1. Module-3- Research Design and Sampling Design

Part-A-Research Design Important questions and Answers

1. Define Meaning of research design. Explain in detail Different ResearchDesigns.

Meaning of Research Design

- A Research Design is simply a **structural framework** of various **research methods** as well as **techniques** that are utilized by a researcher.
- The research design helps a researcher to pursue their ***journey into the unknown but with a systematic*** approach by their side.
- The way an **engineer** or **architect** frames a *design for a structure*, likewise the researcher picks the design from various approaches in order to check which type of research to be carried out.

There are three main types of research design: exploratory, descriptive, and hypothesis-testing. Here are some key characteristics of each:

1. Exploratory research design:

1) Aimed at gaining a better understanding of a phenomenon or problem.
2) Often used when little is known about a topic.
3) Can involve collecting data through interviews, focus groups, or observations.
4) Data analysis is often qualitative in nature.
5) Can help generate hypotheses for further research.
6) Results are not typically conclusive, but can provide a foundation for future research.

2. Descriptive research design:

1) Aims to describe and understand a particular phenomenon or problem in detail.
2) Often used when trying to identify potential areas for further investigation.
3) Can involve collecting data through surveys, observations, or experiments.
4) Data analysis can be qualitative or quantitative in nature.
5) Can help identify patterns or relationships between variables.
6) Results can be used to develop hypotheses for further research.

3. Hypothesis-testing research design:

1) Focuses on testing hypotheses about the relationship between variables.
2) Often involves experiments, where one variable is manipulated to observe its effects on another variable.
3) Requires careful design to ensure that the results are valid and reliable.
4) Data analysis is often quantitative in nature.
5) Can be used to establish causal relationships between variables.
6) Results can be used to inform policy or decision-making.

2. Describe need and features of good research design.

And explain differencebetween explorative and descriptive research design

Need of Research Design

- *Research design is needed because it facilitates the **smooth sailing of the various research operations**, thereby making research as efficient as possible yieldingmaximal information with minimal expenditure of effort, time and money.*
- *Research design is like a **blueprint** which helps **In Advance** collecting the relevant data and techniques to be used for a research project.*

Features of Good Research Design

1. ***flexible,***
2. ***appropriate,***
3. ***efficient,***
4. ***economical,***

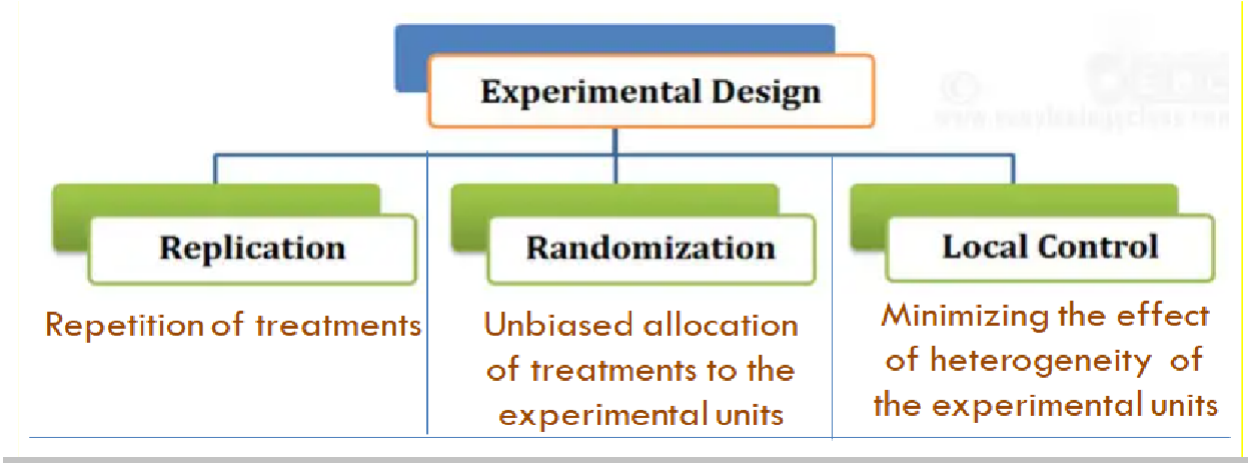
Difference between explorative and descriptive

