on important sub-populations and ignores irrelevant ones.
- Stratified Sampling allows use of different sampling techniques for different subpopulations.
- It improves the accuracy/efficiency of estimation.
- Stratified Sampling permits greater balancing of statistical tests of differences between strata by sampling equal numbers from strata varying widely in size.

Disadvantages:

- Stratified sampling requires selection of relevant stratification variables which can be difficult.
- Stratified sampling is not useful when there are no homogeneous subgroups.
- Stratified sampling can be expensive to implement.

Probability-Proportional-to-Size Sampling:

In some cases the sample design has access to an "auxiliary variable" or "size measure" and is believed to be correlated to the variable of interest, for each element in the population. Those data can be used to improve accuracy in sample design. As discussed above, one option is to use the auxiliary variable as a basis for stratification.

Another option is Probability Proportional to Size ('PPS') sampling is the way, in which the selection probability for each element is set to be proportional to its size measure, up to a maximum. In a simple 'PPS' design, these selection probabilities can then be used as the basis/support for Poisson sampling. This includes the drawback of variable sample size, and different portions of the population may still be over- or under-represented due to chance variation in selections.

Multistage Sampling:

Multistage sampling refers to a sampling technique which is carried out into various stages.

For example, if we are interested in obtaining a sample of, say, n households from a particular state the first stage units may be districts, the second stage units will be households in the villages. Each and every stage thus results in a reduction of the sample size.

Advantages:

- Cost and speed that the survey can be done is quite efficient
- Convenience/benefit of finding the survey sample
- It is more accurate than cluster sampling for the same size sample

Disadvantages:

- Multistage Sampling is not as accurate as Simple Random Sample if the sample is the same size
- More testing is difficult to do.

Cluster Sampling:

In this case the total population is divided, depending on the problem under study, into some recognizable subdivisions which are termed as clusters and a simple random sample of these clusters is drawn.

For example, if the investigator is interested in obtaining the income or opinion data in a city, the whole city may be divided into N different blocks or localities (which determine the clusters). Then a simple random sample of n blocks is drawn. The individuals in the selected blocks determine/decide the cluster sample.

Quota Sampling:

In quota sampling, at first the population is segmented into mutually exclusive sub-groups, just as in stratified sampling. After that, judgment is used to select the subjects or units from each segment based on a specified proportion. For example, an interviewer may be told to sample 200 females and 300 males between the age of 45 and 60.

It forms the second step which makes the technique one of non-probability sampling. Here the selection of the sample is non-random. For example interviewers might be induced to interview those who look most helpful. The difficulty is that these samples may be biased because not everyone gets a chance of selection.

Accidental Sampling:

Accidental sampling sometimes known as grab, convenience or opportunity sampling. It is a type of non-probability sampling which involves the sample being drawn from that part of the population which is close to hand. It means that, a population is selected because it is readily available and convenient.

It may be done through the following ways:

- meeting the person or
- including a person in the sample when one meets them or
- chosen by finding them through technological means such as the internet or
- through phone.

The researcher using such a sample cannot scientifically make generalizations about the total population from this sample. It would not be representative enough. For example, if the interviewer were to conduct such a survey at a shopping complex early in the morning on a given day, the people that he/she could interview would be limited. That would not represent the views of other members of society in such an area. If the survey was to be conducted at different times of day and several times per week, it will be more fruitful than the previous one. This type of sampling is most suitable for pilot testing.

Panel Sampling:

Panel sampling is the method where one first select a group of participants through a random sampling method and then ask that group for (potentially the same) information several times over a period of time. Therefore, each participant is interviewed at two or more times. Each period of data collection is called a "wave". The method was developed by sociologist Paul Lazarsfeld in 1938 as a result of studying political campaigns. This is a longitudinal sampling-method. It allows estimates of changes in the population, for example, with regard to chronic illness to job stress to weekly food expenditures. Panel sampling can also be used to inform investigators about within-person health changes due to age or to help in explaining changes in continuous dependent variables such as spousal interaction.

Snowball Sampling:

Snowball sampling deals with the finding of a small group of initial respondents and using them to recruit more respondents. It is particularly useful in such cases where the population is hidden or difficult to enumerate.

Purposive Sampling:

A sample which is selected on the basis of individual judgment of the sampler is called purposive Sampling. There is no special technique for selecting a purposive sample; but the sampler picks out a typical or representative sample according to his own judgment. It all depends on the personal factor and chance is not allowed to play at all.

6.2.14 Tools of research:

Reliability and validity are closely related, though they are different. A measurement can be reliable without being valid one. However, if a measurement is valid, it is usually be reliable. However, reliability is not enough to ensure validity. Even if a test is reliable, it may not accurately reflect the real situation or be valid one.

Validity:

Validity deals with the accuracy of a measure. It explains the extent to which the results really measure what they are supposed to measure. Validity can be accessed by checking how well the results correspond to established theories and other measures of the same concept. In other words, it refers to how accurately a method measures what it is intended to measure. If research has high validity, that means it produces results that correspond to real properties, characteristics, variations in the physical or social world. High reliability indicates that a measurement is valid. If a method is not reliable, it probably is not valid one. Types of validity are: Construct validity, Content validity, Criterion validity. To assess the validity of a cause-effect relationship, one need to consider internal validity (the design of the experiment) and external validity (the generalizability of the results).

Type of validity	Description
Content validity	Content validity is the extent to which a research instrument accurately measures all aspects of a construct
Construct validity	Construct validity is the extent to which a research instrument (or tool) measures the intended construct
Criterion validity	Criterion validity is the extent to which a research instrument is related to other instruments that measure the same variables

There are three types of evidence that can be used to demonstrate construct validity:

- 1) **Homogeneity:** meaning that the instrument measures one construct.
- 2) **Convergence:** Convergence occurs when the instrument measures concepts similar to that of other instruments. If there are no similar instruments available this will not be possible to do.
- 3) **Theory evidence:** Theory evidence is evident when behaviour is similar to theoretical propositions of the construct measured in the instrument. For example, when an instrument measures anxiety, one would expect that participants who score high on the instrument for anxiety also demonstrate symptoms of anxiety in their everyday lives.

Criterion validity is measured in three ways:

- 1) **Convergent validity:** Convergent validity shows that an instrument is highly correlated with instruments measuring similar variables.
- 2) **Divergent validity:** Divergent validity shows that an instrument is poorly correlated to instruments that measure different variables. In that case, for example, there should be a low correlation between an instrument that measures motivation and one that measures self-efficacy.
- 3) **Predictive validity:** It means that the instrument should have high correlations with future criterions.

For example, a score of high self-efficacy related to performing a task/activity should predict the likelihood a participant completing the task/activity.

Reliability:

Reliability is about the consistency of a measure. It explains the extent to which the results can be reproduced when the research is repeated under the same conditions. It can be accessed by checking the consistency of results across time, across different observers, and across parts of the test itself. It refers how consistently a method measures something. If the same result consistently be achieved by using the same methods under the same circumstances, the measurement is considered as reliable.

Types of reliability:

Test-retest, Interrater, Internal consistency

Attributes of reliability	Description
Homogeneity (or internal consistency)	The extent to which all the items on a scale measure one construct
Stability	The consistency of results using an instrument with repeated testing
Equivalence	Consistency among responses of multiple users of an instrument, or among alternate forms of an instrument

6.2.15 Standardisation of a Tool:

Preparation of tools:

At first, with help of the guide, researcher will prepare research related scales, questionnaire, construct achievement tests, diagnostic tests etc as per the requirement of the research and select dimensions for the study.

Pilot study:

The main reasons to conduct a pilot study are:

Process: It means where the feasibility of the key steps in the main study is assessed.

- recruitment rate;
- retention levels
- eligibility criteria etc.

Resources: It deals with the assessing problems with time and resources that may occur during the main study. Researcher will have to keep in mind the following aspects:

- How much time the study will take to be completed;
- Whether the use of some equipment will be feasible;
- Whether the form(s) of evaluation selected for the main study are as good as possible etc.

Management: It means the problems with data management and with the team involved in the study.

- If there were problems with collecting all the data needed for future analysis;
- If the collected data are highly variable
- If data from various institutions can be analyzed together etc.

After the development of tool the investigator will take pilot test.

Any changes recommended to the protocol by the experts should be clearly outlined.

Reliability: It refers how consistently a method measures something. If the same result consistently be achieved by using the same methods under the same circumstances, the measurement is considered as reliable.

Validity: Validity refers to how well a tool measures what it intends to measure. Validity is concerned with different aspects of a measurement process. It uses logic, statistical verification or both to determine the degree of validity and has special value under certain conditions. Main types of validity include content validity, predictive validity, and construct validity.

6.2.16 Types of Tools:

6.2.16.1 Rating scale:

A rating scale is a set of categories designed to draw out information about a quantitative or a qualitative attribute. It is one of the most popular question types for online and offline surveys where survey respondents are expected to rate an attribute or feature. Rating scale is such a tool by which it knows that any person regarding some specific properties, what impact on coming persons. In rating scale a catalogue of some properties in which before all some digit is written. According to experience of rator tick marked to related persons. In all methods of psychological measures rating scale user much.

The credit of its inception goes to Fechner in the field of psycho-physics. But first of all Galton in 1883 published rating scale which is related to imagery. After that in 1906—1907 Pearson for measuring intelligence formulated a rating scale in which was seven categories. In this technology any person's personality measures is done on the basis of such a man's opinion that know former person through and through. In these testimonials, character certificate, confidential reports etc are main, but due to low level of reliability and validity of rating scale it can be user in experiment work rarely.

Types of Rating Scale:

Rating scales can be divided into two groups: Ordinal and Interval Scales.

There are four primary types of rating scales used in online survey:

- Graphic Rating Scale
- Numerical Rating Scale
- Descriptive Rating Scale
- Comparative Rating Scale

Graphic rating scale: It is a type of performance appraisal method. It indicates the answer options on a scale of 1-3, 1-5, etc. Example of graphic rating scale is Likert Scale.

Numerical rating scale: It deals with numbers as answer options and not each number corresponds to a characteristic or meaning. Visual Analog Scale or a Semantic Differential Scale are some of the most effective types of numerical rating scale.

Descriptive rating scale: Here each answer option is elaborately explained for the respondents. There are certain surveys, for example, a STUDENTS' SATISFACTION SURVEY, which needs to describe all the answer options in detail so that every student has thoroughly explained information about what is expected from the survey.

Comparative rating scale: It expects respondents to answer a particular question in terms of comparison, based on relative measurement or keeping other organizations/products/features as a reference.

Advantages of Rating Scale:

- Rating scale questions are very simple to understand and implement.
- It offers a comparative analysis of quantitative data within the target sample for researchers to make well-informed decisions.
- Ample information can be collected and analyzed using a rating scale.
- It is easy for researchers to create surveys, using graphic rating scales, as they consume the least time to configure.
- The analysis of rating scale questions is quick and less time-consuming.
- Rating scale should be standard for collecting qualitative and quantitative information for research.

6.2.16.2 Attitude scale:

Attitude is a psychological construct, a mental and emotional entity that characterizes a person. It can be referred to as a person's viewpoint, mindset, beliefs, etc.

Definition of attitude scale:

According to Merriam-Webster dictionary, attitude scale indicates a measure of the relative quantity of an attitude possessed by an individual as contrasted with a reference group .

Assumptions of attitude:

- Attitudes are predispositions to respond.
- Attitudes are persistent over time.
- Attitudes are liable to change, but not easily.
- Attitudes produce consistency in behavior.
- Attitudes are directional (Summers, 1970).

Types of Attitudinal Scales:

- Likert (summed rating)
- Semantic Differential
- Guttman (cumulative)
- Thurstone (equal-appearing interval)

Attitude scales:

Thurstone scale: It is an attitude scale consisting of items (in the form of statements) with which the respondent has either to agree or disagree. Only those items with which the respondent agrees are scored. Every item has a value and the respondent's score on the scale corresponds to the median score of the items with which the respondent agrees. The item scores are usually obtained from asking a number of judges to rank each item on the scale using an eleven-point scale reflecting the attitude that is being measured. The score of each item is the median of the judges' individual scores. The final part is based on two criteria: first, that items covering the whole eleven-point range are included; second items should have a small variation (between judges).

Likert scale: It is an attitude scaling method where respondents indicate the extent of their agreement with each item on a scale (e.g., a five- or-seven point scale). Their score on the scale is the sum total of the scores for each item.

Likert scales were come up with in 1932 as a development of Thurstone scales. The aim of this scale was to eliminate the unreliability of using intermediary judges in scale construction. The original Likert scales had no neutral or middle point. Respondents were 'forced' to some degree of agreement or disagreement with the scale item. Likert scales are relatively easy to construct.

It should be noted that Likert scales may not always be unidimensional but the approach basically assumes a single dimension. It is often found that analysis of a Likert scale could identify clusters that are indicative of a number of dimensions, although this is much weaker than the multi-dimension identification claimed for Guttman scaling. The Likert method attains only index measurement.

Semantic differential: It is a flexible method of attitude scaling. Here subjects rate the concepts, in which the researcher is interested, on a bipolar (usually) seven-point scale. The two ends of the scale are defined by pairs of adjectives with an opposite meanings (e.g. good/bad, etc.)

Guttman scale: It involves the researcher constructing a set of hierarchical statements relating to the concept under investigation. All statements should reflect an increasing intensity of attitude. The respondent's disagreement at any point with a statement reflects the respondent's scale position. The strength of the Guttman method is its capacity to identify more than one dimension in the scale. Guttman approach does not make inferences about the latent nature of the data but manipulates the empirical data directly for the determination of an attitude.

