

# **A strategy to foster bilingualism (Spanish–English) in undergraduate Biological Sciences students at Universidad de los Andes: *First stage***

**Pablo Antonio Archila**  
PhD in Educational sciences  
PhD in Education  
Postdoctoral researcher

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Education for bilingualism and multilingualism®

# Scientific communication

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# SCIENCE

“Without **communication** there would be no **science**” (Abelson, 1980, p. 60)

## *Science Centennial*

3 July 1880 to 4 July 1980

*Edited by Philip H. Abelson and Ruth Kulstad*

### **Scientific Communication**

Philip H. Abelson

Those engaged in the pursuit and preservation of scientific knowledge are part of a great and lasting enterprise. Through the devoted efforts of a relatively tiny fraction of the earth's population, a marvelous edifice of knowledge has been created. Each day additions to the structure are made. Occasionally modifications or partial renovations are neces-

structure, the intricacy and subtlety with which it is tied together, or the solidity of the foundations on which it is built. However, billions of people already have enjoyed some kinds of benefits from applications of science, as will countless billions in the years to come.

The key element in the building and preservation of this marvelous edifice is

ber, were similar in form to those of today. But quantitative aspects have changed greatly and new patterns, such as electronic storage of data, are beginning to emerge.

When the first issue of *Science* was printed, several scientific journals were being published in Europe but only one respectable publication, the *American Journal of Science*, was being published in the United States. There were few scientists and few were being educated here. The American Association for the Advancement of Science was a small but vital organization that held annual meetings and maintained a sense of community among scientists.

From 1880 on, the number of scientists

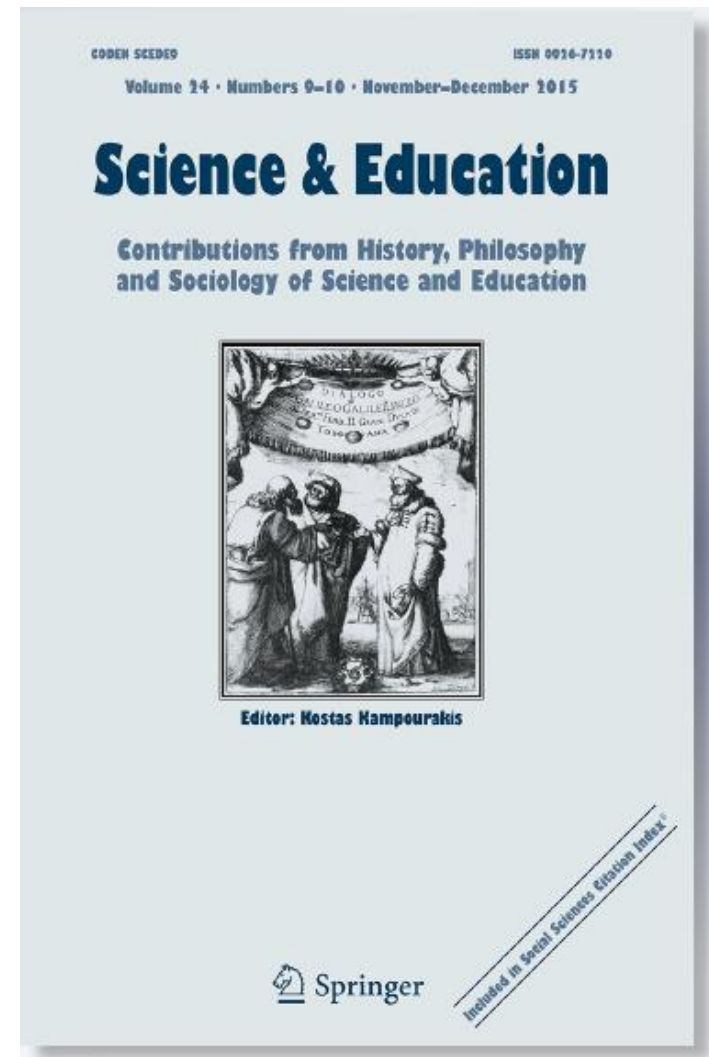
# Scientific communication

“**Communication** is an important part of **scientific practice** and, arguably, may be seen as **constitutive** to scientific knowledge” (Nielsen, 2013, p. 2067)