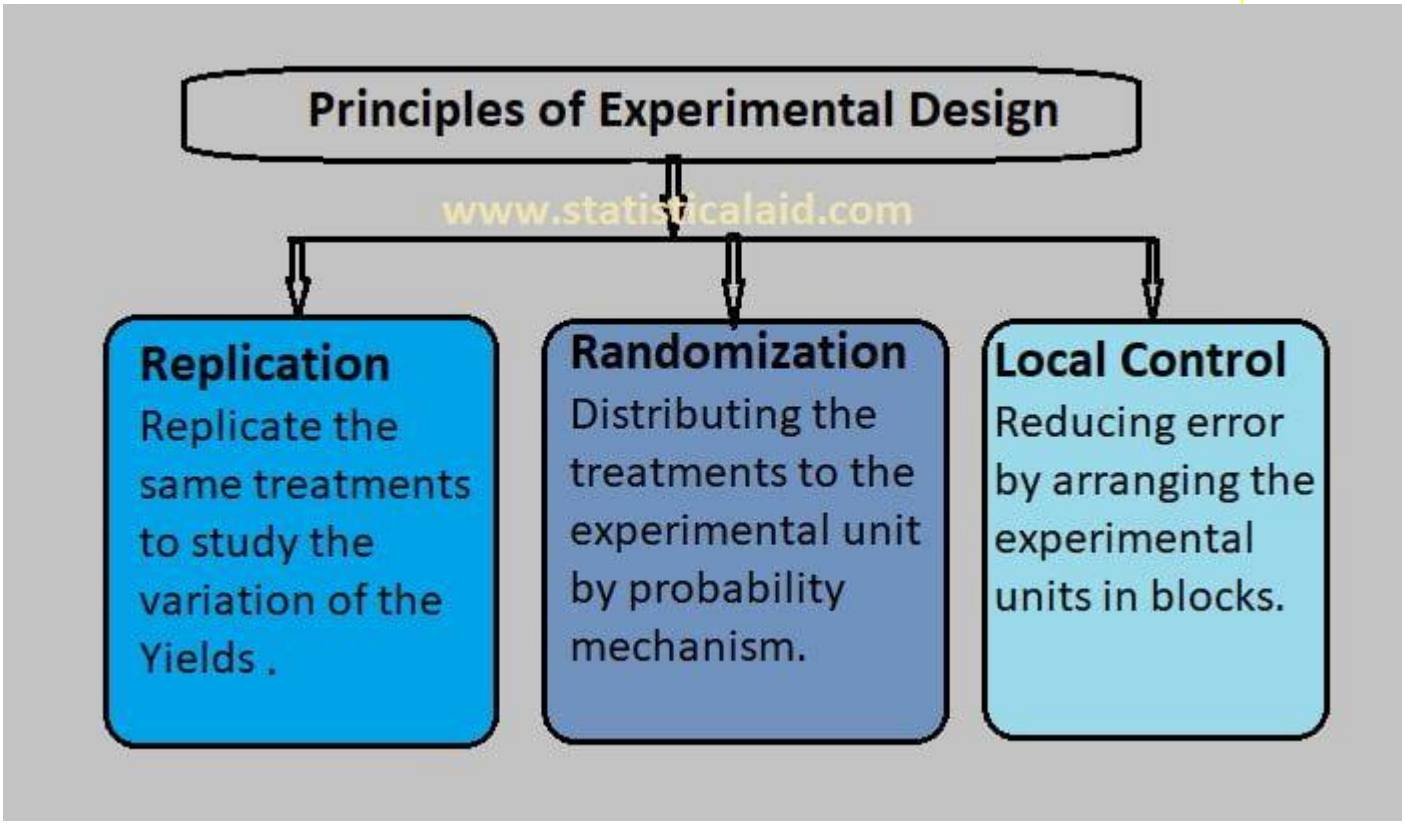
Research Design	*Type of study*	
	Exploratory of Formulative	*Descriptive/Diagnostic*
Overall design	Flexible design (design must provide opportunity for considering different aspects of the problem)	Rigid design (design must make enough provision for protection against bias and must maximise reliability)
(i) Sampling design	Non-probability sampling design (purposive or judgement sampling)	Probability sampling design (random sampling)
(ii) Statistical design	No pre-planned design for analysis	Pre-planned design for analysis
(iii) Observational design	Unstructured instruments for collection of data	Structured or well thought out instruments for collection of data
(iv) Operational design	No fixed decisions about the operational procedures	Advanced decisions about operational procedures.

3. Explain three basic principles of experimental designs with suitableexample.

What is Experimental Design?

It involves testing **an independent variable** against a **dependent variable**. It is a central feature of the scientific method.





3. *Explain the meaning of the following in context of Research design.*

(a) Extraneous variables; (b) Confounded relationship; (c) Research hypothesis; (d) Experimental and Control groups; (e) Treatments.