6.2.16.3 Questionnaire:

For the internal quality of personalise related that particular quality questionnaire is found by selecting question, which can do measure more accurately. In this method questionnaire is given to the persons, on which direction is given. Person has react according to directions. Hence, this is a good techniq for measurement of many persons in more less time. These questionnaire either impulsive fluctuation found to person or either found to specific virtue or uses of diagnosis. Questionnaire is a self-rather scale. Persons determined by medium of different post that, how he will behave in the different situations of life. Although this method is seems to be simple internally. But for its formation and by its scientifically collection of data needs a good training. In questionnaire one true answer is found quality of objectivity. Questionnaires are under of self-report techniques. In words of Lazarus – Simply stated the self-report technique, involve attempting to measure aspects of human personality on the basis of what a person can say or is willing to say about himself. They usually consist of a series of printed objective questions presented to the subject or to a group of subjects. Such inventories of questions can be used to study interests, attitudes and various other facts of personality. They are objective, because the subject must respond usually with a 'Yes' or 'No' or 'I don't know answer of question.

Types of Questionnaire:

1. Closed Questionnaire:

Here answer of the question is given with tick mark on the one of the option Yes or No. The form of questions in questionnaire is as:

- (a) Do you always worried? Yes/No
- (b) Do you like meet with people? Yes/No
- (c) Do you see nightmares? Yes/No

2. Open Questionnaire:

In this questionnaire some questions or statements are given about that, person own views are express in detail. The form of question is like this type—

- (a) What do you mean by 'Operation Black Board'?
- (b) What is your opinion regarding success of new education policy?
- (c) What is your concept regarding justification of rule of reservation?

3. Pictorial Questionnaire:

In this types of questionnaire, some questions are asked with the help of figures, person gives the answer of those questions by tick marking or by underline of the figure.

4. Mixed Questionnaire:

As its clear by the name, in these types of questionnaire almost all types of questions are found in combined form.

Limitations of Questionnaire:

Although questionnaire method is very simple, low cost, and in short time technique to observe the more people and therefore this is very popular also, but also, there are some limitations It is necessary that these should be keep in mind.

1. Sometimes respondent did not want to give answer with honesty of any question. So that, they have to push up own impulsion and can gives wrong information.
2. This is also, more probability of that point, candidates could not understand the question properly so that they may not give conceptual information.
3. Sometimes candidates fill's questionnaire carelessly and its tick mark on 'yes' or 'No' without thinking which, effects goes on the result.
4. Sometimes it may happen that which events at discuss of the form of questions they did not happening in the life of candidate or at that conditions of he had forget, in this stage answer are not realistic but imaginary.
5. Some questions, whose answer candidate does not want to give in spite of given consolation to him that the answer will not be explore in front of society.
6. In these questionnaires are of less importance of solution, because questions of credulity and validity in low level.
7. People do not show the interest in fill of questionnaire, because less quantity of questionnaire are return.
8. This is possible that the sample of questionnaire is unfavourable for the respondent.
9. This is not possible that the prepare enact questions will be able to every educational and cultural level of people.
10. In adjustment related question the adjustment can not apply to all people, this is possible that in such condition one person can be adjusted other could not.
11. It has been seen the fixed of scoring rationale on also the given marks by examiner's not in equality.

6.2.16.4 Aptitude test:

In referring to a person's aptitude for mathematics or mechanical or science or music, we are looking to the future. An aptitude is a combination of inborn capacities and developed abilities, skills etc, that makes the person what he is at any given time and forecast what he may become.

According to Bingham (1937), the concept of aptitude carries with it certain basic assumptions :

- i) An individual's potentialities are not all equally strong.
- ii) Individuals differ one from another in their potentialities.
- iii) Differences are relatively stable.

Basic assumptions:

- An individual's potentialities are not all equally strong.
- Individuals differ from each other in their potentialities.
- Many differences of them are relatively stable

Characteristic of Aptitude:

- Aptitude is an abstract noun. It is not a quality, possessed by the individual, but is an integrative part of his personality.
- Aptitude is a present condition with a future reference. It is symptomatic or indicative of potentialities. Understanding of an individual's aptitudes helps us to know what he shall do in the future.
- Any measure of aptitudes would only be in terms of probabilities.
- An individual may have many aptitudes -or potentialities, but they are not equally strong. Even Leonardo da Vinci, an extremely versatile engineer, musician, painter, airplane designer, philosopher etc. was not equally gifted in all these fields.
- There are individual differences in potentialities. People do not inherit the same endowments, nor do they develop equally. There is an obvious contrast between the feeble minded and the strong, the submission and the master.
- Potentialities of an individual are fairly stable. But it does not mean that they are perfectly constant and do not alter. It means that changes are not sudden and take, years.

Aptitude test:

Aptitude tests like tests of intelligence are intended for measuring an individual's ability to perform tasks of a limited on specific kind (such as mechanical, clerical, musical etc.). Aptitude testing received considerable attention during the first world war and the period that followed it. There were several reasons for this. The most important among them was, during the war times, there was urgent need for selecting a right person for a right type of job. Thus some sort of vocational testing was essential for filling suitably varied posts in the army after taking into account personal capabilities. The aptitude testing programme met this objective to a considerable extent. As a result, we have today a vast array of aptitude tests developed specially for predicting educability and performance in such areas as in music, drawing, mechanical and clerical occupations, in medicine, law and in many other such areas. Some aptitude tests are intended for the study of specific type of subject matter, such as science, foreign languages and mathematics.

Aptitude tests can be broadly categorised under two heads :

- i) Differential Aptitude Test Battery, and
- ii) Special Aptitude tests.

i) Differential Aptitude Test Battery:

This is a comprehensive and carefully developed Battery. It has been developed by George K. Bennett, Harold G. Seashore and Alexander G. Wesman. It is immensely used in educational and vocational counselling of high school students.

The Battery consists of 7 subtests.

These subtests are:

1. Verbal reasoning test,
2. Numerical ability test,
3. Abstract reasoning test,
4. Space relations tests,
5. Mechanical reasoning test,
6. Clerical speed and accuracy test, and
7. Language usage test.

(ii) Special Aptitude Tests:**A) Mechanical Aptitude Test:**

1. Minnesota Mechanical Assembly Test.
2. Minnesota Spatial Relations Test.
3. Minnesota Paper Form Board.
4. Johnson O'Connor's Wiggly Blocks.
5. Sharma's Mechanical Aptitude Test Battery.
6. Stengquist Mechanical Aptitude Tests.

B) Clerical Aptitude Tests:

1. Minnesota Clerical Aptitude Test.
2. General Clerical Aptitude.
3. The Detroit Clerical Aptitude Examination.
4. P.R.W. Test.
5. Orissa Test of Clerical Aptitude.
6. Clerical Aptitude Test.

C) Tests of Artistic Aptitude:

1. Graphic Arts Test:
2. Musical Aptitude Tests:
3. Literary Aptitude Tests:

D) Professional Aptitude Tests:

These tests primarily measure aptitude for different professions, like medical, legal, engineering, teaching etc.

E) Scholastic Aptitude Tests: These tests measure the scholastic aptitudes.**Uses of Aptitude Tests:**

- Aptitude tests are generally used to predict the future success both in educational and vocational careers.
- Help students to choose potential courses, subjects and careers.
- They are used as supplementary for other psychological test.
- It is used for the improvement of certain special traits of the students.

6.2.16.5 Achievement Test:

Achievement tests are for the following purposes:

- To measure whether the students have achieved from today's lesson or not
- To monitor students' learning
- To provide feedback to both students and teachers during the teaching-learning process.
- To identify the students' learning difficulties
- To assign grades/marks.

Steps:

A) Set Instructional Objectives: Remember objective is considered to be the lowest level of learning whereas understand, application of knowledge in sciences or behavioural sciences are considered higher levels of learning.

B) Select Design: The Design specifies weightages to different instructional objectives, types (or forms) of questions, units and sub-units of the course content, levels of difficulty. It also indicates whether there are any options in the question paper, and if yes, what their nature is.

C) Prepare a Blueprint: At this stage the paper setter decides how many questions are to be set for different objectives. Again he/she decides under which unit/topic a particular question is to be set. He/she picks up various forms of questions.

The three dimensions of the blueprint:

1. Content areas in horizontal rows
2. Objectives in vertical columns
3. Forms of questions in vertical columns.

After that the paper setter can write/select the items and prepare the question paper.

D) Writing of Questions: While writing a question, one can proceed in several ways.

- a) Either writing all questions (step by step) belonging to one objective at a time i.e. remember or understand or application followed by other objectives
- b) Selecting questions according to their form/type i.e. Essay Type , Short Answer Type, Very Short Answer Type or in any other order
- c) Selecting questions for each unit of the syllabus or portion to be covered at a time.

E) Mention Marking Scheme: It helps to prevent inconsistency in judgement. The various value points for each response are graded and the marks allowed to each value point indicated. It ensures objectivity in judgement and eliminates differences in score. The marking scheme includes the scoring key, which is prepared in respect of objective type questions.

F) Question-wise Analysis: Next step is that of question-wise analysis. It helps the paper setter to ensure that there is no imbalance in the question paper.

TYPES OF QUESTIONS:

Short Answer type Questions:

- Extended Answer Type:

Example-

1. Describe briefly two causes that contribute to the outbreak of the second world War. (not more than thirty words).
2. Write two separate sentences with the word 'eminent' and 'imminent'.

- Completion Type:

Example- Fill in the blanks with appropriate phrasal verbs:

Don't run --- the sun.

Put --- the lamp.

Objective type Question:

- True-False
- Matching Block
- Simple Recall
- Multiple Choice

6.2.16.6 Inventory:

It is a list, record or catalogue containing list of traits, preferences, attitudes, interests or abilities, used to evaluate personal characteristics or skills. The purpose of inventory is to list a specific trait, activity or programme and to check to what extent the presence of that ability. It is a type of psychological test. This type of test is often presented in a paper-and-pencil format or may be administered on a computer. Examples of inventory are market research surveys, online personality tests, questionnaires used by the doctors for specific treatment to collect specific data from the patient, even the fun quizzes we often see on facebook are examples of inventories.

Types of inventory:

Interest inventory: These inventories attempt to measure the types of activities that an individual has a tendency to do or like or choose. They are like self-report instruments, standardised by subject experts, in which individuals note their own likes and dislikes. It is most frequently used in the field of vocational and educational guidance, case studies.

Personality inventory: These are the standardised self-report instruments which yield scores that are assumed or have been shown to measure certain personality traits or tendencies.

6.2.17 Techniques of Research:**6.2.17.1 Observation:**

According to Smt P.V. Young, The study of self-developed incidents at the time of their happening arranged and knowingly done by eyes is called observation.

Types of Observation:

Observation is mainly of two types:

- External Observation
- Self-observation

When a teacher observes child's behaviour, it is called external observation.

Sometimes we face the situation when we ask a particular person that how many times he has done so? Why and when he did so? This is called self-observation.

Observation can be divided into the following types:

- Direct Observation
- Indirect Observation.

Direct Observation:

Here a person is examined in practical situations. In this method, child's behaviour is directly observed by observer child becomes busy in his daily work and observer notes down all his observations regularly. It's obvious that child's behaviour becomes unnatural in the presence of observer. Consequently our observation can't be said accurate despite of that we get correct behaviour related facts of child through direct observation.

Indirect Observation:

On the basis of collected information's direct observation we try to understand a person. This method is processed or finished form of direct observation. In the field of sociology this method has proved very useful for research. The sociology researches introduced life-style of tribereenan through this medium.

For effective application of this method we should keep in mind the following things:

- Confirming the behaviour pattern
- Specification of practical aspects of selected pattern.
- Arrangement the recording of behaviour observation.
- Quantification of observation work.
- Training of indirect observation to the teacher.

Characteristics of Observation:

- In observation child's practical behaviour is evaluated.
- Observation is equally applied to both on child and on adults to evaluate behaviour.
- Behaviour is done in general conditions.
- This method is also applied for deaf, dump end disabled persons to evaluate their behaviour.
- Observation is often used to study innocent child.
- There is no need of any special training in this method. So this method is easily used by all.
- It is possible, by using this method, to observe a person or a group simultaneously.

Limitations of Observation:

- This method suffers from subjectivity and Bias.
- An observer is influenced by prejudice. Psychologically it is called as Halo-effect.
- The report/data is not same prepared by different observers.
- It takes long time while observing.
- Observation is also influenced by observer's behaviour, his mood, physical and mental state, and his tiredness.
- An observer influences the natural behaviour of a person. But psychological-environment of a child remains unnatural despite many attempts.
- A person does not explore his intentions and shows or behaves differently opposite to his intentions. In this situation observation remains unsuccessful.

6.2.17.2 Interview:

Interview is that arranged method in which two or more than two persons keeping in mind the main objective, argues, discuss and cross questions to each other. This is a psychological technique in which Interviewer study the emotions, thoughts, psychology insight and internal or personal life.

Meaning and Definition of Interview:

Interviews lead to internal survey or inspection. Interview is a simple and convenient method, because it can be applied to any category of the society. Through this technique, the matter that a person tries to hide get explored.

According to John G. Darley, Interview is a purposeful discussion.

According to Maccoby and Maccoby, Interview refers to a verbal face to face interchange is which one person the interviewer attempts to elicit information or expressions of opinion or belief from another person.

According to P.V. Young, The Interview may be regarded as a systematic method by which one person enters more or less imaginatively into the inner life of a comparative stranger.

Interview in another word is a form of questionnaire. The only difference is that questionnaire is in a written form and students write their option/reactions and there is no need of candidate to be present during the administer, but in interview all the work is done verbally and interviewee and interviewer should be present in front of each other.

General characteristics of interview:

- a) Face to face interaction
- b) Means of communication with each other

Purpose of Interview:

- For the confirmation of pre received knowledge
- To know the person's thought, values and psychology.
- To survey the physical of the person.
- To find the unconscious situation of a person's inner world.
- To study the unnatural behaviour affected by tension and frustration.
- To explain the inspirational and working powers of a person.
- For the use of complementary measurement of a person.
- To get the knowledge that appears on conscious after many hindrances. Kinds of Interview

Interviews mostly are of the following three kinds:

1. Directed or structured interview
2. Non-directed Interview
3. Eclectic Interview

1. Directed or Structured Interview:

It is a kind of closed questionnaire. In this kind of interview method, time and language of the questionnaire is pre decided. All the candidates are asked the questions in a same order. Interview is done according to a well structured, decided plan. In this plan the Interviewee lights upon his experiences, emotions and thoughts, and the draft of planning is determined by interviewer, because he is known as more capable of doing so. In this technique it is easy to compare different persons. Directed interview deals with two types of interview. The first type of questionnaire is such that answers are remains controlled and candidate do not get any freedom. To give answers of second type, candidates are free and can express their feelings.

