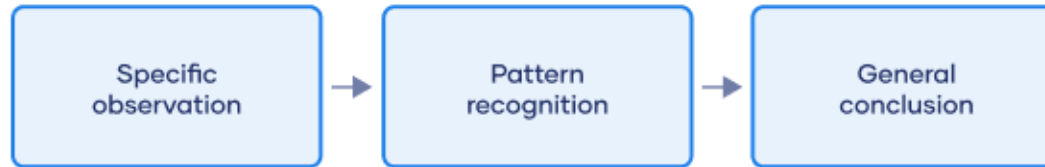
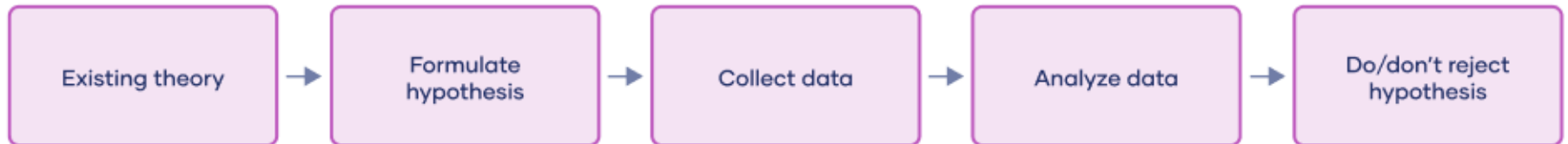


# Inductive vs. deductive reasoning

## Inductive



## Deductive



# Deductive vs. Inductive Research Processes

## Deductive - Quantitative approach

Known idea or theory exists



Form hypothesis



Test hypothesis and Observe results/data



Confirm results

## Inductive - Qualitative approach

Observation of phenomenon



Detecting a pattern



Develop tentative hypothesis



Form a theory

\*Mixed methods can allow for both processes to occur either simultaneously or be used in a cyclical manner.

# Inductive research approach

When there is little to no existing literature on a topic, it is common to perform [inductive research](#), because there is no theory to test. The inductive approach consists of three stages:

## 1. Observation

- A low-cost airline flight is delayed
- Dogs A and B have fleas
- Elephants depend on water to exist

## 2. Seeking patterns

- Another 20 flights from low-cost airlines are delayed
- All observed dogs have fleas
- All observed animals depend on water to exist

## 3. Developing a theory or general (preliminary) conclusion

- Low cost airlines always have delays
- All dogs have fleas
- All biological life depends on water to exist

# Examples of inductive research

1. A researcher observes patterns in the behavior of a particular group of individuals and uses those patterns to develop a theory about the underlying psychological processes that drive their behavior.

2. A researcher conducts a series of interviews with patients who have recovered from a particular disease and uses the information obtained to generate hypotheses about the potential causes of the disease.

3. A researcher collects data on consumer behavior in a particular market and uses that data to identify trends and patterns that can inform marketing strategies.

## Limitations of an inductive approach

A conclusion drawn on the basis of an inductive method can never be fully proven. However, it can be invalidated.