Answer:

a) Extraneous Variables:-

An extraneous variable is any factor that is not the independent variable that can affect an experiment's dependent variables, which are the controlled conditions. Since unexpected variables can change an experiment's interpretation and results, it's important to learn how to control them.

Example: For example, we might want to know how the number of hours that a basketball player trains per week affects their average points per game. However, an extraneous variable that could also affect their points per game is the number of hours they spend stretching each week.

b) Confounded Relationship:-

When the dependent variable is not free from the influence of extraneous variable's, the relationship between the dependent and independent variables is said to be confounded by an extraneous variable.

For example, a study looking at the association between obesity and heart disease might be confounded by age, diet, smoking status, and a variety of other risk factors that might be unevenly distributed between the groups being compared

c) Research Hypothesis: -

When a prediction or a hypothesised relationship is to be tested by scientific methods, it is termed as research hypothesis. The research hypothesis is a predictive statement that relates an independent variable to a dependent variable. Usually a research hypothesis must contain, at least, one independent and one dependent variable. Predictive statements which are not to be objectively verified or the relationships that are assumed but not to be tested, are not termed research hypotheses.

d) Experimental and control groups: -

'control group',

group is exposed to usual conditions,

'experimental group'.

exposed to some novel or special condition,

Example: The Group A of 25 students can be called a control group and the Group B of 25 students an experimental group. If both groups A and B are exposed to special studies programmes, then both groups would be termed 'experimental groups.' It is possible to design studies which include only experimental groups or studies which include both experimental and control groups.

e) Treatments: -

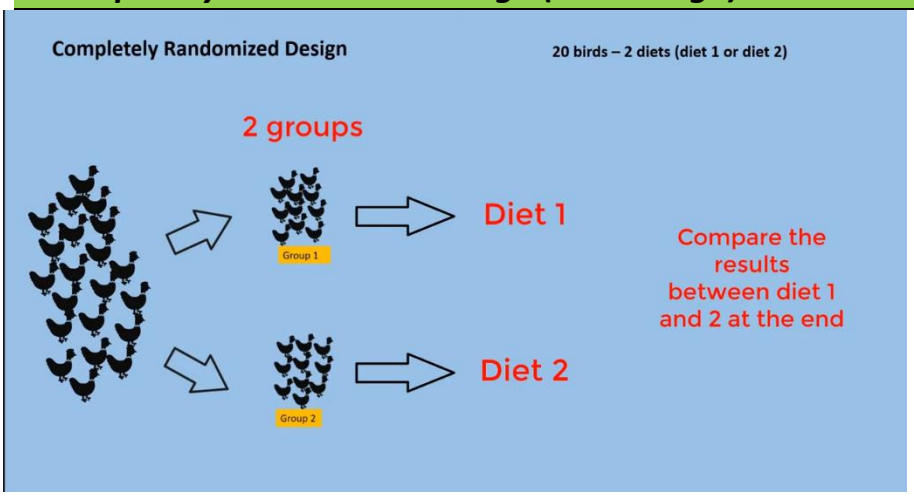
The different conditions under which experimental and control groups are put are usually referred to as treatments.

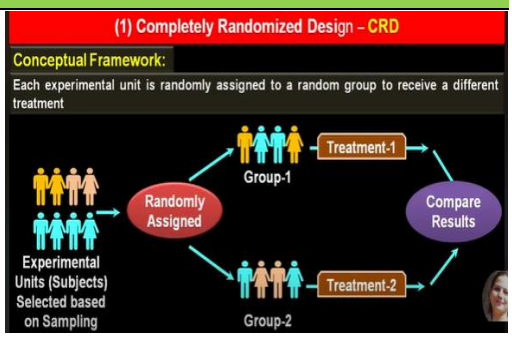
In the illustration taken above, the two treatments are the usual studies programme and the special studies programme. Similarly, if we want to determine through an experiment the comparative impact of three varieties of fertilizers on the yield of wheat, in that case the three varieties of fertilizers will be treated as three treatments.

