

# GEO305

## RESEARCH METHOD I



Course video is available on our app

**Course code: GEO 305**

**Course title: Research Method I**

**Course credit load: 2 Units**

**Series 1: Foundations of Research in Geography**

## **1.1 Concept of Research in Geography**

- 1.1.1 Definition of research
- 1.1.2 Importance of research in geography
- 1.1.3 Characteristics of scientific research

## **1.2 Basic Elements of Research Methods**

- 1.2.1 Research problems and objectives
- 1.2.2 Variables and their types
- 1.2.3 Scope and limitations in geographical research

## **1.3 Types and Approaches to Research in Geography**

- 1.3.1 Qualitative and quantitative approaches
- 1.3.2 Descriptive, analytical, and experimental research
- 1.3.3 Case studies and field surveys

## **1.4 Ethical Considerations and the Role of the Geographer**

- 1.4.1 Ethical principles in research
- 1.4.2 Responsibilities of the researcher
- 1.4.3 Application of research findings in geography

## **Introduction**

Research is central to the growth of knowledge in geography, as it provides systematic ways of asking questions about the world and finding reliable answers. Imagine trying to explain why certain regions experience flooding more frequently than others without a structured approach. Without research, such explanations would remain speculative and incomplete. This Series sets the foundation for our journey into research methods, helping us to appreciate how geographical investigations are framed, conducted, and applied.

The aim of this Series is to introduce us to the fundamental principles of research in geography and to equip you with the skills needed to define concepts, identify problems, and recognise the essential elements that make research both scientific and meaningful.



We shall commence this Series by exploring the concept of research in geography, including its definition, importance, and scientific characteristics. Next, we will examine the basic elements of research methods, focusing on problems, objectives, and variables. Following that, we will move on to the different types and approaches to research in geography, such as qualitative, quantitative, descriptive, and experimental methods. Finally, we will wrap up by considering ethical issues and the role of the geographer in applying research responsibly. This sequential flow will ensure that we build a strong foundation before progressing to more advanced aspects of research in later Series.

## Series Learning Outcomes

**Upon completing this Series, you should be able to:**

- **SLO 1.1** define the concept of research in geography
- **SLO 1.2** explain the importance of research and identify the characteristics of scientific research
- **SLO 1.3** describe the basic elements of research methods including problems, objectives, and variables
- **SLO 1.4** analyse different types and approaches to research in geography such as qualitative, quantitative, descriptive, and experimental methods
- **SLO 1.5** evaluate ethical considerations and demonstrate the role of the geographer in applying research responsibly.

## 1.1 Concept of Research in Geography

Research is the systematic process of investigating questions, problems, or phenomena in order to generate new knowledge or validate existing ideas. In geography, research provides the framework for exploring spatial patterns, human–environment interactions, and the processes that shape our world. Without research, geographical explanations would remain speculative and fragmented.

### 1.1.1 Definition of research

**Research** is a structured and organised inquiry aimed at discovering, interpreting, or revising facts, theories, and applications. In geography, it involves collecting data about physical and human environments, analysing relationships, and drawing conclusions that can inform planning and decision-making.



## DEFINITION OF RESEARCH IN GEOGRAPHY

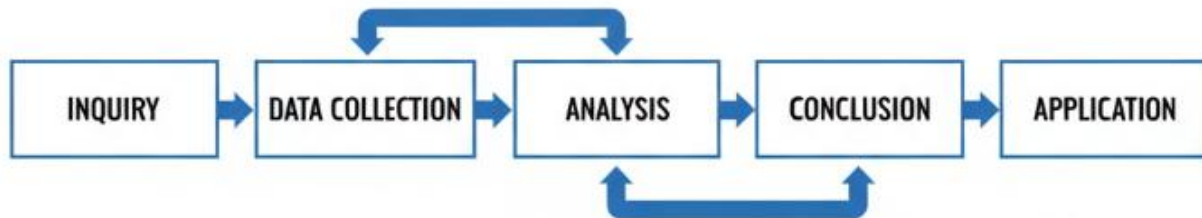


Figure 1.1 Definition of research in geography represented as a flow diagram

Fill in the blank: Research is a structured and organised \_\_\_\_\_ aimed at discovering or revising facts and theories.

### 1.1.2 Importance of research in geography

Research in geography is important because it helps explain spatial variations, supports environmental management, and guides policy decisions. For example, studying patterns of urban growth can inform sustainable city planning. It also contributes to academic advancement by refining theories and methods.

**Importance of systematic inquiry:** Systematic inquiry ensures that findings are reliable, reproducible, and applicable to real-world problems.





Plate 1.1 Example of a geographical research field survey

Fill in the blank: Studying patterns of \_\_\_\_\_ growth can inform sustainable city planning.

### 1.1.3 Characteristics of scientific research

Scientific research in geography is distinguished by several characteristics:

- **Objectivity:** Findings are based on evidence rather than personal opinion.



- **Systematic approach:** Steps are organised logically from problem identification to conclusion.
- **Replicability:** Methods can be repeated by other researchers to verify results.
- **Empirical basis:** Data are collected through observation, measurement, or experimentation.

| Characteristic                            | Description                                                                                                                                                                      |
|-------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>1. Spatial Orientation</b>             | The primary hallmark of geographic research. It focuses on <b>location, distribution, and spatial patterns</b> , asking "where" things are and "why" they are there.             |
| <b>2. Empirical Observation</b>           | Relies on <b>verifiable evidence</b> gathered through fieldwork, remote sensing, or archival data. It emphasizes "truth-seeking" through observable facts rather than intuition. |
| <b>3. Systematic &amp; Logical</b>        | Follows a structured process (inductive or deductive) using <b>logical reasoning</b> to connect observations with broader theories or laws.                                      |
| <b>4. Replicability &amp; Objectivity</b> | Research designs must be transparent so that other scholars can <b>repeat the study</b> to verify findings, ensuring that conclusions are not based on personal bias.            |

#### Key characteristics of scientific research in geography

- Objectivity: evidence-based conclusions
- Systematic approach: logical sequence of steps
- Replicability: methods can be repeated
- Empirical basis: data from observation or measurement

Fill in the blank: A research method that can be repeated by other researchers to verify results is said to be \_\_\_\_\_.

#### Pilot questions 1.1

1. Research in geography can be defined as:
  - a. Guesswork about spatial patterns
  - b. Structured inquiry into geographical phenomena
  - c. Random collection of facts
  - d. Personal opinion about places



2. Which of the following is an example of the importance of research in geography?
- Explaining myths about rivers
  - Studying urban growth for sustainable planning
  - Collecting random stories about landscapes
  - Guessing why climates vary
3. Which characteristic of scientific research ensures that findings are based on evidence rather than personal opinion?
- Replicability
  - Objectivity
  - Empirical basis
  - Systematic approach
1. Fill in the blank: Research in geography is important because it helps explain \_\_\_\_\_ variations and supports environmental management.
2. Match the characteristic of scientific research in Column A with its description in Column B.
- Objectivity → Evidence-based conclusions
  - Replicability → Methods can be repeated
  - Empirical basis → Data from observation or measurement

## 1.2 Basic Elements of Research Methods

Research methods in geography are built upon certain basic elements that guide the entire process of inquiry. These elements provide structure and ensure that the investigation is purposeful, systematic, and capable of producing reliable results. Without them, research would lack direction and clarity.

### 1.2.1 Research problems and objectives

A **research problem** is the specific issue or question that a study seeks to address. It defines the focus of the investigation and sets boundaries for what will be studied. A well-defined problem is precise, researchable, and relevant to geographical concerns.

**Research objectives** are the clear statements of what the study intends to achieve. They provide direction and serve as benchmarks for evaluating the success of the research. Objectives are usually expressed in measurable terms such as identifying, analysing, or evaluating.

Geography Research Process Flowchart



|                                                                                                                                                                                                                                                                            |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Phase-by-Phase Breakdown                                                                                                                                                                                                                                                   |
| <ul style="list-style-type: none"> <li>1. The Research Problem</li> </ul>                                                                                                                                                                                                  |
| <ul style="list-style-type: none"> <li> <ul style="list-style-type: none"> <li><b>Focus:</b> Identifying a spatial gap, environmental challenge, or social-spatial inequality.</li> </ul> </li> </ul>                                                                      |
| <ul style="list-style-type: none"> <li> <ul style="list-style-type: none"> <li><i>Example:</i> "How has urban sprawl in the last decade impacted local groundwater recharge rates in City X?"</li> </ul> </li> </ul>                                                       |
| <ul style="list-style-type: none"> <li>2. Research Objectives</li> </ul>                                                                                                                                                                                                   |
| <ul style="list-style-type: none"> <li> <ul style="list-style-type: none"> <li><b>Focus:</b> Breaking the problem into actionable "to-do" lists. These usually begin with verbs like <i>Map</i>, <i>Quantify</i>, <i>Assess</i>, or <i>Compare</i>.</li> </ul> </li> </ul> |
| <ul style="list-style-type: none"> <li> <ul style="list-style-type: none"> <li><i>Objective A:</i> Map land-cover changes from 2015–2025.</li> </ul> </li> </ul>                                                                                                           |
| <ul style="list-style-type: none"> <li> <ul style="list-style-type: none"> <li><i>Objective B:</i> Measure soil infiltration rates across different urban densities.</li> </ul> </li> </ul>                                                                                |
| <ul style="list-style-type: none"> <li>3. Data Collection (The Methodology)</li> </ul>                                                                                                                                                                                     |
| <ul style="list-style-type: none"> <li> <ul style="list-style-type: none"> <li><b>Primary Data:</b> Field surveys, GPS mapping, soil sampling, or household interviews.</li> </ul> </li> </ul>                                                                             |
| <ul style="list-style-type: none"> <li> <ul style="list-style-type: none"> <li><b>Secondary Data:</b> Satellite imagery (Landsat/Sentinel), GIS layers, or census records.</li> </ul> </li> </ul>                                                                          |
| <ul style="list-style-type: none"> <li>4. Data Analysis</li> </ul>                                                                                                                                                                                                         |
| <ul style="list-style-type: none"> <li> <ul style="list-style-type: none"> <li><b>Spatial Analysis:</b> Using GIS for overlay analysis, heat mapping, or buffer zones.</li> </ul> </li> </ul>                                                                              |
| <ul style="list-style-type: none"> <li> <ul style="list-style-type: none"> <li><b>Statistical Analysis:</b> Correlation between urban density (built-up area) and water table levels.</li> </ul> </li> </ul>                                                               |
| <ul style="list-style-type: none"> <li>5. Synthesis and Findings</li> </ul>                                                                                                                                                                                                |
| <ul style="list-style-type: none"> <li> <ul style="list-style-type: none"> <li>Answering the initial problem by visualizing the relationship between the geographic variables studied.</li> </ul> </li> </ul>                                                              |

## 1.2 Flowchart showing the relationship between research problems and objectives

Fill in the blank: A research problem is the specific \_\_\_\_\_ that a study seeks to address.



## 1.2.2 Variables and their types

A **variable** is any characteristic or attribute that can take different values in a study. In geography, variables may include temperature, population density, or land use. Variables are central to research because they allow relationships to be measured and analysed.

Types of variables include:

- **Independent variable:** the factor that is manipulated or considered as the cause.
- **Dependent variable:** the outcome or effect that is measured.
- **Control variable:** factors kept constant to avoid influencing results.

| Research Topic     | Independent Variable (The Cause)  | Dependent Variable (The Effect) | Control Variables (The Constants)                  |
|--------------------|-----------------------------------|---------------------------------|----------------------------------------------------|
| River Erosion      | Water velocity (speed of flow)    | Rate of bank erosion            | Type of rock/soil, river depth, water temperature. |
| Urban Heat Islands | Surface type (concrete vs. grass) | Surface temperature             | Time of day, weather conditions, altitude.         |
| Population Density | Distance from City Center         | Average rent/housing cost       | Quality of housing, proximity to public transit.   |
| Agricultural Yield | Amount of fertilizer used         | Crop weight/biomass             | Soil type, amount of water, seed variety.          |
| Coastal Flooding   | Sea level height                  | Inland distance of flooding     | Slope of the beach (gradient), coastal defenses.   |
| Climate Change     | CO <sub>2</sub> concentration     | Global mean temperature         | Solar radiation levels, volcanic activity.         |

Table 1.1 Types of variables in geographical research

Fill in the blank: The variable that represents the outcome or effect being measured is called the \_\_\_\_\_ variable.



### 1.2.3 Scope and limitations in geographical research

The **scope** of research refers to the extent or coverage of the study. It defines the boundaries of what will be investigated, such as the geographical area, time frame, or specific themes.

**Limitations** are the constraints or restrictions that may affect the study. These could include limited data availability, financial resources, or time constraints. Acknowledging limitations is important because it helps readers interpret findings realistically.

| Category    | Definition                                                                                                                                               | Geographical Examples                                                                                                                                                                                                                                                                                                                                                                                           |
|-------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Scope       | The boundaries within which the research is conducted. It includes the <b>spatial extent</b> , <b>timeframe</b> , and <b>specific variables</b> studied. | <ul style="list-style-type: none"><li>* <b>Spatial:</b> Studying urban heat islands specifically within the city limits of Lagos.</li><li>* <b>Temporal:</b> Analyzing shoreline changes over a 20-year period (2005–2025).</li><li>* <b>Thematic:</b> Focusing only on the impact of vegetation on soil erosion, excluding wind factors.</li></ul>                                                             |
| Limitations | Constraints or weaknesses often beyond the researcher's control that may influence the study's outcome or generalizability.                              | <ul style="list-style-type: none"><li>* <b>Data Resolution:</b> Satellite imagery may be too coarse (e.g., 30m pixels) to detect small-scale drainage issues in a neighborhood.</li><li>* <b>Accessibility:</b> High-altitude or conflict-prone regions may prevent on-site ground-truthing.</li><li>* <b>Sample Size:</b> Surveying only 50 households in a massive urban slum due to budget limits.</li></ul> |



## Box 1.2 Scope and limitations in geographical research

Fill in the blank: The constraints or restrictions that may affect a study are referred to as \_\_\_\_\_.

### Pilot questions 1.2

1. A research problem can best be described as:
    - a. A random guess about a topic
    - b. The specific issue or question a study addresses
    - c. A broad theme without focus
    - d. A personal opinion of the researcher
  2. Research objectives are important because they:
    - a. Provide direction and benchmarks for success
    - b. Replace the need for a research problem
    - c. Eliminate the need for data collection
    - d. Are optional in geographical studies
  3. The variable that is manipulated or considered as the cause in a study is the:
    - a. Dependent variable
    - b. Independent variable
    - c. Control variable
    - d. Random variable
- 
1. Fill in the blank: The variable that represents the outcome or effect being measured is called the \_\_\_\_\_ variable.
  2. Which of the following is an example of a limitation in geographical research?
    - a. Clear objectives
    - b. Limited financial resources
    - c. Defined scope
    - d. Identified variables

## 1.3 Types and Approaches to Research in Geography



Research in geography can be approached in different ways depending on the nature of the problem, the objectives, and the type of data required. These approaches provide frameworks for how investigations are carried out and how conclusions are drawn.

### 1.3.1 Qualitative and quantitative approaches

**Qualitative research** refers to investigations that focus on descriptive data such as observations, interviews, and case studies. It seeks to explain meanings, experiences, and relationships rather than numerical measurements.

**Quantitative research** involves the use of numerical data and statistical techniques to measure and analyse variables. It is often used to test hypotheses and establish patterns or correlations.



# GEOGRAPHY RESEARCH APPROACHES

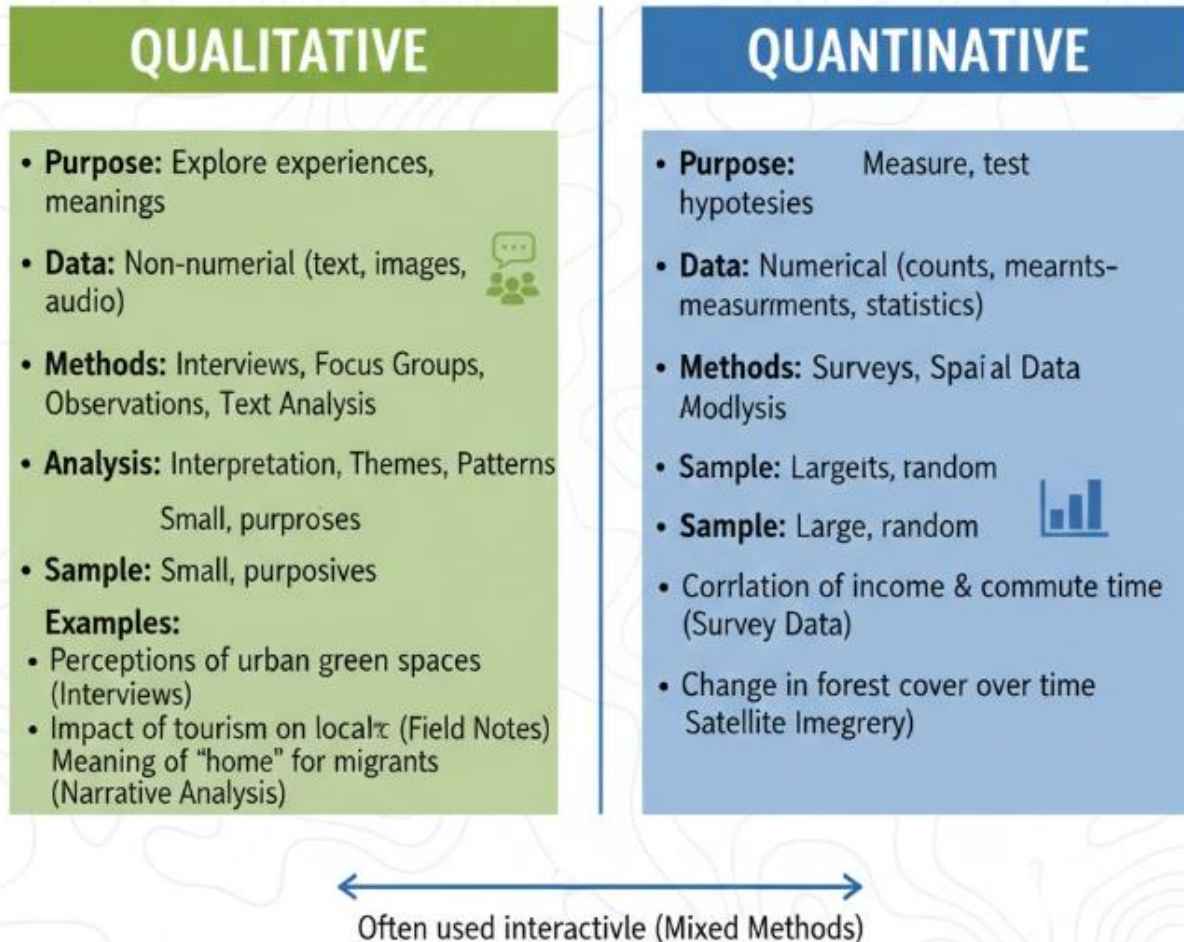


Figure 1.3 Comparison of qualitative and quantitative approaches in geography

Fill in the blank: Research that focuses on descriptive data such as interviews and case studies is called \_\_\_\_\_ research.