2. Non-directed or unstructured Interview:

This is a kind of open-end-questionnaire. It is also known as depth interview, clinical interview or focussed interview. There are some problems in human life whose study is only possible by non-directed interview. This type of interview is used by psychologist for the study of a person's imperator, psychology, etc. the nature of this interview is soft and the language of questionnaire, method, time, order etc. are not pre-decided. And the candidate is free to give answer of questionnaire. An interviewer inspires a candidate to be open for his expressions by creating a friendly environment. After open expression he develops internal sense and he feels his own capabilities and weaknesses. In these types of interview impulsive side is preferred to intelligence side. Also, open expression as a limit of this, because by this the received data corrected on this bases we can't comparative study of a person.

3. Eclectic Interview:

This is a contained form of direct and indirect interview. In this technique the good matter of these two methods involved. Here a candidate develops different types of sense. At the end of interview, is asked for the conclusion in brief. If candidate is unable to do so then interviewee presents briefly himself. In this interview and interviews neither have non-directional freedom and non have direction interview like freedom. That's why it is a valid and best method of interview.

Merits of Interview:

- It is very easy and convenient to use this technique.
- The drafting of interview can be prepared according to different problems and objectives.
- Interview can be applied easily on any group of society. There is no any problem is Interview, because a candidate does not need to give anything in writing so he cooperates happily.
- Interview helps a person to develop insightness.
- The nature of interview is completely flexible.
- Genuine expression of a candidate explores many hidden facts of a person.
- Interview is a best technique for the study of impulsive problems of the inner world of a person.
- Through interview, an Interviewer can also know the facts of a candidate's behaviour which a candidate tries to hide.

Limitations of Interview:

- This is a double subjective technique , a candidate gives answers to interviewer to make him happy.
- An Interview is completely affected by personal feelings.
- Interview can't be considered verily and erodible.
- Interview is more flexible in nature consequently Interviewer turns interview to his likeness.
- Because of persona, social limitations a candidates doe not state everything. Social foundations prohibit him to do so.
- When a candidate does not want give answers of some of the questions, then he replies in a round way and tries to keep himself site.
- In an indirect interview as a candidate has enough freedom so the answer are not receive with conceptually.

6.2.17.3 Projective Techniques:

- It is an indirect and unstructured form of questioning technique that encourages respondents to project their underlying unconscious beliefs, attitudes or feelings etc. regarding the issues of concern.
- Through explaining the behaviour of others, respondents indirectly project their own beliefs, attitudes, feelings into the situation.
- Freud's theory of psychoanalysis became the pillar of all projective techniques.
- The term 'projection' has been in use for a long time. The expression "projective technique" first made its appearance in a paper by L. K. Frank.

Classification of projective techniques:

Lindzey (1961, P 45) has categorized the great variety of projective devices:

- **Association techniques:** Examples are the Rorschach ink block test and word association.
- **Construction techniques:** Example- thematic apperception test.
- **Completion techniques:** It require the subject to finish an incomplete task in any manner he wishes, such as the sentence-completion procedure.
- **Choice or ordering techniques:** Example- Tomikas Horn Picture Arrangement Test
- **Expressive techniques:** Example- play situations with children or the draw-a-person test.

Advantages of projective technique:

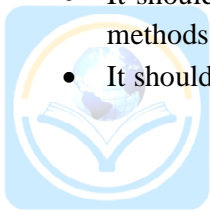
- It is helpful to know the personal, sensitive, or subject issues.
- It is a helpful process where the underlying motivations, beliefs, and attitudes are operating at a subconscious or unconscious level.

Disadvantages of projective technique:

- It suffers from many of the disadvantages of unstructured direct techniques.
- It requires skilled interviewers.
- It requires skilled interpreters to analyze the responses.
- It suffers from interpretation bias.
- It is an expensive technique.

Guideline for using projective techniques:

- It should be used as the required information can't be accurately obtained by direct methods.
- It should be used for exploratory research to gain insights and understanding.



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Previous Year Question**June 2014**

1. Which of the following variable is discrete?

- (A) Achievement
- (B) Intelligence
- (C) Aptitude
- (D) Attribute**



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Answer

SL NO	ANSWER
1	D



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December 2014

1. A researcher wants to study whether discovery learning procedure has an impact on the motivation of students. In this situation, the variable motivation will be labelled as
- (A) Intervening variable
 - (B) Independent variable
 - (C) **Dependent variable**
 - (D) Extraneous variable
2. In labelling research variables, the designations of variables from one research to the other have to be
- (A) Identical
 - (B) **Different**
 - (C) Sometimes identical
 - (D) Sometimes different



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Answer

SL NO	ANSWER
1	C
2	B



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June 2015

1. In order to ensure that the impact on dependent variable is only due to independent variable, which of the following method will be more appropriate?

- (A) Descriptive method
- (B) Experimental method**
- (C) Field method
- (D) Ex-post-facto research

2. In a positive correlation, the increase in X (one variable) is followed by

- (A) Decrease in Y
- (B) Increase in Y**
- (C) Neither a nor b
- (D) Decrease/ increase in Y is by chance



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Answer

SL NO	ANSWER
1	B
2	B



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December 2015

1. In the process of classroom teaching and learning, which of the following schedule of reinforcement may not be usually found?

- (A) Variable ratio schedule
- (B) Continuous schedule**
- (C) Interval schedule
- (D) Fixed interval schedule

2. Hypothesis making is basically a

- (A) Creative process**
- (B) Logical process
- (C) Scientific process
- (D) Epistemological process



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Answer

SL NO	ANSWER
1	B
2	A



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January 2017

1. Assertion: (A) The research hypothesis, being the alternative hypothesis (H_1) has to be kept in the domain of acceptability.

Reason: (R) The null hypothesis (H_0) has been rejected at high alpha (significance) level, thereby rendering the possibility of Type 1 error quite insubstantial.

Codes :-

(A) Both A and R are true and R is the correct explanation of A

(B) Both A and R are true, but R is not the correct explanation of A

(C) A is true, but R is false

(D) A is false, but R is true.



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Answer

SL NO	ANSWER
1	A



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July 2017

1. The hypothesis in research usually formulated on the basis of
- (A) **Setting up relationships between two or more than two variables**
 - (B) Identification of variables and their nature
 - (C) Reading research articles
 - (D) Holding conversations with senior researchers



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Answer

SL NO	ANSWER
1	A



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July 2018

1. If two variables X and Y have significant negative correlation, which of the following statement is true?
- (A) X causes variation in Y
 - (B) Y causes variation in X
 - (C) X and Y vary together**
 - (D) X and Y cause each other to vary
2. Two variables X and Y have a negative correlation coefficient of -0.48 . The proportion of variance common to both the variables will be
- (A) 0.23**
 - (B) 0.27
 - (C) 0.48
 - (D) 0.52



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Answer

SL NO	ANSWER
1	C
2	A



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June 2014

1. Which of the following types of tools is most appropriate to assess one's interest in a particular phenomenon?
- (A) Questionnaire
 - (B) Scale
 - (C) Test
 - (D) Inventory**
2. Which of the following is not related to item analysis?
- (A) Item difficulty index
 - (B) Item discrimination index
 - (C) Reliability co-efficient**
 - (D) Sensitivity of item to instructional effects
3. Miss Reema obtained grades in the subjects as follows in a 5point scales: English- A; Mathematics- B; Science- D and Social Science- A. Her Grade Point Average (GPA) will be
- (A) 5
 - (B) 3
 - (C) 4**
 - (D) 3.5
4. Teacher Eligibility Test conducted for selection of candidates for admission into teacher education institution is an example of
- (A) Placement test
 - (B) Aptitude test**
 - (C) Attitude test
 - (D) Achievement test
5. For conducting research in group dynamics, which of the following techniques can be used?
- (A) Anthropometry
 - (B) Biometry
 - (C) Geometry
 - (D) Sociometry**

6. An experimenter administered pretest on both experimental and control groups and found that the pre-test mean scores of the groups differ. Which of the following statistical techniques can address this difference in studying the impacts of independent variable?

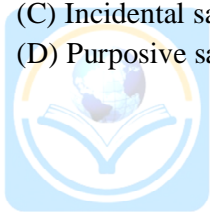
- (A) Analysis of variance
- (B) t-test**
- (C) Regression analysis
- (D) Analysis of co-variance

7. Sampling error can't be estimated when the researcher employs

- (A) Simple random sampling
- (B) Stratified random sampling**
- (C) Systematic sampling
- (D) Purposive sampling

8. Which of the following is not a non-probability sampling technique?

- (A) Snowball sampling
- (B) Stratified random sampling**
- (C) Incidental sampling
- (D) Purposive sampling



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Answer

SL NO	ANSWER
1	D
2	C
3	C
4	B
5	D
6	B
7	B
8	B



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December 2014

1. For collecting information under Right to Information Act from five different states, the better research tool will be

- (A) Observation schedule
- (B) Rating scale
- (C) Questionnaire**
- (D) Checklist

2. The procedure of sampling which provides equal and independent chance to each unit while being selected in a sample is called

- (A) purposive sampling
- (B) convenient sampling
- (C) snowball sampling
- (D) random sampling**

3. Which of the following research tools/technique will be appropriate for an in-depth understanding of cultural and social aspects of a tribe?

- (A) Questionnaire
- (B) Participant observation**
- (C) Sociometric technique
- (D) Rating scale

4. Match the following

List 1	List 2
A. Achievement test	1. Predictive validity
B. Aptitude test	2. Content validity
C. Personality test	3. Criterion related validity
D. Performance test	4. Concurrent validity
	5. Construct validity

Codes:

- | | a | b | c | d |
|------------|----------|----------|----------|----------|
| (A) | 2 | 3 | 4 | 1 |
| (B) | 1 | 2 | 5 | 3 |
| (C) | 2 | 1 | 5 | 4 |
| (D) | 4 | 2 | 3 | 5 |

Answer

SL NO	ANSWER
1	C
2	D
3	B
4	C



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December 2015

1. Which of the following technique can not specify the probability of each unit to be included in the sample?
- (A) Stratified sampling
 - (B) Systematic sampling
 - (C) Quota sampling**
 - (D) Cluster sampling
2. In a study on tribal community the researcher finds that there are several groups in which the members exist. As an advice to the researcher for the choice of sample which method from among the following you will recommend?
- (A) Stratified sampling
 - (B) Simple random sampling
 - (C) Quota sampling
 - (D) Cluster sampling**
3. In a case study of truant children in a school a few cases have to be identified to compose the sample. Which of the following sampling will you recommend for the sample of the case study?
- (A) Simple random sampling
 - (B) Cluster sampling
 - (C) Snowball sampling**
 - (D) Quota sampling
4. A researcher wants to conduct a large-scale survey regarding the effectiveness of mid-day-meal scheme. For this purpose, which tool will be suitable?
- (A) Observation schedule
 - (B) Questionnaire**
 - (C) Sociometric technique
 - (D) Interview
5. The dimensional sampling procedure is the same as
- (A) A further reinforcement of quota sampling**
 - (B) Stage sampling
 - (C) Cluster sampling
 - (D) Purposive sampling

6. Interview is considered as the best tool in analysing the problem of a client because
- (A) It is very easy to conduct
 - (B) It will give first-hand information**
 - (C) It will help for counselling
 - (D) It can be recorded easily



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Answer

SL NO	ANSWER
1	C
2	D
3	C
4	B
5	A
6	B



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January 2017

1. A student wants to know whether he will perform well in a particular job. Which of the following tools will predict this?

- (A) Attitude test
- (B) Aptitude test**
- (C) Intelligence test
- (D) Interest test

2. For collecting data in respect of attitude of school teachers towards the new curriculum, which of the following scales, will use summated rating scores as an indicator?

- (A) Thurstone scale
- (B) Guttman scale
- (C) Likert scale**
- (D) Osgood scale

3. Which of the following sampling techniques belongs to probability sampling?

- (A) Convenience sampling
- (B) Snowball sampling
- (C) Quota sampling
- (D) Random sampling**



Answer

SL NO	ANSWER
1	B
2	C
3	D



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November 2017

1. Match the following

List 1 (Techniques of sampling)	List 2 (Characteristics of procedure)
a. Purposive sampling	1. Dividing the population into subgroups and taking one or more groups at random
b. Multistage sampling	2. Researcher relies on his or her own judgement when choosing members from the population
c. Systematic sampling	3. Obtaining K 'interval' through N/n and using it for constituting the sample
d. Stratified sampling	4. Researcher divides the entire population into homogeneous subgroups and randomly selects the final sample

Codes:

	A	B	C	D
(A)	1	3	4	2
(B)	2	1	3	4
(C)	4	2	1	3
(D)	3	1	4	2

2. A test conducted by a class teacher for the purpose of identifying the strengths and weakness of students in a specified content area is technically called

- (A) Aptitude test
- (B) Prognostic test
- (C) **Diagnostic test**
- (D) Placement test

3. Match the following

List 1 (Item types)	List 2 (Characteristics)
a. Short answer items	1. Require students to demonstrate skills by actually engaging in the task
b. Interpretive exercises	2. Measure exclusively the recall of memorised information
c. Performance based tests	3. Assess a large amount in a relatively short time
d. Matching exercises	4. More flexible to measure a variety of learning outcomes
	5. Provide scope to measure a large number of factual information in a given field

Codes:

	A	B	C	D
(A)	2	5	1	3
(B)	1	2	3	5
(C)	3	4	1	2
(D)	5	1	3	4

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Answer

SL NO	ANSWER
1	B
2	C
3	A



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July 2018

1. Which of the following tools at a guidance centre can be used for ascertaining prospective success in a chosen occupation?