“There is an international push to improve the effectiveness with which **scientists communicate**” (Mercer-Mapstone & Kuchel, 2015, p. 1614)

# Scientific communication and education

“[Participants] found experimentation in science to be a more relevant type of evidence than **communication in science**” (Archila, 2015, p. 1219)



# *English* and *science*

“Practically the entire scholarly community of the **natural sciences** reads **English**, and the vast majority publishes in that language” (de Swaan 2001, p. 73)

# *English* and *science*

**English** is the global **language of science**, in written as well as oral communication

(Ammon, 2013; Archila, 2013; Cabezuelo-Gutiérrez & Fernández-Fernández, 2014; Cockcroft, 2016; EF-EPI, 2015; Källkvist y Hult, 2016)

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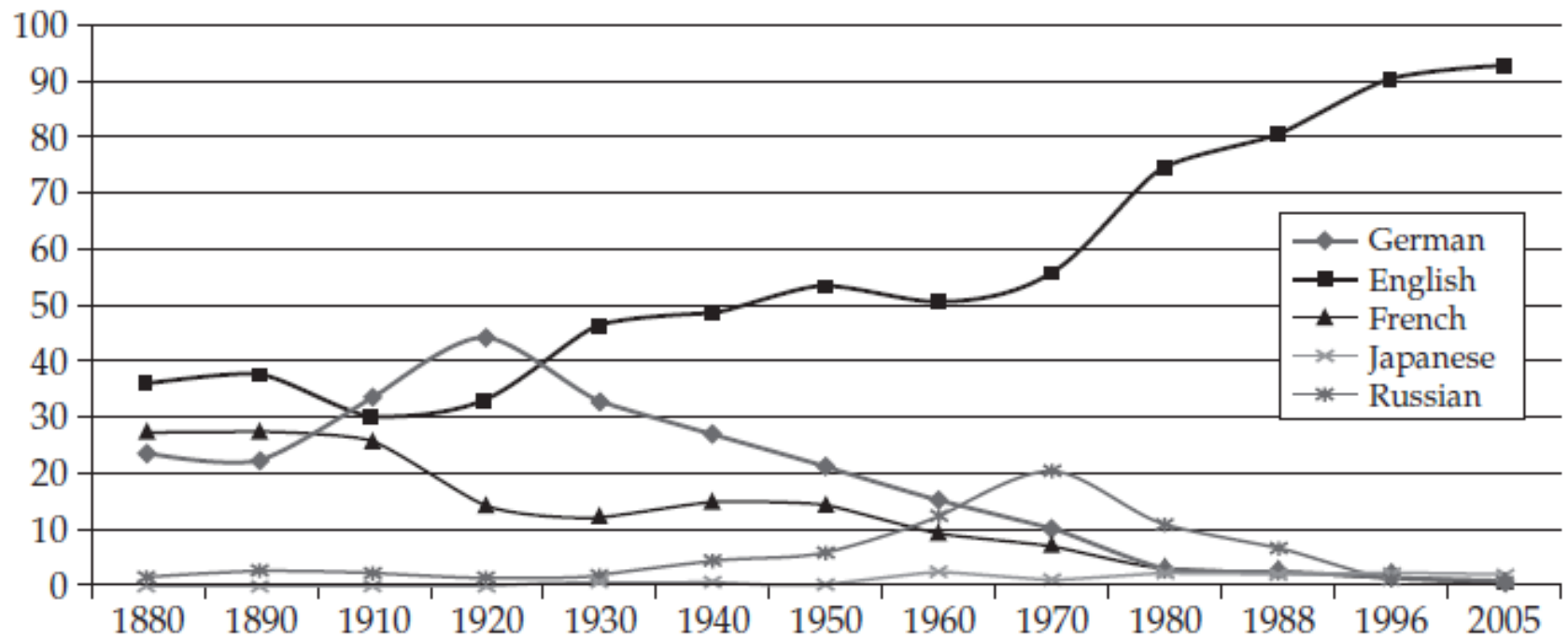
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# English and science