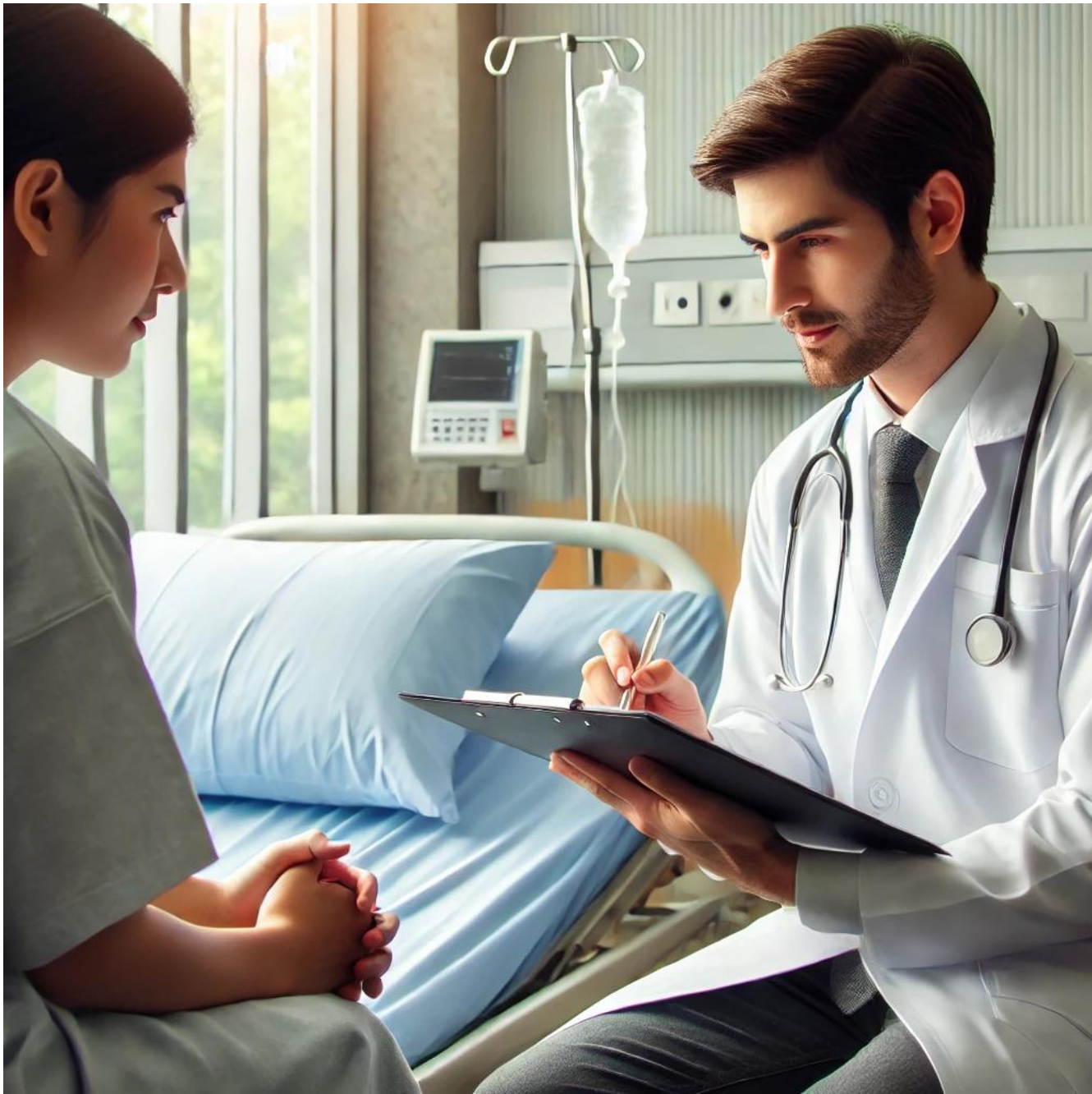
### Example

- ❑ You observe 1000 flights from low-cost airlines. All of them experience a delay, which is in line with your theory.
- ❑ However, you can never prove that flight 1001 will also be delayed.
- ❑ Still, the larger your dataset, the more reliable your conclusions.

- **Observing shopping habits of customers in a supermarket to identify patterns in product preferences.**
- **Deriving theories about customer segmentation (e.g., budget-conscious shoppers, brand-loyal customers).**







## **Deductive research approach**

- ❑ When conducting deductive research, you always start with a theory.**
- ❑ This is usually the result of inductive research. Reasoning deductively means testing these theories.**
- ❑ Remember that if there is no theory yet, you cannot conduct deductive research.**
- ❑ Limitations of a deductive approach is that the conclusions of deductive reasoning can only be true if all the premises set in the inductive study are true and the terms are clear.**



# Examples of deductive research

1. A researcher formulates a hypothesis about the relationship between two variables and then tests that hypothesis through an experimental study.

2. A researcher develops a theory about the impact of a particular policy on social outcomes and then collects data to evaluate whether the theory is supported by the evidence.

3. A researcher uses existing theories about the causes of a particular disease to develop a set of predictions about the characteristics of individuals who are most likely to develop the disease and then tests those predictions through a survey or case-control study.