- (A) Achievement test
- (B) Interest inventory
- (C) Differential aptitude test**
- (D) Personality inventory

2. An investigator wants to conduct a study to ascertain the progress of implementation of RTE Act- 2009. Which of the following research tools would be most suitable for this purpose?

- (A) Rating scale
- (B) Questionnaire**
- (C) Observation
- (D) Sociometry

3. Match the following

List 1 (Approaches to sampling in qualitative research)	List 2 (Characteristics)
a. Extreme case sampling	1. Seeks cases that are typical
b. Purposive sampling	2. Seeks cases that are highly similar to each other
c. Snowball sampling	3. Seeks cases that are unusual
	4. Seeks help from participants to identify additional participants
	5. Seeks cases according to his/her judgement about the appropriateness

Codes:

- | | | | |
|------------|----------|----------|----------|
| | a | b | c |
| (A) | 1 | 4 | 3 |
| (B) | 2 | 4 | 1 |
| (C) | 3 | 5 | 4 |
| (D) | 4 | 2 | 3 |

4. Which of the following decisions will tend to decrease sampling error?

- (A) Obtaining representative sample**
- (B) Decreasing the sample size
- (C) Homogeneous grouping of individuals
- (D) Possibility of reduction of the sample size

5. A method of sampling that ensures proportional representation of all sections of a population is technically called

- (A) Quota sampling
- (B) Systematic sampling
- (C) Snow-ball sampling
- (D) Stratified sampling**

6. When you read a research article published in a journal which is not peer reviewed, what aspect of the report should you be most concerned about?

- (A) Author's sincerity and skill in writing
- (B) Rigour reflected in reporting the research**
- (C) Length of the report
- (D) Practical importance of the research question

7. Match the following

List 1 (Categories of Test)	List 2 (Description)
a. Standardised test	1. Development by teachers for local purposes to measure achievement
b. Norm referenced test	2. Used for comparing individuals in terms of their relative position
c. Diagnostic test	3. Analysis of strength and weakness of students for further help
d. Criterion referenced test	4. Developed by experts, administered and scored by using an objective procedure
	5. Raw scores are compared with some pre-determined standard

Codes :

- | | | | | |
|------------|----------|----------|----------|----------|
| | A | B | C | D |
| (A) | 3 | 5 | 1 | 4 |
| (B) | 4 | 2 | 3 | 5 |
| (C) | 2 | 3 | 4 | 1 |
| (D) | 4 | 5 | 3 | 2 |

Answer

SL NO	ANSWER
1	C
2	B
3	C
4	A
5	D
6	B
7	B



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SUB UNIT 3

6.3.1 Types of Measurement Scale:

Nominal scale is also called categorical variable scale. Nominal scale is the most simple of the four measurement scales. Nominal scale is a naming scale. Here variables are simply labelled or “named”, with no specific order.

Example:

Gender	Place of residence	Political preferences
Male (M)	1= Town	1= Independent
Female (F)	2= Village	2= Democratic
		3= Secular

Ordinal scale has all its variables in a specific order, with naming them. It simply depicts the order of variables and not the difference between the variables. These scales are generally used to depict non-mathematical ideas like happiness, a degree of pain, satisfaction, frequency etc. The distance between variables can't be calculated through this scale. There is no fixed start or “true zero”.

Example: Ranking of school students – 1st, 2nd, 3rd, etc

People's view on a specific topic-

- Totally agree
- Agree
- Neutral
- Disagree
- Totally disagree

Interval scale has labels, order, a specific interval between each variable. It can be presented in tabular or graphical formats. Mann-Whitney U test and Kruskal–Wallis H test can be used to analyze ordinal data. These methods are implemented to compare two or more ordinal groups.

In the Mann-Whitney U test, researchers can analyze which variable is bigger or smaller than another variable of a randomly selected group. In the Kruskal–Wallis H test, researchers can find whether two or more ordinal groups have the same median or not.

Ratio scale contains all the characteristics of an interval scale. It has a value of true zero. It is a measurement scale that not only produces the order of variables but also makes the difference between variables on the basis of true zero.

Examples of ratio scales are weight and height. In market research, a ratio scale is mostly used to calculate annual sales, market share, number of consumers, the price of an upcoming product etc.

Measuring a person's weight in Kgs:

Less than 45 kgs

45 – 65 kgs

66 – 75 kgs

76 – 85 kgs

86-95

More than 95 kgs

Generally, all three data are used in practical scientific education, psychology and sociology.

All these

data are represented in the table below.

Students	Name Related	Order Related	Equal interval
	Sex	Skill level	Skill marks
A	Boy	Second	68
B	Girl	First	76
C	Girl	Third	60
D	Boy	Fifth	28
E	Girl	Fourth	48

FEATURE	NOMINAL SCALE	ORDINAL SCALE	INTERVAL SCALE	RATIO SCALE
The sequence of variables is established	NO	YES	YES	YES
Mean	NO	NO	YES	YES
Median	NO	YES	YES	YES
Mode	YES	YES	YES	YES
Difference between variables can be evaluated	NO	NO	YES	YES
Addition and Subtraction of variables	NO	NO	YES	YES
Multiplication and Division of variables	NO	NO	NO	YES
Absolute zero	NO	NO	NO	YES

6.3.2 Quantitative Data Analysis:

Descriptive data analysis:

Measures of central tendency:

Measures of central tendency or averages are used to conclude the data to specify a single most representative value to describe the data set. There are several statistical measures of central tendency or “averages”. The three most commonly used averages are: Arithmetic Mean, Median, Mode.

Arithmetic Mean: To find the arithmetic mean, add the values of all terms and then divide sum by the number of terms, the quotient is the arithmetic mean. There are three methods to find the mean :

- Direct method: In individual series of observations X_1, X_2, \dots, X_n the arithmetic mean is obtained by following formula.

$$AM = \frac{X_1 + X_2 + X_3 + \dots + X_{n-1} + X_n}{n}$$

- Short-cut method: This method is used to make the calculations simpler. Let A be any assumed mean (or any assumed number), d the deviation of the arithmetic mean, then we have

$$M = A + \frac{\sum fd}{N} \quad (\text{Where, } d = (x - A))$$

- Step deviation method: If in a frequency table the class intervals have equal width, say i then it is convenient to use the following formula.

$$M = A + \frac{\sum fu}{n} \times i$$

where $u = (x - A) / i$, and i is length of the interval, A is the assumed mean.

Median :

(a) Median in individual series.

Let n be the number of values of a variate (i.e. total of all frequencies). First of all we write the values of the variate (i.e., the terms) in ascending or descending order of magnitudes

Here two cases arise:

Case1: If n is odd then value of $(n+1)/2$ th term gives the median.

Case2: If n is even then there are two central terms

$$\text{i.e., } n/2^{\text{th}} \text{ and } (n+1)/2^{\text{th}}$$

The mean of these two values gives the median. (b) Median in continuous series (or grouped series).

In this case, the median (M_d) is computed by the following formula

$$M_d = l + \frac{n/2 - cf}{f} \times i$$

Where, M_d = median

l = lower limit of median class

cf = total of all frequencies before median class

f = frequency of median class

i = class width of median class.

Mode:

Definition: The mode is that value (or size) of the variate for which the frequency is maximum or the point of maximum frequency or the point of maximum density. In other words, the mode is the maximum ordinate of the ideal curve which gives the closest fit to the actual distribution.

Method to Compute the mode:

(a) When the values (or measures) of all the terms (or items) are given. In this case the mode is the value (or size) of the term (or item) which occurs most frequently.

Example: 1.

Size of shoes	1	2	3	4	5	6	7	8	9
Frequency	1	1	1	1	2	3	2	1	1

Here maximum frequency is 3 whose term value is 6. Hence the mode is modal size number 6.

(b) In continuous frequency distribution the computation of mode is done by the following formula

$$Mo = l + (f_1 - f_0) / (2f_1 - f_0 - f_2) \times i$$

Where, l = lower limit of class,

f_1 = frequency of modal class,

f_0 = frequency of the class just preceding to the modal class,

f_2 = frequency of the class just following of the modal class,

i = class interval

Empirical relation between Median and Mode:

For moderately asymmetrical distribution (or for asymmetrical curve), the relation

$$\text{Mean} - \text{Mode} = 3 (\text{Mean} - \text{Median}),$$

approximately holds. In such a case, first evaluate mean and median and then mode is determined by

$$\text{Mode} = 3 \text{ Median} - 2 \text{ Mean}.$$

If in the asymmetrical curve the area on the left of mode is greater than area on the right then

$$\text{Mean} < \text{median} < \text{mode, i. e., } (M < Md < M_0)$$

	ADVANTAGE	DISADVANTAGE
ARITHMETIC MEAN	<ul style="list-style-type: none"> • Easy to calculate • Represent whole set of data • Suited for further statistical analysis 	<ul style="list-style-type: none"> • Value may not correspond to an actual value • Distorted/pulled by extreme values
MEDIAN	<ul style="list-style-type: none"> • Easy to understand and calculate • Not affected by extreme values • Even if unknown extreme values median can be calculated • Not much affected by sampling fluctuation • Can calculate data based on ordinal scale 	<ul style="list-style-type: none"> • Not based on all values of the given data • Arrangement of data for larger data size is a difficult process • Not capable of further mathematical treatment
MODE	<ul style="list-style-type: none"> • Easy to find and calculate • Even if extreme values are not known mode can be calculated • Uninfluenced by extreme values • Can be used for non-numerical data 	<ul style="list-style-type: none"> • Do not take every value into account • Few instability found in the measure • Not capable of further mathematical treatment

Variability:

Measures of Variability (Dispersion) : It allows us to summarize our data set with a single value. Variability provides a quantitative measure of the degree to which scores in a distribution are spread out or clustered together.

Central Tendency + Variability = a more accurate picture of our data set.

The 3 main measures of variability: Range, Variance, and Standard Deviation.

Range:

The range is the difference between the largest and smallest values of a data distribution.

The numerical distance between the largest (X maximum) and smallest values (X minimum), tells us something about the variation in scores we have in our data, or it tells us the width of our data set.

Range = X maximum - X minimum

Example:

Consider the following data

4 7 3 8 15 11 9 13

For these data $X_{\max} = 15$, with an upper real limit of 15.5, and $X_{\min} = 3$, with an upper real limit of 3.5.

Thus $\text{Range} = X_{\max} - X_{\min}$

$$= 15.5 - 3.5$$

$$= 12$$

The range is simple to compute and is useful when you wish to evaluate the whole of a dataset.

The range is useful for showing the spread within a dataset and for comparing the spread between similar datasets.

Problems with Range:

Does not directly consider every value in the data set (here only the two extreme numbers; largest and smallest).

We do not know whether most of the scores occur at the extremes of the distribution or toward the centre. The range is considered to be a crude and unreliable measure of variability.

Variance:

Variance indicates the total amount of variability (differences between scores) in a data set by directly considering every observation. It requires a point from which each observation can be compared to assess the amount they differ. The Mean can be used as a point of comparison, since it considers every observation in its calculation.

Variance = Mean square deviation = sum of square deviation/ number of scores

Population Variance = $\sigma^2 = \frac{\sum X^2 - (\sum X)^2 / N}{N}$

Sample Variance = $s^2 = \frac{\sum X^2 - (\sum X)^2 / n}{n-1}$

Note sample variance uses n-1 rather than N because it is an estimate of the population variance. Due to this reduced denominator the sample variance will always be slightly larger than the population variance.

Problem with Variance:

This formula is the base for many other statistical formulas, however as a single summary measure it has little numerical meaning until it is converted to a standardized score.

Right now it represents the average distance each penguin is from the mean, in squared mile units.

Standard Deviation:

Standard Deviation= The square root of a variance.

Standard deviation = $\sqrt{\text{Variance}}$

The standard deviation of an entire population is known as σ (sigma) and is calculated using:

$$\sigma = \sqrt{\sum x^2 / N}$$

Where,

x represents each value in the population,

μ is the mean value of the population,

Σ is the summation (or total), and

N is the number of values in the population.

Fiduciary limits:

Fiducial inference

Fiducial inference is a type of statistical inference. By using it conclusions can be drawn from samples of data. Fiducial inference was proposed by Ronald Fisher. The word "fiducial" comes from the Latin for faith. Fiducial is an attempt to perform inverse probability without making prior probability distributions.

Fiduciary limits/ Measures of Probability:

In order to estimate the population mean or the probable variability, it is important to fix up limits for a given degree of confidence which will hold the mean or the standard deviation since limits define the confidence interval.

Estimation: (Fiduciary Limits)

The limits of the confidence intervals of parameters are called fiduciary limits. They are calculated for mean at 0.95 levels of confidence and for standard deviation at 0.99 levels of confidence respectively.

Formula:

$$S.E_M = \sigma / \sqrt{N}$$

At 0.95 level; mean $\pm S.E_M \times 1.96$

At 0.99 level; mean $\pm S.E_M \times 2.58$

Formula for calculating standard error of S.D.:

$$S.E_D = 0.71\sigma / \sqrt{N}$$

At 0.95 level; S.D. $\pm S.E_D \times 1.96$

At 0.99 level; S.D. $\pm S.E_D \times 2.58$

Where, $S.E_M$ = standard error of mean

$S.E_D$ = standard error of standard deviation

σ = standard deviation

N = total number of scores

M = Mean



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Graphical presentation of data:**Histogram:**

Histogram is a non-cumulative frequency graph. It is drawn on a natural scale in which the representative frequencies of the different class of values are represented. Values are represented through vertical rectangles drawn closed to each other. Mode, Measure of central tendency can easily be determined with the help of histogram.

Step 1: Represent, on natural scale, the class intervals of the variables along the X axis and their frequencies along the Y-axis.

Step 2: Start X axis with the lower limit of the lowest class interval.

When the lower limit happens to be a distant score from the origin give a break in the X-axis to indicate that the vertical axis has been moved in for convenience.

Step 3: Draw rectangular bars in parallel to Y axis above each of the class intervals (with class units as base). The areas of rectangles must be proportionate to the frequencies of the correspond classes.

Advantages:

- It is very easy to draw and simple to understand.
- Helps to understand the distribution easily and quickly.
- It is more accurate than the polygon.

