



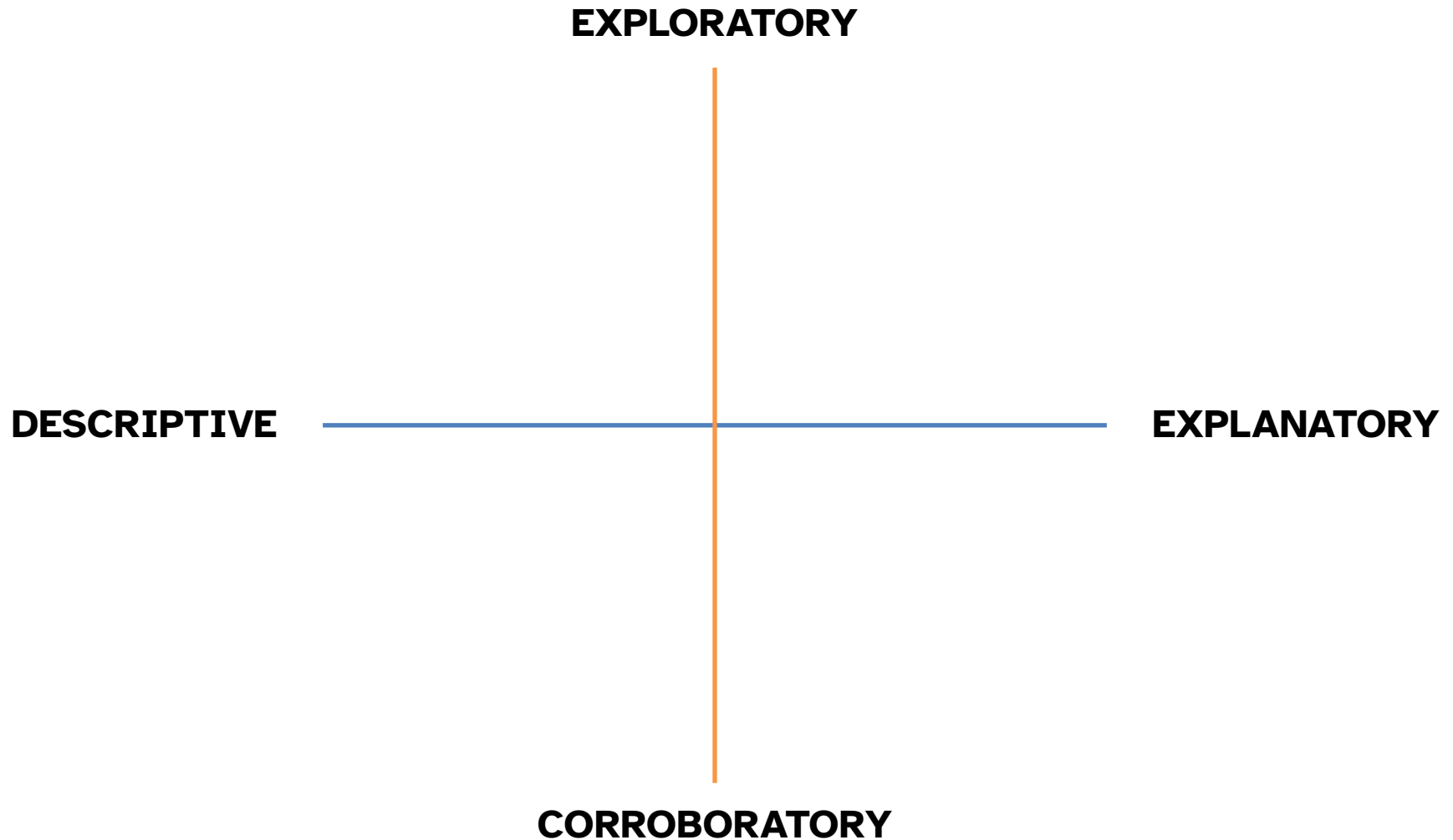
# Research questions and hypotheses

Define your research problem, question and hypothesis

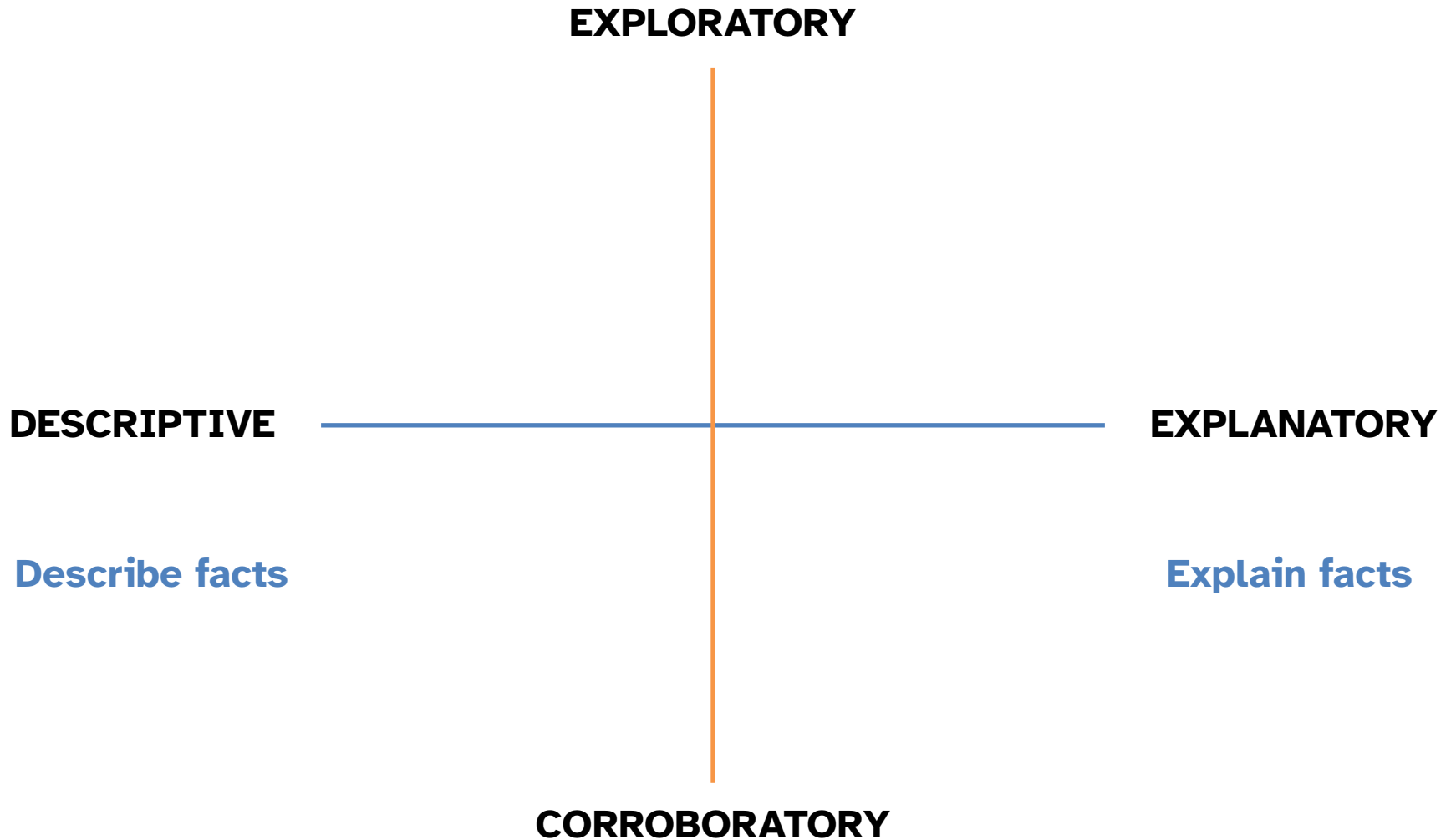
# Empirical research

- Empirical = **DATA**
- Two "axes" of research types

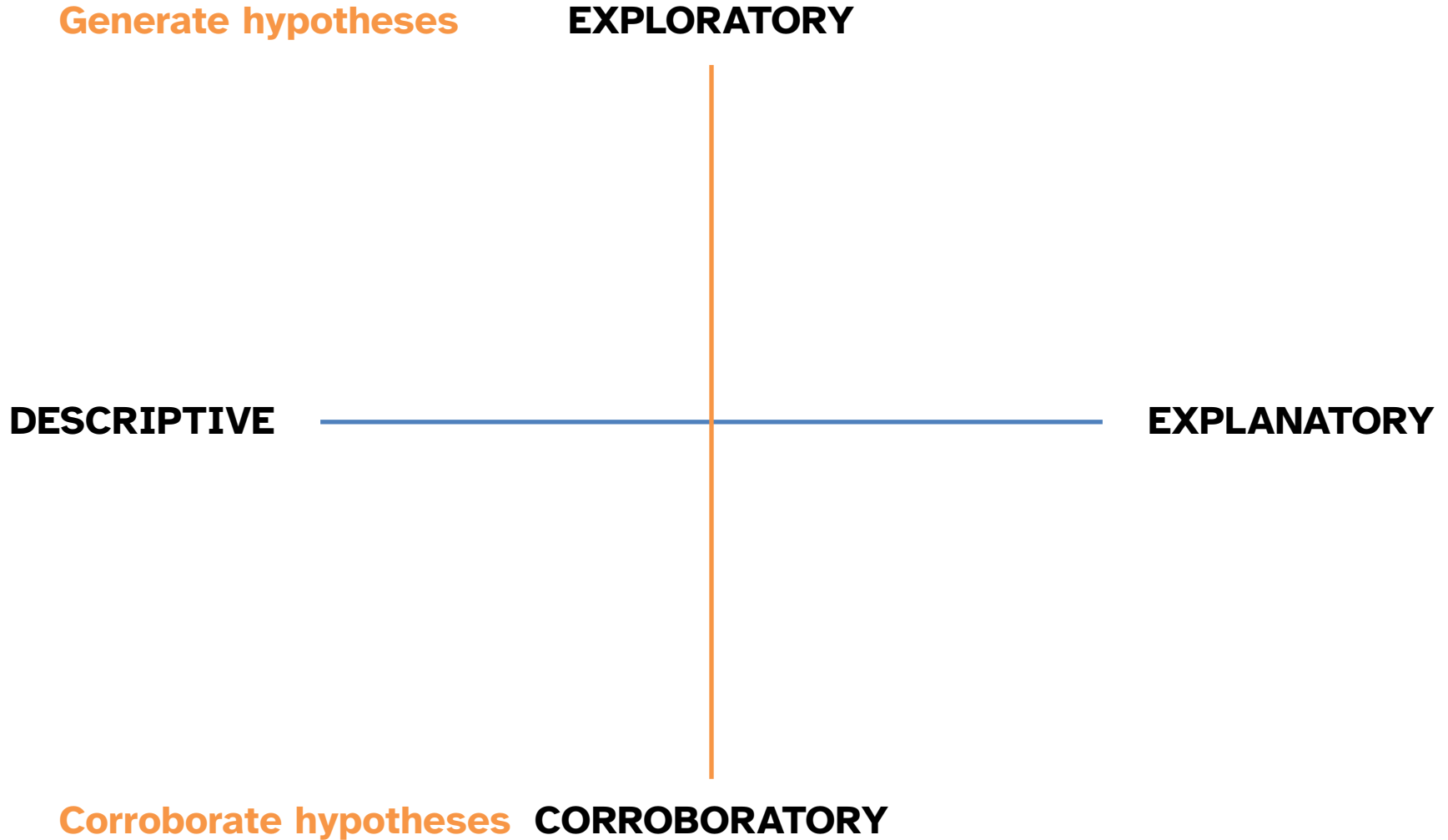