## 1.3.2 Descriptive, analytical, and experimental research

**Descriptive research** aims to provide a detailed account of phenomena as they exist. For example, mapping land use patterns in a city is descriptive.

**Analytical research** goes further by examining relationships and causes. For instance, analysing why certain areas experience higher population density.



**Experimental research** involves manipulating variables under controlled conditions to test hypotheses. In geography, this may include simulating erosion processes in a laboratory.



1.2 Example of experimental research in a geography laboratory

Fill in the blank: Mapping land use patterns in a city is an example of \_\_\_\_\_ research.

### 1.3.3 Case studies and field surveys

**Case study** research focuses on an in-depth examination of a single location, event, or phenomenon. It allows for detailed insights but may not be generalisable.



**Field surveys** involve systematic collection of data directly from the environment. This may include measuring rainfall, interviewing residents, or recording land use.

| Method              | Focus & Purpose                                                                                                                   | Common Geographical Examples                                                                                                                                                                                      |
|---------------------|-----------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Case Study</b>   | <b>In-depth Analysis:</b> Investigation of a specific place or event to understand the "how" and "why" of geographical processes. | <p><b>Tectonic Hazards:</b> Analyzing the social and economic impacts of the 2015 Nepal Earthquake.</p> <p><b>Urban Regeneration:</b> Assessing the success of the London Docklands redevelopment.</p>            |
| <b>Field Survey</b> | <b>Data Collection:</b> First-hand gathering of primary data using specific tools and techniques to test a hypothesis.            | <p><b>Fluvial Geography:</b> Measuring the velocity and bedload size at different points along the River Tees.</p> <p><b>Urban Geography:</b> Conducting a pedestrian count in a city center to map footfall.</p> |

Box 1.3 Case studies and field surveys in geography

Fill in the blank: An in-depth investigation of a single location or phenomenon is called a \_\_\_\_\_.

### Pilot questions 1.3

1. Research that focuses on descriptive data such as interviews is called:
  - a. Quantitative research
  - b. Qualitative research
  - c. Analytical research
  - d. Experimental research
2. Mapping land use patterns in a city is an example of:



- a. Analytical research
  - b. Experimental research
  - c. Descriptive research
  - d. Quantitative research
3. Which type of research involves manipulating variables under controlled conditions?
- a. Analytical research
  - b. Experimental research
  - c. Descriptive research
  - d. Qualitative research
4. Fill in the blank: An in-depth investigation of a single location or phenomenon is called a \_\_\_\_\_.
5. Field surveys in geography involve:
- a. Collecting data directly from the environment
  - b. Guessing based on maps
  - c. Relying only on laboratory experiments
  - d. Using only secondary sources

## 1.4 Ethical Considerations and the Role of the Geographer

Ethics are central to research because they ensure that investigations are conducted responsibly and respectfully. In geography, ethical considerations protect participants, communities, and environments from harm while promoting integrity in research.

### 1.4.1 Ethical principles in research

**Ethical principles** are standards that guide researchers in conducting fair and responsible studies. These include respect for participants, honesty in reporting, and avoidance of harm. In geographical research, this may involve obtaining consent before interviews or ensuring that sensitive data are kept confidential.

[Insert Box here]

Box 1.4 Ethical principles in geographical research

Respect for participants

Honesty in reporting

Avoidance of harm

Confidentiality of sensitive data



Fill in the blank: Ensuring that sensitive data are kept \_\_\_\_\_ is an important ethical principle in research.

### 1.4.2 Responsibilities of the researcher

The geographer has responsibilities that extend beyond data collection. These include maintaining accuracy, acknowledging sources, and ensuring that findings are used constructively. Researchers must also avoid bias and present results objectively.

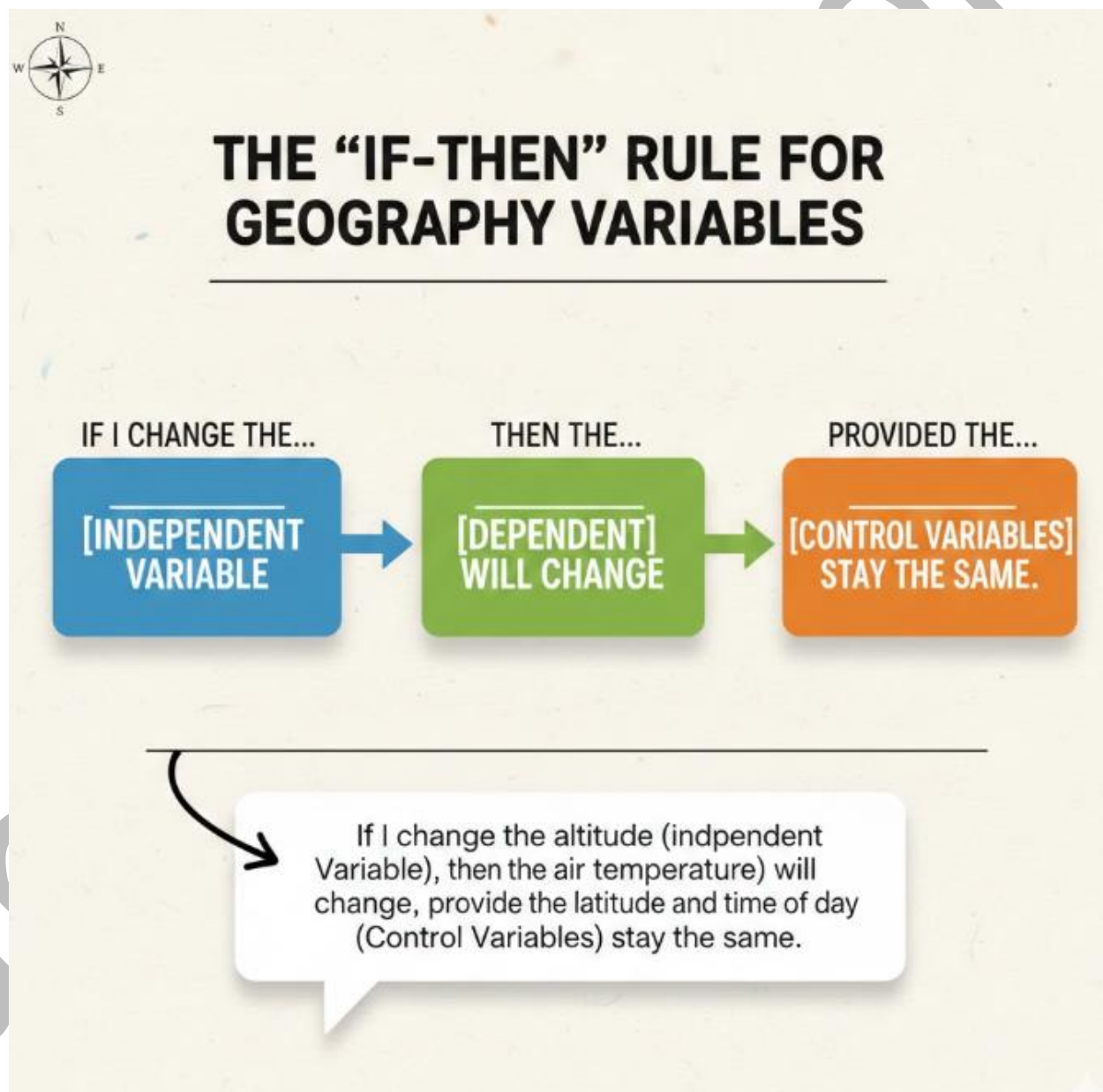


Figure 1.4 Responsibilities of a geographer in research



Fill in the blank: One responsibility of the geographer is to present results \_\_\_\_\_.

### 1.4.3 Application of research findings in geography

Research findings in geography are applied in planning, policy-making, and environmental management. For example, studies on deforestation can inform conservation strategies, while urban growth research can guide sustainable development. The role of the geographer is to ensure that findings are communicated clearly to stakeholders and used to improve society.



Plate 1.3 Application of geographical research findings in urban planning

Fill in the blank: Studies on \_\_\_\_\_ can inform conservation strategies in environmental management.



## Pilot questions 1.4

1. Which of the following is an ethical principle in geographical research?
  - a. Ignoring participants' consent
  - b. Honesty in reporting
  - c. Manipulating data for convenience
  - d. Concealing sources
2. One responsibility of the geographer is to:
  - a. Present results objectively
  - b. Avoid acknowledging sources
  - c. Focus only on personal opinions
  - d. Ignore accuracy in findings
3. Fill in the blank: Ensuring that sensitive data are kept \_\_\_\_\_ is an important ethical principle in research.
4. Which of the following is an example of applying research findings in geography?
  - a. Using deforestation studies to inform conservation strategies
  - b. Ignoring urban growth data in planning
  - c. Relying only on personal impressions of landscapes
  - d. Avoiding communication with stakeholders
5. Fill in the blank: Studies on \_\_\_\_\_ can inform conservation strategies in environmental management.

## Series Summary

This Series has introduced us to the foundations of research in geography, highlighting its purpose and relevance as the basis for systematic inquiry into spatial patterns, human–environment interactions, and geographical processes. By working through the content, we have seen how research provides clarity, direction, and reliability in geographical investigations.

We began by defining research and explaining its importance, before moving on to the basic elements such as problems, objectives, and variables. We then examined different types and approaches, including qualitative, quantitative, descriptive, analytical, experimental, case studies, and field surveys. Finally, we considered ethical principles, the responsibilities of the geographer, and the application of findings in planning and environmental management. By completing this Series, you should now be able to define research in geography, explain its importance, describe its basic elements, analyse different approaches, and evaluate ethical considerations, thereby achieving the learning outcomes set for this stage of the course.



## Glossary of Terms

**Analytical research:** A type of research that examines relationships and causes, often seeking to explain why certain phenomena occur.

**Case study:** An in-depth investigation of a single location, event, or phenomenon, providing detailed insights but with limited generalisation.

**Control variable:** A factor kept constant in a study to prevent it from influencing the results.

**Dependent variable:** The outcome or effect being measured in a study, which changes in response to the independent variable.

**Descriptive research:** Research that provides a detailed account of phenomena as they exist, without attempting to explain causes.

**Ethical principles:** Standards that guide researchers to conduct fair and responsible studies, including respect for participants, honesty, and confidentiality.

**Experimental research:** Research that involves manipulating variables under controlled conditions to test hypotheses.

**Field survey:** The systematic collection of data directly from the environment, such as measuring rainfall or interviewing residents.

**Independent variable:** The factor that is manipulated or considered as the cause in a study.

**Limitations:** Constraints or restrictions that may affect a study, such as limited data, resources, or time.

**Qualitative research:** Research that focuses on descriptive data such as observations, interviews, and case studies.

**Quantitative research:** Research that uses numerical data and statistical techniques to measure and analyse variables.

**Research objectives:** Clear statements of what a study intends to achieve, expressed in measurable terms.

**Research problem:** The specific issue or question that a study seeks to address.



**Scope:** The extent or coverage of a study, including the geographical area, time frame, and themes.

**Scientific research:** Research characterised by objectivity, systematic approach, replicability, and empirical basis.

**Variable:** Any characteristic or attribute that can take different values in a study, such as temperature or population density.

## Concept Check Questions

### Objective questions

1. Research in geography can best be defined as:
  - a. Guesswork about spatial patterns
  - b. Structured inquiry into geographical phenomena
  - c. Random collection of facts
  - d. Personal opinion about places(Linked to SLO 1.1)
2. Which of the following is an example of a dependent variable in geographical research?
  - a. Rainfall amount
  - b. Population density
  - c. Land use type
  - d. Outcome being measured(Linked to SLO 1.3)
3. Which type of research involves manipulating variables under controlled conditions?
  - a. Analytical research
  - b. Experimental research
  - c. Descriptive research
  - d. Qualitative research(Linked to SLO 1.4)
4. Which of the following is an ethical principle in geographical research?
  - a. Ignoring participants' consent



- b. Honesty in reporting
  - c. Manipulating data for convenience
  - d. Concealing sources
- (Linked to SLO 1.5)

### **Short-answer questions**

- 5. Define a research problem and explain its role in guiding a study.  
(Linked to SLO 1.3)
- 6. State one difference between qualitative and quantitative research approaches in geography.  
(Linked to SLO 1.4)
- 7. Identify two responsibilities of a geographer when conducting research.  
(Linked to SLO 1.5)

### **Long-answer questions**

- 8. Analyse the importance of research in geography by discussing how it contributes to planning and environmental management.  
(Linked to SLO 1.2)
- 9. Evaluate the characteristics of scientific research in geography and explain why they are essential for producing reliable results.  
(Linked to SLO 1.3)

## **Answers to Concept Check Questions**

### **Objective questions**

- 1. Answer: B. Structured inquiry into geographical phenomena
- 2. Answer: D. Outcome being measured
- 3. Answer: B. Experimental research
- 4. Answer: B. Honesty in reporting

### **Short-answer questions**

- 5. A research problem is the specific issue or question a study seeks to address. It guides the focus of the investigation and sets boundaries for what will be studied.
- 6. Qualitative research focuses on descriptive data such as interviews and case studies, while quantitative research uses numerical data and statistical techniques.
- 7. Responsibilities include maintaining accuracy, presenting results objectively, and ensuring findings are used constructively.



## Long-answer questions

8. **Basic response:** Research in geography is important because it explains spatial variations and supports planning and environmental management. For example, studies on urban growth can guide sustainable city development, while deforestation research informs conservation strategies.

**Value-added response:** Beyond these, research also contributes to disaster risk reduction, climate change adaptation, and socio-economic policy-making. It provides evidence-based insights that help governments and organisations design interventions that balance human needs with environmental sustainability.

9. **Basic response:** Scientific research in geography is characterised by objectivity, systematic approach, replicability, and empirical basis. These ensure that findings are evidence-based, logically organised, repeatable, and grounded in observation or measurement.

**Value-added response:** These characteristics are essential because they allow geographical research to be integrated with other disciplines, enhance credibility in policy-making, and support innovation in methods such as GIS and remote sensing. They also ensure that geographical knowledge remains relevant in addressing global challenges like climate change and urbanisation.

## Answers to Pilot Questions

### Part 1.1

1. Structured inquiry into geographical phenomena
2. Studying urban growth for sustainable planning
3. Objectivity
4. Spatial
5. Objectivity → Evidence-based conclusions; Replicability → Methods can be repeated; Empirical basis → Data from observation or measurement

### Part 1.2

1. The specific issue or question a study addresses
2. Provide direction and benchmarks for success
3. Independent variable
4. Dependent
5. Limited financial resources



### Part 1.3

1. Qualitative research
2. Descriptive research
3. Experimental research
4. Case study
5. Collecting data directly from the environment

### Part 1.4

1. Honesty in reporting
2. Present results objectively
3. Confidential
4. Using deforestation studies to inform conservation strategies
5. Deforestation

## References and Attributions

### References (APA style)

- Gregory, D., Johnston, R., Pratt, G., Watts, M., & Whatmore, S. (2009). *The dictionary of human geography* (5th ed.). Wiley-Blackwell.
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- Open University. (2019). *Research methods in geography*. OpenLearn. Retrieved from <https://www.open.edu/openlearn/>
- National Geographic Society. (2020). *Geography resources for educators*. Retrieved from <https://www.nationalgeographic.org/education>

### Illustrations and Figures

- *Figure 1: Map of World Regions* – Adapted from National Geographic Society (2020). Attribution: © National Geographic Society.
- *Figure 2: Research Cycle Diagram* – AI-generated using Microsoft Copilot. Prompt: “Generate a clear diagram of the research cycle in geography showing stages from problem identification to reporting.” Tool: Copilot Image Generation.
- *Table 1: Comparison of Qualitative and Quantitative Methods* – Adapted from Clifford et al. (2016). Attribution: © Sage Publications.
- *Box 1: Key Terms in Geographic Research* – Compiled from Cresswell (2013) and Gregory et al. (2009). Attribution: Author synthesis.



## Open Educational Resources (OERs)

- OpenLearn (Open University). *Research methods in geography*. Available under Creative Commons BY-NC-SA licence.
- National Geographic Education. *Teaching resources for geography*. Available for classroom use under institutional licence.

**Course code: GEO 305**

**Course title: Research Method I**

**Course credit load: 2 Units**

**Series 2:** Selecting and Defining Research Topics

### Part 2.1: Understanding Research Topics

- **2.1.1 What is a research topic?**
- **2.1.2 Difference between a research problem and a research topic**
- **2.1.3 Importance of topic selection in academic research**

### Part 2.2: Criteria for Selecting a Topic

- **2.2.1 Relevance to the field of study**
- **2.2.2 Feasibility (time, resources, and scope)**
- **2.2.3 Originality and significance**
- **2.2.4 Avoiding overly broad or trivial topics**

### Part 2.3: Defining and Refining the Topic

- **2.3.1 Techniques for narrowing broad ideas**
- **2.3.2 Aligning the topic with research objectives**
- **2.3.3 Formulating clear and focused research questions**
- **2.3.4 Examples of well-defined vs. poorly defined topics**

## Introduction

Choosing a research topic is often the very first challenge faced by learners embarking on academic inquiry. Many students begin with broad ideas or personal interests but struggle



to refine them into clear, manageable topics that can guide meaningful research. This Series is designed to help you overcome that hurdle by showing you how to select topics that are relevant, feasible, and academically significant, while also teaching you how to define them with precision.

The aim of this Series is to equip you with the knowledge and practical skills needed to identify suitable research topics and to refine them into well-defined questions that can serve as the foundation for your study.

We shall commence this Series by exploring what research topics are and why they matter. Next, we will examine the criteria for selecting a topic, considering aspects such as relevance, feasibility, and originality. Finally, we will wrap up by learning how to define and refine your chosen topic, narrowing broad ideas into focused research questions that align with your objectives.

## Series Learning Outcomes

**Upon completing this Series, you should be able to:**

**SLO 2.1** Define a research topic and distinguish it from a research problem.

**SLO 2.2** Evaluate research topics based on criteria such as relevance, feasibility, originality, and significance.

**SLO 2.3** Apply techniques for narrowing broad research ideas into focused, manageable topics.

**SLO 2.4** Formulate clear and answerable research questions from a well-defined topic.

**SLO 2.5** Align research topics with specific research objectives to ensure coherence and purpose.

## 2.1 Understanding Research Topics

### 2.1.1 Definition of a research topic

A **research topic** is the central idea or subject that a study seeks to investigate. It provides the focus and direction for the entire research process. Without a clearly defined topic, research can become scattered and unfocused, making it difficult to achieve meaningful outcomes. A topic is not the same as a **research problem**; while a problem identifies a gap or challenge, the topic frames the specific area of inquiry.

Fill in the blank: A research topic is the \_\_\_\_\_ idea or subject that guides a study.



