Research Design

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Course: **RESEARCH METHODOLOGY/BIOSTATISTICS** (MA 322)

Summer-Class

Week 3

Date 27-8-2025

Outline

- What is Research Design.
- Importance of Research Design.
- Components of Research Design.
- Types of Research Designs.
- Example of a Research Design

Objectives

❖ By the end of this lecture, students should be able to:

1. Define research design and explain its importance in research.
2. Identify different types of research designs.
3. Distinguish between qualitative and quantitative research.
4. Apply appropriate research designs to given research problems.
5. Evaluate the strengths and limitations of various research designs.

❑ What is Research Design?

- A research design is the **overall strategy** or **blueprint** that guides how a research study is conducted.

- It specifies how data will be **collected**, **measure**d, and **analyzed** to answer **research questions** or **test hypotheses**.

- In simple terms: Research design is the plan that connects research questions to the execution of the study.

❑ A good research design ensures:

- The research problem is addressed clearly.
- The evidence obtained is relevant and reliable.
- The study can be replicated if needed.

❖ Example:

- If you want to study the effect of music on memory retention among university students, your research design will determine:

- How you select participants.
- What type of music is played.
- How memory is tested.

❑ Importance of Research Design

- **A strong research design:**

1. Provides structure and clarity to the study.

2. Ensures that results are valid, reliable, and unbiased.

3. Saves time and resources by avoiding poor planning.

4. Facilitates replication of research by other scientists.

- Example: If you design a survey on eating habits but only include medical students, your results won't represent the general student population (sampling bias).

❑ Main Components of Research Design:

1. **Research Problem**:– The question your study seeks to answer.

- Example: Does physical exercise improve academic performance?

2. Review existing literature

3. Objectives of the Study:– What you aim to achieve.

- Example: To determine if daily exercise improves concentration levels.

4. Type of Data Needed :– Qualitative or quantitative.

- Example: Measuring concentration scores (quantitative) vs. student opinions on exercise (qualitative).

5. Methods of Data Collection :–

- Surveys, interviews, experiments, observation, etc.

6. Sampling Design :– How participants are selected.

- Example: Random sampling, stratified sampling, purposive sampling.

7. Data Analysis Plan :– How you will interpret results.

❑ Types of Research Designs:

A) Quantitative Research Designs B) Qualitative Research Designs

C) Mixed-Methods Research Design D) Common Specific Designs

A) **Quantitative Research Designs**: Used when the goal is to test hypotheses, measure variables, and analyze numerical data.

✓**Descriptive Research Design**, **Correlational RD**, **Experimental RD**, and **Quasi-Experimental RD**.

1. **Descriptive Research Design**:

- Purpose: Describe characteristics without testing cause-and-effect.
- Example: A survey on dietary habits among university students.

2. **Correlational Research Design**:

- Purpose: Examine relationships between two or more variables, without manipulation.
- Example: Investigating the relationship between sleep duration and academic performance."

3. **Experimental Research Design**:

- Purpose: Determine cause-and-effect by manipulating the independent variable and controlling other factors.

- Example: Testing whether a new teaching method improves exam scores compared to traditional lectures.

4. **Quasi-Experimental Research Design**:

- Purpose: Similar to experimental, but without random assignment of participants.

- Example: Comparing test scores between students in two schools where one uses e-learning and the other does not.

B) Qualitative Research Designs

- Used when the goal is to explore meanings, experiences, or social phenomena.

✓**Case Study**, **Ethnography**, **Phenomenological Research.**

1. **Case Study**: In-depth investigation of a single individual, group, or event.

- Example: A case study on coping mechanisms of cancer survivors.

2. **Ethnography**: Study of people and cultures through immersion.

- Example: Studying learning styles among rural communities

3. **Phenomenological Research**: Focus on exploring lived experiences.

- Example: Exploring the experiences of first-year nursing students during clinical training.

C) Mixed-Methods Research Design:

- Combines both qualitative and quantitative approaches.
- Example: Studying teacher satisfaction (survey + interviews).

D) Common Specific Designs:

1. Experimental Design
2. Cross-Sectional Design
3. Longitudinal Design

1. **Experimental Design**: Researcher manipulates variables to observe effects.

- Example: Giving one group of plants fertilizer A and another group fertilizer B to compare growth.

2. **Cross-Sectional Design**: Data collected at one point in time.

- Example: Surveying students' social media use in January 2025.

3. **Longitudinal Design**: Data collected over a long period.

- Example: Tracking student academic performance from Grade 7 to university.

❖ Choosing the Right Research Design:

- When selecting a research design, consider:

1. **Research question/hypothesis:**
2. **Nature of variables (measurable or descriptive):**
3. **Resources available (time, money, participants)**
4. **Ethical considerations.**

❖ Example of a Research Design in Action:

- **Title:** The effect of caffeine on alertness among university students.
- **Research Problem:** Does caffeine improve alertness in students?
- **Type:** Experimental (Quantitative).
- **Sample:** 60 students randomly divided into caffeine and non-caffeine groups.
- **Data Collection:** Measuring reaction time with a computer-based test.
- **Analysis:** Compare average reaction times using statistical tests.

References

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3. Council for International Organizations of Medical Sciences (CIOMS). (2016). International Ethical Guidelines for Health-related Research Involving Humans.

Thanks