The deductive research approach consists of four stages:

**1. Start with an existing theory and create a problem statement**

- Low cost airlines always have delays
- All dogs have fleas
- All biological life depends on water to exist

**2. Formulate a falsifiable hypothesis, based on existing theory**

- If passengers fly with a low cost airline, then they will always experience delays
- All pet dogs in my apartment building have fleas
- All land mammals depend on water to exist

**3. Collect data to test the hypothesis**

- Collect flight data of low-cost airlines
- Test all dogs in the building for fleas
- Study all land mammal species to see if they depend on water

#### 4. Analyze and test the data

- 5 out of 100 flights of low-cost airlines are not delayed
- 10 out of 20 dogs didn't have fleas
- All land mammal species depend on water

#### 5. Decide whether you can reject the null hypothesis

- 5 out of 100 flights of low-cost airlines are not delayed = reject hypothesis
- 10 out of 20 dogs didn't have fleas = reject hypothesis
- All land mammal species depend on water = support hypothesis

### Limitations of a deductive approach

The conclusions of deductive reasoning can only be true if all the premises set in the inductive study are true and the terms are clear.

- Example**

- All dogs have fleas (premise)**

- Benno is a dog (premise)**

- Benno has fleas (conclusion)**

**Based on the premises we have, the conclusion must be true. However, if the first premise turns out to be false, the conclusion that Benno has fleas cannot be relied upon.**

Topics	Inductive research	Topics	Deductive research
Bottom-up approach	<p>In inductive research, the researcher starts with data and observations, then uses data patterns to develop theories or generalizations.</p> <p>This is a bottom-up approach in which the researcher builds from specific observations to more general theories.</p>	Top-down approach	<p>In deductive research researcher starts with a theory or hypothesis, then tests it through observations and gathering data.</p> <p>This is a top-down approach in which the researcher tests a theory or generalization using specific observations.</p>
Develops theories from observations	<p>In inductive research, theories or generalizations are made based on what has been seen and how it has been seen.</p> <p>The goal is to create theories explaining and making sense of the data.</p>	Tests theories through observations	<p>Deductive research aims to use real-world observations to test theories or hypotheses.</p> <p>The person doing the research gathers data to prove or disprove the theory or hypothesis.</p>



Used in exploratory studies	Inductive research is often used to learn more about a phenomenon or area of interest when there is a limited amount of previous research on the subject. With this method, new theories and ideas can be made from the data.	Used in confirmatory studies	Researchers often use deductive research when they want to test a well-known theory or hypothesis and either prove or disprove it. This method works best when the researcher has a clear research question and wants to test a specific hypothesis.
Flexible and adaptable to new findings	Inductive research is flexible and open to new information because researchers can change their theories and hypotheses based on their findings. This method works best when the research question is unclear, or unexpected results arise.	Structured and systematic	Deductive research is structured and methodical because it uses a research design and method that have already been decided upon. This method starts with a clear plan for the research, making it easier to collect and analyze data more objectively and consistently.

Relies more on qualitative analysis	Inductive research uses more qualitative analysis, like textual or visual analysis, to find patterns and themes in the data.	Relies more on quantitative analysis	Deductive research uses more quantitative methods, like statistical analysis, to test and confirm the theory or hypothesis. This method uses numbers to test the theory or hypothesis and draw objective conclusions.
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# DIFFERENCE BETWEEN INDUCTIVE VS DEDUCTIVE RESEARCH



## Inductive Research

1. Bottom-up approach
2. Develops theories from observations
3. Used in exploratory studies
4. Flexible and adaptable to new findings
5. Relies more on qualitative analysis



## Deductive Research

1. Top-down approach
2. Tests theories through observations
3. Used in confirmatory studies
4. Structured and systematic
5. Relies more on quantitative analysis

## Combining inductive and deductive research

- ❑ Many scientists conducting a larger research project begin with an inductive study.
- ❑ This helps them develop a relevant research topic and construct a strong working theory.
- ❑ The inductive study is followed up with deductive research to confirm or invalidate the conclusion.
- ❑ This can help you formulate a more structured project, and better mitigate the risk of research bias creeping into your work.



