

OBJECTIVES, RESEARCH QUESTION & HYPOTHESIS

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11/02/2025, 18:00-19:30

FRANCESINHAS 2, Room 2.02

In the previous class...

- **Conducting a Systematic Bibliographic Search.**
- **Introducing students to the 'EBSCO Discovery Service'.**
- **Creating an 'Article Matrix' as a tool for systematizing information.**
- **The link between search, systematization and TFM**

Today...

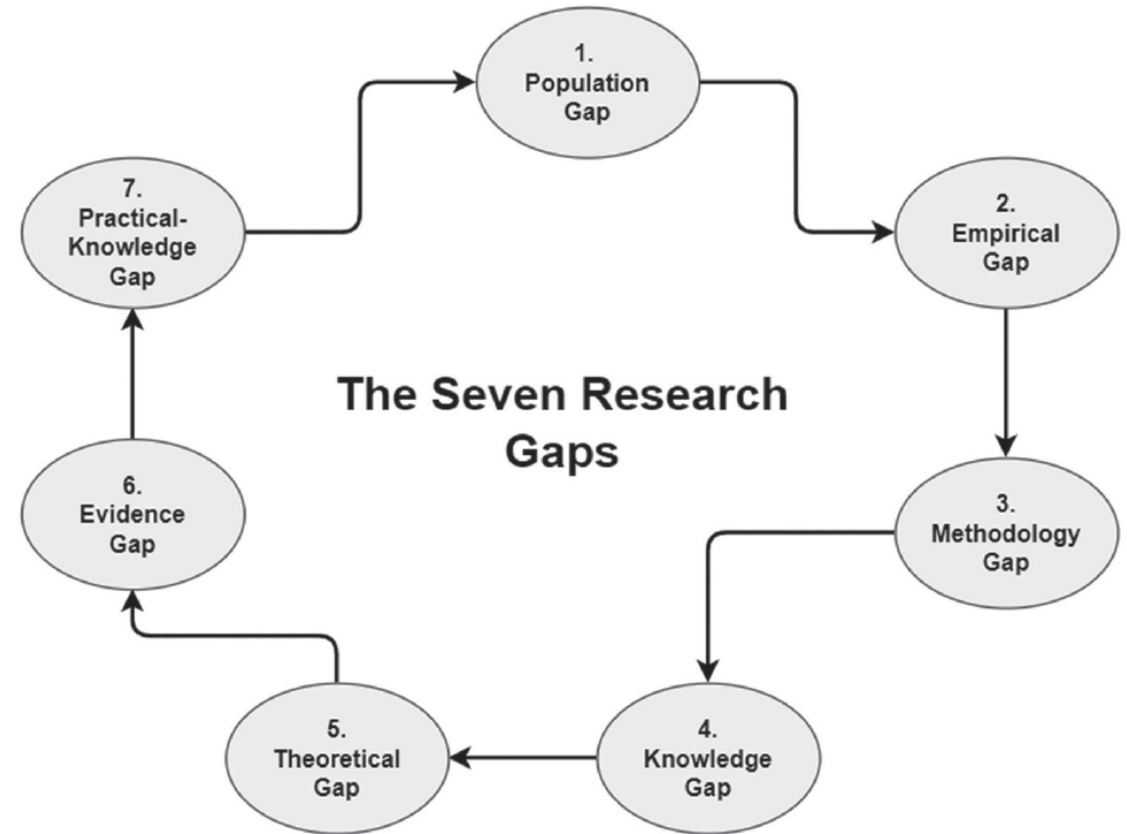
We aim to introduce students to the key issues in defining the basis of their Research Project:

- **Circumscribe the Goal / Aim of the study;**
- **Formulate the Research Question;**
- **Specify (eventual) Research Hypothesis.**