# Axes of research type



# Axes of research type



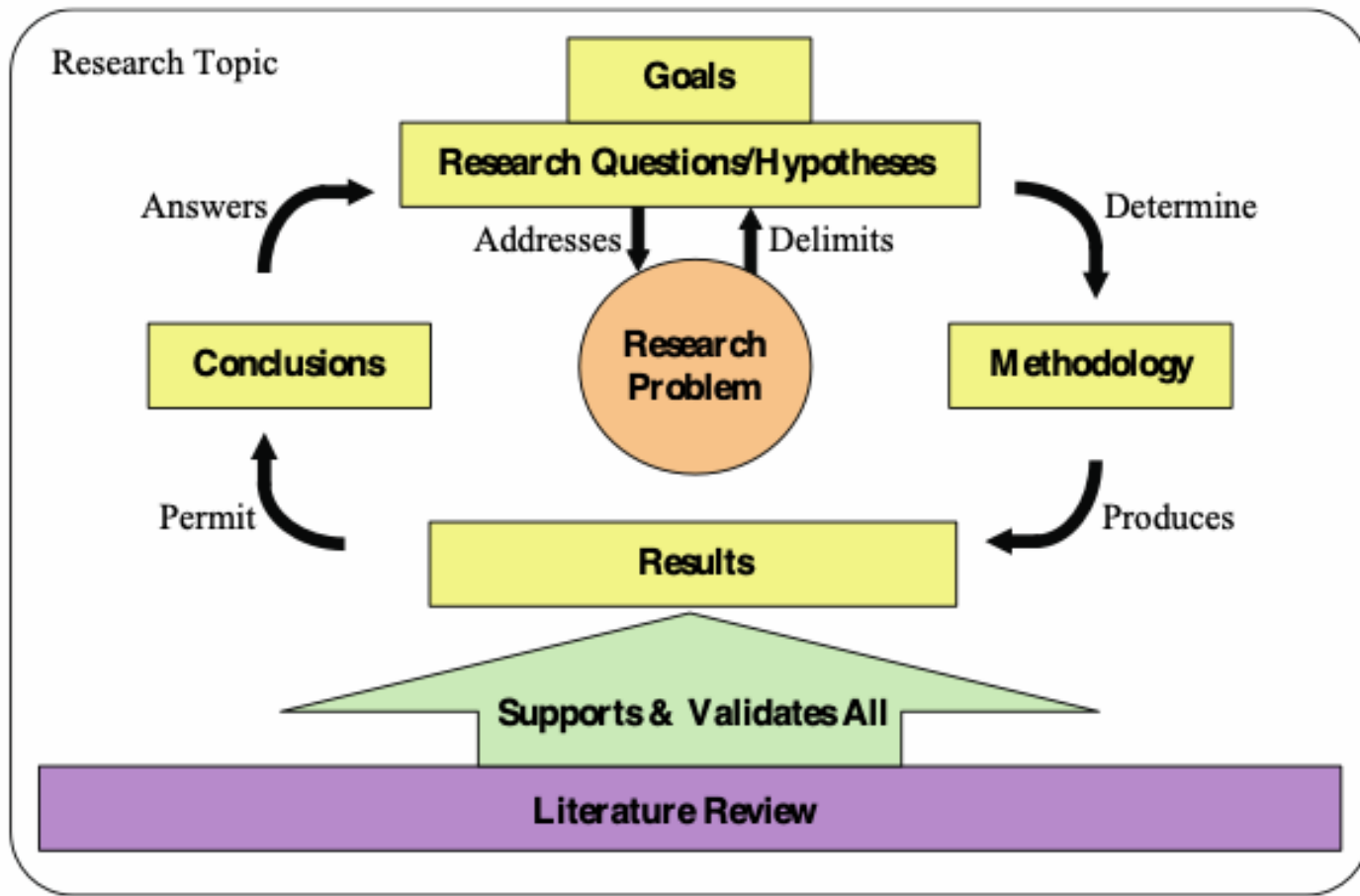
# Axes of research type



# Research objectives

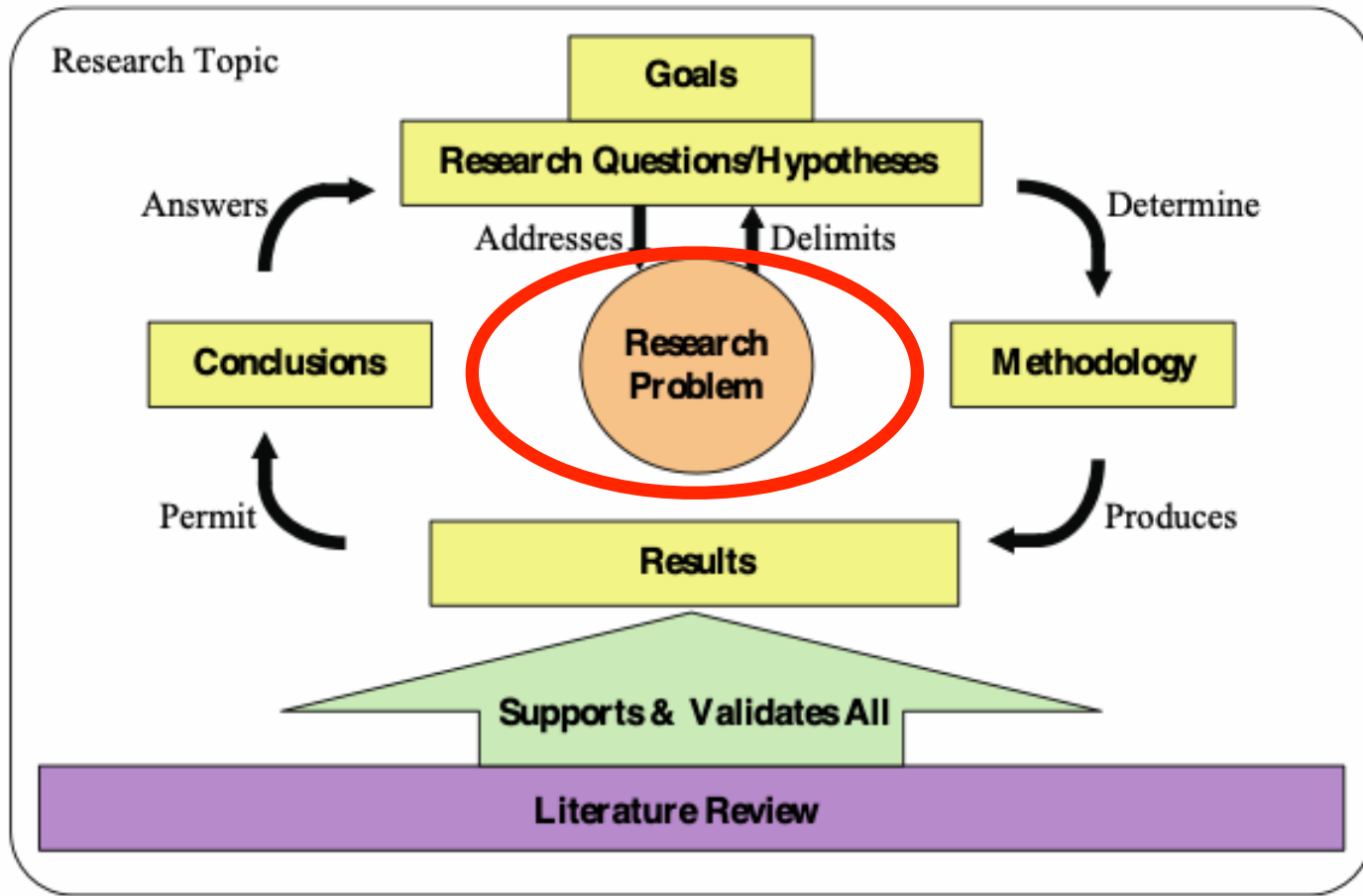
- Establish **facts** as they are (agnostic).
  - Fill a **gap** in knowledge
    - Jusczyk & Aslin (1995): We don't know when infants become able to identify words in continuous speech. When is it?
  - Accumulate **evidence** for an idea
    - Birdsong & Molis (2001): It is said that the ability to acquire an L2 catastrophically decline after puberty. But the evidence is scant. Can we be sure about it?
- **Improve fit** of framework to facts.
- **Compare fit** of different frameworks.
  - Potter et al. (1984): There are two possible models for the bilingual lexicon: Word association and concept mediation. Which one better describes and explains the data?