**Qualitative vs Quantitative Research:  
Tell a Story or Use a Graph?**



# **Quantitative research**

- ❑ Quantitative research is expressed in numbers and graphs. It is used to test or confirm theories and assumptions.**
- ❑ This type of research can be used to establish generalizable facts about a topic.**
- ❑ Common quantitative methods include experiments, observations recorded as numbers, and surveys with closed-ended questions.**

# **Qualitative research**

- ❑ Qualitative research is expressed in words. It is used to understand concepts, thoughts or experiences.**
- ❑ This type of research enables you to gather in-depth insights on topics that are not well understood.**
- ❑ Common qualitative methods include interviews with open-ended questions, observations described in words, and literature reviews that explore concepts and theories.**



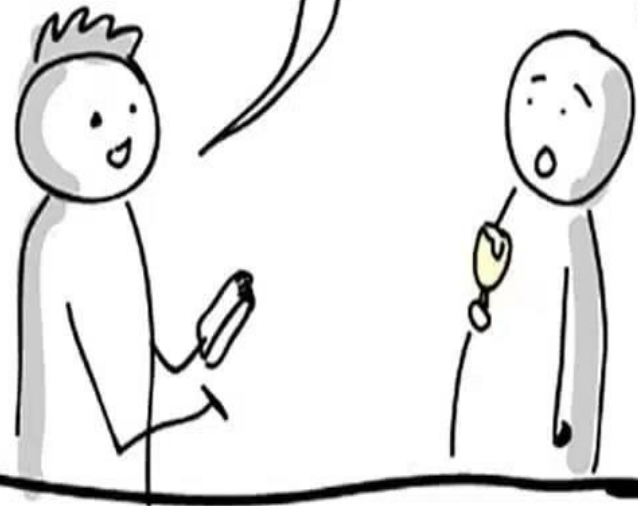
"You'd be surprised at the number of disruptive participants we get at these focus groups".

## Qualitative Methods

What did you feel when you saw the free ice cream?

Excited.  
A little scared.

And why was that?



# What is Qualitative Research?

*“Qualitative research involves an **interpretive**, naturalistic approach to the world. This means that qualitative researchers study things in their natural settings attempting to make sense of, or interpret, phenomenon in terms of the meanings people bring to them.”*

-Denzin and Lincoln, 2003

# So why conduct qualitative research?

- ▶ Understand behavior, beliefs, opinions and emotions from the perspective of participants
- ▶ Understand and explain views and behaviors
- ▶ Understand processes, such as how people make decisions
- ▶ Understand meaning people attribute to their experiences
- ▶ Understand social interactions among people and the values shared by them
- ▶ Identify social, cultural, economic, and physical context in which events take place
- ▶ Give voice to issues of certain populations that may be overlooked, and examine sensitive and complex issues in detail (e.g. sexuality, violence, drug use)
- ▶ Provide depth, detail, nuance, and context to research issues



# Strengths of Qualitative Research

- ▶ Gain insider perspectives into issues that are often missed (subtleties and complexities)
- ▶ Building relationships, causes, and effects, and dynamic processes surrounding issues
- ▶ Allows for ambiguities/contradictions in the data, which reflect social reality and duality behind many major issues
- ▶ Descriptive, narrative style which provides rich data

# Limitations of Qualitative Research

- ▶ Lengthy and complicated designs, which do not draw large samples
- ▶ Validity of reliability of subjective data
- ▶ Difficult to replicate study because of central role of the researcher and context
- ▶ Data analysis and interpretation is time consuming
- ▶ Subjective - open to misinterpretation



*"I once mistakenly thought I was dating someone for a whole month because I couldn't tell that his texts were sarcastic."*

## Quantitative research

Test hypotheses

Expressed in numbers

Larger sample size

Math/statistical analysis

## Qualitative research

Formulate hypotheses

Expressed in words

Smaller sample size

Summarize, categorize, interpret

# Qualitative vs. quantitative research

	Qualitative research	Quantitative research
Focus	Exploring ideas or formulating hypotheses/theories	Testing hypotheses or theories
Analysis	Summarizing, categorizing, interpreting	Math and statistical analysis
Expressed in	Words	Numbers, graphs, tables, fewer words
Sample	Few respondents	Many respondents
Questions	Open-ended	Close-ended or multiple choice
Characterized by	Understanding, context, complexity, subjectivity	Testing, measurement, objectivity, replicability