4. Discuss in detail the various formal experimental designs with examples

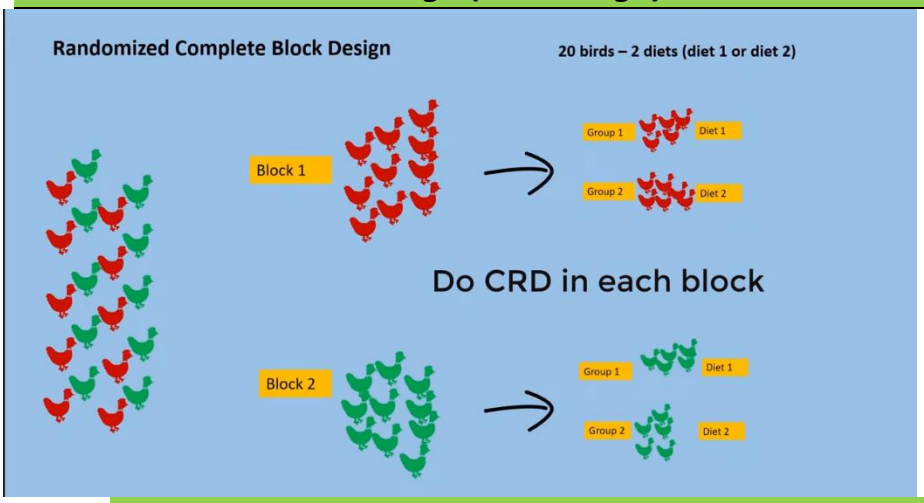
i. **C**ompletely **R**andomized **D**esign (C.R. Design).
ii. **R**andomized **B**lock **D**esign (R.B. Design).
iii. **L**atin **S**quare **D**esign (L.S. Design).
iv. **F**actorial **D**esigns. (F.D)

I. Completely Randomized Design (C.R. Design).

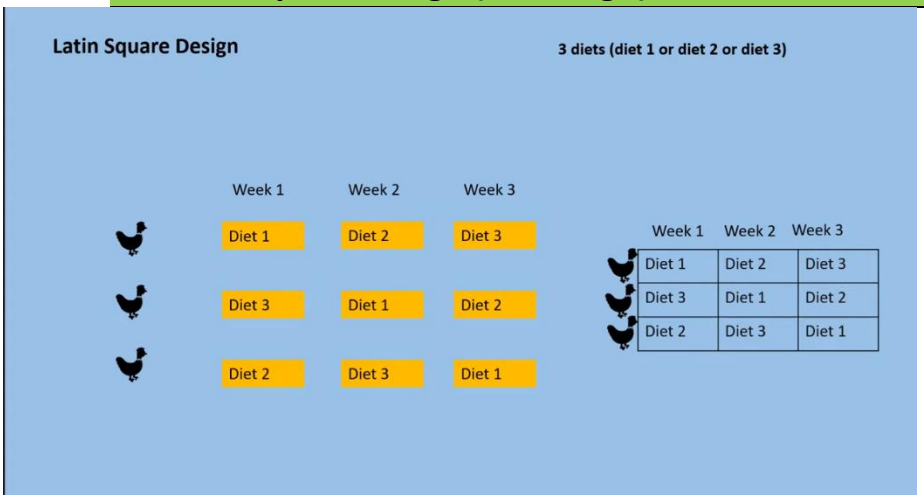




ii. Randomized block design (R.B. design)



III. Latin square design (L.S design)

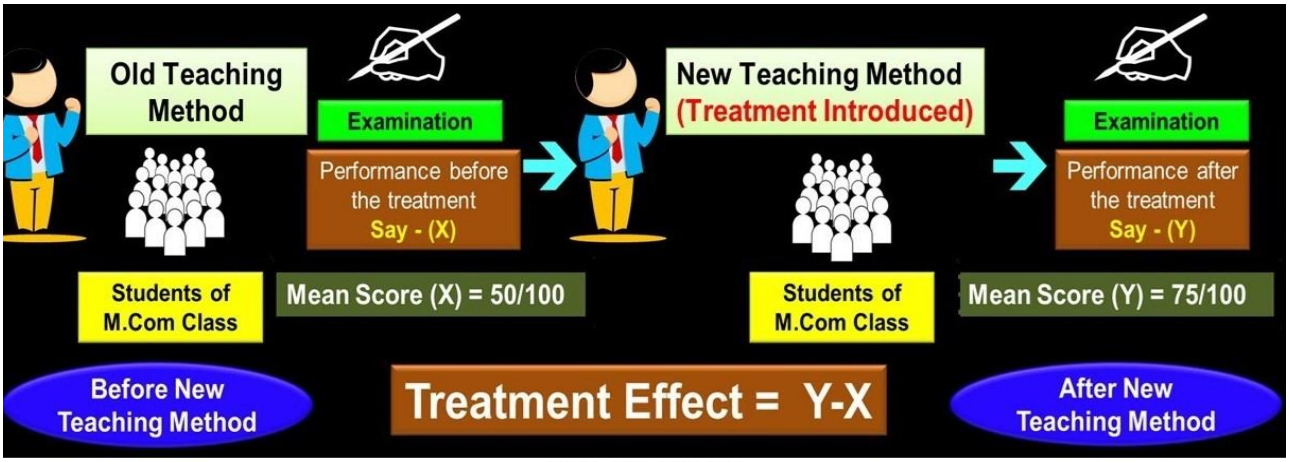


5. Discuss in detail the various informal experimental designs with examples.

Ans. Informal experimental designs are that normally use a less sophisticated form of analysis based on differences in magnitudes, whereas formal experimental designs offer relatively more control and use precise statistical procedures for analysis.

