MCA

The Scientific Method and

Research Ethics of Research

Steps, Characteristics, Importance, Ethics, and Integrity

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LECTURE 2

Agenda

1. **Steps of the Scientific Method**
2. **Characteristics of Scientific Research**
3. **Importance of the Scientific Method in Research**
4. **Ethical Issues in Research**
5. **Integrity in Research**
6. **Codes of Conduct for Researchers**
7. **Real-life Examples and Case Studies**
8. **Quiz**

The Scientific Method Overview

Definition: A systematic process for investigating phenomena and acquiring new knowledge.

Example: Solving everyday problems using a structured approach.

Steps of the Scientific Method

1. **Observation:** Identify a phenomenon or problem.(cyber attacks)
2. **Question:** Formulate a research question or hypothesis.(solve using ai)
3. **Hypothesis:** Propose a tentative explanation.
4. **Experiment:** Design and conduct experiments to test the hypothesis.
5. **Analysis:** Analyze the data and draw conclusions.
6. **Conclusion:** Determine whether the hypothesis is supported or refuted.
7. **Report:** Share the findings with the scientific community.

Example of Scientific Method in Daily Life

Scenario: Your plant is not growing well.

1. **Observation:** Plant looks unhealthy.
2. **Question:** Why is my plant not growing?
3. **Hypothesis:** The plant is not getting enough sunlight.
4. **Experiment:** Move the plant to a sunnier spot and monitor growth.
5. **Analysis:** Compare growth before and after moving the plant.
6. **Conclusion:** Plant growth improved in sunlight.
7. **Report:** Share findings with a gardening group

Characteristics of Scientific Research

1. Systematic and logical approach
2. Empirical evidence (based by observation or experience)
3. Replicability .. find example
4. Objectivity and unbiased find example
5. **Example:** Consistently measuring temperature with a thermometer.

Importance of the Scientific Method in Research

- Ensures reliable and valid results
- Promotes transparency and accountability
- Facilitates peer review and validation
- **Case Study:** Development of vaccines using rigorous scientific methods.

Research Ethics and Integrity

Ethical Issues in Research

- Informed consent
- Confidentiality and privacy
- Avoidance of harm to participants
- **Example:** Ensuring participants understand the risks in a clinical trial.

Integrity in Research

- Honesty in data collection and reporting
- Avoiding fabrication and falsification
- Proper attribution and avoiding plagiarism
- Properly citing sources and giving credits

- **Example:** Accurately reporting survey results without manipulation.

Codes of Conduct for Researchers

Adherence to institutional and legal guidelines

Ethical treatment of human and animal subjects

Responsible publication practices

Case Study: The Tuskegee Syphilis Study and its ethical violations.

Real-life Example of Research Ethics

Scenario: Conducting a survey on students' study habits.

- Obtain informed consent from participants.
- Ensure data privacy and confidentiality.
- Report findings truthfully, even if they are unexpected.

QUIZ

Question 1: What is the first step of the scientific method?

- a) Hypothesis
- b) Observation
- c) Experiment
- d) Conclusion

QUIZ

Question 2: Which characteristic ensures that research can be repeated and verified by others?

- a) Objectivity
- b) Replicability
- c) Empirical evidence
- d) Systematic approach

QUIZ

Question 3: Which of the following is an example of research integrity?

- a) Fabricating data to support a hypothesis
- b) Properly citing sources and giving credit and notifying the subjects about the experiment.
- c) Ignoring unexpected results
- d) Hiding negative findings

Summary

Recap of key points: Steps of the scientific method, characteristics and importance, ethical issues, integrity, and codes of conduct.

Emphasize the importance of following a structured approach and maintaining high ethical standards in research.