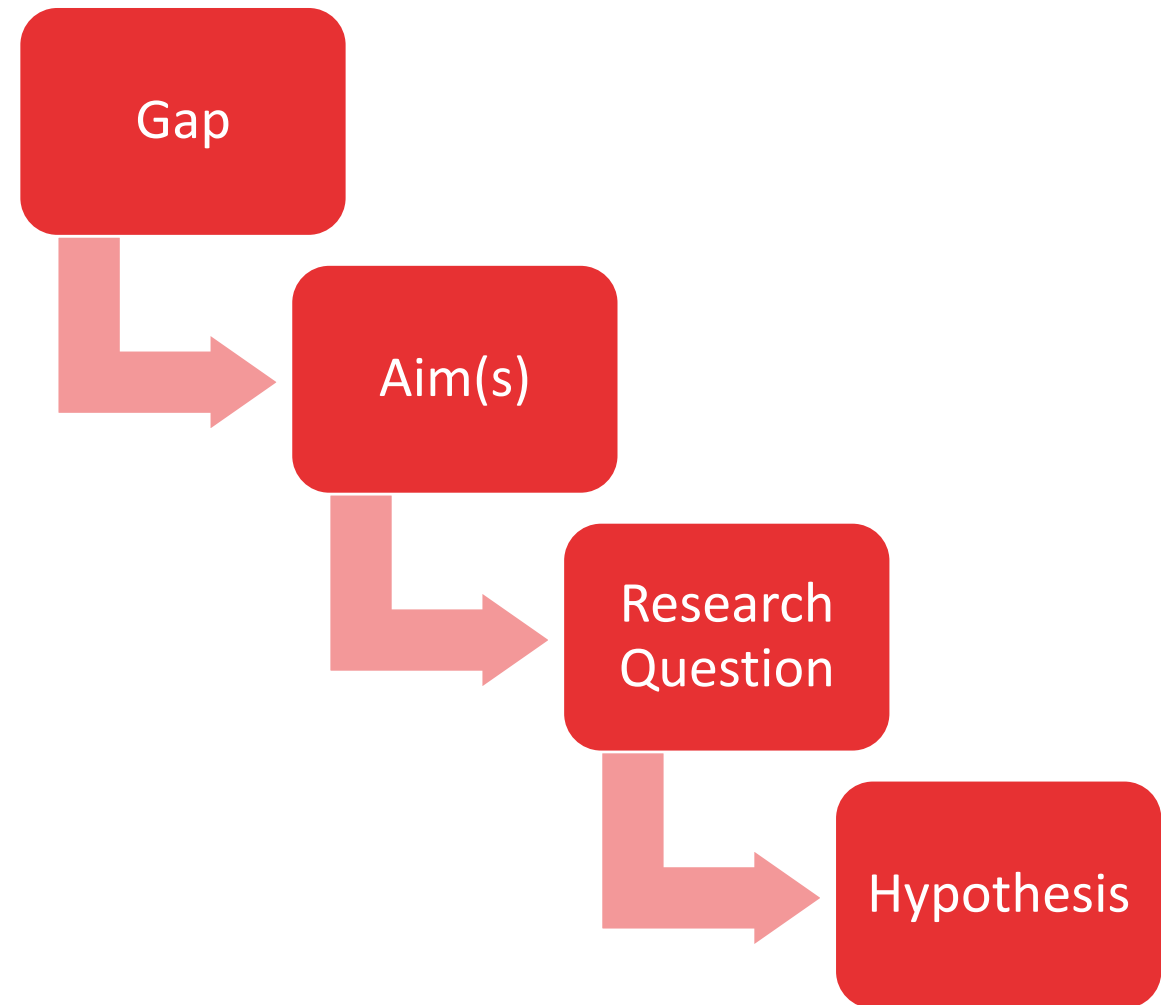
At the end of this class, you should be able to:

- **Know how to define the Goal/Aim of a Research Project**
- **Know how to specify a Research Question by reference to the Goal / Aim of the Study.**
- **Know how to use the PICO/PEO Models to formulate the Research Question.**
- **Know what are the criteria to take in consideration when specifying the Research Hypothesis.**
- **Know the difference between Error Types (I & II) and how these can emerge during the empirical validation of Research Hypothesis.**

Adu e Miles (2024) have identified 7 Research Gaps...