# The research process



Ellis & Levy (2008)

# The research process



Ellis & Levy (2008)



# Problem? What problem?

- Finding a research problem is “the most difficult and important part of the whole process” (Kerlinger & Lee, 2000: 15)
- A research problem:
  - ... is an issue in the field that **prevents us from gaining better or deeper understanding** of a topic.
  - ... implicitly answers the question: “**Why does this research need to be done?**” Don’t let people think “Who cares!”
  - ... must, when solved, **give us new knowledge or perspective or offer new evidence** for what we already now.

# Research problem $\neq$ Topic

**Jusczyk & Aslin (1995)**

General



Specific

Topic Infant word identification

Research problem We do not know when infants become able to identify words in running speech.

Goal To identify the youngest age at which infants can identify words in running speech.

Research Can 6-month-olds detect words in questions fluent speech contexts? Can 7½-month-olds do it?

# Discussion 1

In Slevc and Miyake (2006), what is/are the:

1. Topic?
2. Research problem(s)?
3. Goal(s)?
4. Research question(s)/hypotheses?

# Finding research problems

The 4-step process (Ellis & Levy, 2008)

## **Step 1: Look**

Follow your personal interests, hunches and gut feelings to look for topics, issues and questions.

## **Step 2: Read**

Read the literature purposefully with the goal to find out what is already known, and, more importantly, what is *not* known or *not* resolved in the area.

# Finding research problems

## Resources

- <https://www.semanticscholar.org>
- <https://www.connectedpapers.com>
- <https://scholar.google.com>
- Scholars to Read/Know in the Field of Language <https://bit.ly/3f3YAl4>
- <https://wals.info>
- <https://glottolog.org>

# Finding research problems

## Step 3: Synthesise

Critically evaluate a range of sources to construct your best understanding of the 'state of the art'.

- What observations/explanations are widely accepted?
- Where are the main areas of disagreement?
- Where is the 'adjacent possible', the (small) next step you can add to existing knowledge?

## Step 4: Consult

Ask supervisors and experienced researchers if the potential research problem you have identified is really research worthy.

# A cartographic analogy

Fra Mauro map (c 1450)



[https://commons.wikimedia.org/wiki/  
File:Fra\\_Mauro%27s\\_Map\\_of\\_the\\_World.ogv](https://commons.wikimedia.org/wiki/File:Fra_Mauro%27s_Map_of_the_World.ogv)

[https://en.wikipedia.org/wiki/Fra\\_Mauro\\_map](https://en.wikipedia.org/wiki/Fra_Mauro_map)