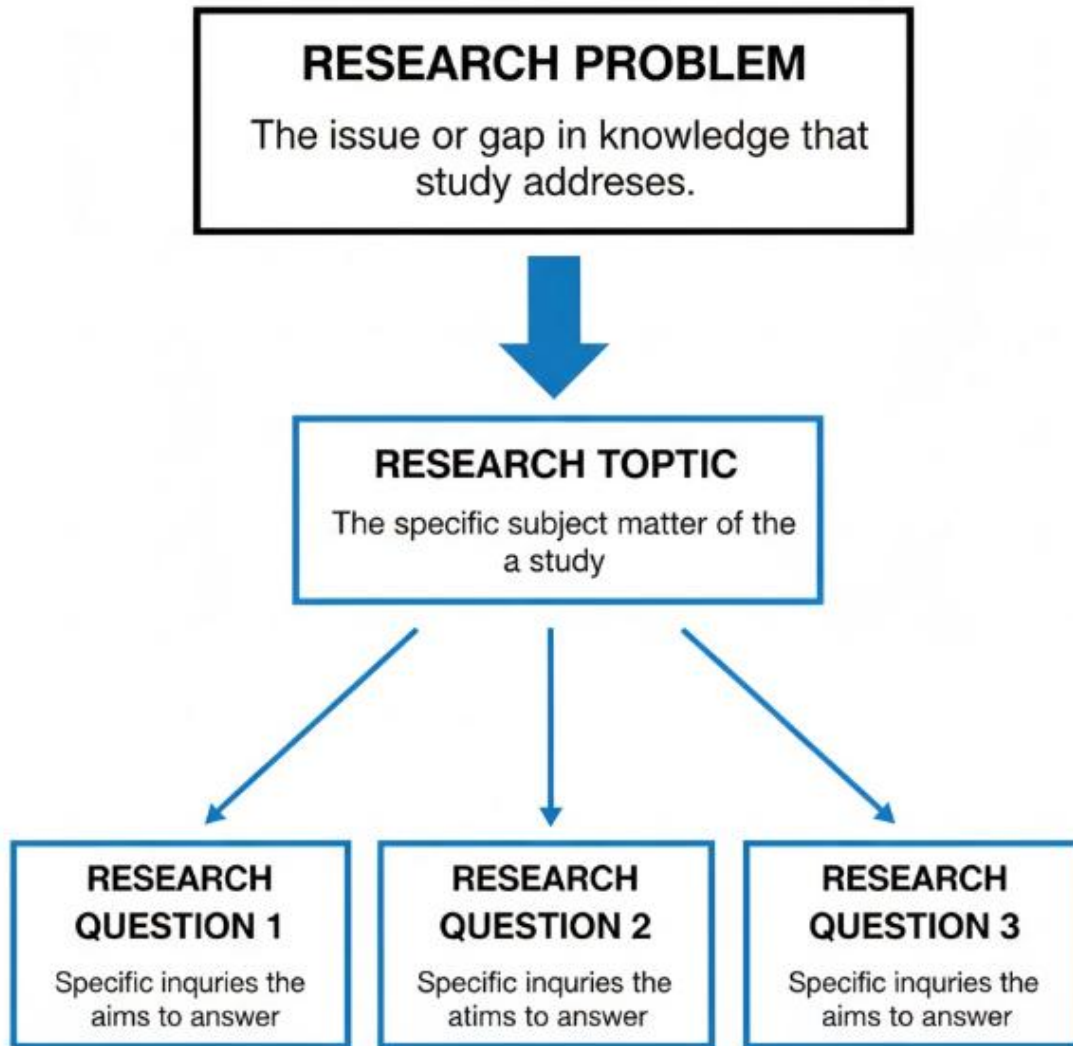


Figure 2.1 Relationship between research problem, research topic, and research questions

**Pilot questions:**

- How would you explain the difference between a research topic and a research problem in your own words?
- If you were asked to study “climate change,” how could you frame it as a research topic rather than a vague idea?



## 2.1.2 Importance of topic selection

Selecting the right topic is crucial because it determines the relevance and quality of your research. A well-chosen topic ensures that your study contributes to knowledge, addresses real-world issues, and remains manageable within the available time and resources. Poor topic selection often leads to frustration, wasted effort, and inconclusive findings.

Fill in the blank: A well-chosen topic ensures that research is \_\_\_\_\_, manageable, and contributes to knowledge.



Plate 2.1 Brainstorming potential research topics



### Pilot questions:

- Why do you think feasibility is an important factor when choosing a research topic?
- Imagine you have only three months to complete a project. What kind of topic would be realistic for you to select?

### 2.1.3 Difference between a research problem and a research topic

A **research problem** is a specific issue, gap, or challenge that requires investigation, while a **research topic** is the broader area within which the problem is situated. For example, the problem might be “low literacy rates among rural children,” while the topic could be “educational development in rural communities.” Understanding this distinction helps you avoid confusing the scope of your study.

Fill in the blank: A research problem identifies a gap or challenge, while a research topic frames the \_\_\_\_\_ area of inquiry.

| Research Topic        | Research Problem                                                                                                                                           |
|-----------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. Renewable Energy   | High installation costs and low battery efficiency are preventing rural communities in developing nations from adopting solar power.                       |
| 2. Urban Food Deserts | Low-income residents in downtown areas have limited access to fresh produce, leading to higher rates of diet-related illnesses compared to suburban areas. |
| 3. Online Education   | There is a significant lack of data on how prolonged screen time affects the intrinsic motivation of primary school students in virtual classrooms.        |

Box 2.1 Example of research problem vs. research topic

### Pilot questions:

- Can you think of a research problem in your field of study and suggest a broader topic it belongs to?



- Why is it important to distinguish between the problem and the topic before starting research?

## 2.2 Criteria for Selecting a Topic

### 2.2.1 Relevance to the field of study

A good research topic must be **relevant**, meaning it contributes to the discipline and connects with current debates or practical issues. Relevance ensures that your work is meaningful to both academic and professional audiences.

Fill in the blank: A topic is considered \_\_\_\_\_ when it contributes to the discipline and connects with current debates.

#### Pilot questions:

- Why is relevance important when selecting a topic in your field?
- Can you think of a topic that is popular but not academically relevant?

| Relevant Research Topics<br>(Focused & Actionable)                                                            | Irrelevant Research Topics (Vague or Out of Scope)                                                                                               |
|---------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Analyzing the impact of urban green spaces</b> on local surface temperatures in Chicago from 2015 to 2025. | <b>The history of the Earth.</b> (Too broad; lacks specific focus and manageable timeframe).                                                     |
| <b>Evaluating the effectiveness of mangrove restoration</b> in reducing coastal erosion in the Niger Delta.   | <b>Why plants are green.</b> (A biological question that lacks a geographic or spatial problem-solving angle).                                   |
| <b>Mapping the relationship between income levels and access to healthy food</b> in South London using GIS.   | <b>A list of all the countries in the world and their capitals.</b> (Purely descriptive/encyclopedic; contains no research problem or analysis). |

Box 2.2 Examples of relevant vs. irrelevant topics

### 2.2.2 Feasibility (time, resources, and scope)



A topic must be **feasible**, meaning it can be researched within the available time, resources, and scope. Ambitious topics may sound appealing but can quickly become overwhelming if they require data or resources beyond your reach.

Fill in the blank: A feasible topic is one that can be researched within the available \_\_\_\_\_, resources, and scope.

**Pilot questions:**

- What factors might make a topic unfeasible for a student researcher?
- If you had limited access to funding, how would that affect your choice of topic?

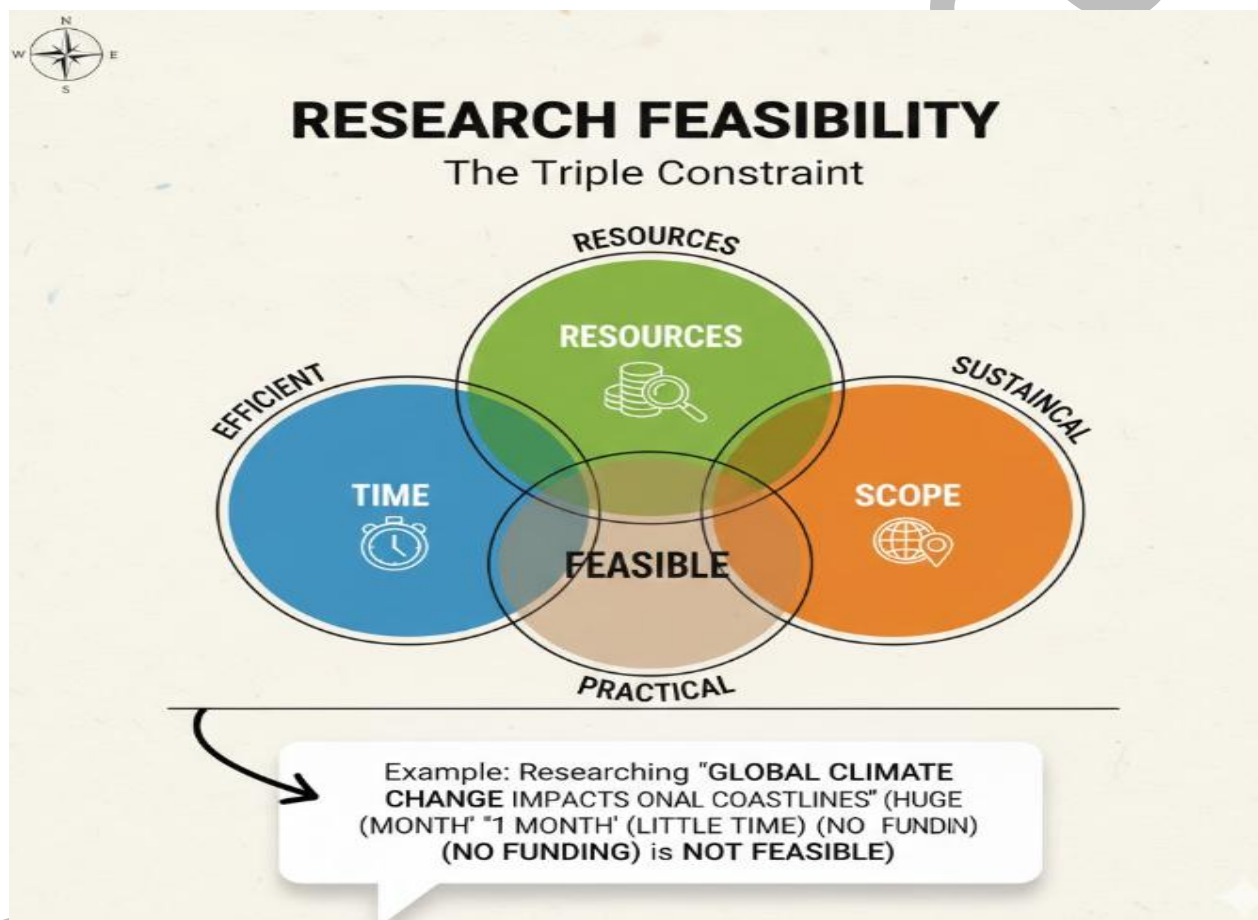


Figure 2.2 Key factors influencing feasibility of a research topic

### 2.2.3 Originality and significance

A strong topic should demonstrate **originality**, meaning it offers new insights or approaches, and **significance**, meaning it addresses important questions or problems.



Originality does not always mean inventing something entirely new; it can involve applying existing ideas in fresh contexts.

Fill in the blank: A topic is significant when it addresses important \_\_\_\_\_ or problems in the field.

**Pilot questions:**

- How can a student ensure their topic is original without being unrealistic?
- Why is significance valued more highly than novelty in some disciplines?



Plate 2.2 Sharing original research ideas

## 2.3 Defining and Refining the Topic

### 2.3.1 Techniques for narrowing broad ideas



Broad topics often need to be narrowed down to make them manageable. Techniques include focusing on a specific population, timeframe, or geographic area. For example, instead of “education,” you might study “the impact of mobile learning on secondary school students in Lagos.”

Fill in the blank: Narrowing a topic often involves focusing on a specific \_\_\_\_\_, timeframe, or geographic area.

**Pilot questions:**

- How would you narrow the topic “climate change” into a manageable research study?
- Why is narrowing a topic important for feasibility?

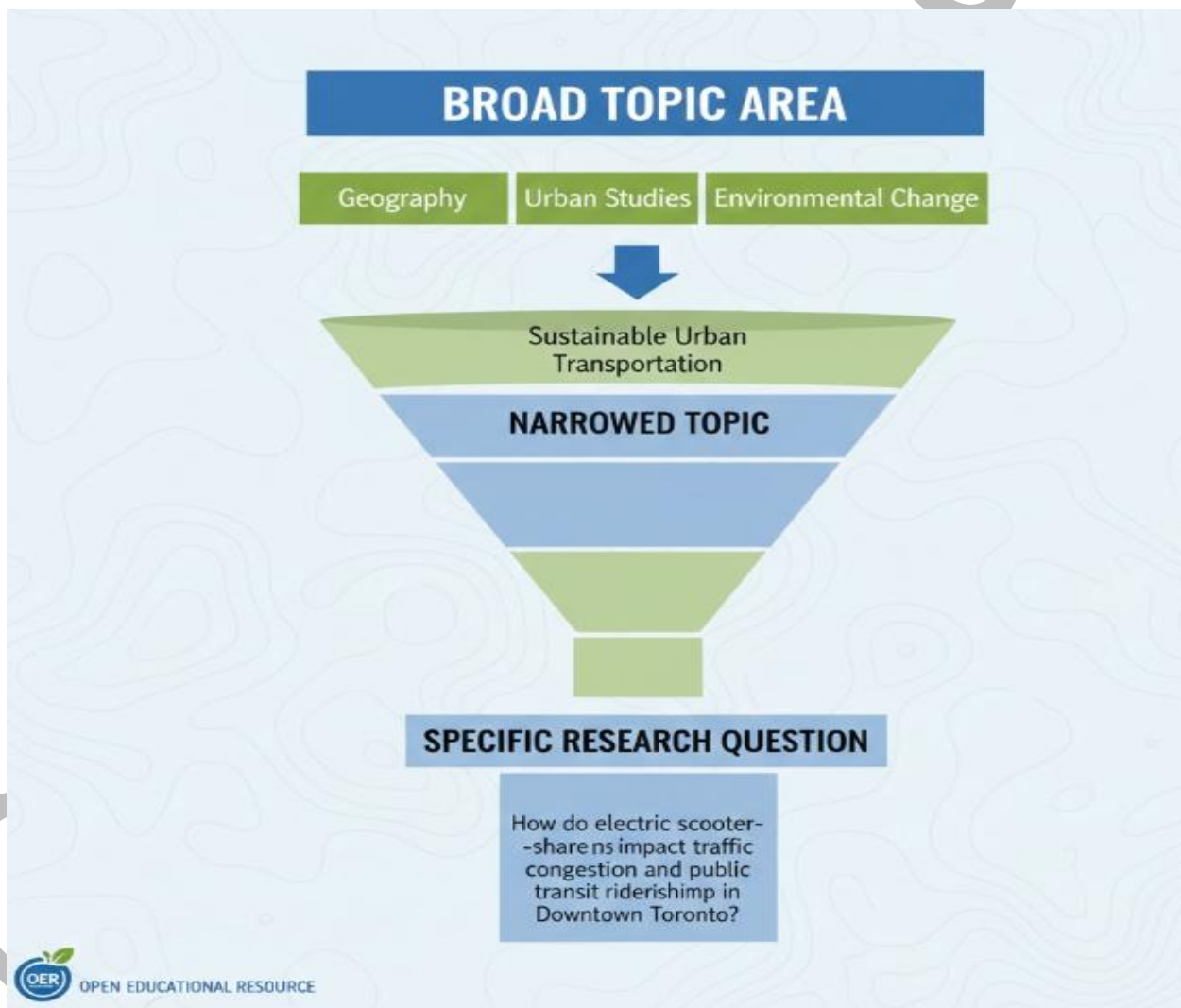


Figure 2.3 Narrowing a broad topic into a specific research focus



### 2.3.2 Aligning with research objectives

A topic must align with your **research objectives**, which are the specific goals you intend to achieve. Misalignment can lead to confusion and wasted effort. Objectives act as a compass, guiding the scope and direction of your study.

Fill in the blank: Research objectives act as a \_\_\_\_\_, guiding the scope and direction of your study.

#### Pilot questions:

- How can you check if your topic aligns with your objectives?
- What risks arise when a topic does not match the objectives?

| Research Topic                           | Research Objectives                                                                                                                                                                                                                                                                                                                                                        |
|------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. Urban Heat Islands                    | <ul style="list-style-type: none"><li>* <b>To measure</b> surface temperature variations across different land-cover types in the city.</li><li>* <b>To analyze</b> the correlation between canopy cover and local microclimate cooling.</li><li>* <b>To evaluate</b> the effectiveness of "green roof" initiatives in reducing building energy consumption.</li></ul>     |
| 2. Soil Erosion in Agricultural Basins   | <ul style="list-style-type: none"><li>* <b>To quantify</b> the annual rate of topsoil loss using sediment traps and GIS mapping.</li><li>* <b>To identify</b> the primary human drivers (e.g., tillage practices) contributing to slope instability.</li><li>* <b>To model</b> future erosion scenarios based on projected increases in extreme rainfall events.</li></ul> |
| 3. Access to Healthcare in Rural Regions | <ul style="list-style-type: none"><li>* <b>To map</b> the spatial distribution of primary clinics relative to aging populations.</li></ul>                                                                                                                                                                                                                                 |



| Research Topic | Research Objectives                                                                                                                                                                                                                     |
|----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                | <p>* <b>To determine</b> the average travel time and transportation barriers for residents without private vehicles.</p> <p>* <b>To propose</b> optimal locations for new mobile health units based on population density clusters.</p> |

Box 2.3 Examples of alignment between topics and objectives

### 2.3.3 Formulating clear and focused research questions

Once a topic is defined, the next step is to develop **research questions**. These questions should be clear, specific, and answerable within the scope of your study. Good research questions transform a topic into a structured investigation.

Fill in the blank: Good research questions should be clear, specific, and \_\_\_\_\_ within the scope of the study.

#### Pilot questions:

- What makes a research question answerable?
- Can you draft one research question from the topic “social media use among university students”?





Plate 2.3 Drafting research questions from a defined topic

## Series Summary

This Series has guided you through the essential process of selecting and defining research topics, a critical step in ensuring that your study is both meaningful and achievable. By understanding what a research topic is and why it matters, you have gained the foundation needed to approach academic inquiry with clarity and confidence.

We began by exploring the definition of a research topic and distinguishing it from a research problem. We then examined the criteria for selecting a topic, focusing on relevance, feasibility, originality, and significance. Finally, we considered how to define and refine a topic, narrowing broad ideas, aligning them with objectives, and formulating clear research questions. In line with the Series Learning Outcomes, you should now be



able to identify suitable topics, evaluate them against key criteria, and refine them into focused questions that provide a strong basis for your research journey.

## **Glossary of Terms**

### **Feasibility**

The practicality of carrying out a research topic within the available time, resources, and scope.

### **Originality**

The quality of a research topic that offers new insights, perspectives, or approaches, even if it builds on existing ideas.

### **Relevance**

The extent to which a research topic contributes to the discipline and connects with current debates or practical issues.

### **Research objectives**

The specific goals a study aims to achieve, which guide the scope and direction of the research.

### **Research problem**

A specific issue, gap, or challenge that requires investigation and provides the basis for research.

### **Research questions**

Clear, specific, and answerable questions that transform a research topic into a structured investigation.

### **Research topic**

The central idea or subject that a study seeks to investigate, providing focus and direction for the research process.

### **Significance**

The importance of a research topic in addressing meaningful questions or problems within a field of study.