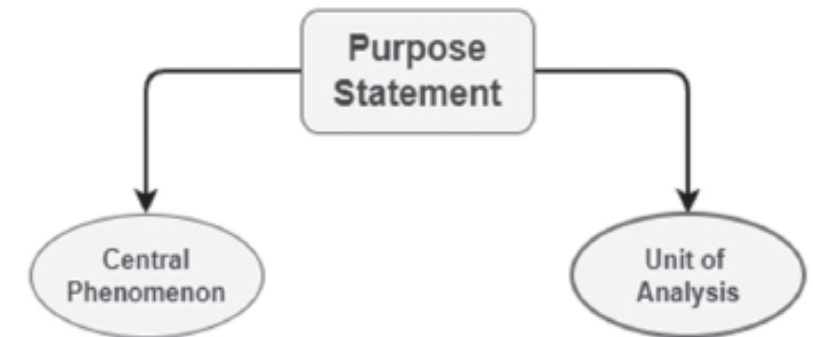
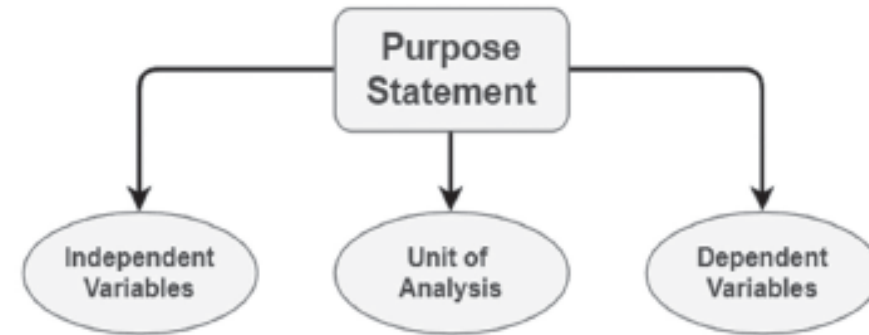


Identifying the gap we intend to fill is an essential step in defining the objective and/or research question of TFM.



How to define the Aim/ Goal of your study?

- What should be included in the definition of the purpose statement varies according to the type of methodology.



How to define the Aim/ Goal of your study?

- A good way of clarifying the purpose of your study involves disentangling a set of specific objectives within the overall aim/goal.

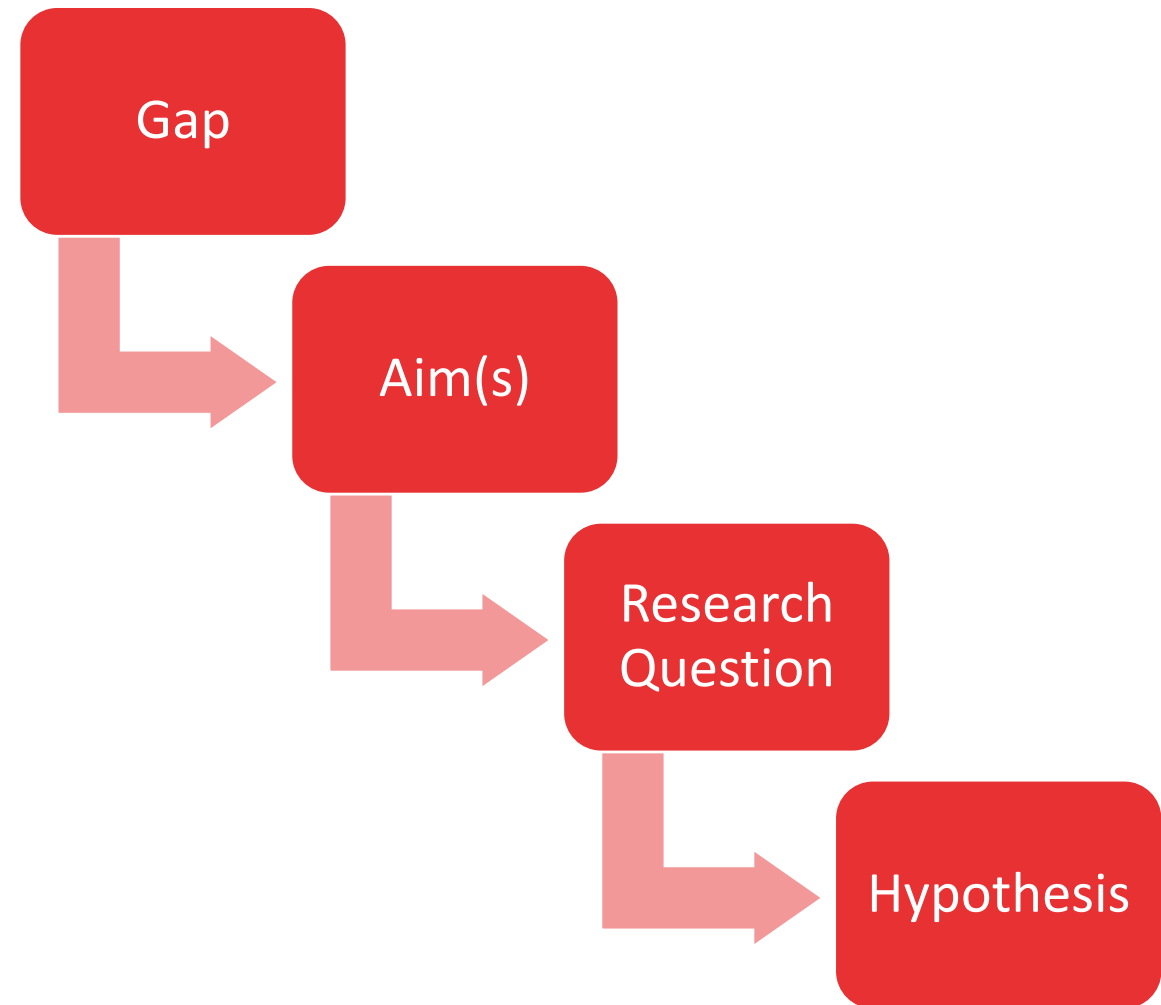
GOAL / AIM: XXXX		
PRIMARY OBJECTIVE: XXXX	PRIMARY OBJECTIVE: XXXX	PRIMARY OBJECTIVE: XXXX