# Quantitative vs. Qualitative

## Quantitative

- ▶ What? Who? Which? When? Where?
- ▶ Conducted during later phases of research
- ▶ Quicker data collection and analysis
- ▶ Close ended questions or scales (e.g. Yes/No, 1-10 scales)
- ▶ Larger sample sizes
- ▶ Objective data - precise measurements and analyses

## Qualitative

- ▶ How? Why?
- ▶ Initial phases of research -exploratory
- ▶ Lengthy, tedious data collection and analysis
- ▶ Open ended questions
- ▶ Smaller and more focused sample sizes
- ▶ Subject data - experiences and interpretations of events



## Quantitative data collection methods

- **Surveys:** List of closed or multiple choice questions that is distributed to a **sample** (online, in person, or over the phone).
- **Experiments:** Situation in which different **types of variables** are controlled and manipulated to establish cause-and-effect relationships.
- **Observations:** Observing subjects in a natural environment where variables can't be controlled.

## Qualitative data collection methods

- **Interviews:** Asking open-ended questions verbally to respondents.
- **Focus groups:** Discussion among a group of people about a topic to gather opinions that can be used for further research.
- **Ethnography:** Participating in a community or organization for an extended period of time to closely observe culture and behavior.
- **Literature review:** Survey of published works by other authors.

# When to use qualitative vs. quantitative research

A rule of thumb for deciding whether to use qualitative or quantitative data is:

- Use quantitative research if you want to **confirm or test something** (a theory or hypothesis)
- Use qualitative research if you want to **understand something** (concepts, thoughts, experiences)

## **Quantitative research approach**

You survey 300 students at your university and ask them questions such as: “on a scale from 1-5, how satisfied are you with your professors?”

You can perform statistical analysis on the data and draw conclusions such as: “on average students rated their professors 4.4”.

## **Qualitative research approach**

You conduct in-depth interviews with 15 students and ask them open-ended questions such as: “How satisfied are you with your studies?”, “What is the most positive aspect of your study program?” and “What can be done to improve the study program?”

## **Mixed methods approach**

You conduct interviews to find out how satisfied students are with their studies. Through open-ended questions you learn things you never thought about before and gain new insights. Later, you use a survey to test these insights on a larger scale.

It's also possible to start with a survey to find out the overall trends, followed by interviews to better understand the reasons behind the trends.

## Analyzing quantitative data

Quantitative data is based on numbers. Simple math or more advanced [statistical analysis](#) is used to discover commonalities or patterns in the data. The results are often reported in graphs and tables.

Applications such as Excel, SPSS, or R can be used to calculate things like:

- ✓ Average scores ([means](#))
- ✓ The number of times a particular answer was given
- ✓ The [correlation or causation](#) between two or more variables
- ✓ The [reliability and validity](#) of the results

## Analyzing qualitative data

Qualitative data is more difficult to analyze than quantitative data. It consists of text, images or videos instead of numbers.

Some common approaches to analyzing qualitative data include:

- **Qualitative content analysis:** Tracking the occurrence, position and meaning of words or phrases
- **Thematic analysis:** Closely examining the data to identify the main themes and patterns
- **Discourse analysis:** Studying how communication works in social contexts

# Primary/Secondary research

	Primary research	Secondary research
<b>Original data</b>	Collected by you	Collected by someone else
<b>Research type</b>	Qualitative or quantitative	Qualitative or quantitative
<b>Methods</b>	<ul style="list-style-type: none"><li>• Surveys</li><li>• Focus groups</li><li>• Interviews</li><li>• Observations</li><li>• Experiments</li></ul>	Any type of research previously collected by someone else
<b>Key advantages</b>	<ul style="list-style-type: none"><li>✓ You decide what you want to study or observe and how</li><li>✓ You maintain control over the data. You ensure that it is objective, reliable, and valid</li><li>✓ The ensuing results are yours to manage as you wish</li></ul>	<ul style="list-style-type: none"><li>✓ Information you need is readily available</li><li>✓ Research is quick and efficient</li><li>✓ Secondary data can give you great ideas for primary research</li></ul>
<b>Key disadvantages</b>	<ul style="list-style-type: none"><li>✗ Expensive and time-consuming</li><li>✗ Often insufficient as a standalone research method</li><li>✗ Prone to bias</li></ul>	<ul style="list-style-type: none"><li>✗ Data can be outdated, corrupted, biased, or unethical</li><li>✗ Quality is not known</li><li>✗ Public availability can lead to duplicate findings and research aims</li></ul>