Limitations:

- Not possible to plot more than one distribution on same axes.
- Not possible to make comparison of more than one frequency distribution on the same axes.

Uses of histogram:

- Represents the data in graphic form.
- Provides the information about the distribution of the scores in the group. It provides information, if the scores are piled up at the lower or higher end of the distribution or are evenly and regularly distributed throughout the scale.

Frequency Polygon:

The frequency polygon is a frequency graph. It is drawn by joining the coordinating points of the mid-values of the class intervals and their corresponding frequencies.

Step 1: First draw a horizontal line at the bottom of graph paper named 'OX' axis. Then mark off the exact limits of the class intervals by this axis. Start with c.i. of lowest value. When the lowest score of a distribution is a large number, it is not possible to show it graphically if we start with the origin. So, put a break in the X axis () to show that the vertical axis has been moved in for convenience. It is noted that two additional points may be added to the two extreme ends.

Step 2: Now draw a vertical line through the extreme end of the horizontal axis (OY axis). By this line separate the units to represent the frequencies of the class intervals. Take care of that it will make the largest frequency (height) of the polygon approximately 75 percent of the width of the figure.

Step 3: Now plot the points at a height proportion to the frequencies directly above the point on the horizontal axis (representing the mid-point of each class interval).

Step 4: After plotting all the points on the graph, join these points by a series of short straight lines. Two additional intervals at the high end and low end of the distribution should be included. The frequency of these two intervals will be zero.

Advantage:

- Easy to draw and simple to understand.
- It is possible to make it smooth.
- Comparison of two distributions can be made through frequency polygon.
- It is possible to plot two distributions at a time on the same axes.

Limitation:

- It is less precise.
- Less accurate in terms of area the frequency upon each interval.

Uses of frequency polygon:

- Frequency polygon is used when two or more distributions are to be compared.
- The data is represented in graphic form.
- It provides information about how the scores in one or more group are distributed. It provides information, if the scores are piled up at the lower or higher end of the distribution or are evenly and regularly distributed throughout the scale.

Cumulative Frequency Polygon or Ogive:

Ogive is a cumulative frequency graphs. It is drawn on natural scale to determine the values of certain factors (like median, Quartile, Percentile etc). Here the exact limits of the class intervals are shown along the X-axis. The cumulative frequencies are shown along the Y-axis.

Step 1: First get the cumulative frequency by adding the frequencies cumulatively. It will be done from the lower end (to get a less than ogive) or from the upper end (to get a more than ogive).

Step 2: Then mark off the class intervals in the X-axis.

Step 3: Then represent the cumulative frequencies along the Y-axis. Begin with zero at the base.

Step 4: Put dots at each of the coordinating points of the upper limit and the corresponding frequencies.

Step 5: Now join all the dots with a line drawing smoothly.

Uses:

- It is useful to determine the number of students below and above a particular score.
- By plotting the scores of two groups on a same scale comparison can be made on both the groups.
- It is useful when the median as a measure of central tendency is wanted.
- It is useful when the quartiles, deciles and percentiles are wanted.

The Pie Diagram:

The **Pie Diagram** below shows the distribution of academic achievement of pupils in Class VI of a school. Of the total, 60% are high achievers, 25% middle achievers and 15% low achievers.

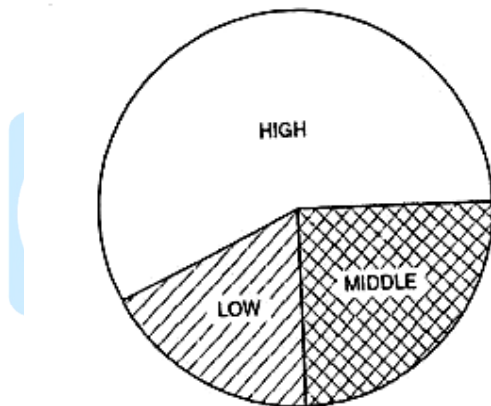


Fig. 7.6. Distribution by academic achievement of pupils in Class VI of a school.

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Uses of Pie diagram:

- It is used when one wants to picture proportions of the total in a striking way.
- It is used when a population is stratified. Each strata is to be presented as a percentage.

6.3.3 Testing of Hypothesis: Type I and Type II Errors:

Type I Error: A type I error occurs when the null hypothesis (H_0) is rejected, when it is true. A type I error may be compared with a so-called false positive. It is a result that indicates that a given condition is present when it actually is not present. In tests where a single condition is tested for. A false positive error is a Type I error. Here the test is checking a single condition, and results in an affirmative or negative decision usually designated as 'true or false'. The rate of the type I error is often called the size of the test. It denoted by the Greek letter α (alpha). It usually equals to the significance level of a test. In case of a simple null hypothesis α is the probability of a type I error.

Rejection of the null hypothesis: (when it is true, constitutes a type I error or alpha error):

At the 0.05 level of significance the experimenter commits a 5% type I error when he rejects a null hypothesis. The 0.01 level is one such level where commits a 1% type I error and it suggests that 99% probability exists that the obtained results are due to the experimental treatment, and once in 100 replications of the experiment, the null hypotheses would be true.

Type II Error: A type II error occurs when the null hypothesis is false, but erroneously fails to be rejected and eventually accept it. A type II error may be compared with a so-called false negative. Here an actual 'hit' was disregarded by the test and seen as a 'miss'. In a test checking for a single condition with a definitive result of true or false. A false negative error is that where a test result indicates that a condition failed, while it actually was successful. A false negative error is a type II error. It is occurring in test steps where a single condition is checked for and the result can either be positive or negative. The rate of the type II error is denoted by the Greek letter β (beta). It is related to the power of a test (which equals $1-\beta$).

6.3.4 Levels of Significance:

It is the probability of rejecting a true null hypothesis that is the probability of "Type I error" and is denoted by α . The frequently used values of α are: 0.05; 0.01; 0.1 etc.

When, $\alpha = 0.05$ it means that the level of significance is 5%.

$\alpha = 0.01$ it means 1% level of significance.

$\alpha = 0.10$ it means 10% level of significance.

In fact α specifies the critical region. A competed value of the test statistic which falls in the critical region (CR) is said to be significant. So, α is called the level of significance.

6.3.5 Power of a statistical test and effect size:

The power of a statistical test is the probability that it correctly rejects the null hypothesis when the null hypothesis is false. It can be equivalently thought of as the probability of correctly accepting the alternative hypothesis when the alternative hypothesis is true - that is, the ability of a test to detect an effect, if the effect actually exists. If the power increases, the chances of a Type II error occurring decrease.

The probability of a Type II error occurring is referred to as the false negative rate (β) and the power is equal to $1-\beta$. The power is also known as the sensitivity.

The directional null hypothesis is called a one-tailed test. When the null hypothesis is rejected by using a one-tailed test, we say that we are rejecting the null hypothesis at 1% or 5% points, not levels. When the null hypothesis is rejected by using a two-tailed test, we say that we are rejecting the null hypothesis at 5% or 1% levels, not at 5% or 1% points.

Decision on Null Hypothesis	States of Nature	
	Null Hypothesis True	Null Hypothesis False
Accept	Correct Decision Probability = $1-\alpha$ (Confidence Level)	Type II error Probability = β
Reject	Type I error Probability = α (α is called significance level)	Correct Decision Probability = $1-\beta$ ($1-\beta$ is called power of a test)

We have found six factors that affect the power of a test, the probability of rejecting H_0 when it is false. They are –

Discrepancy between the True Population Mean (μ true) and the Hypothesized Mean (μ hyp):
The larger the discrepancy, the greater the power.

Sample Size: Other things being equal, the larger the size of the sample, the smaller the standard error of the mean and the greater the power of the test.

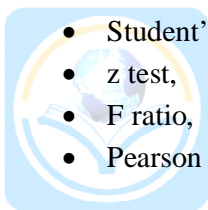
Standard Deviation of the Variable: The smaller the standard deviation, the greater the power. The standard deviation can be reduced by improving the reliability of the measuring instrument.

Relation between Samples (More Than One Mean): Dependent samples can increase power. In general, the higher the correlation induced by pairing, the stronger the effect on power.

Level of Significance: The larger the value of α , the lower the value of β and the greater the power.

Choice of H1: Power is greater for a one-tailed test than for a two-tailed test (when the direction specified by H1 is correct).

6.3.6 Parametric Techniques:



- Student's t test ,
- z test,
- F ratio,
- Pearson r

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6.3.7 Non- Parametric Techniques:

- Chi-square Test,
- Mann-Whitney U Test,
- Rank –difference Methods,
- Coefficient of Concordance (W),
- Median Test,
- Kruskal-Wallis H Test,
- Friedman Test.

6.3.8 Conditions to be satisfied for using parametric techniques:

Non-parametrical test does not impose any condition of anyone regarding parametrical population, therefore these are called non-parametrical tests. In some non-parametrical test some concepts are vested, but they are least and of general types. In the universe, there is no condition regarding distribution of variables. Therefore, generally it is called is distribution free statistical method.

- In non-parametrical statistical techniques groups are compared on the basis of distribution of variables in place of parameters such as mean, variance etc.
- In the condition of very low sample ($N=6$) only these tests can be used.
- This test can be used where the samples have been categorized in different population groups.
- Whatever may be the shape of distribution of variables in the whole population these tests have the capacity of correct statement of probability of available results.
- When thesis is available in the form of categories and ranks then the application of these tests is possible.
- Understanding these tests, learning their application and computation regarding these etc. are very simple.
- It can be used in those circumstances in which parametrical test is applicable.
- In any condition of parametrical test where their conditions do not fulfils, non-parametrical tests can be used.

6.3.9 Inferential data analysis:

Inferential statistics has two goals. They are:

- To determine what might be happening in a population, based on a sample drawn from the population.
- To determine what might happen in the future.

Therefore, inferential statistics are to estimate and/or to predict. To use it only a sample of the population is needed.

Inferential statistics are used to draw conclusions about hypothesis and to determine probabilities of an outcome.

- It draws inferences beyond data obtained from sample.
- It includes t-test, analysis of variance, Pearson's correlation, linear regression, multiple regression.
- It comprise the use of statistics to make inferences, concerning some known aspects of population.

6.3.10 Use and Interpretation of statistical techniques:

6.3.10.1 Correlation:

Correlation is a statistical tool that helps to measure and analyze the degree of relationship between two variables. Correlation analysis deals with the association between two or more variables. The measure of correlation called the correlation coefficient. The degree of relationship is expressed by coefficient which range from correlation ($-1 \leq r \leq +1$)

Types of correlation: type 1

Positive correlation: the correlation is said to be positive correlation if the values of two variables changing with same direction. Example: height and weight. Water consumption and temperature.

Negative correlation: the correlation is said to be negative correlation when the values of variables change with opposite direction. Example: price and quantity demanded. Alcohol consumption and driving ability.

Types of correlation: type 2

Simple correlation: under simple correlation problem, there are only two variables are studied.

Multiple correlation: under multiple correlation three or more than three variables are studied.

Partial correlation: analysis recognizes more than two variables but considers only two variables keeping the other constant.

Total correlation: it is based on all the relevant variables, which is normally not feasible.

Types of correlation: type 3

Linear correlation: it happens when the amount of change in one variable tends to bear a constant ratio to the amount of change in the other.

Non linear correlation: it happens if the amount of change in one variable does not bear a constant ratio to the amount of change in the other variable.

Methods of studing correlation:

- Scatter diagram
- Correlation graph
- Product moment coefficient of correlation
- Rank difference correlation method
- Method of least square
- Karl pearson's coefficient of correlation

Uses of correlation:

- To make predictions.
- In the technique of factor analysis
- In the technique of path analysis
- To evaluate the degree of reliability and validity of psychological tests and inventories.

6.3.10.2 t-test:

When sample size is less than 30, we use t test for testing the significance of difference between two means. This concept of small sample size test was developed by William Seely Gosset in 1915.

t-test is used for following purposes :

- Testing significance between hypothetical mean of sample and population mean.
- Testing significance between mean of 2 different samples.
- Testing significance between mean of sample post and prior to a stimuli or operation.
- Testing significance between hypothetical rank correlation coefficient and population rank correlation coefficient
- Testing line of regression analysis
- Testing significance of partial and multiple correlation coefficient .

6.3.10.3 z-test:

Z-test is a statistical test where normal distribution is applied and is basically used for dealing with problems relating to large samples when $n \geq 30$. n = sample size .

For example suppose researcher wants to test if both fish & chicken are equally popular in a particular area. Then he can take a sample of size say 600 from the area out of which suppose 290 are chicken lovers. To test the hypothesis, researcher can use Z-test.

The Z-test is used to compare means of two distributions with known variance. One sample Z-tests are useful when a sample is being compared to a population, such as testing the hypothesis that the distribution of the test statistic follows a normal distribution. Two sample Z-tests are more appropriate for comparing the means of two samples of data.

Requirements for the Z-test:

- The mean and standard deviation of the population distribution are known
- The mean of the sample distribution is known
- The variance of the sample is assumed to be the same as the population
- The population is assumed to be normally distributed

The usage of z test:

- To judge the significance of statistical measures, particularly the mean. This is done by comparing the observed value (test statistic) with the probable value (table value) at a specified level of significance.
- It is used to compare the mean of a sample with some hypothesized mean of the population.
- It is also used to judge the significance of difference between means of two independent samples.
- It can also be used for judging the significance of difference between sample and population proportion or proportions of two independent samples.
- Finally this test can also be used for measuring the significance of median, mode, coefficient of correlation and other measures.

6.3.10.4 ANOVA:

ANOVA is analysis of variance, where the comparison between means of samples drawn from some population having same mean values by testing the significance of difference between more than two sample means and inferences are made. In case of population from which two means are drawn having the same mean values, the significant difference between these two can be found with the help of analysis of variance technique i.e. ANOVA.

- F-test is applied to check significant difference between the means.
- The value of F is the ratio of variance of the two samples.
- To test the equality of variances, we use 'F' test.
- By comparing the observed 'F' value with table value of 'F' and analyzing the significance of differences (if any) we test our hypothesis.