## **Concept Check Questions**

### **Objective Questions**



1. Fill in the blank: A research topic is the \_\_\_\_\_ idea or subject that guides a study. (Linked to SLO 2.1)
2. Which of the following is NOT a criterion for selecting a research topic?
  - a. Relevance
  - b. Feasibility
  - c. Originality
  - d. Personal preference alone (Linked to SLO 2.2)
3. True or False: A research problem and a research topic are identical concepts. (Linked to SLO 2.1)
4. Good research questions should be clear, specific, and \_\_\_\_\_ within the scope of the study. (Linked to SLO 2.3)

### Short-Answer Questions

5. Define the term **feasibility** in the context of research topic selection. (Linked to SLO 2.2)
6. Explain why originality is important when choosing a research topic. (Linked to SLO 2.2)
7. Provide one example of a broad topic and show how it can be narrowed into a manageable research focus. (Linked to SLO 2.3)
8. Distinguish between a research problem and a research topic using a simple example. (Linked to SLO 2.1)

### Long-Answer Questions

9. Discuss the importance of selecting a relevant and feasible research topic. In your answer, highlight the risks of poor topic selection. (Linked to SLO 2.2)
10. Evaluate the process of refining a research topic into clear research questions. Provide examples to illustrate how this process strengthens the research design. (Linked to SLO 2.3)

### Objective Questions

1. Central
2. Personal preference alone
3. False
4. Answerable

### Short-Answer Questions

5. Feasibility refers to the practicality of carrying out a research topic within the available time, resources, and scope.
6. Originality ensures that the research contributes new insights or perspectives, making the study valuable and distinctive.
7. Broad topic: "Education." Narrowed focus: "The impact of mobile learning on secondary school students in Lagos."
8. A research problem is a specific issue, such as "low literacy rates among rural children,"



while the research topic is the broader area, such as “educational development in rural communities.”

## Long-Answer Questions

### 9. Importance of selecting a relevant and feasible topic

- **Basic response:** Selecting a relevant and feasible topic ensures that the research contributes meaningfully to the field and can be completed within available resources. Poor topic selection may lead to wasted effort, frustration, and inconclusive findings.
- **Value-added response:** Beyond feasibility, relevance ensures alignment with current debates and professional needs. A poorly chosen topic may also affect career prospects, publication opportunities, and the credibility of the researcher. Outstanding learners may connect this to real-world examples, such as failed projects due to unrealistic scope.

### 10. Refining a topic into clear research questions

- **Basic response:** Refining involves narrowing broad ideas, aligning them with objectives, and formulating clear, specific, and answerable questions. This strengthens the research design by providing focus and direction.
- **Value-added response:** Outstanding learners may highlight that well-formulated questions also determine the choice of methodology, data collection techniques, and analysis strategies. They may provide examples from their discipline, showing how precise questions lead to impactful findings and practical applications.

## Answers to Pilot Questions

### Part 2.1 Understanding Research Topics

- A research topic is the central idea or subject that guides a study.
- A research topic frames the area of inquiry, while a research problem identifies a specific gap or challenge.
- Framing “climate change” as a research topic could be “the impact of climate change on coastal agriculture.”
- A well-chosen topic ensures research is relevant, manageable, and contributes to knowledge.

### Part 2.2 Criteria for Selecting a Topic



- Relevance is important because it ensures the topic contributes meaningfully to the discipline.
- A topic may be popular but not academically relevant if it lacks scholarly value, for example “celebrity fashion choices.”
- Feasibility means the topic can be researched within the available time, resources, and scope.
- Limited funding or access to data can make a topic unfeasible.
- Originality ensures the research adds new insights, while significance ensures it addresses important questions or problems.
- Significance is valued because it ensures the research has meaningful impact, even if the idea is not entirely new.

### Part 2.3 Defining and Refining the Topic

- Narrowing a topic often involves focusing on a specific population, timeframe, or geographic area.
- Narrowing “climate change” could be “effects of climate change on rice production in Nigeria between 2010 and 2020.”
- Research objectives act as a compass, guiding the scope and direction of the study.
- Alignment can be checked by ensuring the topic directly supports the stated objectives.
- Misalignment leads to wasted effort and unclear findings.
- Good research questions should be clear, specific, and answerable within the scope of the study.
- A sample research question from “social media use among university students” could be “How does social media use affect academic performance among undergraduate students?”

## References and Attributions

This section lists all references and attributions for Series 2: *Selecting and Defining Research Topics*. Entries are presented in APA style for clarity and consistency.

### General References

- Creswell, J. W. (2018). *Research design: Qualitative, quantitative, and mixed methods approaches* (5th ed.). Thousand Oaks, CA: Sage Publications.
- Punch, K. F. (2014). *Introduction to social research: Quantitative and qualitative approaches* (3rd ed.). London: Sage Publications.
- Open Educational Resources (OER Commons). (n.d.). Retrieved from <https://www.oercommons.org>



## Illustrations

- **Figure 2.1 Relationship between research problem, research topic, and research questions**
  - Attribution: AI-generated using prompt “Create a labelled diagram showing research problem at the top, research topic in the middle, and research questions branching below.”
  - Tool/platform: Microsoft Copilot graphic generation.
  - Suggested OER source: Search string “diagram relationship research problem topic questions OER.”
- **Plate 2.1 Brainstorming potential research topics**
  - Attribution: AI-generated using prompt “Generate an image of a student brainstorming research ideas with sticky notes and notebooks.”
  - Tool/platform: Microsoft Copilot graphic generation.
  - Suggested OER source: Search string “student brainstorming research ideas OER image.”
- **Box 2.1 Example of research problem vs. research topic**
  - Attribution: AI-generated using prompt “Create a table with two columns: research problem and research topic, with three examples.”
  - Tool/platform: Microsoft Copilot graphic generation.
  - Suggested OER source: Search string “examples research problem vs research topic OER.”
- **Box 2.2 Examples of relevant vs. irrelevant topics**
  - Attribution: AI-generated using prompt “Create a table with two columns: relevant topics and irrelevant topics, with three examples each.”
  - Tool/platform: Microsoft Copilot graphic generation.
  - Suggested OER source: Search string “examples relevant vs irrelevant research topics OER.”
- **Figure 2.2 Key factors influencing feasibility of a research topic**
  - Attribution: AI-generated using prompt “Create a Venn diagram showing time, resources, and scope overlapping to represent feasibility.”
  - Tool/platform: Microsoft Copilot graphic generation.
  - Suggested OER source: Search string “feasibility factors research topic diagram OER.”
- **Plate 2.2 Sharing original research ideas**
  - Attribution: AI-generated using prompt “Generate an image of a student presenting a unique research idea to classmates.”
  - Tool/platform: Microsoft Copilot graphic generation.
  - Suggested OER source: Search string “student presenting original research idea OER image.”
- **Figure 2.3 Narrowing a broad topic into a specific research focus**
  - Attribution: AI-generated using prompt “Create a funnel diagram showing broad topic at the top narrowing into specific research focus.”
  - Tool/platform: Microsoft Copilot graphic generation.



- Suggested OER source: Search string “diagram narrowing broad research topic OER.”
- **Box 2.3 Examples of alignment between topics and objectives**
  - Attribution: AI-generated using prompt “*Create a table with two columns: research topic and research objectives, with three examples.*”
  - Tool/platform: Microsoft Copilot graphic generation.
  - Suggested OER source: Search string “examples alignment research topic objectives OER.”
- **Plate 2.3 Drafting research questions from a defined topic**
  - Attribution: AI-generated using prompt “*Generate an image of a student writing research questions in a notebook.*”
  - Tool/platform: Microsoft Copilot graphic generation.
  - Suggested OER source: Search string “student writing research questions OER image.”

**Course code: GEO 305**

**Course title: Research Method I**

**Course credit load: 2 Units**

## **Series 3: Formulating Questions, Problems, and Hypotheses**

### **Part 3.1: Understanding and Developing Research Questions**

- 3.1.1 Definition of a research question
- 3.1.2 Characteristics of good research questions (clarity, specificity, feasibility)
- 3.1.3 Types of research questions (descriptive, comparative, causal, exploratory)
- 3.1.4 Examples of well-formulated questions

### **Part 3.2: Identifying and Defining Research Problems**

- 3.2.1 What is a research problem?
- 3.2.2 Sources of research problems (literature gaps, real-world issues, theoretical debates)
- 3.2.3 Criteria for a good research problem (significance, originality, feasibility)
- 3.2.4 Distinguishing between problems and topics

### **Part 3.3: Developing and Testing Hypotheses**

- 3.3.1 Definition of a hypothesis



- 3.3.2 Types of hypotheses (null, alternative, directional, non-directional)
- 3.3.3 Role of hypotheses in guiding research design
- 3.3.4 Examples of hypotheses linked to research questions
- 3.3.5 Importance of testing and refining hypotheses

## Introduction

Formulating clear questions, identifying research problems, and developing hypotheses are at the heart of any successful research project. Without these elements, a study lacks direction and coherence, making it difficult to produce meaningful results. This Series is designed to help you understand how questions, problems, and hypotheses work together to shape the research process.

The aim of this Series is to equip you with the ability to frame precise research questions, identify and define research problems, and develop hypotheses that guide investigation.

We shall commence this Series by exploring the nature and types of research questions. Next, we will examine how to identify and define research problems, considering their sources and criteria. Finally, we will conclude by studying hypotheses, their types, and their role in guiding research design, ensuring that questions, problems, and hypotheses are properly aligned.

### Series Learning Outcomes

**Upon completing this Series, you should be able to:**

**SLO 3.1** define a research question and identify its key characteristics (clarity, specificity, feasibility, relevance),

**SLO 3.2** classify research questions into descriptive, comparative, causal, and exploratory types,

**SLO 3.3** identify sources of research problems and evaluate them based on significance, originality, and feasibility,

**SLO 3.4** distinguish between research problems and research topics using clear examples,

**SLO 3.5** define a hypothesis and differentiate between null, alternative, directional, and non-directional hypotheses, and

**SLO 3.6** explain the role of hypotheses in guiding research design and align them with research questions and problems.

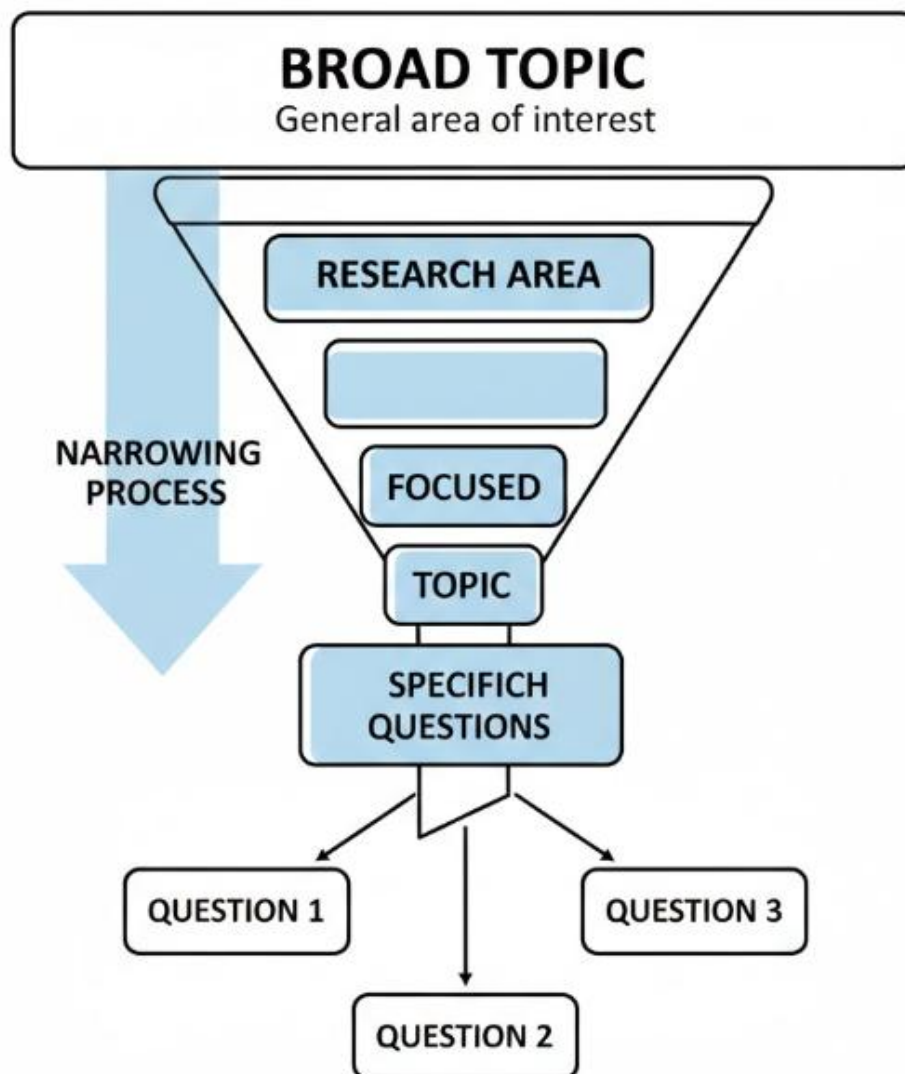
## 3.1 Understanding and Developing Research Questions



### 3.1.1 Definition of a research question

A **research question** is a clear, focused, and answerable inquiry that guides the direction of a study. It transforms a broad topic into a specific investigation, ensuring that the research remains structured and purposeful. Without well-formulated questions, research risks becoming vague and unfocused.

Fill in the blank: A research question is a clear, focused, and \_\_\_\_\_ inquiry that guides a study.



**OER**

Open Edu Research Initiative

Figure 3.1 Narrowing a topic into research questions



### Pilot questions:

- How would you explain the difference between a topic and a research question?
- Why do you think research questions are necessary for structuring a study?

### 3.1.2 Characteristics of good research questions

Good research questions are **clear** (easy to understand), **specific** (focused on a defined issue), and **feasible** (answerable within available time and resources). They should also be **relevant**, meaning they contribute to knowledge or address real-world problems.

Fill in the blank: Good research questions should be clear, specific, feasible, and \_\_\_\_\_ to the field.

| Criterion          | Description                                                                      | Example (Geography)                                                                            |
|--------------------|----------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------|
| <b>Clarity</b>     | The question is clear, easy to understand, and free of jargon.                   | "What is the relationship between park proximity and physical activity?"                       |
| <b>Specificity</b> | The question focuses on a particular location, population, or time period.       | "How has coastal erosion affected residential property values in Lagos since 2010?"            |
| <b>Feasibility</b> | The question can be answered using available resources, data, and time.          | "Can I access local climate data for this specific mountain range within a semester?"          |
| <b>Relevance</b>   | The question addresses a real-world problem or fills a gap in current knowledge. | "Does the expansion of urban heat islands disproportionately affect low-income neighborhoods?" |

Box 3.1 Checklist for evaluating research questions

### Pilot questions:

- Which of the four characteristics do you think is most difficult to achieve, and why?
- Can you give an example of a question that is clear but not feasible?



### 3.1.3 Types of research questions

Research questions can be classified into different types:

- **Descriptive questions** ask about characteristics or features (e.g., “What are the study habits of first-year students?”).
- **Comparative questions** examine differences between groups (e.g., “How do study habits differ between male and female students?”).
- **Causal questions** explore cause-and-effect relationships (e.g., “Does regular study time improve academic performance?”).
- **Exploratory questions** investigate new or less understood areas (e.g., “How do students use AI tools in learning?”).

Fill in the blank: Comparative questions examine \_\_\_\_\_ between groups, while causal questions explore cause-and-effect relationships.





Plate 3.1 Categorising types of research questions

#### Pilot questions:

- Which type of research question would be most suitable for studying the impact of mobile learning?
- Why might exploratory questions be more challenging to answer than descriptive ones?

#### 3.1.4 Examples of well-formulated questions



Examples help illustrate how broad topics can be transformed into precise questions:

- Topic: “Social media use among university students.”
  - Research question: “How does social media use affect academic performance among undergraduate students?”
- Topic: “Climate change.”
  - Research question: “What impact has climate change had on rice production in Nigeria between 2010 and 2020?”

Fill in the blank: A well-formulated research question transforms a broad \_\_\_\_\_ into a precise and answerable inquiry.

| Broad Geographic Topic | Refined Research Question                                                                                                                   |
|------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|
| Urbanization           | How has the expansion of impermeable surfaces in <b>Downtown Lagos</b> affected local street flooding frequency between 2010 and 2020?      |
| Coastal Erosion        | To what extent do different types of hard engineering (e.g., sea walls vs. groynes) reduce cliff retreat rates at <b>Holderness Coast</b> ? |
| Food Security          | What is the spatial correlation between the location of "food deserts" and household income levels in <b>South East London</b> ?            |

Box 3.2 Examples of topics and corresponding research questions

#### Pilot questions:

- Can you create one research question from the topic “renewable energy adoption in Africa”?
- Why do examples help in understanding how to formulate questions?

## 3.2 Identifying and Defining Research Problems



### 3.2.1 What is a research problem?

A **research problem** is a clearly stated issue, gap, or challenge that requires investigation. It provides the rationale for conducting a study and helps to justify why the research is necessary. Unlike a topic, which is broad, a problem pinpoints the specific aspect that needs to be addressed.

Fill in the blank: A research problem is a clearly stated \_\_\_\_\_, gap, or challenge that requires investigation.