# Primary research vs Secondary research

Primary Research	Secondary Research
Data collection directly from original sources.	Utilizes existing data and information.
Involves gathering new and firsthand data.	Relies on pre-existing data collected by others.
Time-consuming and resource-intensive.	Time-efficient and cost-effective.
Provides unique insights specific to the research objective.	Offers broader context and generalizable findings.
Can be tailored to specific research questions.	Covers a wide range of topics and research areas.
Enables direct interaction with participants or subjects.	Does not have direct contact with participants.
Offers flexibility in study design and methodology.	Limited control over data quality and collection methods.
Higher control over data reliability and validity.	Relies on the quality and credibility of the selected sources.
Allows for in-depth exploration of research questions.	Supports hypothesis testing and comparative analysis.
Requires ethical considerations for participant involvement.	Ethics demand proper citation and adherence to copyright laws.



## Examples of Primary Research

- ❑ **Conducting a survey to collect data on customer satisfaction and preferences for a new product directly from the target audience.**
- ❑ **Designing and conducting an experiment to test the effectiveness of a new teaching method by comparing the learning outcomes of students in different groups.**
- ❑ **Observing and documenting the behavior of a specific animal species in its natural habitat to gather data for ecological research.**
- ❑ **Organizing a focus group with potential consumers to gather insights and feedback on a new advertising campaign.**
- ❑ **Conducting interviews with healthcare professionals to understand their experiences and perspectives on a specific medical treatment.**

# Examples of Secondary Research

- ❑ **Accessing a market research report to gather information on consumer trends, market size, and competitor analysis in the smartphone industry.**
- ❑ **Using existing government data on unemployment rates to analyze the impact of economic policies on employment patterns.**
- ❑ **Examining historical records and letters to understand the political climate and social conditions during a particular historical event.**
- ❑ **Conducting a meta-analysis of published studies on the effectiveness of a specific medication to assess its overall efficacy and safety.**

# Action research cycle



- ❑ **Action research** is a research method that aims to simultaneously investigate and solve an issue.
- ❑ In other words, as its name suggests, action research conducts research and takes action at the same time. It was first coined as a term in 1944 by MIT professor Kurt Lewin.
- ❑ A highly interactive method, action research is often used in the social sciences, particularly in educational settings.
- ❑ Particularly popular with educators as a form of systematic inquiry, it prioritizes reflection and bridges the gap between theory and practice.
- ❑ Due to the nature of the research, it is also sometimes called a cycle of action or a cycle of inquiry.

## Types of action research

There are 2 common types of action research: participatory action research and practical action research.

- **Participatory action research** emphasizes that participants should be members of the community being studied, empowering those directly affected by outcomes of said research. In this method, participants are effectively co-researchers, with their lived experiences considered formative to the research process.

- **Practical action research** focuses more on how research is conducted and is designed to address and solve specific issues.

Both types of action research are more focused on increasing the capacity and ability of future practitioners than contributing to a theoretical body of knowledge.

## Action research models

Action research is often reflected in 3 action research models: operational (sometimes called technical), collaboration, and critical reflection.

- **Operational (or technical) action research** is usually visualized like a spiral following a series of steps, such as “planning → acting → observing → reflecting.”

- **Collaboration action research** is more community-based, focused on building a network of similar individuals (e.g., college professors in a given geographic area) and compiling learnings from iterated feedback cycles.

- **Critical reflection action research** serves to contextualize systemic processes that are already ongoing (e.g., working retroactively to analyze existing school systems by questioning why certain practices were put into place and developed the way they did).