For example, productivity usually depends on multiple factors like level of technology used in production, workers' skill, incentives and gain sharing, training, supervision and industrial relations. All these factors are independent variables. Now a researcher may be interested in knowing the differences amongst these factors, i.e. which one of the above factors is more effective in raising productivity (by studying their respective differences at various level of significances) or he may be interested in investigating the differences amongst various categories of same factor (for example various methods on incentive and gain sharing) which influence productivity. When we investigate various categories of one factor only, we carry out **one-way ANOVA**. But when we are interested in investigating two factors at a time, we carry out **two-way ANOVA**.

6.3.10.5 Chi-Square Test:

The Chi-Square test is a statistical procedure used by researchers to examine the differences between categorical variables in the same population. It is also called a "goodness of fit" statistic, because it measures how well the observed distribution of data fits with the distribution that is expected if the variables are independent.

Chi-square (χ^2) is such a non-parametric statistical method. It tests a frequency distribution which is obtained by research is significantly differ or not on the basis of expected frequency distribution. If they are not different then both is considered to be associated. Chi-Square is a method of test of mutual relationship of two variables or two frequency distribution. Chi-square (χ^2) helps us to know whether the difference between obtained and expected frequencies is only a chance or a realistic. There are of 4 types of this design as follows:

- One way status
- Two independent group's status
- Contingency-analysis
- More than two independent groups' status

Formula of Calculation of Chi-square is

$$X^2 = \sum (F_o - F_e)^2 / F_e$$

In which, F_e is expected frequencies and
 F_o is required frequencies.

Calculation of Dependent Factors (df):

In the use of table-D concepts of df is used. The formula of getting it is $(r-1) \times (k-1)$ i.e, deducting one

from each number of row and column, remaining is multiplied mutually. In the Previous example there are 3 Rows and Columns. Thus $df = (3-1) \times (2-1) = 2$.

Relevancy- In table D there are 2df and at 0.5 level Chi-value is 5.991. Obtained value is 6.0 which is more than table value.

Hence hypotheses H_0 that “there is no difference between both distribution” reject it, this conclusion will be drawn that there is significant difference in distribution. In other words it will be to say that females like doing job because “yes” answer frequencies is maximum. If “no” answers frequencies may maximum then conclusion is that females do not likes doing job. Hence, in fact what will be the conclusion, this depends upon data frequencies observations.

If test is to be done from one side then the value of Chi in table D at 0.05 levels observes in column. 01 and for .01 observe in column 0.02

Hypotheses of Expected frequencies:

In the condition of one way sample to know expected frequencies, the concept of “normal probability” can be used as it has been cleared in previous given example. Besides this “normal distribution” concept it can be used also. It depends upon condition of research which method will be used and where. For example if we try to know that any class scores distribution is normal or not then expected frequency will be calculated on the basis of normal distribution.

Uses of Chi-square (χ^2) test:

It can be used when the data satisfies four conditions.

- There must be two observed sets of data or one observed set of data and one expected set of data (generally, there are n-rows and c-columns of data)
- The two sets of data must be based on the same sample size.
- Each cell in the data contains the observed or expected count of five or large?
- The different cells in a row of column must have categorical variables (male, female or younger than 25 years of age, 25 year of age, older than 40 years of age etc.)

Application of chi-square test:

The χ^2 distribution typically looks like a normal distribution, which is skewed to the right with a long tail to the right. It is a continuous distribution with only positive values.

It has following applications:

- To test whether the sample differences among various sample proportions are significant or can they be attributed to chance.
- To test the independence of two variables in a contingency table.
- To use it as a test of goodness of fit.

Limitations of Chi-Square:

The application of Chi-Square is prohibited in following conditions.

- When df only one e.g., K (group) = 2 and any expected frequency is less than 5.
- When df is more than 1 but more than 20% frequency is less than 5 or any expected frequency is less than 1.

6.3.11 Qualitative Data Analysis:**Data Reduction and Classification:**

Data reduction is the transformation of numerical or alphabetical digital information derived empirically into a more simplified, ordered and corrected form.

Data reduction is the process of reducing the amount of capacity required to store data. Data reduction can increase storage efficiency and reduce costs. Principal component analysis (PCA) and factor analysis (FA) methods are popular techniques.

Data reduction can be achieved in several ways.

The main types are:

- Data deduplication
- Compression
- Single-instance storage.

Data deduplication: Data deduplication is also known as data dedupe. It eliminates redundant segments of data on storage systems. It only stores redundant segments once. Then uses that one copy whenever to access that piece of data. Data dedupe is more granular than single-instance storage.

Data compression: It specifically refers to a data reduction method by which files are shrunk at the bit level. It works by using formulas or algorithms to reduce the number of bits needed to represent the data.

Common techniques of data reduction:

There are ways to reduce the amount of data without shrinking the sizes of blocks and files. These techniques include the following:

- Data archiving
- Thin provisioning

Archiving data: It reduces data on storage systems, though the approach is different. Archiving removes older, infrequently accessed data from expensive storage. Then moves it to low-cost, high-capacity storage. Archive storage can be on disk, tape or cloud.

Thin provisioning: It is achieved by allocating storage space in a flexible manner. Thin provisioning keeps reserved space just a little ahead of actual written space. It enables more unreserved space to be used by other applications.

Analytical Induction:

Analytic induction is a qualitative research method which uses inductive reasoning, as opposed to deductive reasoning.

Analytic induction was first introduced in 1934 by Florian Znaniecki. After that, Donald Cressey summarized Znaniecki's complex description of Analytic Induction (AI) by defining following six steps.

1. A phenomenon is defined in a tentative manner
2. A hypothesis is developed about it
3. A single instance is considered to determine if the hypothesis is confirmed
4. If the hypothesis fails to be confirmed either the phenomenon is redefined or the hypothesis is revised so as to include the instance examined
5. Additional cases are examined and, if the new hypothesis is repeatedly confirmed, some degree of certainty about the hypothesis results
6. Each negative case requires that the hypothesis be reformulated until there are no exceptions

Advantages:

- Analytic induction is inductive rather than deductive
- Analytic induction is well suited from an ethnographic viewpoint (good fit with the ethnographic narrative)
- Analytic induction is orients observations towards developing a better hypothesis by allowing revision
- Analytic induction allows redefining what is studied to better exclude exceptions

Shortcomings:

In analytic induction, initial attempts at universalism could not be realized

Analytic induction is similar to grounded theory but has significant differences.

Grounded theory	Analytic induction
<ul style="list-style-type: none"> Grounded theory focus more on generation and constant comparison 	<ul style="list-style-type: none"> Analytic induction generates and tests theory provisionally Analytic induction focuses on causation It requires all data to be tested against the hypothesis.

Constant Comparison:

Maykut and Morehouse (1994) draw the constant comparative method from the work of Glaser and Strauss (1967) and Lincoln and Guba (1985) in their development of this methodological framework.

Qualitative research is not given to mathematical abstractions. It is nonetheless systematic in data collection and analysis. Whether data is collected through questionnaires or interviews, open-ended questioning allows participants to articulate their experiences and perceptions freely and spontaneously. In analysing these data, responses are not grouped according to pre-defined categories. Rather, through the process of inductive reasoning, salient categories of meaning and relationships between categories are derived from the data itself. The constant comparative method offers the ways through which researcher may access and analyse these articulated perspectives.

The constant comparative method involves breaking down the data into discrete 'incidents' or 'units'. Then coding these discrete 'incidents' or 'units' to categories. Categories generally take two forms:

1. Categories that are derived from the participants' customs and language
2. Categories that the researcher identifies as significant to the study

The goal of the first form is to reconstruct the categories to conceptualise their (the participants') own experiences and world view. The goal of the second form is to assist the researcher in developing theoretical insights under study. Thus the process of constant comparison stimulates thought that leads to both descriptive and explanatory categories. In the constant comparative method the researcher simultaneously codes and analyses data in order to develop concepts. The researcher refines these concepts through constant comparison, identifies their properties, explores their relationships to one another, and integrates them into a coherent explanatory model.

Concept of Triangulation:

Triangulation refers to the use of multiple methods or data sources in qualitative research to develop a comprehensive understanding of phenomena. Triangulation also has been viewed as a qualitative research strategy to test validity through the collection of data through multiple sources to include interviews, observations and document analysis. The purpose of triangulation in qualitative study is to increase the credibility and validity of the results.

Feature:

- Triangulation can be used in both quantitative and qualitative studies.
- Triangulation increases the credibility of qualitative analyses.
- Triangulation is an alternative to traditional criteria like reliability and validity.
- Triangulation is the most preferred criteria in the social sciences.

Types:

Denzin (2006) identified four basic types of triangulation:

Data triangulation: Data triangulation involves time, space, and persons.

Investigator triangulation: Investigator triangulation involves multiple researchers in an investigation.

Theory triangulation: Theory triangulation involves using more than one theoretical scheme in the interpretation of the phenomenon.

Methodological triangulation: Methodological triangulation involves using more than one method to gather data, such as interviews, observations, questionnaires, and documents.

Previous Year Question

June 2014

1. Which of the following falls under inferential statistics?
A) **Arithmetic mean**
B) Standard Deviation
C) Harmonic mean
D) Analysis of variance

2. The most stable measure of variability is
A) range
B) mean deviation
C) **standard deviation**
D) quartile deviation

3. The range of coefficient of correlation between two variables is
A) 0 to +1
B) **+1 to -1**
C) 0 to -1
D) None of these

4. Which of the following is a non-parametric test?
A) t-test
B) F-test
C) **X^2 test**
D) Z- test

Answer

SL NO	ANSWER
1	A
2	C
3	B
4	C



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December 2014

1. In research situations, non-parametric statistics is used for

A) nominal data

B) ordinal data

C) interval data

D) ratio data

2. Which of the following research tools/ techniques will be appropriate for an in-depth understanding of cultural and social aspects of a tribe?

A) Questionnaire

B) Participant's observation

C) Sociometric technique

D) Rating scale

3. If the computed values are used only to explain the properties of a particular sample taken for the study, the statistics used is called

A) descriptive statistics

B) inferential statistics

C) both a and b

D) neither a and b

4. The association among variables in a scientific study is indicated quantitatively as

A) coefficient

B) ratio

C) percentile

D) variance

5. In the process of standardization of a multiple-choice test, the researcher while doing item analysis wants to test the hypothesis for each item response. The most appropriate statistics, the researcher may use will be

A) t-test

B) F-test

C) Chi-square test

D) Sign test

6. Match the following

List 1	List 2
A. Product moment correlation	1. Both variables expressed in an ordinal scale
B. Rank order correlation	2. Both variables are in an interval scale
C. Biserial correlation	3. One variable is continuous and the other is truly discontinuous
D. Point biserial correlation	4. Both variables are true dichotomy
	5. One variable is continuous and the other is artificially discontinuous

Codes:

	A	B	C	D
(A)	1	3	2	5
(B)	2	1	5	3
(C)	2	3	5	1
(D)	1	2	5	3



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Answer

SL NO	ANSWER
1	A
2	B
3	A
4	A
5	C
6	B



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June 2015

1. If there is true dichotomy present in two variables, which of the following correlational techniques will be suitable?

- A) **Point biserial correlation**
- B) Biserial correlation
- C) Product moment correlation
- D) Rank difference correlation



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Answer

SL NO	ANSWER
1	A



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December 2015

1. For estimating coefficient of correlation, in which of the following techniques, characteristics of both the variables and assumed to be essentially on a nominal scale with genuine dichotomy?
- A) Biserial coefficient
 - B) Point biserial coefficient
 - C) Tetra – choric coefficient
 - D) Pie- coefficient**
2. An educational researcher wants to study the relationship between academic performance and motivation, by keeping the effect of a third variable, such as socio-economic status neutral. Which of the following technique of correlation will be appropriate in such a situation?
- A) Contingency coefficient
 - B) Eta coefficient
 - C) Multiple correlation
 - D) Partial correlation**
3. In a research, undertaken by a school teacher in respect of critical understanding of the students of his/her school, the following results were obtained.
Mean = 50, $\sigma = 10$, N = 100
Indicate the range of scores at alpha level 0.05 for finding the value of true mean for the population of such students in the whole district.
- A) from 50.1 to 52.2
 - B) from 48.04 to 51.96**
 - C) from 47.42 to 52.58
 - D) from 48.11 to 53.0
4. In a normal distribution, what is the position of the three measures of central tendency?
- A) Mean is higher than median
 - B) Median is lower than mode
 - C) Both mean and median are higher than mode
 - D) All the three measures coincide**

5. Which of the following statements is not correct?

A) **Correlation indicates causation or cause and effect relationship**

B) In a negatively skewed curve, the value of mean will be pulled towards the lower end of the scale

C) Chi-square test is a distribution free test

D) For computing Pearson's r , the relationship between two variables have to be rectilinear



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Answer

SL NO	ANSWER
1	D
2	D
3	B
4	D
5	A



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July 2016

1. On a test, with a mean of 80 and a Standard Deviation of 20, an individual with a score of 60 will have a Z-score of

- A) 0.1
- B) 1.0
- C) -0.1
- D) -10**

2. Match the following

List 1 (Variables)	List 2 (Scales of Measurement)
a. Intelligence scores on a verbal test	1. Ratio scale
b. Ranks of the students in a musical test	2. Interval scale
c. Number of children in tribal families	3. Ordinal scale
d. Length and breadth of classroom	4. Nominal scale

Codes:

- | | | | | |
|------------|----------|----------|----------|----------|
| | a | b | c | d |
| (A) | 2 | 3 | 4 | 1 |
| (B) | 2 | 4 | 3 | 1 |
| (C) | 1 | 2 | 3 | 4 |
| (D) | 4 | 3 | 1 | 2 |

3. In using inferential statistics, which one of the following will be considered as relevant information?

- A) Information about the tool of research
- B) Information about the research design
- C) Nature of the aggregate (population)**
- D) Sampling procedure used

4. In calculating F value from a research data, which of the following is required at the end of operation?

- A) Finding out the total sum of squares
- B) Finding out the ratio of total sum of square and between sum of squares
- C) Finding out the ratio between sum of squares and within sum of squares**
- D) Finding out the ratio of within sum of squares and total sum of squares

Answer

SL NO	ANSWER
1	D
2	A
3	C
4	C



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January 2017

1. In a study, the significance of difference between means was tested through use of a t-test for a large group. The value of 't' being 2.10, what will be the decision warranted in respect of H₀ (Null hypothesis)?