How to define the Aim/ Goal of your study?

- **Example:**

<p>GOAL / AIM:</p> <p><i>The purpose of this study is to investigate the issues affecting the job satisfaction of nursing faculty members in metropolitan New York. Interviewing and questioning nursing faculty living in metropolitan New York provides insight into their personal experiences of job satisfaction while working in the nurse educator role. The researcher has identified three primary objectives as a basis for this study.</i></p>		
<p>PRIMARY OBJECTIVE #1:</p> <p><i>Examine the issue of job satisfaction among the nursing faculty.</i></p>	<p>PRIMARY OBJECTIVE #2:</p> <p><i>Investigate the impact of low wages on the nursing faculty.</i></p>	<p>PRIMARY OBJECTIVE #3:</p> <p><i>Examine the complexities of the nursing faculty role.</i></p>

Once we have clearly established the Research Gap and the Aim of the study, we are in position to define the Research Question.



Types of Research Questions

- **We can classify Research Questions by reference to two criteria:**
 - **By Reference to Purpose**
 - **By Reference to Method**

Types of Research Questions

- We can classify Research Questions by reference to two criteria:
 - **By Reference to Purpose**
 - **W-Questions (Vau, 2001)**
 - **Adu & Miles (2024)**
 - **By Reference to Method**

Descriptive Questions

What
Who
When
Where

Explanatory Questions

How
Why

Types of Research Questions

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<i>Type of Research Question</i>	<i>When To Use</i>	<i>First Word Normally Used</i>	<i>Example</i>
<i>Descriptive</i>	When you plan to use data collected to describe the phenomenon of interest	What	What is the experience of mothers homeschooling their children?
<i>Exploratory</i>	When you want to engage in inquiry to find out what is going on	What, How	What makes physicians quit their jobs?
<i>Process-focused</i>	When you want to demonstrate how a phenomenon occurs	How	How do people labeled as Generation Z become financially independent?
<i>Comparative</i>	When you plan to compare entities or phenomena or processes	How	How is working from home different from working in the office?
<i>Explanatory</i>	When you plan to explain a phenomenon or process	Why, How	Why are some CEOs concerned about allowing employees to work from home?