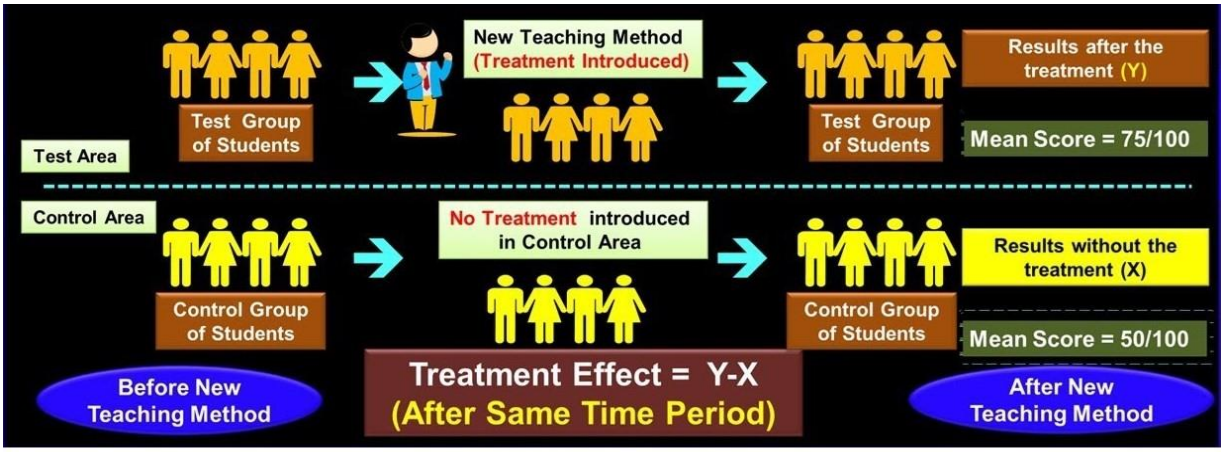
Informal experimental designs follow

6. Before-and-after without control design.



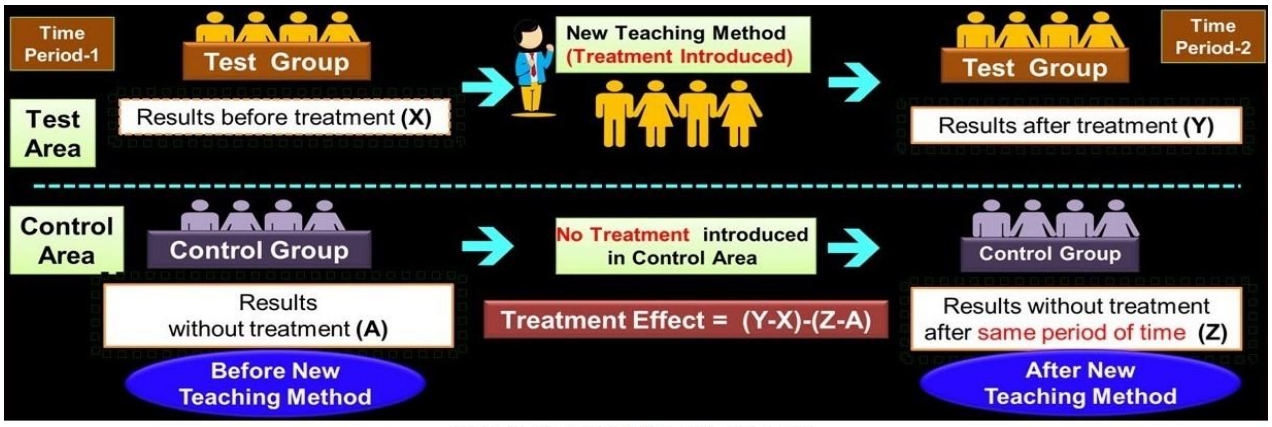
Y-X=75-50=25

After-only with control design..



Y-X=75-50=25

Before-and-after with control design.



(Y-X)-(Z-A)=(75-50)-(50-50)=25-0=25