- A) the H₀ will be rejected
- B) the H₀ will be rejected at 0.01 level of significance
- C) the H₀ will be rejected at 0.05 level of significance only**
- D) the H₀ will be rejected at both the levels of significance

2. For the use of a non-parametric test, like the chi-square, which of the following assumptions has to be satisfied?

- A) The data should arise from interval measure
- B) the distribution has to be normal
- C) no assumption about nature of distribution is required**
- D) the variables under reference must be dichotomous

3. A researcher finds out the relationship between three variables, such as academic achievement, intelligence and socio-economic status of children using Pearson's product moment 'r'. As per objective of his/her study, the relationship between academic achievement and intelligence is also to be estimated by controlling the influence of socio-economic status. Which statistical technique will be appropriate in this context?

- A) finding out multiple correlation
- B) finding out correlation ratio
- C) estimating contingency coefficient via chi-square
- D) finding out partial correlation**

4. For computation of F value in one-way ANOVA, what is the final procedural step?

- A) Finding out the within sum of squares
- B) Finding out the between sum of squares
- C) Finding out the ratio of within and between sum of squares
- D) Finding out the ratio of between and within variance**

5. Percentile scores assume a scale of measurement called

- A) nominal scale
- B) ordinal scale**
- C) interval scale
- D) ratio scale

6. The purpose of methodology section of qualitative studies is to

- A) show how researcher inter-relations will be made
- B) present the focus of the study
- C) provide general background of the study
- D) describe the overall design of the study**

7. Internal reliability in qualitative research design, refers to

- A) information selection
- B) inter-observer reliability**
- C) extent to which the results approximate the reality
- D) accuracy of measures



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Answer

SL NO	ANSWER
1	C
2	C
3	D
4	D
5	B
6	D
7	B



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November 2017

1. The mean and standard deviation of a set of scores are 50 and 10, respectively. If each raw score is increased by 3, the new mean and standard deviation would be

- A) 53, 13
- B) 50, 13
- C) **53, 10**
- D) 50, 10



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Answer

SL NO	ANSWER
1	C



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July 2018

1. A researcher used t-test to compare two means based on independent and found the t-value to be significant at .05 level. This means that

A) chances are 5 out of 100 that the difference between means has occurred due to sampling errors

B) chances are 95 out of 100 that the difference between means has occurred due to sampling errors

C) if experiment is repeated 100 times, it would give the obtained result only 5 times

D) if the experiment is repeated 5 times, it would give the same result every time

2. A researcher uses both t-test and F –test on the same data obtained from two groups. The functional relationship between values of t and F, if calculate would be

A) $t = F$

B) $t^2 = F$

C) $t = F^2$

D) $t^2 = F^2$

3. Match the following

List 1 (Parametric Tests)	List 2
A. Independent t-test	1. Chi-square test
B. Dependent t-test	2. Kruskal Wallis' H-test
C. ANOVA F-test	3. Mann Whitney's U-test
	4. Willeoxon's T-test

Codes:

- | | | | |
|-----|----------|----------|----------|
| | A | B | C |
| (A) | 2 | 1 | 4 |
| (B) | 3 | 1 | 2 |
| (C) | 3 | 4 | 2 |
| (D) | 2 | 1 | 3 |

4. Match the following

List 1 (scales)	List 2 (Characteristics)
A. Nominal scale	1. Superior performance in musical events
B. Ordinal scale	2. Performance scores on a spelling test
C. Interval scale	3. Listing students , according to participation in co-curricular activities
D. Ratio scale	4. Speed of students in writing words per minute

Codes:

	A	B	C	D
(A)	3	1	2	4
(B)	1	3	2	4
(C)	2	1	4	3
(D)	4	2	3	1



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Answer

SL NO	ANSWER
1	A
2	B
3	C
4	A



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SUB UNIT 4

6.4.1 Qualitative Research Designs:

6.4.1.1 Grounded Theory Designs:

A grounded theory design is a systematic, qualitative procedure used to generate a theory. It is a process, an action, or an interaction about a substantive topic. It explains an educational process of events, activities, actions, and interactions that occur over time. In the late 1960s Barney G. Glaser and the late Anselm L. Strauss, developed grounded theory.

Grounded Theory is ‘the discovery of theory from data systematically obtained from social research’ (Glaser and Strauss 1967)

Grounded Theory was developed in the School of Nursing, University of California San Francisco by sociologists Glaser and Strauss when they worked on hospital patient’s – Awareness of Dying . They were influenced by Symbolic Interactionism theory of Blumer (1969).

Types of coding in Grounded Theory:

Ground theorists analyze and categorize events and try to identify the meaning of the text with the help of the prepared code notes. Preparation of the code is done in the following three ways:

Selective Coding: In selective coding, the ground theorist selects one category to be the center/major one and then tries to relate the other categories with the selected major category. Through this, the ground theorist tries to analyze how other categories are affecting the major category and the vice versa.

Open Coding: It is the process of identifying, labeling and analyzing the phenomena found in the text. The ground theorist on the basis of generalization categorizes names, events or properties in to more general categories or dimensions.

Axial Coding: Axial Coding is the process of relating the categories or properties (codes) to each other with the help of inductive and deductive thinking. The ground theorists try to analyze the causal relations between these variables, that is, which of the code is the ‘cause’ which has led to the occurrence of other codes- the ‘context’. The ground theorist analyses and interprets the ‘cause’ and ‘context’ codes with much interest rather than on the ‘consequences’ of the phenomenon itself.

Characteristics of Grounded Theory:

Simultaneous collection and analysis of data , Discovery of basic social processes in the data , Creation of analytic codes and categories developed from data and not by pre-existing conceptualisations (theoretical sensitivity) , Inductive construction of abstract categories , The integration of categories into a theoretical framework, Theoretical sampling to refine categories , Writing analytical memos as the stage between coding and writing.

- **Process approach:** A process in grounded theory research is a sequence of actions and interactions among people and events pertaining to a topic.
- **Theoretical sampling:** Theoretical sampling in grounded theory means that the researcher chooses forms of data collection that will yield text and images useful in generating a theory. This means that the sampling is intentional and focused on the generation of a theory.
- **Constant comparative data analysis:** Constant comparison is an inductive (from specific to broad) data analysis procedure in grounded theory research of generating and connecting categories by comparing incidents in the data to other incidents, incidents to categories, and categories to other categories.
- **A core category:** the researcher selects a core category as the basis for writing the theory.
- **Theory generation:** This theory in grounded theory research is an abstract explanation or understanding of a process about a substantive topic grounded in the data.
- **Memos:** Memos are notes the researcher writes throughout the research process to elaborate on ideas about the data and the coded categories.

Designs in Grounded Theory:

A grounded theory design is a qualitative procedure used to generate a theory that explains, a process, an action, or an interaction about a substantive topic.

However, three dominant designs are discernible:

- The systematic design
- The emerging design
- The constructivist design

The Systematic Design:

The systematic design for grounded theory is widely used in educational research, and it is associated with the detailed, rigorous procedures that Strauss and Corbin identified in 1990 and elaborated in their second and third editions on techniques and procedures for developing grounded theory (1998).

A systematic design in grounded theory emphasizes the use of data analysis steps of open, axial, and selective coding, and the development of a logic paradigm or a visual picture of the theory generated.

The Emerging Design:

Glaser (1992), however, stressed the importance of letting a theory emerge from the data rather than using specific, preset categories such as we saw in the axial coding paradigm (causal conditions, content, intervening condition, strategies, and consequences). For Glaser, the objective of a grounded theory study was to explain a “basic social process.” This explanation involved the constant comparative coding procedures of comparing incident to incident, incident to category, and category to category. The focus was on connecting categories and emerging theory, not on simply describing categories. In the end, the researcher builds a theory and discusses the relationship among categories without reference to a diagram or picture.

The more flexible, less prescribed form of grounded theory research as advanced by Glaser (1992) consists of several major ideas:

1. Grounded theory exists at the most abstract conceptual level rather than the least abstract level as found in visual data presentations such as a coding paradigm.
2. A theory is grounded in the data and it is not forced into categories.
3. A good grounded theory must meet four central criteria: fit, work, relevance, and modifiability. By carefully inducing the theory from a substantive area, it will fit the realities in the eyes of participants, practitioners, and researchers. If a grounded theory works, it will explain the variations in behaviour of participants. If it works, it has relevance.

The Constructivist Design:

This design was developed by Kathy Charmaz. She reported the feelings of the men, using active code labels such as awakening, accommodating, defining, and preserving. Charmaz paid more attention to individual's principles, opinions, beliefs, sensations, expectations and philosophy rather than truth and explaining acts. Thus this design has advantages in addressing ‘why’ questions and preserving the complexity of social life.

Steps in conducting a GT research:

- Step 1: Decide If a Grounded Theory Design Best Addresses the Research Problem.
- Step 2: Identify a Process to Study.
- Step 3: Seek Approval and Access.
- Step 4: Conduct Theoretical Sampling.
- Step 5: Code the Data.
- Step 6: Use Selective Coding and Develop the Theory
- Step 7: Validate the Theory.
- Step 8: Write a Grounded Theory Research Report.

Strengths of GT:

- Grounded Theory is helpful to develop an understanding of phenomena that can not be explained with existing theories and paradigms.
- This methodology offers a systematic and rigorous process of data collection and data analysis. So research problem can be studied in a great level of depth.
- Application of this methodology in practice fosters critical thinking and creativity.
- It is an effective approach to build new theories and understanding of new phenomenon.
- It deals with detailed and systematic procedures for data collection, analysis and theorising.

Weakness of GT:

- Grounded theory methodology is time consuming and difficult to conduct.
- There is a great scope for researcher induced biases.
- Presentation of research findings is not straight forward.
- It is not possible to start a research study without some pre-existing theoretical ideas and assumptions.

6.4.1.2 Narrative Research Designs:**Meaning:**

Narrative research designs are qualitative procedures in which researchers describe the lives of individuals, collect and tell stories about these individuals' lives, and write narratives about their experiences.

The term narrative comes from the verb "to narrate" or "to tell (as a story) in detail". In narrative research designs, researchers describe the lives of individuals, collect and tell stories about people's lives, and write narratives of individual experiences.

Key Characteristics:

- Experiences of an individual—social and personal interactions
- Chronology of experiences—past, present, and future experiences
- Life stories—first-person, oral accounts of actions obtained through field texts (data)
- Restorying (or retelling or developing a metastory) from the field texts
- Coding the field texts for themes or categories
- Incorporating the context or place into the story or themes
- Collaboration between the researcher and the participants in the study, such as negotiating field texts.

Examples of types of narrative research forms:

- Autobiographies
- Personal narratives
- Narrative interviews
- Biographies
- Life writing
- Oral histories
- Ethno-biographies
- Popular memories
- Personal documents
- Life stories and life histories

Steps in conducting NR design: *Text with Technology*

Step 1: Identify a Phenomenon to Explore That Addresses an Educational Problem.

Step 2: Purposefully Select an Individual From Whom You Can Learn About the Phenomenon.

Step 3: Collect the Story From That Individual.

Step 4: Restory or Retell the Individual's Story.

Step 5: Collaborate with the Participant–Storyteller.

Step 6: Write a Story about the Participant's Experiences.

Step 7: Validate the Accuracy of the Report.

6.4.1.3 Case Study:

Meaning:

Case study is one of the important types of non-experimental or descriptive research. It is an in-depth study of one situation or cases which may be one subject, group or event. Frederick Le Play (1806-1882) had, for the first time, introduced this method into social science research. Herbert Spencer, an English sociologist (1820-1903), was the first to use case materials in his ethnographic studies. William Hwaly, a psychologist, for the first time adopted this method in his work with juvenile delinquencies. Sigmund Freud used this method in the field of psychiatry.

A case study is an in-depth exploration of a bounded system (e.g., activity, event, process, or individuals) based on extensive data collection. Bounded means that the case is separated out for research in terms of time, place, or some physical boundaries. The “case” may be a single individual, several individuals separately or in a group, a program, events, or activities (e.g., a teacher, several teachers, or the implementation of a new math program).

Characteristics:

In case study the researcher tends to study the aspect of ‘what’ and ‘why’ of the social unit. The social unit may be an individual only, or may be a family, social group, social institution or community. It is a descriptive research, no variable are manipulated here. Data is gathered through observation, interview, questionnaire, opinionnaire, other psychological tests and other recorded data from news paper, school, society or other similar sources.

Characteristics of a Good Case Study:

- It should be based on adequate and complete data.
- Its data should be valid.
- It should have continuity about it.
- Its records should be kept confidential.
- Its data should be specifically synthesized and this synthesis should be as much prognostic as diagnostic.
- Its follow up work should be undertaken.

Components of a CS design:

Types of CS design:

Six types of case studies are conducted which are as follows:

- i) A group or community case study.
- ii) Causal comparative ca studies.
- iii) Activity analysis.
- iv) Content or document analysis.
- v) A follow up study.
- vi) Trend studies.

Steps of conducting a CS research:

A case study is conducted into three phases:

- Retrospective phase refers to the past records of the case completely which is used in diagnosing the case.
- Prospective phase refers to the present status of the case, which is helpful in understanding the case. The suggestions and remediation can be offered to the case.
- Consecutive phase refers to the future development and improvement of the case which is also employed to examine the effects of the remediation given to the case.

Strengths:

- In-depth analysis of organised data from persons' life history, history of a group/society, some delimited social processes.
- Case study provides sufficient basal facts for developing hypotheses regarding the social unit being studied. For that questionnaire, opinionnaire or any psychological tests is to be developed.

