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0.1 5a) Characteristics of Research

Research is a systematic process aimed at discovering new knowledge, solving problems, or answering specific questions. Key characteristics include:

- 1. **Systematic Approach:** Research follows a structured and organized methodology.
- 2. **Objective and Logical:** Conclusions are based on factual evidence and logical reasoning.
- 3. **Empirical:** Research is based on real-world observations and data.
- 4. **Replicable:** Methods and findings can be repeated and verified by others.
- 5. **Controlled:** Efforts are made to minimize the influence of extraneous variables.
- 6. **Critical Thinking:** Research involves analytical thinking and evaluation of results.
- 7. **Innovative:** It aims to explore new areas or improve existing understanding.
- 8. **Ethical:** It adheres to ethical standards in data collection, analysis, and reporting.

0.2 5b) Difference Between ‘Fundamental’ and ‘Applied’ Research

Aspect	Fundamental Research	Applied Research
Purpose	To gain knowledge and understand phenomena	To solve practical problems
Focus	Theoretical frameworks	Real-world application
Outcome	New theories, models, or principles	Practical solutions, products, or techniques
Nature	Exploratory and explanatory	Problem-solving and implementation
Example	Study of quantum mechanics	Development of a new drug using quantum theory

0.3 5c) Example of Research Hypothesis

Problem Statement:

Does the use of spaced repetition improve long-term retention of academic content in college students?

Research Hypothesis:

Students who use spaced repetition for studying will retain more academic content after 4 weeks

than those who use traditional cramming methods.

0.4 5d) Good Practices for Literature Survey

1. **Define Scope Clearly:** Know what to search for—topics, keywords, and boundaries.
 2. **Use Reliable Sources:** Prefer peer-reviewed journals, books, and reputed databases (e.g., IEEE Xplore, PubMed).
 3. **Organize Sources:** Use reference managers like Zotero or Mendeley.
 4. **Take Structured Notes:** Summarize key points, methodologies, and findings.
 5. **Identify Gaps:** Look for areas not yet explored or needing further research.
 6. **Be Critical:** Evaluate the methodology and conclusions of each study.
 7. **Stay Updated:** Regularly check for new publications in your area.
 8. **Avoid Plagiarism:** Always cite sources correctly.
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0.5 a) Steps Involved in Carrying Out a Research

1. **Identify the Problem:** Define the issue or area of interest clearly.
 2. **Review Literature:** Explore existing research to understand current knowledge and gaps.
 3. **Formulate Objectives and Hypotheses:** Define what the research aims to achieve and propose hypotheses.
 4. **Design the Research:** Choose the type (qualitative, quantitative, or mixed), methods, and tools.
 5. **Collect Data:** Gather data through surveys, experiments, observations, or other methods.
 6. **Analyze Data:** Use statistical or thematic methods to interpret the data.
 7. **Draw Conclusions:** Evaluate findings in relation to the research objectives or hypotheses.
 8. **Report and Present Results:** Document the process, findings, and implications.
 9. **Review and Reflect:** Assess limitations, ethical aspects, and future research directions.
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0.6 b) Ethical Considerations in Research and Their Importance

0.6.1 Key Ethical Considerations:

- **Informed Consent:** Participants must voluntarily agree with full understanding of the study.
- **Confidentiality:** Personal data and identity must be protected.
- **No Harm Principle:** Avoid physical, psychological, or social harm to participants.
- **Integrity and Honesty:** Avoid falsifying data or plagiarizing content.
- **Transparency:** Clearly disclose funding sources, conflicts of interest, and research intentions.

0.6.2 Importance:

- Ensures **public trust** in research.
- Protects the **rights and dignity** of participants.
- Maintains **credibility** and **reputation** of researchers and institutions.
- Supports **valid and reliable** research outcomes.

0.7 c) Importance of Literature Review and Its Role in Formulating Research Objectives

0.7.1 Importance:

- **Identifies Research Gaps:** Helps spot areas that require further investigation.
- **Avoids Duplication:** Ensures the research is original and builds on previous studies.
- **Provides Context:** Frames the study within existing knowledge and theory.
- **Supports Methodology Choice:** Offers insights into best practices and proven methods.

0.7.2 Contribution to Research Objectives:

- Helps refine the **problem statement**.
 - Clarifies **research questions and goals**.
 - Informs the **development of hypotheses**.
 - Guides the **scope and direction** of the study.
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0.8 d) What is a Hypothesis in Research?

A **hypothesis** is a testable prediction or educated guess about the relationship between variables.

0.8.1 Types of Hypotheses in Scientific Studies:

1. Null Hypothesis (H_0):

- States that there is *no effect* or *no relationship* between variables.
- Example: “There is no difference in test scores between students who study with music and those who don’t.”

2. Alternative Hypothesis (H_1 or H_a):

- Suggests that there *is an effect* or *relationship*.
- Example: “Students who study with music score differently than those who don’t.”

3. Directional Hypothesis:

- Specifies the expected direction of the relationship.
- Example: “Students who study with music perform *worse* than those who don’t.”

4. Non-directional Hypothesis:

- Suggests a relationship exists but doesn’t specify the direction.
- Example: “There is a difference in performance between students who study with and without music.”

5. Statistical Hypothesis:

- Used in hypothesis testing involving quantitative data.

6. Research Hypothesis:

- A general statement of expectation based on theory or observation.
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