Types of Research Questions

- **We can classify Research Questions by reference to two criteria:**
 - **By Reference to Purpose**
 - **W-Questions (Vau, 2001)**
 - **Adu & Miles (2024)**
 - **By Reference to Method**
 - **Quantitative**
 - **Qualitative**

Table 1 Types of quantitative research question

Type	Question
Descriptive	<ul style="list-style-type: none"> ■ Seeks to quantify responses to one or more variables ■ Often begins with 'What is...?' or 'What are...?'
Comparative	<ul style="list-style-type: none"> ■ Seeks to compare two or more groups for some outcome variable ■ Often uses words such as 'compare' ■ When it involves two groups it can be written as: 'What is the difference in (dependent variable) between (group 1) and (group 2)?' ■ Can be extended to three or more groups by replacing the word 'between' with 'among' ■ Can be causal in nature, such as the effect of X on Y ■ Such causal questions are implicitly comparative in nature when a comparison is made between a group where X is involved and a group where X is not involved
Relationship	<ul style="list-style-type: none"> ■ Is concerned with trends between or among two or more variables ■ Often uses words such as 'relate', 'relationship', 'association' and 'trend' ■ Relationship questions involving two variables usually can be written using: 'What is the relationship between (independent variable) and (dependent variable) among (population)?' ■ Can be extended to three or more variables by replacing the word 'between' with 'among'

(Onwuegbuzie and Leech 2006)

Source: Doody & Bayley (2016: 20)

Types of Research Questions

- We can classify Research Questions by reference to two criteria:
 - **By Reference to Purpose**
 - W-Questions (Vau, 2001)
 - Adu & Miles (2024)
 - **By Reference to Method**
 - Quantitative
 - Qualitative

Table 2 Types of qualitative research question	
Type	What it does
Contextual	Describes the form or nature of what exists
Explanatory	Examines the reasons for or associations between what exists
Evaluative	Appraises the effectiveness of what exists
Generative	Provides new ideas, aiding the development of theories, strategies or actions
Ideological	Advances the ideology of a position
Exploratory	Investigates a phenomenon where little is understood
Explanatory	Explains a phenomenon
Descriptive	Tries to describe a phenomenon
Emancipatory	Engages in social action related to a phenomenon

(Ritchie et al 2014, Marshall and Rossman 2011)

Source: Doody & Bayley (2016: 21)

How Good is your Research Question?

How Good is your Research Question?

- **F**easible
- **I**nteresting
- **N**ovel
- **E**thical
- **R**elevant

How Good is your Research Question?

- **Feasible**
- **Interesting**
- **Novel**
- **Ethical**
- **Relevant**
- **Adequate number of subjects**
- **Adequate technical expertise**
- **Affordable in time and money**
- **Manageable in scope**
- **Fundable**

How Good is your Research Question?

- **F**easible
 - **I**nteresting
 - **N**ovel
 - **E**thical
 - **R**elevant
- Getting the answer intrigues the investigator and her colleagues

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 - **R**elevant
- Provides new findings
 - Confirms, refutes, or extends previous findings
 - May lead to innovations in theory or methodology

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How Good is your Research Question?

- **F**easible
 - **I**nteresting
 - **N**ovel
 - **E**thical
 - **R**elevant
- A study that the institutional review board will approve

How Good is your Research Question?

- **F**easible
- **I**nteresting
- **N**ovel
- **E**thical
- **R**elevant
- Likely to have significant impacts on scientific knowledge, clinical practice, or health policy
- May influence directions of future research

HOW SHOULD I FORMULATE MY RESEARCH QUESTION?

In the area of Health Sciences there is a set of contributions (/models) that can help us in formulating our Research Question.