	Action research	Traditional research
Purpose	<ul style="list-style-type: none"><li>• Solve immediate problems</li><li>• Improve existing systems</li></ul>	<ul style="list-style-type: none"><li>• Draw conclusions from data</li><li>• Advance existing knowledge</li><li>• Provide <b>generalizable</b> and <b>reliable</b> findings</li></ul>
Context	<ul style="list-style-type: none"><li>• Reactive, derived from surroundings</li><li>• Usually not theoretical in nature</li></ul>	<ul style="list-style-type: none"><li>• Focused on crafting strong <b>hypotheses</b> and seeking <b>causal relationships</b> between variables</li><li>• Derived from theory</li></ul>
Significance	<ul style="list-style-type: none"><li>• Practical</li></ul>	<ul style="list-style-type: none"><li>• Statistical</li></ul>

# Exploratory Research

- ❑ Exploratory research is a methodology approach that investigates research questions that have not previously been studied in depth.
- ❑ Exploratory research is often qualitative and primary in nature. However, a study with a large sample conducted in an exploratory manner can be quantitative as well.
- ❑ It is also often referred to as interpretive research or a grounded theory approach due to its flexible and open-ended nature.

## Exploratory research problem

- ☐ Your university dining hall is considering adding Vegan versions of its meals to its daily menu, something it has never offered before.
- ☐ However, the university is hesitant to do so because of concerns that the items will not be sufficiently popular, leading to increased food waste.
- ☐ Your university is eco-conscious and will not add the items if this will increase food waste.
- ☐ As there is also a cost associated with developing the recipes, the plan will only proceed if there is concrete proof that the vegan meals will be successful.

## **Exploratory research questions**

- ❑ What effect does using a digital notebook have on the attention span of middle schoolers?**
- ❑ What factors influence mental health in undergraduates?**
- ❑ What outcomes are associated with an authoritative parenting style?**
- ❑ In what ways does the presence of a non-native accent affect intelligibility?**
- ❑ How can the use of a grocery delivery service reduce food waste in single-person households?**

# Explanatory Research

- ❑ Explanatory research is a research method that explores why something occurs when limited information is available.
- ❑ It can help you increase your understanding of a given topic, ascertain how or why a particular phenomenon is occurring, and predict future occurrences.
- ❑ Explanatory research can also be explained as a “cause and effect” model, investigating patterns and trends in existing data that haven't been previously investigated.

## **Explanatory research questions**

- Why do undergraduate students obtain higher average grades in the first semester than in the second semester?
- How does marital status affect labor market participation?
- Why do multilingual individuals show more risky behavior during business negotiations than monolingual individuals?
- How does a child's ability to delay immediate gratification predict success later in life?
- Why are teens more likely to litter in a highly littered area than in a clean area?



# Research Design

A research design is a strategy for answering your **research question** using empirical data. Creating a research design means making decisions about:

- Your overall **research objectives** and approach
- Whether you'll rely on **primary research** or **secondary research**
- Your **sampling methods** or criteria for selecting subjects
- Your **data collection methods**
- The procedures you'll follow to collect data
- Your **data analysis methods**

## Type of design

## Purpose and characteristics

### Experimental

- Used to test **causal** relationships
- Involves manipulating an independent variable and measuring **its** effect on a **dependent variable**
- Subjects are randomly assigned to groups
- Usually conducted in a controlled environment (e.g., a lab)

### Quasi-experimental

- Used to test causal relationships
- Similar to experimental design, but without **random assignment**
- Often involves comparing the outcomes of pre-existing groups
- Often conducted in a natural environment (higher **ecological validity**)

### Correlational

- Used to test whether (and how strongly) variables are related
- Variables are measured without influencing them

### Descriptive

- Used to describe characteristics, averages, trends, etc
- Variables are measured without influencing them

## Type of design

## Purpose and characteristics

### Case study

- Detailed study of a specific subject (e.g., a place, event, organization, etc).
- Data can be collected using a variety of sources and methods.
- Focuses on gaining a holistic understanding of the case.

### Ethnography

- Detailed study of the culture of a specific community or group.
- Data is collected by extended immersion and close observation.
- Focuses on describing and interpreting beliefs, conventions, social dynamics, etc.

### Grounded theory

- Aims to develop a theory inductively by systematically analyzing qualitative data.

### Phenomenology

- Aims to understand a phenomenon or event by describing participants' lived experiences.