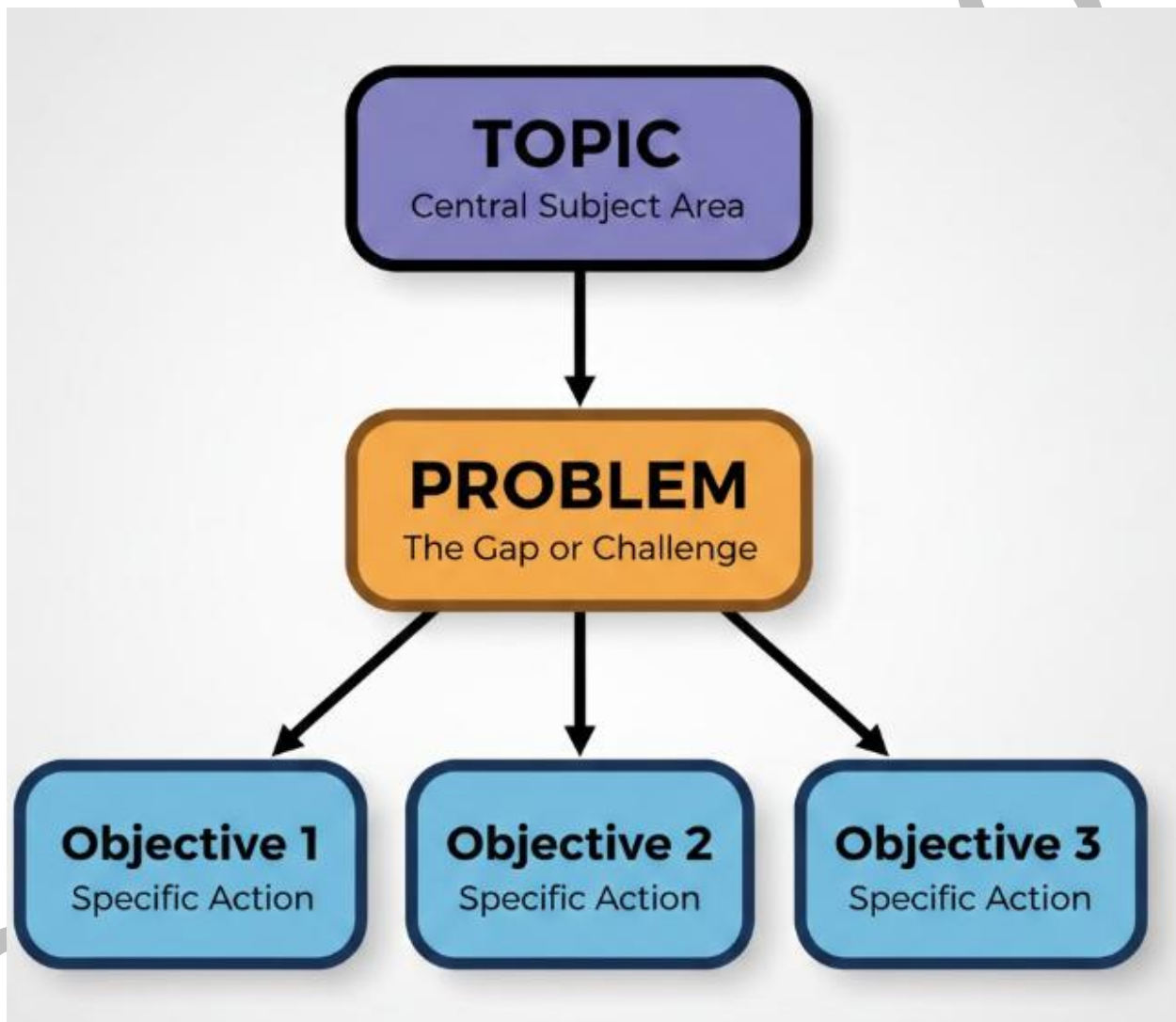


Figure 3.2 Relationship between topic, problem, and objectives

**Pilot questions:**



- Why is it important to distinguish between a topic and a problem?
- Can you think of one example of a problem within your field of study?

### 3.2.2 Sources of research problems

Research problems can arise from different sources, such as gaps in existing literature, real-world issues, or theoretical debates. Identifying these sources ensures that the problem is grounded in evidence and has practical or academic relevance.

Fill in the blank: Research problems can arise from literature gaps, real-world issues, or \_\_\_\_\_ debates.





Plate 3.2 Identifying research problems from literature

**Pilot questions:**

- Which source of research problems do you think is most common in your discipline?
- Why might real-world issues be more urgent sources of problems than theoretical debates?



### 3.2.3 Criteria for a good research problem

A good research problem should be **significant** (important to the field), **original** (not already solved), and **feasible** (researchable within available resources). These criteria ensure that the problem is worth investigating and can realistically be addressed.

Fill in the blank: A good research problem should be significant, original, and \_\_\_\_\_.

| Criterion           | Description                                                                                                                                | Key Considerations                                                                                                |
|---------------------|--------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------|
| <b>Significance</b> | The problem must be "worth solving." It should contribute to the existing body of knowledge, improve practice, or address a gap in theory. | Does this solve a real-world problem? Who benefits from the results? Does it advance the field?                   |
| <b>Originality</b>  | The research should offer a new perspective or unique contribution. It avoids simple duplication of previous work.                         | Is this a new topic? Am I using a new methodology on an old problem? Does it fill a specific "gap" in literature? |
| <b>Feasibility</b>  | The project must be realistic and manageable given the researcher's constraints and resources.                                             | Is there enough time and money? Do I have access to the data/subjects? Do I have the necessary technical skills?  |

Box 3.1 Criteria for evaluating research problems

#### Pilot questions:

- Why is feasibility just as important as originality when defining a research problem?
- Can you provide an example of a problem that is significant but not feasible?

## 3.3 Developing and Testing Hypotheses

### 3.3.1 Definition of a hypothesis

A **hypothesis** is a tentative statement that proposes a relationship between variables. It is testable and provides direction for data collection and analysis. Hypotheses are essential in quantitative research but can also guide qualitative studies.



Fill in the blank: A hypothesis is a tentative statement that proposes a \_\_\_\_\_ between variables.



### 3.3 Hypothesis linking independent and dependent variables

#### Pilot questions:

- Why must a hypothesis be testable?
- How does a hypothesis differ from a research question?

#### 3.3.2 Types of hypotheses

There are several types of hypotheses:

- **Null hypothesis ( $H_0$ ):** States there is no relationship between variables.
- **Alternative hypothesis ( $H_1$ ):** Suggests there is a relationship.
- **Directional hypothesis:** Predicts the direction of the relationship.
- **Non-directional hypothesis:** States a relationship exists but does not predict its direction.

Fill in the blank: A null hypothesis states there is \_\_\_\_\_ relationship between variables.



## Common Types of Research Hypotheses

| Type of Hypothesis                                                   | Definition                                                                                     | Example (Geography & Environment)                                                                                |
|----------------------------------------------------------------------|------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------|
| <b>Null Hypothesis (<math>H_0</math>)</b>                            | States there is no significant difference or relationship between variables.                   | There is no significant difference in soil pH levels between urban gardens and rural farms.                      |
| <b>Alternative Hypothesis (<math>H_a</math> or <math>H_1</math>)</b> | States there is a significant effect, or difference.                                           | Proximity to industrial zones is significantly correlated with higher levels of particulate matter in the air.   |
| <b>Directional Hypothesis</b>                                        | Predicts the specific nature (positive or negative) of local relationship.                     | An increase in urban space leads to a decrease in local surface temperatures.                                    |
| <b>Non-directional Hypothesis</b>                                    | An increase in relationship exists, but not specifying the direction of change, but it occurs. | The implementation of new transit will change average commute time for but it's unclear if increase or decrease. |



Box 3.2 Types of hypotheses with examples

### Pilot questions:

- Which type of hypothesis would be most suitable for testing the effect of study habits on grades?
- Why might a researcher choose a non-directional hypothesis instead of a directional one?

### 3.3.3 Role of hypotheses in guiding research design



Hypotheses guide the choice of research design, methods, and analysis. They help determine what data to collect and how to interpret results. A well-formulated hypothesis ensures that the study remains focused and systematic.

Fill in the blank: Hypotheses help determine what \_\_\_\_\_ to collect and how to interpret results.



Plate 3.3 Hypotheses guiding research design

**Pilot questions:**



- How do hypotheses influence the choice of research methods?
- Why is it important to align hypotheses with research questions and problems?

## Series Summary

This Series has focused on the essential skills of formulating research questions, identifying problems, and developing hypotheses, all of which are central to designing a coherent and meaningful study. By learning how to move from broad topics to precise questions, you have gained the ability to give structure and clarity to your research.

We began by examining the nature and types of research questions, highlighting their characteristics and role in guiding inquiry. We then explored how to identify and define research problems, considering their sources and the criteria that make them significant, original, and feasible. Finally, we studied hypotheses, their types, and their role in shaping research design. In line with the Series Learning Outcomes, you should now be able to frame clear research questions, define problems that are worth investigating, and develop hypotheses that align with your objectives, ensuring your research is both rigorous and purposeful.

## Glossary of Terms

### Alternative hypothesis ( $H_1$ )

A statement suggesting that there is a relationship between variables, often tested against the null hypothesis.

### Causal question

A type of research question that explores cause-and-effect relationships between variables.

### Comparative question

A research question that examines differences between two or more groups.

### Descriptive question

A research question that seeks to describe characteristics, patterns, or behaviours of a population or phenomenon.

### Directional hypothesis

A hypothesis that predicts not only the existence of a relationship but also the direction of that relationship.



**Feasibility**

The practicality of investigating a research problem or question within available time, resources, and scope.

**Hypothesis**

A tentative, testable statement proposing a relationship between variables, guiding data collection and analysis.

**Non-directional hypothesis**

A hypothesis that predicts a relationship exists but does not specify the direction of the relationship.

**Null hypothesis ( $H_0$ )**

A statement that assumes there is no relationship between variables, serving as the default position in statistical testing.

**Originality**

The quality of a research problem or question that introduces new insights, perspectives, or approaches.

**Relevance**

The extent to which a research question or problem contributes to knowledge and connects with current debates or practical issues.

**Research problem**

A clearly stated issue, gap, or challenge that requires investigation and provides justification for a study.

**Research question**

A clear, focused, and answerable inquiry that directs the scope and purpose of a study.

**Significance**

The importance of a research problem or question in addressing meaningful issues within a field of study.

**Concept Check Questions****Objective Questions**

1. Fill in the blank: A research question is a clear, focused, and \_\_\_\_\_ inquiry that guides a study. (Linked to SLO 3.1)
2. Which of the following is NOT a source of research problems?



- a. Literature gaps
  - b. Real-world issues
  - c. Theoretical debates
  - d. Personal hobbies without academic relevance (Linked to SLO 3.2)
3. True or False: A null hypothesis states that there is no relationship between variables. (Linked to SLO 3.3)
  4. Good research questions should be clear, specific, feasible, and \_\_\_\_\_ to the field. (Linked to SLO 3.1)

### Short-Answer Questions

5. Define a **research problem** in simple terms. (Linked to SLO 3.2)
6. Explain why feasibility is important when defining a research problem. (Linked to SLO 3.2)
7. Provide one example of a broad topic and transform it into a precise research question. (Linked to SLO 3.1)
8. Distinguish between a **null hypothesis** and an **alternative hypothesis**. (Linked to SLO 3.3)

### Long-Answer Questions

9. Discuss the characteristics of good research questions. In your answer, explain why each characteristic matters. (Linked to SLO 3.1)
10. Evaluate the role of hypotheses in guiding research design. Provide examples to illustrate how hypotheses influence methods and analysis. (Linked to SLO 3.3)

### Answers to Concept Check Questions [Series 3]

### Objective Questions

1. Answerable
2. Personal hobbies without academic relevance
3. True
4. Relevant

### Short-Answer Questions

5. A research problem is a clearly stated issue, gap, or challenge that requires investigation.
6. Feasibility ensures that the problem can realistically be studied within the available time, resources, and scope.
7. Broad topic: "Renewable energy adoption in Africa." Research question: "What factors influence renewable energy adoption among households in Lagos State?"
8. A null hypothesis states there is no relationship between variables, while an alternative hypothesis suggests that a relationship exists.



## Long-Answer Questions

### 9. Characteristics of good research questions

- **Basic response:** Good research questions are clear, specific, feasible, and relevant. Clarity ensures understanding, specificity keeps the study focused, feasibility makes the research practical, and relevance ensures contribution to knowledge.
- **Value-added response:** Outstanding learners may add that good questions also align with objectives, avoid ambiguity, and guide methodology. They may provide examples, such as comparing “What is climate change?” (too broad) with “How has climate change affected rice production in Nigeria between 2010 and 2020?” (clear and specific).

### 10. Role of hypotheses in guiding research design

- **Basic response:** Hypotheses guide the choice of methods, determine what data to collect, and help interpret results. They keep the study systematic and focused.
- **Value-added response:** Outstanding learners may explain that hypotheses also influence statistical tests, sampling strategies, and analysis techniques. For example, a directional hypothesis about study habits and grades may lead to regression analysis, while a non-directional hypothesis may require correlation tests.

## Answers to Pilot Questions

### Part 3.1 Understanding and Developing Research Questions

- A research question is a clear, focused, and answerable inquiry that guides a study.
- A topic is broad, while a research question narrows it into a specific investigation.
- Research questions are necessary because they provide structure and direction for the study.
- Good research questions should be clear, specific, feasible, and relevant to the field.
- Clarity is often easier to achieve than feasibility, which depends on resources and scope.
- An example of a clear but not feasible question: “What are the study habits of all students worldwide?”
- Comparative questions examine differences between groups, while causal questions explore cause-and-effect relationships.
- The most suitable type of question for studying the impact of mobile learning is a causal question.



- Exploratory questions are more challenging because they deal with new or less understood areas.
- A well-formulated research question transforms a broad topic into a precise and answerable inquiry.
- Example: From “renewable energy adoption in Africa,” a research question could be “What factors influence renewable energy adoption among households in Lagos State?”
- Examples help learners see how broad ideas can be refined into specific, answerable questions.

### **Part 3.2 Identifying and Defining Research Problems**

- A research problem is a clearly stated issue, gap, or challenge that requires investigation.
- It is important to distinguish between a topic and a problem because the problem identifies the specific aspect that needs to be addressed.
- Example: In education, a problem could be “low literacy rates among rural children.”
- Research problems can arise from literature gaps, real-world issues, or theoretical debates.
- The most common source of problems in many disciplines is literature gaps.
- Real-world issues may be more urgent because they have immediate practical implications.
- A good research problem should be significant, original, and feasible.
- Feasibility is just as important as originality because a problem must be researchable within available resources.
- Example: A problem may be significant but not feasible, such as “eliminating poverty worldwide within one year.”

### **Part 3.3 Developing and Testing Hypotheses**

- A hypothesis is a tentative statement that proposes a relationship between variables.
- A hypothesis must be testable so that it can be supported or refuted with evidence.
- A hypothesis differs from a research question because it predicts a relationship, while a question seeks to explore or inquire.
- A null hypothesis states there is no relationship between variables.
- The most suitable type of hypothesis for testing the effect of study habits on grades is a directional hypothesis.
- A researcher might choose a non-directional hypothesis when they expect a relationship but cannot predict its direction.
- Hypotheses help determine what data to collect and how to interpret results.
- Hypotheses influence the choice of research methods by guiding whether to use comparative, correlational, or experimental designs.



- It is important to align hypotheses with research questions and problems to ensure coherence and focus in the study.

## References and Attributions

This section lists all references and attributions for Series 3: *Formulating Questions, Problems, and Hypotheses*. Entries are presented in APA style for clarity and consistency.

### General References

- Creswell, J. W. (2018). *Research design: Qualitative, quantitative, and mixed methods approaches* (5th ed.). Thousand Oaks, CA: Sage Publications.
- Punch, K. F. (2014). *Introduction to social research: Quantitative and qualitative approaches* (3rd ed.). London: Sage Publications.
- OER Commons. (n.d.). Retrieved from <https://www.oercommons.org>

### Illustrations

- **Figure 3.1 Narrowing a topic into research questions**
  - Attribution: AI-generated using prompt “Create a funnel diagram showing broad topic at the top narrowing into specific research questions.”
  - Tool/platform: Microsoft Copilot graphic generation.
  - Suggested OER source: Search string “diagram narrowing topic into research questions OER.”
- **Box 3.1 Checklist for evaluating research questions**
  - Attribution: AI-generated using prompt “Create a checklist table with four criteria for good research questions: clarity, specificity, feasibility, relevance.”
  - Tool/platform: Microsoft Copilot graphic generation.
  - Suggested OER source: Search string “criteria for good research questions OER.”
- **Plate 3.1 Categorising types of research questions**
  - Attribution: AI-generated using prompt “Generate an image of a student sorting cards labelled descriptive, comparative, causal, exploratory into categories.”
  - Tool/platform: Microsoft Copilot graphic generation.
  - Suggested OER source: Search string “types of research questions OER image.”
- **Box 3.2 Examples of topics and corresponding research questions**
  - Attribution: AI-generated using prompt “Create a table with two columns: broad topics and refined research questions, with three examples.”
  - Tool/platform: Microsoft Copilot graphic generation.



- Suggested OER source: Search string “examples topics and research questions OER.”
- **Figure 3.2 Relationship between topic, problem, and objectives**
  - Attribution: AI-generated using prompt “*Create a diagram showing topic at the top, problem in the middle, and objectives branching below.*”
  - Tool/platform: Microsoft Copilot graphic generation.
  - Suggested OER source: Search string “diagram topic problem objectives OER.”
- **Plate 3.2 Identifying research problems from literature**
  - Attribution: AI-generated using prompt “*Generate an image of a student reading academic articles and highlighting gaps.*”
  - Tool/platform: Microsoft Copilot graphic generation.
  - Suggested OER source: Search string “student identifying research problem literature OER image.”
- **Box 3.1 Criteria for evaluating research problems**
  - Attribution: AI-generated using prompt “*Create a table listing three criteria for good research problems: significance, originality, feasibility.*”
  - Tool/platform: Microsoft Copilot graphic generation.
  - Suggested OER source: Search string “criteria for good research problems OER.”
- **Figure 3.3 Hypothesis linking independent and dependent variables**
  - Attribution: AI-generated using prompt “*Create a diagram showing independent variable leading to dependent variable with hypothesis arrow.*”
  - Tool/platform: Microsoft Copilot graphic generation.
  - Suggested OER source: Search string “hypothesis diagram independent dependent variables OER.”
- **Box 3.2 Types of hypotheses with examples**
  - Attribution: AI-generated using prompt “*Create a table with four rows showing types of hypotheses and examples.*”
  - Tool/platform: Microsoft Copilot graphic generation.
  - Suggested OER source: Search string “types of hypotheses examples OER.”
- **Plate 3.3 Hypotheses guiding research design**
  - Attribution: AI-generated using prompt “*Generate an image of a researcher planning a study with hypotheses written on a board.*”
  - Tool/platform: Microsoft Copilot graphic generation.
  - Suggested OER source: Search string “research design guided by hypotheses OER image.”



**Course code: GEO 305**

**Course title: Research Method I**

**Course credit load: 2 Units**

**Series 4: Designing Experiments and Analyzing Data**

## **Part 4.1 Principles of Experimental Design**

- **4.1.1 Definition and purpose of experimental design**
- **4.1.2 Key elements of experimental design (variables, control, randomisation, replication)**
- **4.1.3 Types of experimental designs (true, quasi, factorial, etc.)**
- **4.1.4 Examples of experimental setups**

## **Part 4.2 Collecting and Organising Data**

- **4.2.1 Methods of data collection (surveys, observation, experiments, secondary sources)**
- **4.2.2 Ensuring reliability and validity in data collection**
- **4.2.3 Organising data for analysis (coding, tabulation, data entry)**

## **Part 4.3 Analysing and Interpreting Data**

- **4.3.1 Introduction to data analysis (quantitative and qualitative approaches)**
- **4.3.2 Basic statistical tools (mean, median, correlation, regression, significance tests)**
- **4.3.3 Interpreting results and drawing conclusions**

## **Introduction**

Designing experiments and analysing data are critical stages in the research process. They provide the means to test hypotheses, validate findings, and generate evidence that supports or challenges theoretical claims. Without a sound design and proper analysis, research risks producing unreliable or invalid results.



The aim of this Series is to equip you with the skills to design experiments that are systematic and rigorous, collect and organise data effectively, and apply appropriate methods of analysis to interpret results accurately.

We shall commence this Series by exploring the principles of experimental design, including its definition, purpose, and key elements. Next, we will examine methods of data collection and organisation, focusing on reliability and validity. Finally, we will conclude by studying approaches to data analysis and interpretation, highlighting basic statistical tools and how results can be used to draw meaningful conclusions.

## Series Learning Outcomes

**Upon completing this Series, you should be able to:**

**SLO 4.1** Explain the key principles and elements of experimental design, including variables, control, randomisation, and replication.

**SLO 4.2** Differentiate between types of experimental designs (true, quasi, factorial, cross-sectional) and justify their application.

