
# Introduction to Research Methodology

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

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# Outline

- Definition, objectives, and significance of research
- Types of research
- Characteristics of good research
- The research process overview

# Objectives

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

1. Define research and explain its purpose.
2. Understand the characteristics of research.
3. Distinguish between different types of research.
4. Identify the steps in the research process.
5. Recognize the importance of ethics in research

# ❑ Definition of Research?

- Is a **systematic**, **organized**, and **objective process** of finding **answers to questions**, **solving problems**, or discovering new knowledge.

- Is a **structural investigation** carried out to discover new **knowledge**, **verifying existing knowledge** or **develop practical applications**.

- Example: A biologist studying the effect of temperature on fish growth rates.

# ❑ Research

- It involves:

- **Collecting Data**
- **Analyzing**
- **Interpreting data**

# ❑ Collecting Data

- Is the systematic process of gathering information from various sources to answer research questions, test hypotheses, and evaluate outcomes.

- **Methods of Data Collection:**

- **Surveys**: Measuring students' study hours per week.
- **Interviews**: Asking cancer patients about their coping strategies.
- **Experiments**: Testing a drug's effect on blood pressure.
- **Observations**: Counting the number of patients visiting a clinic daily.

# ❑ Analyzing Data:

- Once collected, the raw data must be processed and examined, it's about making sense of the data you've collected so you can answer your research questions.

- **Types of Data Analysis:**

1. Quantitative Data Analysis (Numerical data)

2. Qualitative Data Analysis (Non-numerical data, image)

## ❑ Steps in Data Analysis:

1. Data Cleaning
2. Data Organization
3. Descriptive Analysis: Calculate measures like mean, median, mode, range, and standard deviation
4. Inferential Analysis: Apply statistical tests t-test, ANOVA, regression to test hypotheses
5. Interpretation
6. Presentation

# ❑ Interpreting data:

- The final stage involves assigning meaning to the analyzed data.

- This is where the researcher explains what the findings signify in the context of the research question and existing knowledge.

## ❑ Key Steps in Interpreting Data:

1. Link Results to Research Questions
2. Compare with Previous Studies
3. Consider Context (factors that could affect results)
4. Identify Patterns and Trends (Unexpected variations)
5. Acknowledge Limitations (Be transparent)
6. Draw Conclusions and Implications (State what the findings mean)

# ❑ Purpose of Research:

## ❖ The main purposes are:

1. To Explore :– Investigating new areas where little is known.

2. To Describe :– Providing detailed information about a phenomenon.

3. To Explain :– Understanding relationships and causes.

4. To Predict :– Using data to forecast future outcomes.

# ❑ Characteristics of Good Research:

- Systematic: Follows a structured plan.
- Logical: Based on sound reasoning.
- Empirical: Based on observation and evidence.
- Replicable: Can be repeated and verified by others.
- Ethical: Respects participants, data, and results.

# ❖ Types of Research:

- Research can be classified in several ways depending on its purpose, approach, and methodology.

1. Basic (Pure) Research: Expand scientific understanding (No need for practical. E.g. Studying the molecular structure of a new virus.)

2. Applied Research: Provide solutions for real-world issues (Developing a vaccine for a newly discovered virus).

3. Descriptive Research: Describes characteristics of a population (Determining the percentage of smokers in a city.)

4. Analytical Research: To explain reasons or relationships (Studying the relationship between smoking and lung cancer risk).

5. Qualitative Research: Uses non-numerical data to explore concepts (Interviewing patients about diabetes management).

6. Quantitative Research

7. Experimental Research

8. Observational Research

9. Cross-Sectional Research: Data collected at one point in time (A 2024 survey of dietary habits among college students)

10. Longitudinal Research: Data collected from the same subjects over time (Tracking weight changes in patients for 5 years after bariatric surgery).

# ❖ The Research Process:

- Is a systematic sequence of steps that guide researchers from identifying a problem to reporting results.

- Understanding this process helps ensure that research is organized, valid, and reliable.

✓ Identification of the Research Problem.

✓ Literature Review.

✓ Formulating Hypotheses or Research Questions (Increased salt intake is associated with elevated blood pressure).

- ✓ Research Design (experimental, observstion).
- ✓ Data Collection.
- ✓ Data Analysis.
- ✓ Drawing Conclusions and Recommendations
- ✓ Reporting and Presentation
- ✓ Review and Publication (Optional)

# ❖ Importance of Research:

1. Improves knowledge and understanding.
2. Helps solve societal, environmental, and economic problems.
3. Supports evidence-based decision-making.
4. Drives innovation and technology.

## ❖ Examples of Research in Different Fields:

- Biology:– Studying the genetic basis of disease.
- Engineering:– Developing eco-friendly building materials.
- Education:– Testing new teaching strategies.
- Health Sciences:– Evaluating new vaccines.
- Public health studies to reduce malaria in rural areas.

# References


1. National Commission for the Protection of Human Subjects of Biomedical and Behavioral Research. (1979). The Belmont Report.
2. World Medical Association. (2013). Declaration of Helsinki.
3. Council for International Organizations of Medical Sciences (CIOMS). (2016). International Ethical Guidelines for Health-related Research Involving Humans.


# Thanks