Weaknesses:

- Case study is a longitudinal study.
- Case study suffers from post hoc fallacy when the effects are wrongly attributed to factors that are simply associated.
- Case study suffers from subjective bias in data gathering.
- Case study is time taking and money consuming.
- Here often researcher comes to feel a false sense of certainty about the conclusion arrived.

6.4.1.4 Ethnography:**Meaning:**

The term ethnography literally means “writing about groups of people.” Ethnographic designs are qualitative research procedures for describing, analyzing, and interpreting a culture-sharing group's shared patterns of behaviour, beliefs, and language that develop over time. Central focus is culture. A culture is “everything having to do with human behaviour and belief”. It can include language, rituals, economic and political structures, life stages, interactions, and communication styles. To understand the patterns of a culture sharing group, the ethnographer typically spends considerable time “in the field” interviewing, observing, and gathering documents about the group to understand their culture-sharing behaviours, beliefs, and language.

Characteristics:

- Cultural themes:
- A culture-sharing group
- Shared patterns of behaviour, belief, and language
- Fieldwork
- Description, themes, and interpretation
- Context or setting
- Researcher reflexivity.

Types of Ethnography:

- Ethnographic case study
- Realist ethnography
- Confessional ethnography
- Life history
- Postmodern ethnography
- Ethnographic novels
- Critical ethnography
- Auto ethnography
- Micro ethnography
- Feminist ethnography

Underlying assumptions:

In a good ethnography must fulfil following assumptions:

- Ethnography identifies a culture-sharing group or case to study.
- Ethnography focuses on a cultural concept (e.g., power, acculturation) recognizing that this concept may be very broad.
- Ethnography provides evidence to show how this group has established over time pattern of behaviour, language, and beliefs.
- Ethnography engages in fieldwork and gathers the evidence through multiple sources including observations and interviews.
- Ethnography shows an analysis of this evidence through a detailed description of the culture sharing group and the context in which it exists, themes that summarize major ideas about how the group works, and interpretation that suggests how the group illustrates “culture at work.”
- Ethnography portrays the researchers as reflecting on their own role in the study and how their background, gender, and history shape the account that they report.

Steps of conducting ethnographic research:

Step 1: Identify Intent and the Type of Design, and Relate Intent to Your Research Problem

Step 2: Discuss Approval and Access Considerations

Step 3: Use Appropriate Data Collection Procedures

Step 4: Analyze and Interpret Data within a Design

Step 5: Write the Report Consistent with the Design

Writing ethnographic account:

Following steps are generally followed while writing an ethnographic account.

Questionnaire formation: While doing ethnographic research, the investigator have to be physically present in the target community or society. To collect data sequentially, scientifically and logically the investigator have to prepare a questionnaire.

Research for a questionnaire: It should be based on personal and theoretical observation of the investigator. This will help in drafting real-time questions leading to viable conclusion.

Introduction: After collecting the data through questionnaire, the investigator need to construct an introduction. This will introduce the questions like, what are you studying? How are you studying? and the like.

Methodology: It includes the procedure of how the researcher gather information for his/her study. One may take support by giving reference to the conversations with the community folk for authenticity of the data. One may also mention the difficulties and limitations of the study.

Data analysis: Here the investigator thoroughly present the analysis of the collected data.

Conclusion: Here sum up the cultural research focussing on methodology and finding.

Strengths:

- Ethnography may help to identify and analyse unexpected issues.
- Ethnographic study can be very helpful in uncovering and analysing relevant user attitudes and emotions.
- It provides a comprehensive perspective.
- Ethnographic research observes natural behaviour of participants in their natural environment.
- It accounts for the complexity of group behaviours, reveal interrelationships among multifaceted dimensions of group interactions.

Weakness:

- Subjects/ participants may not act naturally during a short study.
- It requires a substantial amount of time.
- The success of an ethnographic study largely depends on the subject's willingness to open up to the researcher.
- Ethnographers may be influenced by their cultural bias or ignorance.
- This method is dependent on the researcher's observation and interpretations very much. So it requires a well-trained researcher.
- It is difficult to check the validity of the researcher's conclusion.
- Observer made bias is almost impossible to eliminate.
- It may lack transferability.

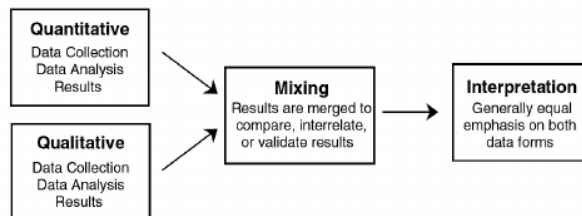
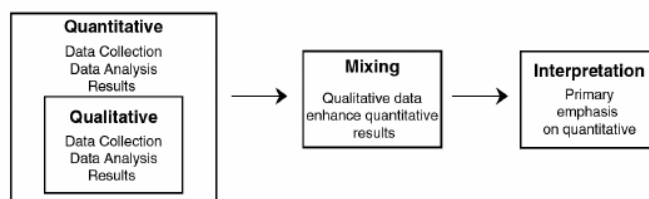
6.4.1.5 Mixed Method Designs:

Mixed methods designs are procedures for collecting, analyzing, and mixing both quantitative and qualitative data in a single study or in a multiphase series of studies.

Mixed methods research offers an option that actually tries to take advantage of the similarities and differences in qualitative and quantitative methods. It represents a pragmatic alternative—showing how research can proceed without resolving the potential conflicts in worldviews. As a result, contemporary supporters of mixed methods research have made an intense effort to define, document, and classify it (e.g., Creswell, 2009; Greene, 2008; Johnson, 2006; Tashakkori & Teddlie, 1998, 2003, 2009).

Characteristics:

- The analysis of both qualitative and quantitative data.
- The collection of both open and closed-ended data (qualitative and quantitative data) in response to research question.
- The use of specific mixed method design that involves a concurrent or sequential integration.

Types of MM designs:**(Triangulation, explanatory and exploratory designs)****(a) Triangulation Design****(b) Explanatory Design****(c) Exploratory Design****(d) Embedded Design***

Steps in conducting a MM designs:**Combinations for Mixing Quantitative and Qualitative Analyses in a Mixed Methods Study****Parallel mixed analysis**

- Interviewing participants (qualitative) at the end of a laboratory experiment (quantitative), to gain insight into the participants' behavior
- Using and analyzing open-ended (qualitative) and closed-ended (quantitative) items as part of the same questionnaire
- Transforming qualitative data into quantitative data through content analysis

Sequential (qualitative first, then quantitative) analysis

- Using qualitative data to define teachers in two groups, based on field observations of their instructional practices (qualitative), and then comparing teachers' responses to a survey (quantitative)

Sequential (quantitative first, then qualitative) analysis

- Using additional qualitative data about individuals who performed extremely well or extremely poorly ("outliers") in a quantitative analysis, to explain their (high or low) quantitative scores

Source: Tashakkori and Teddlie (1998, pp. 128–135).

Strengths:

- Mixed methods design provides strengths that offset the weakness of both qualitative and quantitative research.
- Mixed methods design provides a more complete and comprehensive understanding of the research problem than either qualitative or quantitative approaches alone.
- Mixed methods design provides an approach for developing better, more context specific instruments.
- Mixed methods design helps to explain findings or how causal processes work.
- Researcher can provide strong evidence for a conclusion through convergence and collaboration of findings.

Weakness:

- Mixed methods design can be very complex.
- It takes much time and resources to plan and implementation.
- It may be difficult to plan and implement one method by drawing on the findings of another.
- Here researcher has to learn about multiple methods and approaches and understand how to mix them properly.
- It can be difficult for a new researcher to deal with both qualitative and quantitative research.

Previous Year Question

June 2014

1. A non-government organization conducted a study in a Gram Panchayat to see the impacts of campaign approach on enrolment and retention of rural elementary school children. This is an example of

- A) descriptive study
- B) field experiment**
- C) ex-post facto research
- D) historical research

2. Match the following

List 1 (Types of research)	List 2 (Characteristics)
A. Experimental	1. Criticism
B. Historical	2. Control
C. Case study	3. Interpretative
D. Ethnography	4. Intensive
	5. Intuitive

Codes:

- | | | | | |
|------------|----------|----------|----------|----------|
| | a | b | c | d |
| (A) | 2 | 3 | 4 | 5 |
| (B) | 1 | 2 | 5 | 3 |
| (C) | 3 | 1 | 4 | 5 |
| (D) | 2 | 1 | 4 | 3 |

3. Research conducted by classroom teacher to improve spelling among students in English language is categorized as

- A) pure research
- B) qualitative research
- C) quantitative research
- D) action research**

4. A study of the causes and consequences of India's freedom struggle movement falls under which of the following type of research

- A) ex-post facto research
- B) historical research**
- C) correlational research
- D) phenomenological research

Answer

SL NO	ANSWER
1	B
2	D
3	D
4	B



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December 2014

1. In which research design, sampling is least necessary?

- A) comparative analysis
- B) experimental study
- C) case study**
- D) correlational study

2. Research for explaining the applicability of a theory or law formulated in a specific situation in the field of education is termed as

- A) pure research
- B) action research
- C) applied research**
- D) theoretical research



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Answer

SL NO	ANSWER
1	C
2	C



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June 2015

1. Match the following

List 1 (Study)	List 2 (Description)
A. Analysis of historical records	1. Collection of data for in-depth study in a vertical or horizontal or both manner
B. Non participant's observation	2. Uses open ended and closed question
C. Participant's observation	3. Recording notes from documents, listening to tapes and watching available films
D. Case study	4. Observation scales, use of score cards, etc
	5. Interaction , formal and informal, possible use of tape and video recording

Codes:

- a b c d**
 (A) 1 3 5 4
 (B) 3 4 5 2
 (C) 2 4 3 5
 (D) 3 4 5 1

2. For conducting a study to understand the social customs in a tribal society, which of the following technique will be most appropriate?

- A) interview
B) participant's observation
 C) self-reporting
 D) testing

3. A researcher reports a study in respect of prevailing class control procedures, used by the public schools of Uttar Pradesh. As an expert in research methodology, what will be your intelligent guess in respect of the methodology of research indicated below?

- A) historical
B) descriptive
 C) case study
 D) experimental

4. Internal criticism of data is considered important in which of the following researches?

- A) **Philosophical**
- B) Case study
- C) Descriptive
- D) Experimental

5. In which of the following form of enquiry, research design functions as a specific and precise guidance?

- A) **experimental research**
- B) philosophical research
- C) ethnographic research
- D) case studies



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Answer

SL NO	ANSWER
1	D
2	B
3	B
4	A
5	A



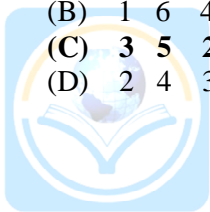
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December 2015**1. Match the following**

List 1 (Types of research)	List 2 (Characteristics)
A. Case study	1. Field research using spontaneous and uninterrupted data collection technique
B. Phenomenological research	2. Research investigating the implied cause-effect relationship, already evident
C. Ex-post-facto research	3. An analysis, the results of which are not generalisable
D. Naturalistic research	4. Application of analytical methodology to the study of the past
	5. Analysis to provide understanding of a concept from the participant's perspectives
	6. Direct manipulation of at least one independent variable

Codes:

	a	b	c	d
(A)	5	3	1	4
(B)	1	6	4	5
(C)	3	5	2	1
(D)	2	4	3	6



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Answer

SL NO	ANSWER
1	C



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July 2016

1. Which of the following methods of data collection can be considered as ... an attempt to map out or explain the richness and complexity of human behaviour by studying it from more than one stand point, using both quantitative and qualitative dated?

- A) non-participant observation
- B) triangulation**
- C) in-depth interview
- D) participant's observation

2. Which of the following type of research can be called as a small-scale intervention in the functioning of the real world with an intent of a close examination of the effects of such intervention?

- A) case study
- B) naturalistic research
- C) action research**
- D) historical research



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Answer

SL NO	ANSWER
1	B
2	C



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January 2017

1. Which one of the following themes may be appropriate for areas of action research in the field of teacher education?

1. improving teaching skills of student teacher
2. identifying suitable criteria for admission
3. modification of teaching behaviour of trainees
4. revisiting teacher education curriculum
5. enhancing professional competencies of both trainees and teacher educators
6. preparing teachers for special schools

Codes:

A) 1, 3 and 5

B) 2, 4 and 6

C) 1, 2 and 3

D) 2, 3 and 4

2. Which of the following is/are not a characteristic(s) of narrative research?

1. collecting individual stories
2. collaborating with participants
3. chronology of the experience
4. association of variables for group of participants
5. data collection at one point of time from a sample

Codes:

A) 2 and 3

B) 1 and 5

C) 4 and 5

D) 2 and 4

Answer

SL NO	ANSWER
1	A
2	C



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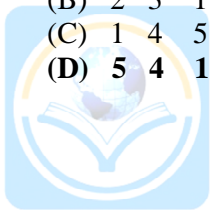
November 2017

1. Match the following

List 1 (Types of research)	List 2 (Descriptions)
A. Naturalistic inquiry	1. Analytical description of social group, related to the shared beliefs, practices and behaviours
B. Phenomenological research	2. Sophisticated analysis, which links participant's perception
C. Ethnographic research	3. Designed to aid and assess the merit and worth of a specific practice in terms of values
D. Grounded theory research	4. Analysis of qualitative data to provide an understanding of a concept from the participant's perspective
	5. Prefer inductive reasoning from grassroots' observation and discovery with an emergent design

Codes:

	a	b	c	d
(A)	3	1	5	2
(B)	2	3	1	5
(C)	1	4	5	2
(D)	5	4	1	2



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Answer

SL NO	ANSWER
1	D



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July 2018

1. While assessing the attitude of administrators towards an 'women empowerment programme', a researcher had no pre-conceived notions about what she might discover and she continued interviewing until key themes emerge. Indicate the paradigm of research being followed.

- A) ethnographic study approach
- B) grounded theory approach
- C) **phenomenological study approach**
- D) case study approach



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Answer

SL NO	ANSWER
1	C



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