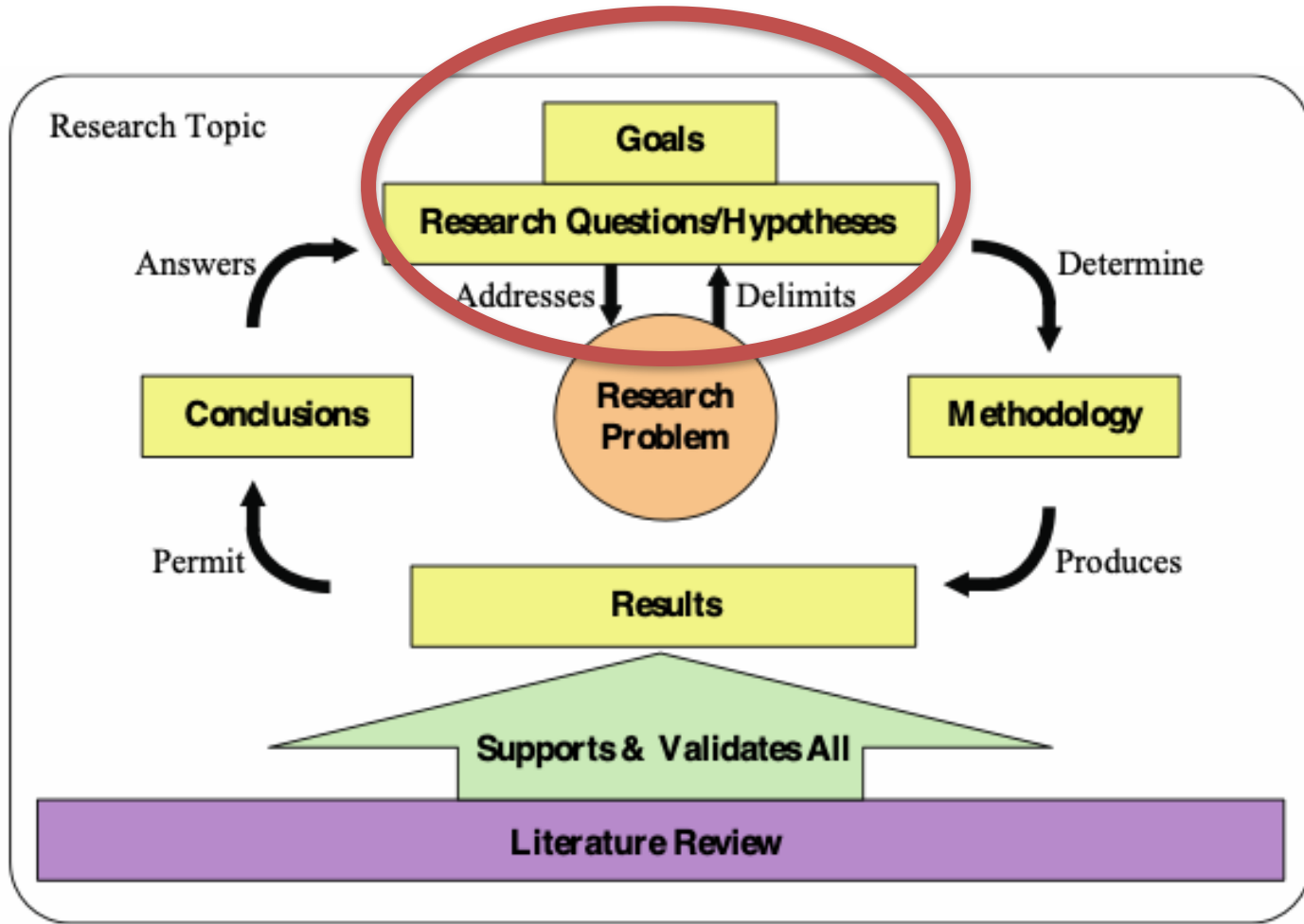
# A cartographic analogy

Salviati Planisphere (c 1525)





# The research process



# Research questions

Research questions are **testable** questions whose answers **directly address** the problem.

**Research problem** We do not know when infants become able to identify words in running speech.

**Goal** To identify the youngest age at which infants can identify words in running speech.

**Research questions** Can 6-month-olds detect words in fluent speech contexts? Can 7½-month-olds do it?

Testable

# Research hypotheses

Research hypotheses are **statements** (not questions) about the research problem.

The hypotheses must be **falsifiable** (there can be in principle an outcome that shows them to be false).

Hypotheses can **never be true nor confirmed**. We can only **corroborate** hypothesis, and it's a long term process.

**Research problem** We do not know when infants become able to identify words in running speech.

**Goal** To identify the youngest age at which infants can identify words in running speech.

**Research questions** Can 5-month-olds detect words in fluent speech contexts? Can 8-month-olds do it?

Testable

**Research hypothesis**

Infants start to detect words in fluent speech after they reached about 6 months of age.

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Testable

Research hypothesis

Infants start to detect words in fluent speech after they reached about 6 months of age.

**You can stop here!**

# Hypotheses and variables

- Research hypotheses should be stated in terms of explicit relationships between **variables**.
- Variables must be **measurable**.