Type of study	Question framework	Components of the model
Interventional/ Effectiveness	PICO(T/S)	Patient/Population, Intervention, Comparator, Outcome, (Time/Study design)
Etiologic/Risk/Cause	PEO	Population, Exposure/Environment, Outcome
Incidence/Prevalence Diagnostic test accuracy	CoCoPop PIRD	Condition, Context, Population Population, Index Test, Reference Test, Diagnosis of Interest
Prognostic	PFO	Population, Prognostic Factor (or model of interest), Outcome
Economic/Cost-effectiveness	PICOC	Population, Intervention, Comparator, Outcomes, Context
Methodologic	SDMO	Study type, Data type, Method type, Outcome
Theory/Model	BeHEMoTh	Behavior of interest, Health context, Exclusions, Models or Theories
Psychometric	CPTM	Construct of interest (measurement instrument), Population, Type of measurement instrument, Measurement properties
Qualitative	PICo	Population, Phenomena of Interest, Context
Qualitative	PPhTS	Participants, Central Phenomenon, Time, and Space
Qualitative: Public health	SPICE	Setting, Perspective, Intervention, Comparison, Evaluation
Qualitative/Mixed-Method: Experience and views	SPIDER	Sample, Phenomenon of Interest, Design, Evaluation, Research type
Qualitative: Organizational and policy evaluation	CIMO	Context, Intervention, Mechanism, Outcome
Qualitative: Health policy and management	ECLIPSe	Expectation, Client group, Location, Impact, Professionals, Service
Scoping	PCC	Population, Concept, Context

Let's focus on two of the most popular models:

PICO Model

(Quantitative Studies)

Population and their Problem

Intervention or Exposure

Comparative Intervention

Outcomes or Themes

PEO Model

(Qualitative Studies)

Population and their Problem

Exposure

Outcomes or Themes

PICO Model

POPULATION AND THEIR PROBLEM

What is the population/group affected by the phenomenon/intervention that you propose to investigate?
(unit of analysis)

INTERVENTION OR EXPOSURE

What is the phenomenon/intervention that you propose to investigate?
(independent variable)

COMPARATIVE INTERVENTION

What is the comparison element (control group) that effectively allows the impact of the phenomenon/intervention to be studied?
(control group/variables)

OUTCOMES OR THEMES

What is the indicator that allows measuring the impact of the phenomenon/intervention that is proposed to be investigated?
(outcome variable)

PICO Model

Table 2.4 Examples of using PICO to ask clear quantitative questions

	<i>Example 1</i>	<i>Example 2</i>	<i>Example 3</i>	<i>Example 4</i>
P Population and their problem	In patients with acute asthma	In children with a spinal deformity	In children with a fever	Among family members of patients with mental health problems
I Intervention or issue	how effective are antibiotics	how effective is bracing	how effective is paracetamol as compared to	how effective is listening to tranquil music, or audiotaped comedy routines
C Comparative intervention	as compared to standard care	as compared to observation	ibuprofen	as compared to standard care (none)
O Outcomes or themes	at reducing sputum production and coughing?	at reducing the scoliosis curvature?	at reducing fever and infection?	in reducing reported anxiety?

How to formulate a Research Question using the PICO Model:

- In _____ (P), what is the effect of _____ (I) on _____ (O) compared with _____ (C)?
- Are _____ (P) who have _____ (I) at (increased/decreased) risk for/of _____ (O) compared with _____ (P) with/without _____ (C)?
- For _____ (P) does the use of _____ (I) reduce the future risk of _____ (O) compared with _____ (C)?

The PEO Model

POPULATION AND THEIR PROBLEM

What is the population/group affected by the phenomenon/intervention/problem that you propose to investigate?

EXPOSURE

What is the phenomenon/intervention/problem that you propose to investigate?

OUTCOMES OR THEMES

In what way do the members of the population perceive/experience the phenomenon/intervention/problem that is under analysis.

The PEO Model

	<i>Example 1</i>	<i>Example 2</i>	<i>Example 3</i>	<i>Example 4</i>
P Population and their problem	In teenagers with a spinal deformity	Older patients with cancer	Student nurses in their first year at university	Family members of patients with mental health problems
E Exposure	the development of a spinal deformity	cancer	studying to be a nurse at university and in their first year	having a family member with mental health problem
O Outcomes or themes	the patients' views	the patients' views	the students' views	the patients' views

How to formulate a Research Question using the PEO Model :