## ENGLISH(ES) AND ACADEMIC PUBLISHING

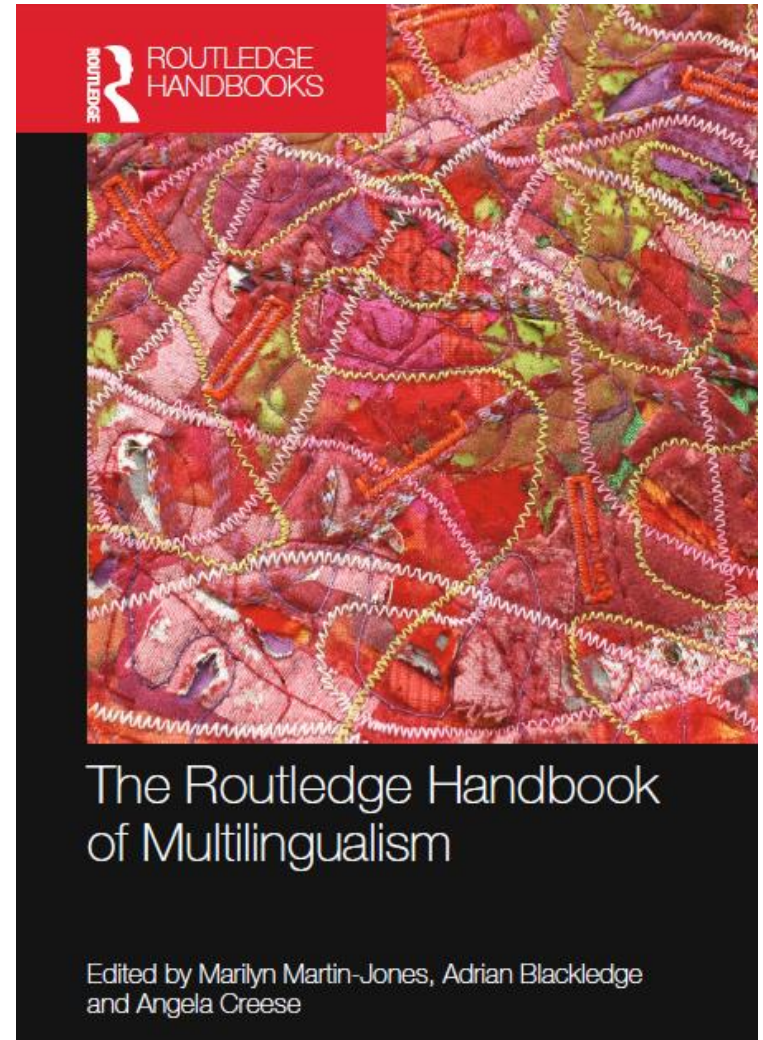


Natural sciences: data based on Tsunoda (1983); Ammon (1998, pp. 137–62); *Biological Abstracts*; *Chemical Abstracts*; *Mathematical Reviews*; *Index Medicus* and *Medline*; *Physics Abstracts*