**SLO 4.3** Evaluate methods of data collection (surveys, observation, experiments, secondary sources) based on reliability and validity.

**SLO 4.4** Organise raw data for analysis using appropriate techniques such as coding, tabulation, and data entry.

**SLO 4.5** Apply basic statistical tools (mean, median, correlation, regression, significance tests) to analyse quantitative data.

**SLO 4.6** Interpret research results and draw conclusions that are statistically sound and aligned with research objectives.

## 4.1 Principles of Experimental Design

### 4.1.1 Definition and purpose of experimental design

**Experimental design** is the structured plan used to conduct research in a way that ensures valid, reliable, and unbiased results. Its purpose is to test hypotheses systematically, control variables, and provide evidence that supports or refutes claims. A well-designed experiment allows researchers to isolate the effect of specific factors and draw meaningful conclusions.

Fill in the blank: Experimental design is a structured \_\_\_\_\_ used to conduct research systematically and reliably.



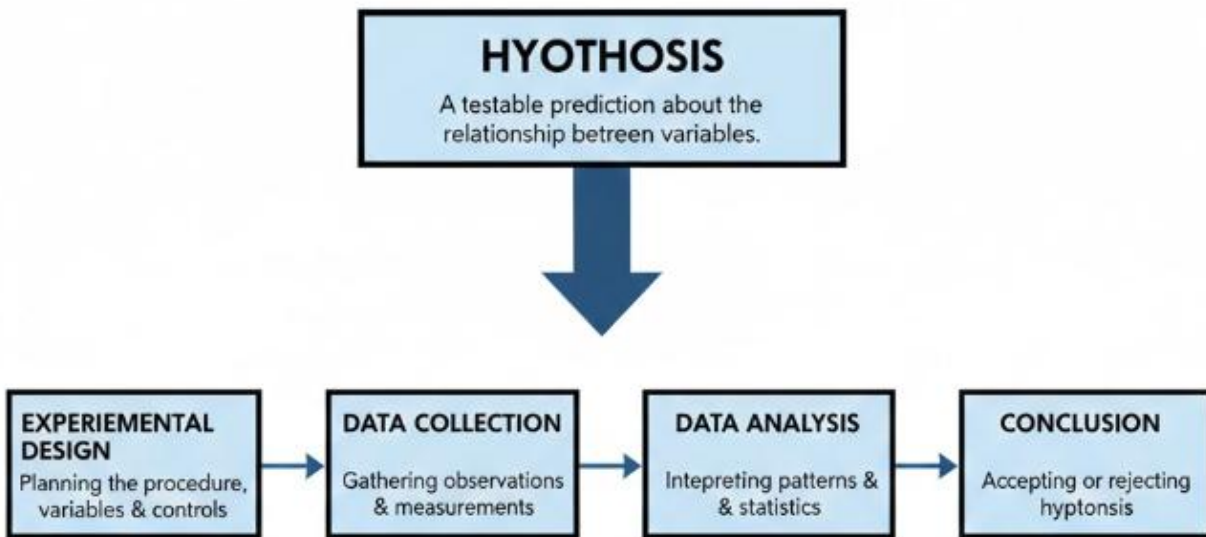


Figure 4.1 The cycle of experimental design

#### 4.1.2 Key elements of experimental design

The main elements of experimental design include:

- **Variables:** These are the factors studied in an experiment. The **independent variable** is manipulated, the **dependent variable** is measured, and **controlled variables** are kept constant to avoid interference.
- **Control:** This ensures that external factors do not influence the results, allowing the researcher to attribute changes to the independent variable.
- **Randomisation:** This involves assigning subjects randomly to groups, reducing bias and increasing the validity of findings.
- **Replication:** This means repeating experiments to confirm reliability and consistency of results.

Fill in the blank: Randomisation helps reduce \_\_\_\_\_ in experimental research.

| Element                     | Definition                                                                                                 |
|-----------------------------|------------------------------------------------------------------------------------------------------------|
| <b>Independent Variable</b> | The factor that is intentionally changed or manipulated by the researcher to observe its effect.           |
| <b>Dependent Variable</b>   | The factor that is measured or observed; it is expected to change in response to the independent variable. |



| Element                                 | Definition                                                                                                                 |
|-----------------------------------------|----------------------------------------------------------------------------------------------------------------------------|
| <b>Control Group</b>                    | A group or site that does not receive the experimental treatment, used as a baseline for comparison.                       |
| <b>Constants (Controlled Variables)</b> | Factors that are kept the same throughout the experiment to ensure that only the independent variable affects the outcome. |

Box 4.1 Key elements of experimental design

### 4.1.3 Types of experimental designs

There are several types of experimental designs:

- **True experiments:** These use random assignment and control groups, making them the most rigorous.
- **Quasi-experiments:** These lack random assignment but still test relationships between variables.
- **Factorial designs:** These test multiple variables simultaneously, allowing researchers to study interactions.
- **Cross-sectional designs:** These examine variables at a single point in time.

Fill in the blank: True experiments use random assignment and \_\_\_\_\_ groups.





Plate 4.1 Types of experimental designs in practice

#### 4.1.4 Examples of experimental setups

Examples help illustrate how designs are applied:

- Testing the effect of a new fertiliser on crop yield.
  - Independent variable: fertiliser type
  - Dependent variable: crop yield
  - Controlled variables: soil type, water, sunlight
- Studying the impact of study schedules on exam performance.



- Independent variable: study schedule
- Dependent variable: exam scores
- Controlled variables: subject content, exam duration

Fill in the blank: In an experiment testing fertiliser, the dependent variable is \_\_\_\_\_ yield.

| Research Scenario                                                                                                     | Independent Variable (The Cause)                                | Dependent Variable (The Effect)               | Controlled Variables (The Constants)                                                     |
|-----------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------|-----------------------------------------------|------------------------------------------------------------------------------------------|
| <b>Soil Infiltration Study:</b> Investigating how different land uses affect how quickly water sinks into the ground. | <b>Land Use Type</b> (e.g., forest floor vs. paved parking lot) | <b>Infiltration Rate</b> (measured in mm/min) | Soil type, initial soil moisture, and the volume of water poured into the infiltrometer. |
| <b>Microclimate Analysis:</b> Studying how urban "heat islands" vary based on distance from a city center.            | <b>Distance from City Center</b> (measured in km)               | <b>Air Temperature</b> (measured in °C)       | Time of day, height of the thermometer above the ground, and prevailing wind conditions. |

Box 4.2 Examples of experimental setups

## 4.2 Collecting and Organising Data

### 4.2.1 Methods of data collection

**Data collection** refers to the process of gathering information that will be used to answer research questions or test hypotheses. Common methods include **surveys** (structured questionnaires to gather opinions or behaviours), **observation** (watching and recording behaviours or events), **experiments** (controlled studies where variables are manipulated), and **secondary sources** (using existing data such as government reports or published studies).

Fill in the blank: The process of gathering information to answer research questions or test hypotheses is called \_\_\_\_\_.



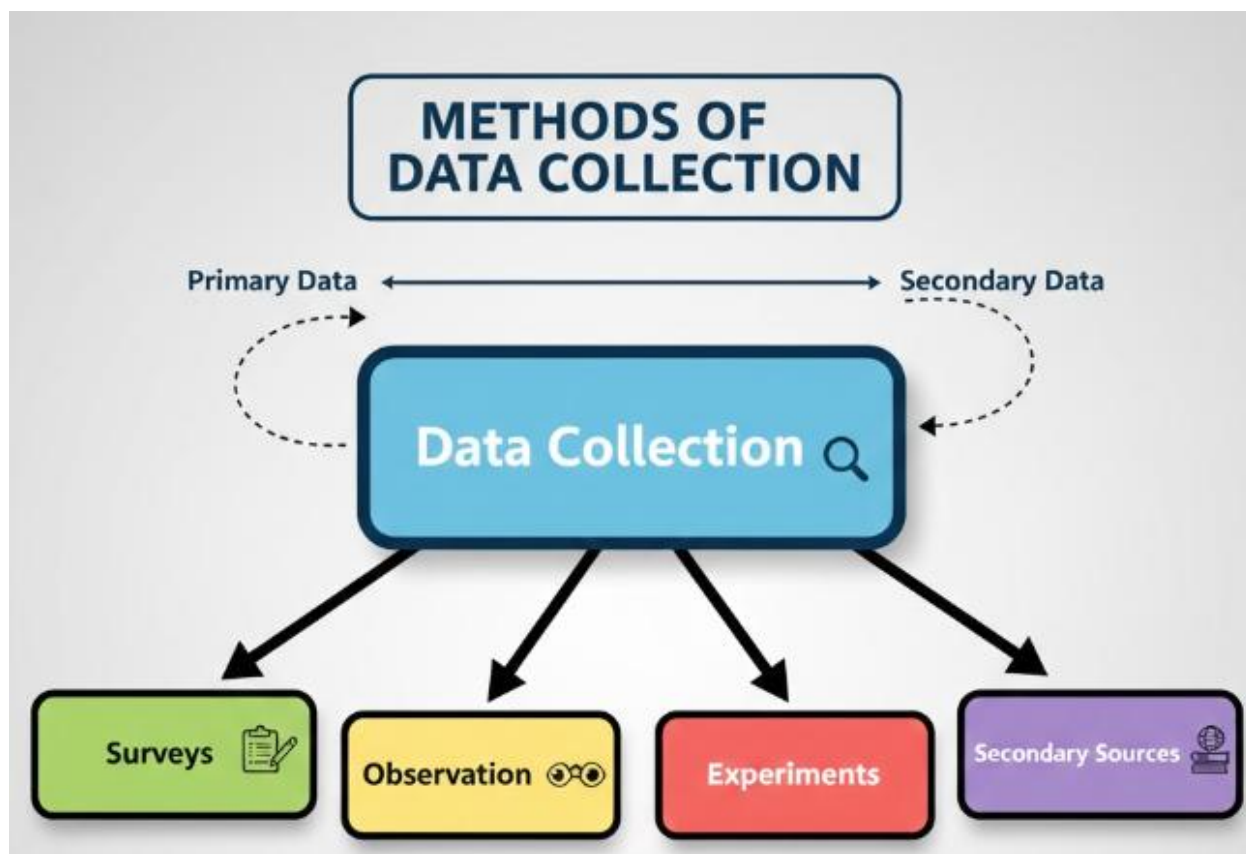


Figure 4.2 Methods of data collection

### 4.2.2 Ensuring reliability and validity in data collection

**Reliability** means that data collection methods produce consistent results when repeated under similar conditions. **Validity** means that the data accurately measures what it is intended to measure. Ensuring both reliability and validity is essential for trustworthy research.

Fill in the blank: Reliability means producing consistent results, while \_\_\_\_\_ means measuring what is intended.

| Feature       | Reliability                                      | Validity                                          |
|---------------|--------------------------------------------------|---------------------------------------------------|
| Focus         | <b>Consistency</b> and stability of the results. | <b>Accuracy</b> and truthfulness of the results.  |
| Core Question | If I repeat this, will I get the same result?    | Does this measure what it is supposed to measure? |



| Feature   | Reliability                                                   | Validity                                                                       |
|-----------|---------------------------------------------------------------|--------------------------------------------------------------------------------|
| Main Goal | Minimizing random error.                                      | Minimizing systematic bias.                                                    |
| Types     | Test-retest, Inter-rater, Internal consistency.               | Face, Content, Criterion, Construct.                                           |
| Example   | A scale that shows the same weight every time you step on it. | A scale that shows your <i>actual</i> weight (not just the same wrong number). |

Box 4.1 Reliability and validity in data collection

### 4.2.3 Organising data for analysis

Once data is collected, it must be organised to make analysis possible. This involves **coding** (assigning labels or numbers to responses), **tabulation** (arranging data into tables for clarity), and **data entry** (inputting information into software or spreadsheets). Proper organisation ensures that data can be analysed efficiently and accurately.

Fill in the blank: Assigning labels or numbers to responses during data organisation is called \_\_\_\_\_.





Plate 4.2 Organising data for analysis

## Pilot Questions 4.2

### 4.2.1 Methods of data collection

- Which method of data collection would be most suitable for studying classroom behaviour?
- Why might secondary sources be useful in research?

### 4.2.2 Ensuring reliability and validity in data collection



- Why is it important to ensure both reliability and validity in data collection?
- Can you give an example of a method that is reliable but not valid?

#### 4.2.3 Organising data for analysis

- Why is coding important in organising data?
- How does tabulation make data easier to analyse?

### 4.3 Analysing and Interpreting Data

#### 4.3.1 Introduction to data analysis

**Data analysis** is the process of examining collected information to identify patterns, relationships, or trends that can answer research questions or test hypotheses. It can be **quantitative**, focusing on numerical data and statistical methods, or **qualitative**, focusing on meanings, themes, and interpretations. Both approaches aim to make sense of raw data and transform it into useful knowledge.

Fill in the blank: The process of examining collected information to identify patterns or relationships is called \_\_\_\_\_.



# DATA ANALYSIS APPROACHES

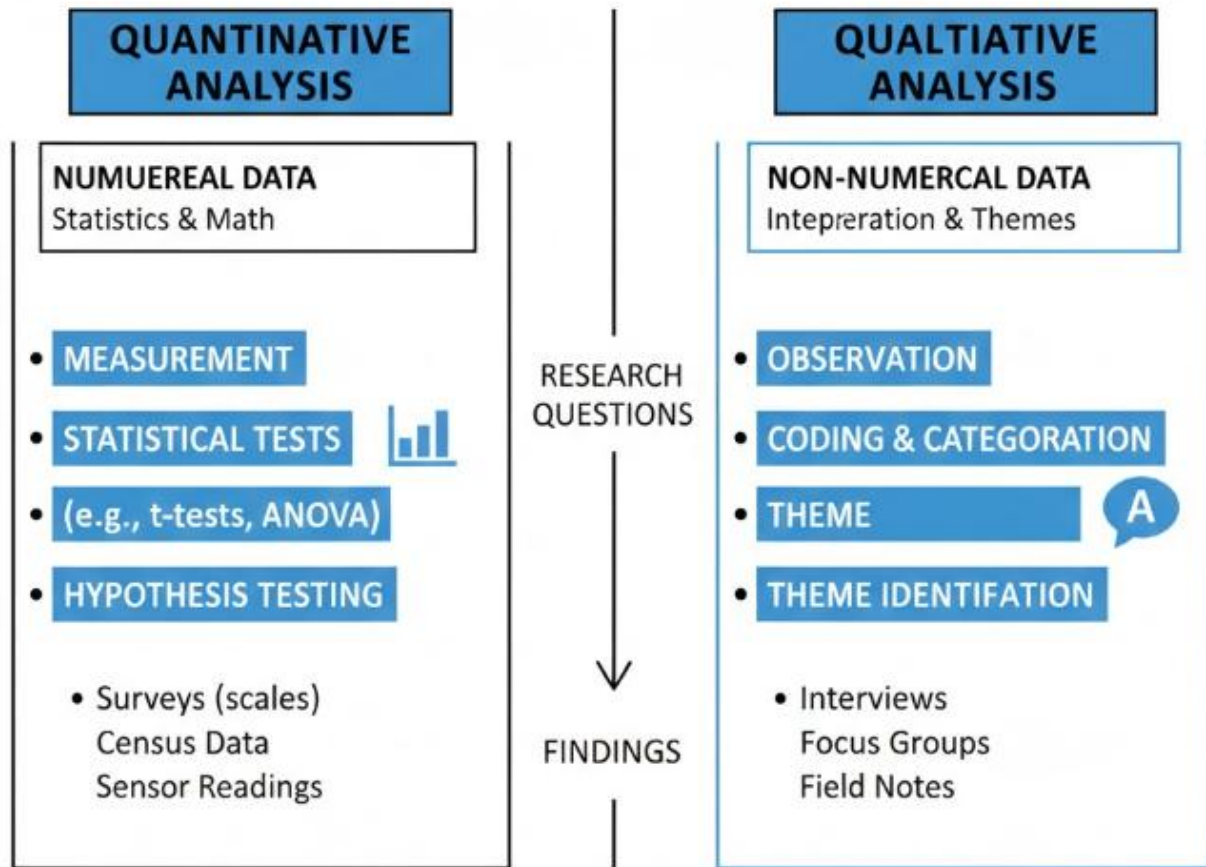


Figure 4.3 Approaches to data analysis

## 4.3.2 Basic statistical tools

Quantitative analysis often uses **statistical tools** to summarise and interpret data. Common tools include:

- **Mean:** The average value of a dataset.
- **Median:** The middle value when data is arranged in order.
- **Correlation:** A measure of the relationship between two variables.
- **Regression:** A technique to predict one variable based on another.
- **Significance tests:** Procedures to determine whether observed results are due to chance or represent real effects.



Fill in the blank: The statistical tool that measures the relationship between two variables is called \_\_\_\_\_.

| Statistical Tool           | Definition                                                                                     | Geography Example                                                                              |
|----------------------------|------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------|
| <b>Mean (Average)</b>      | The sum of all values divided by the number of observations.                                   | Calculating the <b>average annual rainfall</b> in a specific watershed over 30 years.          |
| <b>Standard Deviation</b>  | A measure of how spread out the values are from the mean.                                      | Determining the <b>variability of crop yields</b> across different soil types in a region.     |
| <b>Correlation (\$r\$)</b> | A measure of the strength and direction of a relationship between two variables.               | Investigating the link between <b>distance from a city center</b> and <b>property values</b> . |
| <b>Regression Analysis</b> | A method for modeling the relationship between a dependent and independent variable.           | Predicting <b>future urban sprawl</b> based on past population growth and land availability.   |
| <b>\$t\$-Test</b>          | A test used to determine if there is a significant difference between the means of two groups. | Comparing <b>water quality levels</b> upstream and downstream from an industrial site.         |

Box 4.1 Basic statistical tools

### 4.3.3 Interpreting results and drawing conclusions

**Interpreting results** involves explaining what the analysed data means in relation to the research questions or hypotheses. Researchers must consider whether findings support or refute their hypotheses, and whether results are statistically significant and practically meaningful. **Drawing conclusions** means summarising the implications of the findings and relating them back to the objectives of the study.

Fill in the blank: Interpreting results involves explaining what the analysed data means in relation to the \_\_\_\_\_.





Plate 4.3 Interpreting results and drawing conclusions

## Pilot Questions 4.3

### 4.3.1 Introduction to data analysis

- What is the difference between quantitative and qualitative data analysis?
- Why is data analysis necessary in research?

### 4.3.2 Basic statistical tools



- Which statistical tool would you use to find the average score of a class test?
- How does correlation differ from regression?

### 4.3.3 Interpreting results and drawing conclusions

- Why is it important to check for statistical significance when interpreting results?
- How should conclusions be linked back to research objectives?

## Series Summary

This Series has focused on the essential skills of designing experiments and analysing data, which are central to producing valid and meaningful research. We began by examining the principles of experimental design, highlighting its definition, purpose, and key elements such as variables, control, randomisation, and replication. From there, we explored different types of experimental designs and illustrated how they can be applied in practice. We then moved on to methods of data collection, considering surveys, observation, experiments, and secondary sources, while emphasising the importance of ensuring reliability and validity. Finally, we studied how to organise data through coding, tabulation, and entry, before concluding with approaches to data analysis, including basic statistical tools and the interpretation of results.