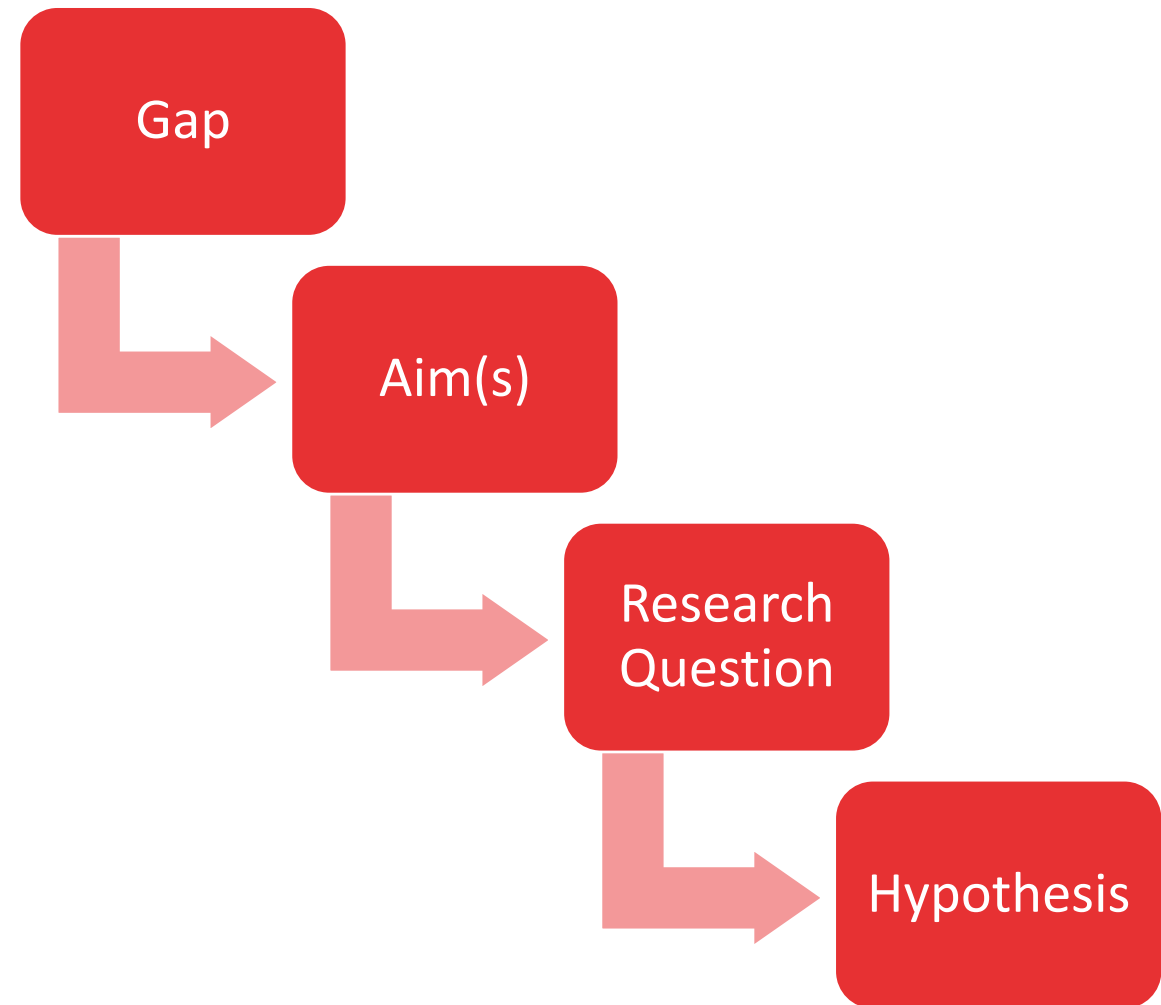
How _____ (P) with _____ (E) **perceives** (O)?

How _____ (P) **experiences** (O) _____ (E)?

What are the **attitudes** (O) of (P) _____ concerning _____ (E)?

Once we settle on a Research Question, we are in a position to specify a Research Hypothesis.*

*** Mostly in quantitative studies.**



Research Hypothesis: What Are We Talking About?