## Research question

Does  
**musical ability**  
account for  
**L2 proficiency?**

— Variable

— Variable

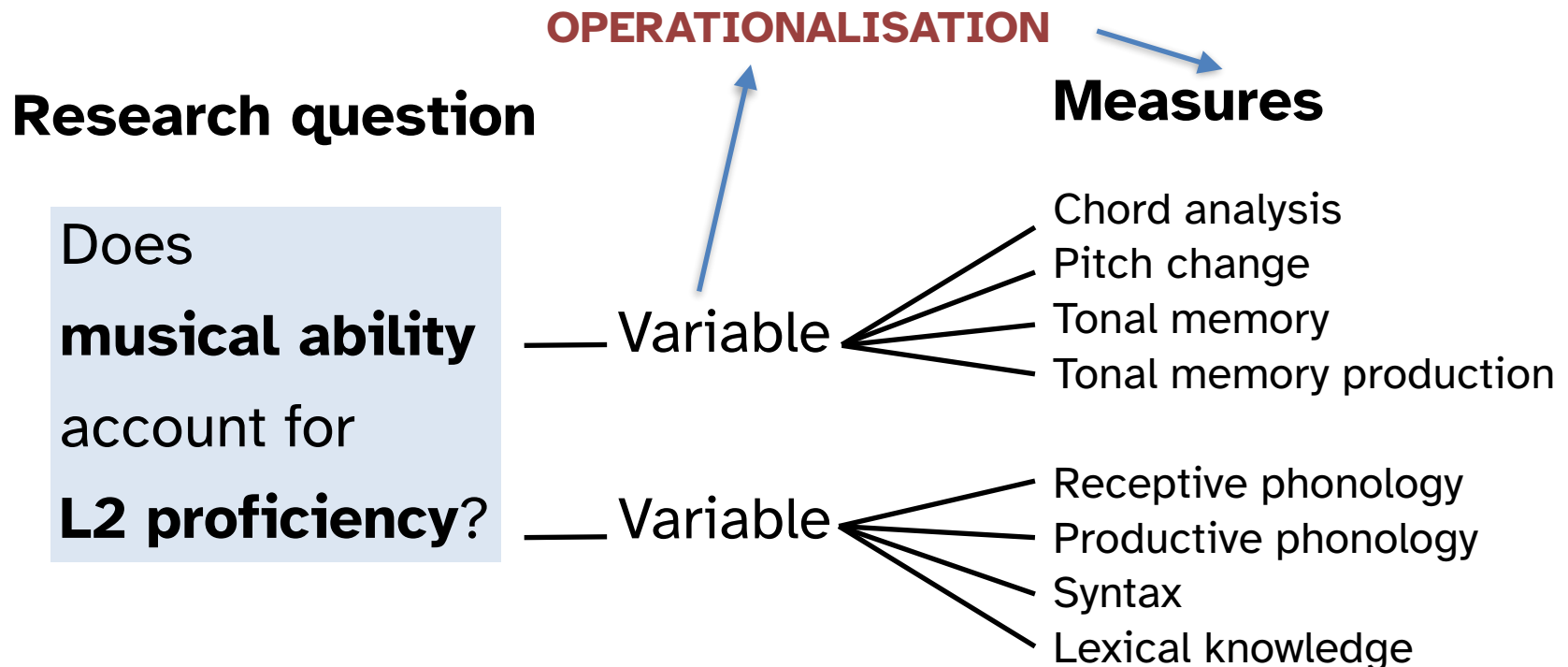
## Measures

Chord analysis  
Pitch change  
Tonal memory  
Tonal memory production

Receptive phonology  
Productive phonology  
Syntax  
Lexical knowledge

# Hypotheses and variables

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# Types of variables

## Independent and dependent variables

An independent variable (IV) is hypothesised to covary with the dependent variable (DV).



Examples:

Education level

Years of L2 exposure

Motivation for L2 learning

Income level

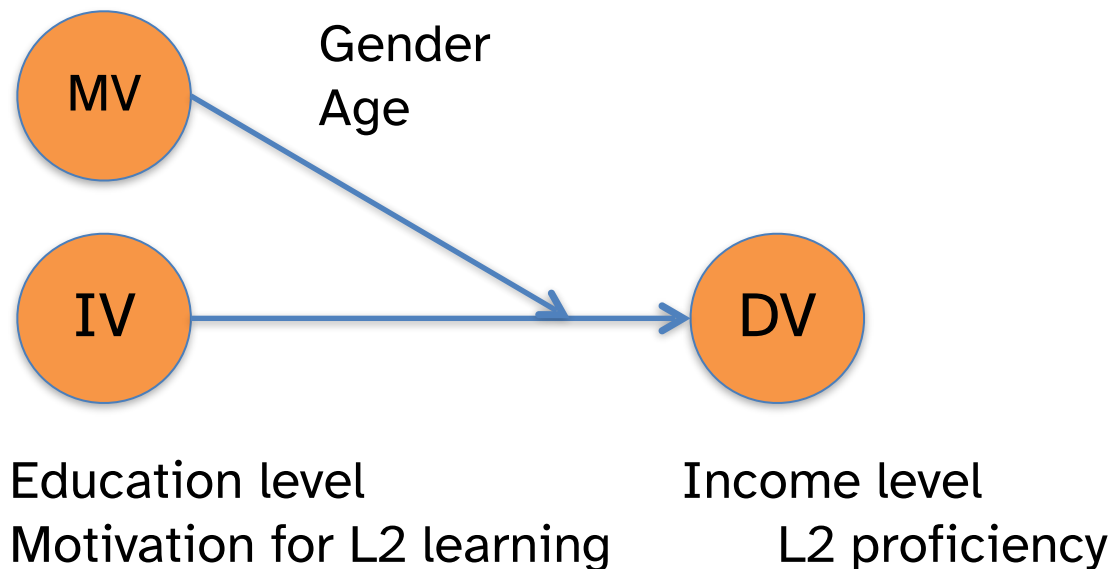
L2 vocabulary

L2 proficiency

# Types of variables

## Moderator (moderating) variable

A moderator variable is a kind of independent variable that may affect the influence of the main IV on the DV.