By working through these topics, you should now be able to design experiments that are systematic and rigorous, collect and organise data effectively, and apply appropriate methods of analysis to interpret findings. In line with the Series Learning Outcomes, you are expected to demonstrate competence in planning experimental setups, ensuring data quality, and using analysis to draw conclusions that are both statistically sound and practically relevant.

## Glossary of Terms

### Control

A condition in an experiment where variables are kept constant to ensure that observed effects are due to the independent variable.

### Correlation

A statistical measure that indicates the strength and direction of the relationship between two variables.

### Cross-sectional design

An experimental or observational design that examines variables at a single point in time.



**Data analysis**

The process of examining collected information to identify patterns, relationships, or trends that answer research questions or test hypotheses.

**Data collection**

The process of gathering information through methods such as surveys, observation, experiments, or secondary sources.

**Dependent variable**

The variable that is measured in an experiment to assess the effect of changes in the independent variable.

**Experimental design**

The structured plan used to conduct research in a way that ensures valid, reliable, and unbiased results.

**Factorial design**

An experimental design that tests multiple independent variables simultaneously to study their main effects and interactions.

**Independent variable**

The variable that is manipulated in an experiment to observe its effect on the dependent variable.

**Mean**

The average value of a dataset, calculated by dividing the sum of all values by the number of values.

**Median**

The middle value in a dataset when the values are arranged in order.

**Quasi-experiment**

A type of experimental design that lacks random assignment but still investigates relationships between variables.

**Randomisation**

The process of assigning subjects randomly to groups in order to reduce bias and increase validity.

**Regression**

A statistical technique used to predict the value of one variable based on another.



**Reliability**

The consistency of a measurement or data collection method when repeated under similar conditions.

**Replication**

Repeating an experiment to confirm the reliability and consistency of results.

**Significance test**

A statistical procedure used to determine whether observed results are likely due to chance or represent real effects.

**True experiment**

An experimental design that uses random assignment and control groups to establish cause-and-effect relationships.

**Validity**

The extent to which a measurement or method accurately captures what it is intended to measure.

**Variables**

Characteristics or factors that can take on different values in a study, including independent, dependent, and controlled variables

## Concept Check Questions and Answers

### Objective Questions

1. Experimental design is a structured \_\_\_\_\_ used to conduct research systematically and reliably.

**Answer:** Plan

2. Randomisation helps reduce \_\_\_\_\_ in experimental research.

**Answer:** Bias

3. True or False: Reliability means producing consistent results, while validity means measuring what is intended.

**Answer:** True

4. The statistical tool that measures the relationship between two variables is called \_\_\_\_\_.

**Answer:** Correlation

### Short-Answer Questions



1. Define **experimental design** in simple terms.

**Answer:** Experimental design is the plan for conducting research that ensures results are valid, reliable, and unbiased.

2. Why is replication important in experimental design?

**Answer:** Replication confirms that results are consistent and reliable when experiments are repeated.

3. Give one example of a method of data collection and explain when it is most useful.

**Answer:** Surveys are useful when gathering opinions or behaviours from a large group of people.

4. Distinguish between **reliability** and **validity** in data collection.

**Answer:** Reliability is about consistency of results, while validity is about measuring what is intended.

### Long-Answer Questions

1. Discuss the key elements of experimental design and explain why each is important.

**Answer:** The key elements are variables, control, randomisation, and replication. Variables define what is being studied, control ensures external factors do not interfere, randomisation reduces bias, and replication confirms reliability. Together, they make experiments systematic and trustworthy.

2. Evaluate the role of statistical tools in analysing data. Provide examples to illustrate how they help researchers draw conclusions.

**Answer:** Statistical tools summarise and interpret data. For example, the mean shows average performance, correlation reveals relationships between variables, and regression predicts outcomes. Significance tests help determine whether results are due to chance. These tools ensure that conclusions are evidence-based and meaningful.

### Answers to Pilot Questions 4.1 Principles of Experimental Design

#### 4.1.1 Definition and purpose of experimental design

- Experimental design is necessary because it ensures research is systematic, valid, and unbiased.
- It differs from simply collecting data because it provides a structured plan that controls variables and tests hypotheses.

#### 4.1.2 Key elements of experimental design



- Replication is important because it confirms that results are consistent and reliable when repeated.
- A controlled variable in a classroom experiment could be the subject content or exam duration.

#### **4.1.3 Types of experimental designs**

- A true experiment would be most suitable for testing the effect of a new teaching method, as it uses random assignment and control groups.
- A researcher might choose a quasi-experiment when random assignment is not possible, for example in natural classroom settings.

#### **4.1.4 Examples of experimental setups**

- A simple experiment to test the effect of sleep on memory could involve two groups of students, one with adequate sleep and one with restricted sleep, then comparing memory test scores.
- Controlled variables are important because they prevent external factors from influencing results, ensuring that observed effects are due to the independent variable.

### **Answers to Pilot Questions**

#### **4.2.1 Methods of data collection**

- Observation would be most suitable for studying classroom behaviour.
- Secondary sources are useful because they save time and resources by providing existing data.

#### **4.2.2 Ensuring reliability and validity in data collection**

- It is important to ensure both reliability and validity so that data is consistent and accurately measures what it is intended to.
- An example of a method that is reliable but not valid is using a broken thermometer that consistently gives the same wrong temperature.

#### **4.2.3 Organising data for analysis**

- Coding is important because it simplifies raw data into categories or numbers, making analysis easier.
- Tabulation makes data easier to analyse by arranging it into clear tables that highlight patterns.

### **Answers to Pilot Questions 4.3 Analysing and Interpreting Data**



#### 4.3.1 Introduction to data analysis

- Quantitative analysis deals with numerical data and statistics, while qualitative analysis focuses on meanings and themes.
- Data analysis is necessary because it transforms raw information into knowledge that answers research questions.

#### 4.3.2 Basic statistical tools

- The mean would be used to find the average score of a class test.
- Correlation measures the strength of a relationship, while regression predicts one variable based on another.

#### 4.3.3 Interpreting results and drawing conclusions

- Statistical significance is important because it shows whether results are likely due to chance or represent real effects.
- Conclusions should be linked back to research objectives to ensure findings are meaningful and relevant.

### General References

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### Illustration Attributions

- *Figure 4.1 The cycle of experimental design*  
AI-generated using prompt: “Create a flow diagram showing hypothesis leading to design, data collection, analysis, and conclusion.”  
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- *Box 4.1 Key elements of experimental design*  
AI-generated using prompt: “Create a table listing four key elements of experimental design with definitions.”  
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- *Plate 4.1 Types of experimental designs in practice*  
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- *Box 4.2 Examples of experimental setups*  
AI-generated using prompt: “Create a table with three columns: independent variable, dependent variable, controlled variables, with two examples.”  
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- *Figure 4.2 Methods of data collection*  
AI-generated using prompt: “Create a diagram showing surveys, observation, experiments, and secondary sources as methods of data collection.”  
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- *Box 4.1 Reliability and validity in data collection*  
AI-generated using prompt: “Create a table comparing reliability and validity in data collection with examples.”  
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- *Plate 4.2 Organising data for analysis*  
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- *Figure 4.3 Approaches to data analysis*  
AI-generated using prompt: “Create a diagram showing quantitative and qualitative approaches to data analysis.”  
Tool/platform: Microsoft Copilot Image Gen.
- *Box 4.1 Basic statistical tools*  
AI-generated using prompt: “Create a table listing five basic statistical tools with definitions and examples.”  
Tool/platform: Microsoft Copilot Image Gen.
- *Plate 4.3 Interpreting results and drawing conclusions*  
Suggested OER search string: “interpreting research results OER image.”  
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### Attribution Notes

- All AI-generated illustrations were created using Microsoft Copilot Image Gen based on prompts provided in the instructional content.
- Where OER search strings are listed, images or diagrams should be sourced from open educational repositories to ensure compliance with licensing.
- Definitions of key terms and examples are adapted from standard research methodology and statistics OERs cited above.
- Pilot questions and concept check questions are original instructional design elements created to reinforce Series Learning Outcomes (SLOs).



**Course code: GEO 305**

**Course title: Research Method I**

**Course credit load: 2 Units**

**Series 5: Developing and Writing Research Proposals**

### **Part 5.1 Understanding Research Proposals**

- **5.1.1 Definition and purpose of a research proposal**
- **5.1.2 Key components of a research proposal**
- **5.1.3 Characteristics of a strong proposal**

### **Part 5.2 Planning and Structuring the Proposal**

- **5.2.1 Title and introduction**
- **5.2.2 Literature review and problem statement**
- **5.2.3 Objectives, hypotheses, and research questions**
- **5.2.4 Methodology and design**

### **Part 5.3 Writing and Presenting the Proposal**

- **5.3.1 Academic writing style and clarity**
- **5.3.2 Formatting and referencing**
- **5.3.3 Presenting and defending the proposal**

## **Introduction**

Developing and writing research proposals is a vital skill for any researcher, as it provides the foundation for conducting a study in a systematic and convincing manner. A **research proposal** is a formal plan that outlines what you intend to study, why it is important, and how you will carry out the investigation. It serves both as a roadmap for your research and as a persuasive document to secure approval, funding, or support.

The purpose of this Series is to guide you through the process of understanding what a research proposal is, planning and structuring its components, and finally writing and presenting it effectively. We will begin by exploring the definition, purpose, and characteristics of strong proposals. Next, we will examine how to plan and organise the proposal, including the title, introduction, literature review, problem statement, objectives, hypotheses, and methodology. Finally, we will focus on writing with clarity,



applying correct formatting and referencing, and presenting or defending the proposal in academic and professional settings.

By the end of this Series, you should be able to design a well-structured proposal that demonstrates the significance of your research, communicates your ideas clearly, and meets academic standards.

### Series Learning Outcomes

**Upon completing this Series, you should be able to:**

**SLO 5.1** Define a research proposal and explain its purpose in academic and professional contexts.

**SLO 5.2** Identify and describe the key components of a research proposal (title, introduction, literature review, problem statement, objectives, hypotheses, methodology, references).

**SLO 5.3** Evaluate the characteristics of a strong research proposal (clarity, conciseness, structure, persuasiveness).

**SLO 5.4** Plan and structure a coherent research proposal that aligns objectives, hypotheses, and methodology.

**SLO 5.5** Apply academic writing principles, correct formatting, and referencing styles (e.g., APA, MLA) in proposal drafting.

**SLO 5.6** Present and defend a research proposal effectively using appropriate communication and visual aids

## 5.1 Understanding Research Proposals

### 5.1.1 Definition and purpose of a research proposal

A **research proposal** is a formal document that outlines the plan for a study. It explains what you intend to research, why the study is important, and how you will carry it out. The purpose of a proposal is to convince others—such as supervisors, funding bodies, or academic committees—that your research is worthwhile and feasible.

Fill in the blank: A research proposal is a formal \_\_\_\_\_ that outlines the plan for a study.





Figure 5.1 The role of a research proposal in the research process

### 5.1.2 Key components of a research proposal

The main components include:

- **Title:** A concise statement of the topic.
- **Introduction:** Background and context for the study.
- **Literature review:** Summary of existing research and identification of gaps.



- **Problem statement:** Clear articulation of the issue to be studied.
- **Objectives and hypotheses:** Specific aims and testable predictions.
- **Methodology:** Description of how the study will be conducted.
- **References:** Sources that support your proposal.

Fill in the blank: The section of a proposal that summarises existing research and identifies gaps is called the \_\_\_\_\_ review.

| Component                    | Explanation                                                                                                 |
|------------------------------|-------------------------------------------------------------------------------------------------------------|
| <b>Title</b>                 | A concise and descriptive statement that reflects the main focus and scope of the research.                 |
| <b>Introduction</b>          | Provides background information, identifies the research problem, and justifies why the study is necessary. |
| <b>Literature Review</b>     | A summary of existing research on the topic to show how your study fills a gap in current knowledge.        |
| <b>Research Question/Aim</b> | The specific, testable question or objective that the research intends to address.                          |
| <b>Methodology</b>           | A detailed plan of the data collection techniques and analysis methods you will use.                        |
| <b>Significance/Impact</b>   | Explains the potential contributions of the research to the field of geography or real-world policy.        |
| <b>Timeline &amp; Budget</b> | A realistic schedule for completing the project and an estimate of the resources required.                  |

Box 5.1 Key components of a research proposal

### 5.1.3 Characteristics of a strong proposal

A strong proposal should be **clear** (easy to understand), **concise** (focused and to the point), **well-structured** (organised logically), and **persuasive** (convincing others of the importance and feasibility of the study).

Fill in the blank: A strong proposal should be clear, concise, well-structured, and \_\_\_\_\_.





Plate 5.1 Presenting a strong research proposal

### Pilot Questions 5.1 – Understanding Research Proposals

1. What is the main purpose of a research proposal?
  - a) To present final research findings
  - b) To outline the plan and secure approval for a study
  - c) To replace the need for a literature review
  - d) To summarise existing studies only
2. Which of the following is NOT a key component of a research proposal?
  - a) Title



- b) Literature review
  - c) Personal biography
  - d) Methodology
3. Fill in the blank: A research proposal is a formal \_\_\_\_\_ that outlines the plan for a study.
  4. True or False: A strong proposal should be persuasive, meaning it convinces others of the study's importance and feasibility.
  5. Which characteristic ensures that a proposal is easy to understand?
    - a) Conciseness
    - b) Clarity
    - c) Persuasiveness
    - d) Structure

## 5.2 Planning and Structuring the Proposal

### 5.2.1 Title and introduction

The **title** should be concise and informative, capturing the essence of the study. The **introduction** provides background, explains the context, and highlights the significance of the research.

Fill in the blank: The \_\_\_\_\_ should be concise and informative, capturing the essence of the study.



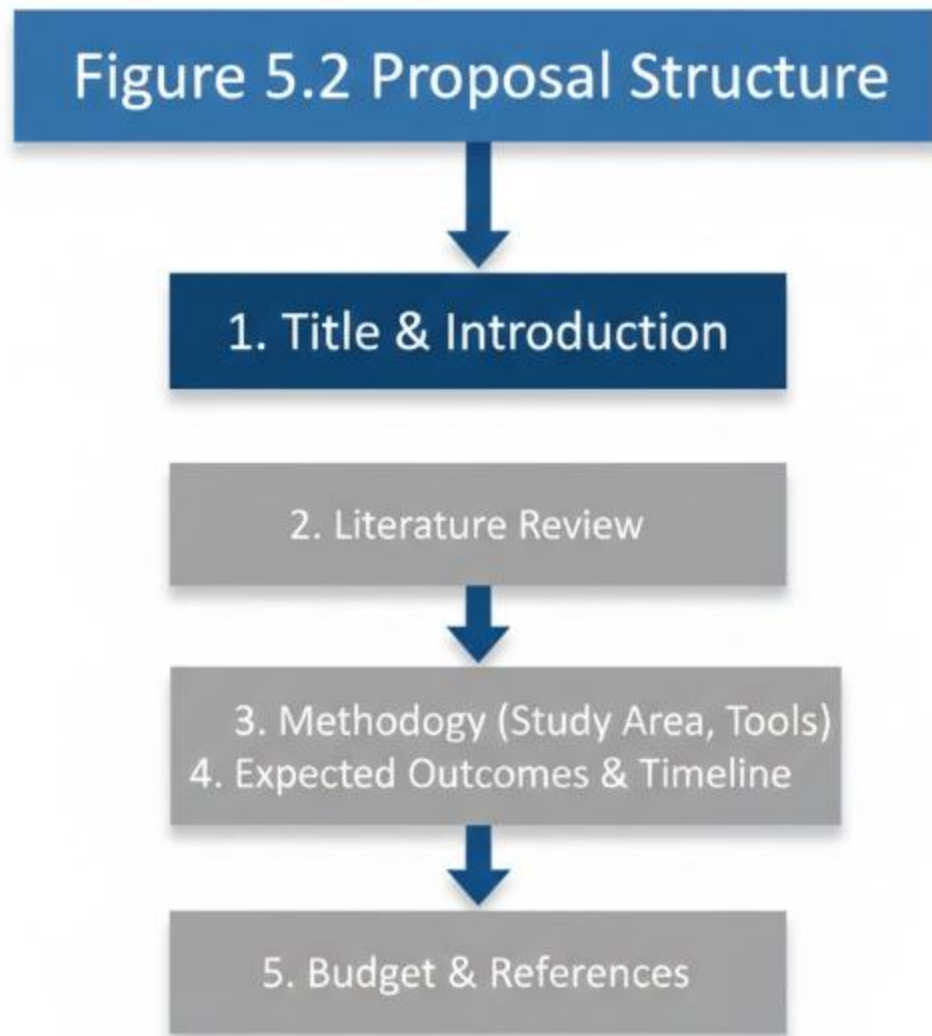


Diagram showing title at the top, introduction below, leading into the rest of the proposal.

### 5.2.2 Literature review and problem statement

The **literature review** summarises existing studies and identifies gaps. The **problem statement** defines the specific issue your research will address. Together, they justify the need for your study.

Fill in the blank: The problem statement defines the specific \_\_\_\_\_ your research will address.



| Feature           | Literature Review                                                                                                                                                   | Problem Statement                                                                                                                                                   |
|-------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Definition</b> | A comprehensive survey and critical analysis of existing research and theories on a specific topic.                                                                 | A concise description of an issue or "gap" in knowledge that needs to be addressed.                                                                                 |
| <b>Purpose</b>    | To show what is already known, identify trends, and demonstrate the researcher's expertise.                                                                         | To justify why the study is necessary and to focus the research objectives.                                                                                         |
| <b>Scope</b>      | <b>Broad:</b> Covers many studies, historical developments, and conflicting viewpoints.                                                                             | <b>Narrow:</b> Focuses specifically on the one issue the current project intends to solve.                                                                          |
| <b>Placement</b>  | Usually a substantial, standalone chapter or a major section of a proposal.                                                                                         | Typically found in the Introduction, often only a few paragraphs or even a single sentence.                                                                         |
| <b>Example</b>    | "Recent studies by Smith (2023) and Jones (2024) suggest that hybrid learning improves student retention, though earlier findings by Doe (2019) were inconclusive." | "Despite the rise in hybrid learning, there is a lack of OER specifically designed for low-bandwidth environments, preventing equitable access for rural students." |

Box 5.2 Literature review and problem statement

### 5.2.3 Objectives, hypotheses, and research questions

**Objectives** are the specific aims of the study. **Hypotheses** are testable predictions about relationships between variables. **Research questions** are guiding queries that shape the investigation.

Fill in the blank: Testable predictions about relationships between variables are called \_\_\_\_\_.





Plate 5.2 Setting objectives, hypotheses, and research questions

#### 5.2.4 Methodology and design

The **methodology** explains how the research will be conducted, including data collection methods, sampling, and analysis techniques. The **design** ensures that the study is systematic and feasible.

Fill in the blank: The methodology explains how the research will be \_\_\_\_\_.