- ***'A hypothesis is a conjectural statement of the relationship between two or more variables'*** (Kerlinger, 1986: 17);
- ***'A proposition that is stated in a testable form and that predicts a particular relationship between two (or more) variables'*** (Bailey 1978: 35);
- ***'A hypothesis is written in such a way that it can be proven or disproven by valid and reliable data'*** (Grinnell, 1988: 200)

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Research Hypothesis: Key Functions

- **Provides a focus:**
 - **It tells you what specific aspects of a research problem to investigate;**
 - **It tells you what data to collect and what not to collect, thereby providing focus the study.**
- **A hypothesis may enable you to add to the formulation of theory.**

Research Hypothesis: Key Requirements

- **Describe variables or establish a relationship between variables;**
- **Be empirically testable (capable of being proven right or wrong);**
- **Should be related to the existing body of knowledge;**
- **Be clear, specific and precise;**
- **Focus on one issue only.**

Research Hypothesis: Types of Hypothesis

- There are different ways of classifying hypothesis:
 - **As statistical categories;**
 - By reference to their nature;
 - By reference to the type of relationship between variables.

- **Null Hypotheses (H_0)** - Or hypothesis of no difference.
- **Alternat(iv)e Hypothesis (H_a)** - States the opposite of the Null Hypothesis.

In statistical tests:

- Acceptance of H_0 , means rejection of H_a ;
- Rejection of H_0 , means acceptance of H_a .

Research Hypothesis: Types of Hypothesis

- There are different ways of classifying hypothesis:
 - As statistical categories;
 - **By reference to their nature;**
 - By reference to the type of relationship between variables.
- **Descriptive** – Describe events.
- **Relational** - Establish relations between variables.
 - **Directional** – Specify the direction of the relation between variables;
 - **Non-Directional** – Do not specify the direction of the relation between variables.

Research Hypothesis: Types of Hypothesis

- There are different ways of classifying hypothesis:
 - As statistical categories;
 - By reference to their nature;
 - **By reference to the type of relationship between variables.**
- **Null Hypothesis (H_0)** - Stipulates that there is no difference between two situations, groups, outcomes, or the prevalence of a condition or phenomenon.
- **Hypothesis of Difference** - Stipulates that there will be a difference between two elements, but does not specify its magnitude;
- **Hypothesis of Point-Prevalence** - Stipulates that there will be a difference between two elements, and quantifies the magnitude of the difference;
- **Hypothesis of Association** - stipulates the extent of the relationship in terms of the effect of different treatment groups on the dependent variable, or the prevalence of a phenomenon in different population groups.

Research Hypothesis: Type I & II Errors

- **A Hypothesis must be subject to empirical validation. However, this process is not without risks, namely:**
 - **the study design selected might be faulty;**
 - **the sampling procedure adopted might be faulty;**
 - **the method of data collection might be inaccurate;**
 - **the analysis might be wrong;**
 - **the statistical procedures applied might be inappropriate; or**
 - **the conclusions drawn might be incorrect.**

Research Hypothesis: Type I & II Errors

- If they materialize, these risks may result in erroneous validation of the research hypothesis, namely:
 - Type I Error - Rejection of a null hypothesis when it is true;
 - Type I Error II - Acceptance of a null hypothesis when it is false.

When all null hypothesis is actually:

<i>When your decision is to:</i>	Accept	Correct decision Type I error
	Reject	Type II error Correct decision

Research Methods and Master's Project

Objectives, Research Question & Hypothesis

TASK: #4a



HOW TO DEVELOP A RESEARCH QUESTION

The PICO Model

Step 1: Defining the Terms of the Question



HOW TO DEVELOP A RESEARCH QUESTION

The PEO Model

Step 1: Defining the Terms of the Question

WHO: Individual (If doing an Dissertation / Project)

WHAT: Using the templates made available to you in Fénix (see the Lesson 5 folder), try to specify the Research Question. Use the 'PICO Model' if your are using a Quantitative approach, and 'PEO Model' if your using a Qualitative Approach.

WHERE: Ms Teams

SUBMISSION: 10th of March, 23:59.



TASK: #4b

WHO: Individual (If doing an Internship)

WHAT: Using the template made available to you in Fénix (see the Lesson 5 folder), try to specify the Goal / Aim for your Internship Report.



OBJECTIVO DO TFM

OBJECTIVO GERAL:		
.xxx		
OBJECTIVO ESPECÍFICO:	OBJECTIVO ESPECÍFICO:	OBJECTIVO ESPECÍFICO:
xxx	xxx	xxx

WHERE: Ms Teams

SUBMISSION: 10th of March, 23:59.