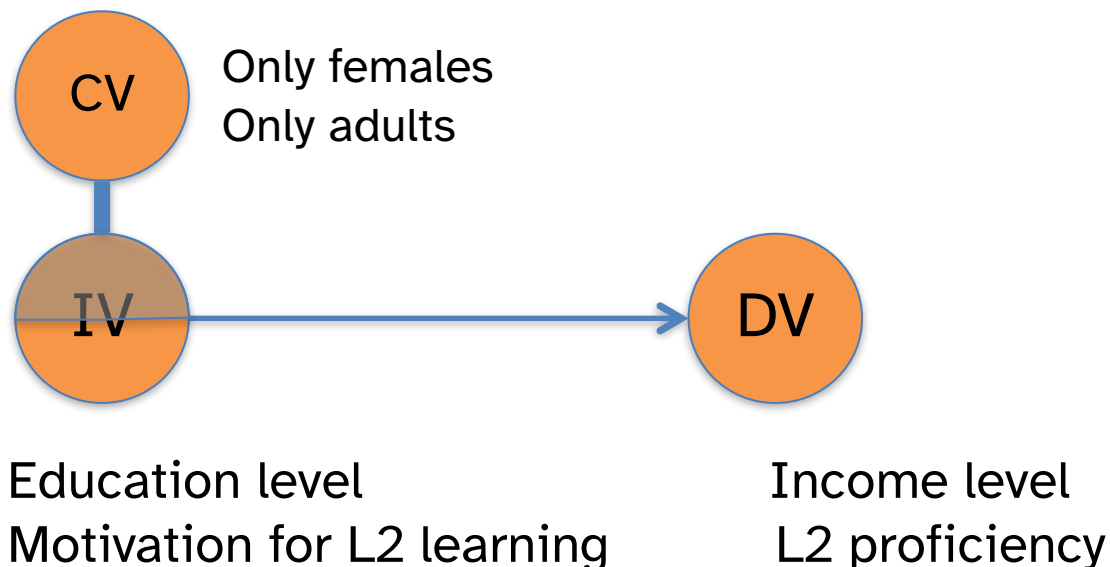




# Types of variables

## Control variable

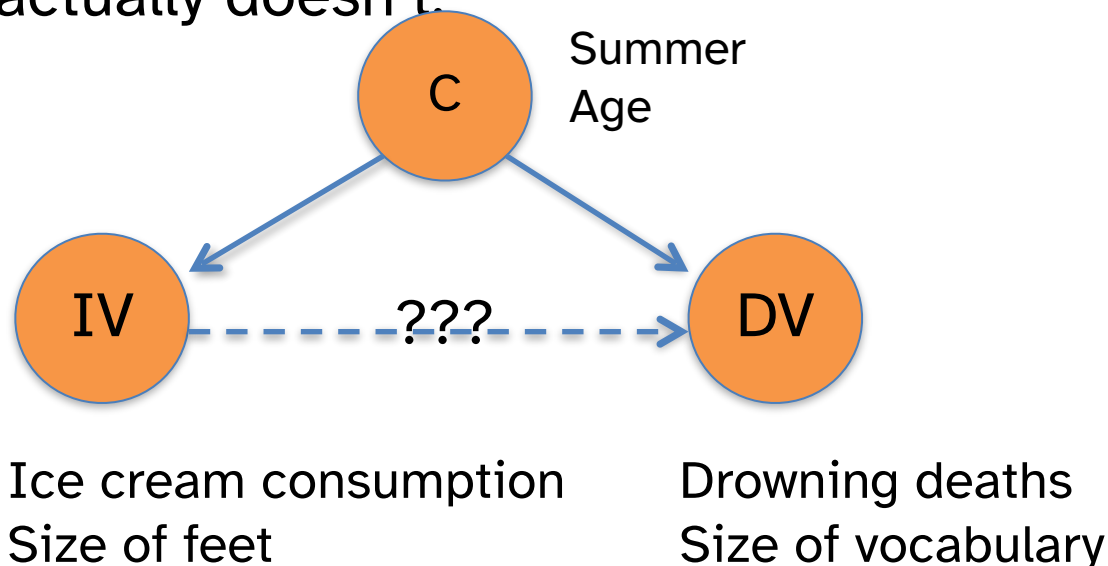
A control variable is something a researcher decides to limit or hold constant in order to study the effects of the IV on the DV.



# Types of variables

## Confounding variable (confound)

A confound is a variable that correlates both with the IV and DV. It can make it look as if the IV directly influences the DV, even when it actually doesn't.



# Types of variable scales

I have  
**ONE**  
eye!

**DISCRETE**

I have **TWO**  
eyes!



I'm 1 m  
tall!

**CONTINUOUS**

# Types of variable scales

Continuous (numeric) variable subtypes:

- The variable can take on **any positive and negative number, including 0**.
- The variable can take on **any positive number only**.
- The variable can take on **any number between 0 and 1** (0, 0.1, 0.25, 0.7425, 0.9, ..., 1).

# Types of variable scales

Discrete variable subtypes:

- The variable is **dichotomous**, i.e. it can take one of two levels.
  - yes/no, correct/incorrect, voiced/voiceless, ...
- The variable is **counts** of something.
  - Counts of words, segments, gestures, anti-passive constructions, ...
- The variable is a **scale**.
  - Likert scales and ratings, language attitude questionnaires...

# Discussion 1

Suppose we want to examine the research hypothesis that age-of-acquisition negatively predicts the ultimate attainment in L2 acquisition.

1. What independent and dependent variables can be used?
2. What types of scales are those variables?
3. What are some of the potential confounds?
4. How can we deal with those confounds so that we do not draw wrong conclusions about the relationship between the independent and dependent variables?

# Summary

1. Finding research-worthy problems is the most important part of the research process.
2. Research problems yield research questions and hypotheses, which should directly address the research problem and be stated in terms of (measurable) variables.
3. We need to identify, not only the main variables of interests (i.e., independent and dependent variables), but other extraneous variables that may help/hinder our understanding of the relationship between the main variables.

# Homework

Read the following statements and decide whether they contain a reasonable research problem. If not, what is the issue?

[Statement 1]

Arabic speakers often encounter difficulties in learning English pronunciation. This is a major issue for Arabic learners of English, because research shows that L2 learners' perceived proficiency level is largely determined by how nativelike one's pronunciation is. In this study, I will record 30 native speakers of Egyptian Arabic who have been learning English for 1 year to find out which English sounds are the most difficult for them and to explain the production problems by comparing the sound systems of Arabic and English.



# Homework

[Statement 2]

Research on early sentence production has concluded that although 1- to 2-year-olds frequently omit functional elements from their production, the order of the main grammatical categories (e.g., subject, object, verb) in their utterances is fairly adult-like. However, this type of investigation has not been extended to Warao, a language isolate spoken in Venezuela and Guyana. In this study, I will record spontaneous speech produced by Warao children to examine if the word order in their sentences is adult-like before the age of 2.