# Research Methodology Design

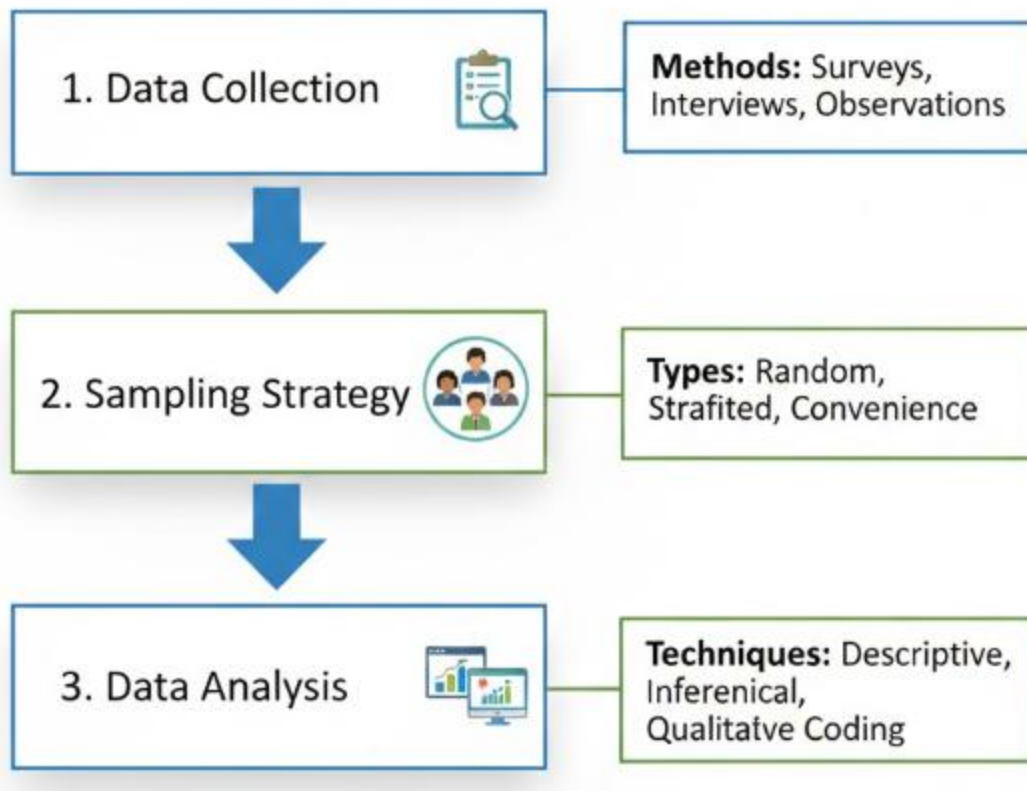


Figure 5.3 Methodology and design in a research proposal

## Pilot Questions 5.2

1. What should a research proposal title ideally be?
  - a) Long and detailed
  - b) Concise and informative
  - c) Abstract and creative
  - d) Vague and broad
2. How does the literature review support the problem statement?
  - a) It lists all published authors
  - b) It summarises existing studies and highlights gaps
  - c) It provides the methodology
  - d) It replaces the need for objectives



3. Fill in the blank: The problem statement defines the specific \_\_\_\_\_ your research will address.
4. What is the difference between objectives and hypotheses?
  - a) Objectives are predictions, hypotheses are aims
  - b) Objectives are aims, hypotheses are testable predictions
  - c) They are the same
  - d) Objectives are optional, hypotheses are required
5. Why must the methodology be both systematic and feasible?
  - a) To ensure the study is ethical
  - b) To ensure the study can be conducted effectively within constraints
  - c) To make the proposal longer
  - d) To avoid referencing

## 5.3 Writing and Presenting the Proposal

### 5.3.1 Academic writing style and clarity

A research proposal must be written in a clear, precise, and formal style. **Academic writing** refers to a structured way of presenting ideas that avoids ambiguity and uses evidence to support claims. Clarity ensures that reviewers understand your intentions, while precision avoids vague statements. Good proposals use straightforward language, avoid unnecessary jargon, and maintain logical flow.

Fill in the blank: Academic writing refers to a structured way of presenting ideas that avoids \_\_\_\_\_.



# ACADEMIC WRITING PILLARS

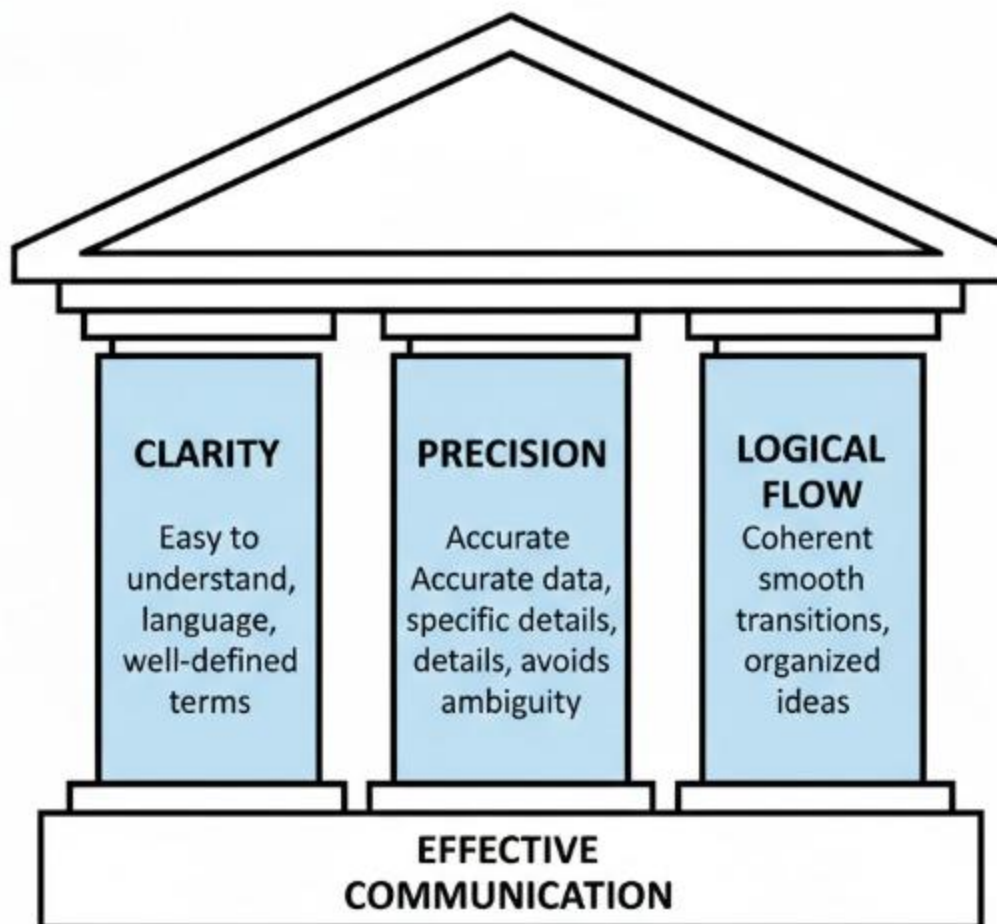


Figure 5.4 Academic writing style and clarity

## 5.3.2 Formatting and referencing

**Formatting** refers to the consistent presentation of text, headings, tables, and references according to institutional or disciplinary guidelines. **Referencing** is the practice of acknowledging sources used in the proposal. Proper referencing not only avoids plagiarism but also demonstrates that your work is grounded in existing scholarship. Common styles include APA, MLA, and Chicago.



Fill in the blank: Proper referencing helps avoid \_\_\_\_\_ and shows that your work is grounded in scholarship.

| Element                  | Explanation                                                                                                                     |
|--------------------------|---------------------------------------------------------------------------------------------------------------------------------|
| <b>Abstract</b>          | A brief summary (usually 150–250 words) of the entire proposal, highlighting the problem, methods, and expected results.        |
| <b>APA Style</b>         | A common citation style in social sciences; uses an <b>(Author, Year)</b> format for in-text citations and a "References" list. |
| <b>Chicago Style</b>     | Often used in humanities and some geography subfields; uses either <b>footnotes/endnotes</b> or an author-date system.          |
| <b>Visual Aids</b>       | Tables, maps, and figures used to present complex spatial data clearly; must be numbered and captioned.                         |
| <b>Appendices</b>        | A section at the end for supplementary material, such as survey instruments, interview protocols, or raw data tables.           |
| <b>In-text Citations</b> | Short notes within the body of the text that point the reader to the full source in the reference list.                         |

#### Box 5.3 Formatting and referencing essentials

### 5.3.3 Presenting and defending the proposal

Once written, a proposal is often presented to supervisors, committees, or funding bodies. **Presentation** involves summarising the key points clearly and confidently, often using slides or visual aids. **Defending the proposal** means responding to questions, clarifying methods, and justifying choices. This stage demonstrates your understanding of the research and your ability to carry it out.

Fill in the blank: Defending a proposal means responding to questions and \_\_\_\_\_ choices made in the study plan.





Plate 5.3 Presenting and defending a research proposal

### Pilot Questions 5.3 – Writing and Presenting the Proposal

1. Why is clarity essential in academic writing?
  - a) It makes the document longer
  - b) It ensures reviewers understand your intentions
  - c) It is only required for the title
  - d) It is optional in proposals
2. How does proper referencing strengthen a research proposal?
  - a) It increases the word count
  - b) It avoids plagiarism and shows scholarly grounding
  - c) It is only needed for the literature review
  - d) It replaces the need for a methodology
3. Fill in the blank: Proper referencing helps avoid \_\_\_\_\_ and shows that your work is grounded in scholarship.



4. What is one strategy to help present a proposal confidently?
  - a) Reading directly from slides without eye contact
  - b) Preparing clear slides and anticipating questions
  - c) Avoiding visual aids
  - d) Speaking quickly to finish early
5. Fill in the blank: Defending a proposal means responding to questions and \_\_\_\_\_ choices made in the study plan.

## Series Summary

This Series has guided you through the process of developing and writing research proposals, emphasising their role as both a roadmap for research and a persuasive document to secure approval or support. We began by understanding what a research proposal is, its purpose, and the characteristics that make it strong. We then explored how to plan and structure the proposal, covering the title, introduction, literature review, problem statement, objectives, hypotheses, and methodology. Finally, we focused on writing with clarity, applying proper formatting and referencing, and presenting or defending the proposal with confidence.

By completing this Series, you should now be able to design, structure, and write a research proposal that is clear, persuasive, and academically sound. In line with the Series Learning Outcomes, you are expected to demonstrate competence in outlining research problems, framing objectives and hypotheses, applying appropriate methodology, and presenting proposals effectively to academic or professional audiences.

## Glossary of Terms

**Academic writing** – A structured way of presenting ideas that avoids ambiguity, uses evidence, and maintains clarity and precision.

**Defending a proposal** – The process of responding to questions, clarifying methods, and justifying choices made in the study plan.

**Formatting** – The consistent presentation of text, headings, tables, and references according to institutional or disciplinary guidelines.

**Hypothesis** – A testable prediction about the relationship between variables, often expressed in measurable terms.



**Introduction** – The opening section of a proposal that provides background, context, and highlights the significance of the research.

**Literature review** – A summary of existing studies that identifies gaps and justifies the need for new research.

**Methodology** – The section of a proposal that explains how the research will be conducted, including data collection, sampling, and analysis.

**Objectives** – The specific aims or goals that a research study seeks to achieve.

**Problem statement** – A clear articulation of the issue or gap that the research intends to address.

**Proposal presentation** – The act of summarising and communicating the key points of a research proposal to an audience, often using slides or visual aids.

**Referencing** – The practice of acknowledging sources used in a proposal, ensuring academic integrity and avoiding plagiarism.

**Research proposal** – A formal document that outlines what you intend to study, why it is important, and how you will carry out the investigation.

**Research questions** – Guiding queries that shape the direction and focus of a study.

**Title** – A concise and informative statement that captures the essence of the research topic.

## Glossary of Terms

**Academic writing** – A structured way of presenting ideas that avoids ambiguity, uses evidence, and maintains clarity and precision.

**Defending a proposal** – The process of responding to questions, clarifying methods, and justifying choices made in the study plan.

**Formatting** – The consistent presentation of text, headings, tables, and references according to institutional or disciplinary guidelines.

**Hypothesis** – A testable prediction about the relationship between variables, often expressed in measurable terms.



**Introduction** – The opening section of a proposal that provides background, context, and highlights the significance of the research.

**Literature review** – A summary of existing studies that identifies gaps and justifies the need for new research.

**Methodology** – The section of a proposal that explains how the research will be conducted, including data collection, sampling, and analysis.

**Objectives** – The specific aims or goals that a research study seeks to achieve.

**Problem statement** – A clear articulation of the issue or gap that the research intends to address.

**Proposal presentation** – The act of summarising and communicating the key points of a research proposal to an audience, often using slides or visual aids.

**Referencing** – The practice of acknowledging sources used in a proposal, ensuring academic integrity and avoiding plagiarism.

**Research proposal** – A formal document that outlines what you intend to study, why it is important, and how you will carry out the investigation.

**Research questions** – Guiding queries that shape the direction and focus of a study.

**Title** – A concise and informative statement that captures the essence of the research topic.

## Concept Check Questions

1. A research proposal is a formal \_\_\_\_\_ that outlines the plan for a study. *(Linked to SLO 5.1)*
2. The section of a proposal that summarises existing studies and identifies gaps is called the \_\_\_\_\_ review. *(Linked to SLO 5.2)*
3. True or False: Objectives are the specific aims of a study, while hypotheses are testable predictions. *(Linked to SLO 5.2)*
4. Proper referencing helps avoid \_\_\_\_\_ and demonstrates grounding in scholarship. *(Linked to SLO 5.3)*

## Short-Answer Questions

5. Define a research proposal in your own words. *(Linked to SLO 5.1)*



6. Identify two characteristics of a strong proposal and explain why they are important. *(Linked to SLO 5.1)*
7. Explain how the literature review supports the problem statement. *(Linked to SLO 5.2)*
8. Why is clarity essential in academic writing? *(Linked to SLO 5.3)*

#### Long-Answer Questions

9. Discuss the key components of a research proposal and explain how they work together to form a coherent plan. *(Linked to SLO 5.2)*
10. Evaluate the importance of presenting and defending a proposal. Suggest strategies that can help a researcher succeed in this stage. *(Linked to SLO 5.3)*

#### Answers to Concept Check Questions [Series 5]

#### Objective Questions

1. Document
2. Literature
3. True
4. Plagiarism

#### Short-Answer Questions

5. A research proposal is a formal plan that explains what you intend to study, why it matters, and how you will conduct the research.
6. Clear and concise: ensures understanding and focus. Persuasive: convinces reviewers of the importance and feasibility of the study.
7. The literature review shows what has already been studied and highlights gaps, which the problem statement addresses.
8. Clarity ensures that reviewers understand your intentions and prevents misinterpretation.

#### Long-Answer Questions

1. **Key components of a research proposal**
  - **Basic response:** A proposal includes the title, introduction, literature review, problem statement, objectives, hypotheses, methodology, and references. Together, these provide background, justify the study, outline aims, and explain how the research will be conducted.
  - **Value-added response:** Beyond listing components, strong proposals integrate these sections seamlessly. For example, the literature review should directly lead into the problem statement, while objectives and hypotheses must align with the chosen methodology. Outstanding learners may also note that



references demonstrate scholarly grounding and that coherence across sections increases persuasiveness.

2. **Importance of presenting and defending a proposal**

- **Basic response:** Presenting and defending a proposal allows researchers to communicate their plan clearly and respond to questions, showing they understand the study.
- **Value-added response:** Outstanding learners may add that this stage builds credibility, helps refine the research through feedback, and demonstrates readiness to undertake the study. Strategies include preparing clear slides, anticipating possible questions, practising delivery, and justifying methodological choices with evidence.

**Answers to Pilot Questions**

**Pilot Questions 5.1 – Understanding Research Proposals**

1. The main purpose of a research proposal is to outline the plan for a study and secure approval, funding, or support.
2. Three key components of a research proposal are: title, literature review, and methodology.
3. document
4. True
5. Clarity

**Pilot Questions 5.2 – Planning and Structuring the Proposal**

1. A research proposal title should be concise and informative.
2. The literature review supports the problem statement by summarising existing studies and identifying gaps that the problem statement addresses.
3. issue or gap
4. Research objectives are the specific aims of the study, while hypotheses are testable predictions about relationships between variables.
5. The methodology must be systematic and feasible to ensure the study can be conducted effectively within available time, resources, and scope.

**Pilot Questions 5.3 – Writing and Presenting the Proposal**

1. Clarity is essential in academic writing because it ensures reviewers understand your intentions and prevents misinterpretation.



2. Proper referencing strengthens a research proposal by avoiding plagiarism and demonstrating that the proposal is grounded in existing scholarship.
3. plagiarism
4. One strategy to present a proposal confidently is to prepare clear slides and anticipate possible questions.
5. justifying

## References and Attributions

This section documents the sources, illustration prompts, and attribution notes for **Series 5: Developing and Writing Research Proposals**. References are presented in APA style for clarity and consistency.

### General References

- Cargill, M., & O'Connor, P. (2013). *Writing scientific research articles: Strategy and steps* (2nd ed.). Wiley-Blackwell.
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### Illustration Attributions

- **Figure 5.1 The role of a research proposal in the research process**  
AI-generated using prompt: “Create a flow diagram showing idea leading to proposal, approval, and research.”  
Tool/platform: Microsoft Copilot Image Gen.
- **Box 5.1 Key components of a research proposal**  
AI-generated using prompt: “Create a table listing the key components of a research proposal with short explanations.”  
Tool/platform: Microsoft Copilot Image Gen.
- **Plate 5.1 Presenting a strong research proposal**  
Suggested OER search string: “student presenting research proposal OER image.”  
Attribution required if sourced externally.
- **Figure 5.2 Title and introduction in a proposal structure**  
AI-generated using prompt: “Create a diagram showing title and introduction



leading into the rest of a research proposal.”

Tool/platform: Microsoft Copilot Image Gen.

- **Box 5.2 Literature review and problem statement**

AI-generated using prompt: “Create a table comparing literature review and problem statement with definitions and examples.”

Tool/platform: Microsoft Copilot Image Gen.

- **Plate 5.2 Setting objectives, hypotheses, and research questions**

Suggested OER search string: “research objectives hypotheses questions OER image.”

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- **Figure 5.3 Methodology and design in a research proposal**

AI-generated using prompt: “Create a flowchart showing methodology steps: data collection, sampling, and analysis.”

Tool/platform: Microsoft Copilot Image Gen.

- **Figure 5.4 Academic writing style and clarity**

AI-generated using prompt: “Create a diagram showing clarity, precision, and logical flow as pillars of academic writing.”

Tool/platform: Microsoft Copilot Image Gen.

- **Box 5.3 Formatting and referencing essentials**

AI-generated using prompt: “Create a table listing formatting elements and referencing styles with short explanations.”

Tool/platform: Microsoft Copilot Image Gen.

- **Plate 5.3 Presenting and defending a research proposal**

Suggested OER search string: “student defending research proposal OER image.”

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### Attribution Notes

- All AI-generated illustrations were created using Microsoft Copilot Image Gen based on prompts provided in the instructional content.
- Where OER search strings are listed, images or diagrams should be sourced from open educational repositories to ensure compliance with licensing.
- Definitions of key terms and examples are adapted from standard research methodology and proposal writing texts cited above.
- Pilot questions and concept check questions are original instructional design elements created to reinforce Series Learning Outcomes (SLOs).



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