



Module 1

INTRODUCTION TO RESEARCH METHODS

[Leedy, Practical Research Planning and Design, 12e]

Learning Objectives

At the end of this module, you will be able to:

01. Define Research

Distinguish between formal research and simple information gathering.

02. Process Cycle

Follow the cyclical process from problem identification to interpretation.

03. Formulate Hypothesis

Explain what a hypothesis is and understand the core elements of a good hypothesis.

04. Research Paradigms

Distinguish between positivism, postpositivism, and pragmatism in a research paradigm.

Research is not merely:



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01. Gathering Information

Just compiling existing facts (e.g., looking up information on a specific product or disease).

02. Rummaging for Facts

Searching around for hard-to-locate details (e.g., information needed to buy or sell property).

03. Transporting Facts

Simply moving information from one place to another without adding value.

e.g., collect information → organize → documentation → reference statements

Alternatives to Research

01. Authority



02. Tradition



03. Common sense



04. Media myths



05. Personal experience



What is Research?



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01. A Systematic Process

A structured methodology consisting of collecting, analyzing, and interpreting information (data) to find answers.

02. The Ultimate Goal

To significantly increase our understanding of a specific phenomenon about which we are interested, concerned, or passionate.

03. Formal Focus Areas

Addressing critical challenges across academia, society, government, industry, and the environment to support Sustainable Development Goals (SDGs).

Research is a Cyclical Process

01

The researcher begins with a problem-an unanswered question.

02

The researcher clearly and specifically articulates the goal of the research endeavor.

03

The researcher often divides the principal problem into more manageable subproblems.

04

The researcher identifies hypotheses and assumptions that underlie the research effort.

05

The researcher develops a specific plan for addressing the problem and its subproblems.

06

The researcher collects, organizes, and analyzes data related to the problem and its sub problems.

07

The researcher interprets the meaning of the data as they relate to the problem and its subproblem.



What is a Hypothesis?

01. Core Definition

A logical supposition, a reasonable guess, and an educated conjecture.

02. Tentative Explanation

Provides a tentative explanation for a phenomenon under investigation, typically between two or more variables.

03. Strategic Direction

May direct thinking to possible sources of information necessary to resolve the research problem and its sub-problems.

Concept of a Hypothesis



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01. Nature & Correctness

Represents what the researchers think will happen in an experiment. It does not necessarily have to be correct; rather, it serves to explore several factors determining the ultimate outcome.

02. Formulated from Research

Built based on previous research or specific theories.

Example: Stress can impact the immune system. (H1: People with high stress levels are more likely to contract Covid-19 after exposure than those with low stress).

03. Folk Wisdom & Beliefs

Can be constructed from commonly held beliefs or intuitive folk wisdom.

Example: H1: Black cumin seeds can treat digestive tract conditions.

Elements of a Good Hypothesis

Validation Checklist

Ask these questions before formulating:

- Is it based on research on the topic?
- Can your hypothesis be tested?
- Does it include dependent & independent variables?



Formulation Process

1. Collect Observations

Gather as many observations as possible about a topic or problem.

2. Evaluate Causes

Analyze findings and look for potential root causes of the problem.

3. List Explanations

Brainstorm a list of logical explanations that you might explore.

4. Design Verification

Plan how to confirm or disprove hypotheses through experimentation.



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QUIZ TIME !



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Quiz 1

Based on the guidelines for forming a hypothesis, select all of the options below that represent **POOR** or **INACCURATE** hypotheses.*

- ☐ Imputing missing values using the median will result in a higher testing accuracy for the XGBoost model compared to dropping rows with missing values.
- ☐ Applying unsupervised learning to our sales database will probably reveal interesting patterns at some point this quarter.
- ☐ Python is a superior programming language to R when it comes to training complex machine learning models.
- ☐ Increasing the learning rate of the gradient descent optimizer from 0.01 to 0.1 will reduce the model's training time but increase the final training loss.

Submit

Your Canva profile name won't be shared

Types of Research

01. QUANTITATIVE

Quantitative Research

Involves looking at amounts, or quantities, of one or more variables of interest.

02. QUALITATIVE

Qualitative Research

Involves looking at characteristics, or qualities, that cannot be entirely reduced to numerical values.

03. MIXED METHOD

Mixed Method Research

Uses a combination of quantitative and qualitative methods.

04. ACTION

Action Research

Focused on outcomes for the practitioner – simultaneously investigating and solving the issue.

Research Paradigms

01. THE DEFINITION

“Research paradigm is the set of common beliefs and agreements shared between scientists about how problems should be understood and addressed.” (Kuhn, 1970)

CORE THESIS

Universally recognized scientific achievements that, for a time, provide model problems and solutions for a community of researchers.

02. KEY COMPONENTS

According to Kuhn, a paradigm contains:

WHAT is to be observed and scrutinized

QUESTIONS to be asked and probed for answers

HOW these questions are to be restructured

HOW results of scientific investigations are interpreted

HOW experiments are conducted and equipped

Different Paradigms

Worldview about how to conduct research” • “In one paradigm there can be several methodologies”

1. POSITIVISM

Empirical & Quantitative

- Belief that human knowledge is produced by the scientific interpretation of observational data.
- Based on the study of facts and gathering of physical evidence — prefers quantitative methods.
- With appropriate measurement tools, researchers can objectively uncover absolute, undeniable truths.

02. POSTPOSITIVISM

Constructed & Fallible

- True objectivity is an elusive goal; reality is constructed by people and experiences.
- Postpositivists argue that researcher influences what they observe and impact what they conclude.
- Assume all observation is fallible and all theories can be revised.
- Uses qualitative to supplement quantitative to bring meaning and context to findings. (surveys, interviews)

Philosophical Orientations Toward Research

- Different approaches to generating and validating knowledge

1. CONSTRUCTIVISM

Subjective & Experiential

- Knowledge is constructed by scientists and opposes the idea of a single self-evident methodology.
- Knowledge is created by individuals based on experiences, beliefs, and social interactions.
- Primary focus on qualitative methods to deeply understand a subject.

02. REALISM

Objective & Practical

- Focuses strictly on facts, empirical data, and measurable aspects of the world.
- Incorporate operational decisions based on "what will work best" to find answers.
- Aims to solve real-world problems and create data-driven solutions.
- Often associated with mixed-methods (experiments, statistical analysis).



In a Nutshell

- Key takeaways of the formal research process and worldview

01. THE CYCLE

Structured Process

Formal research is a structured cycle designed to gather, analyse, and interpret information to solve an unanswered problem.

02. HYPOTHESIS

Cause & Effect

To succeed, a researcher must form a hypothesis about how a cause affects an outcome.

03. WORLDVIEW

Philosophical Lens

How this investigation is carried out depends entirely on the researcher's philosophical worldview—whether they focus strictly on measurable facts, account for human bias, or simply look for practical solutions.

THANK YOU

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