# English-medium education at **university**

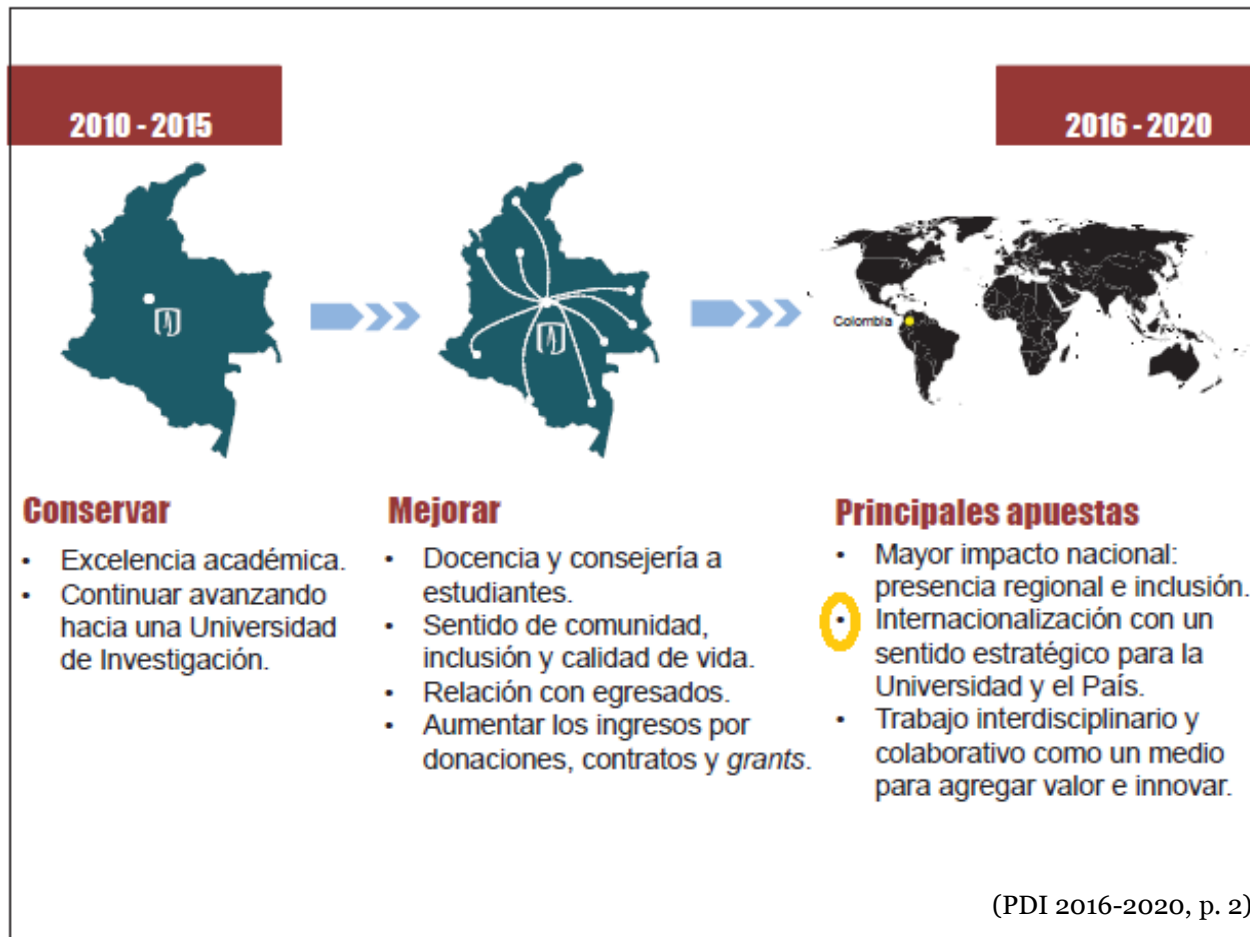
“Students therefore need to be able to **read in English**, and faculty need to be able **to write and publish in English**. In this respect many non-English-medium programmes are increasingly bilingual”  
(Gardner, 2012, p. 257)



# Key factors in the rise in EME at university

1. English has become “**the**” language of scientific publication

# Key factors in the rise in EME at university



2. Education in English permits greater **international mobility** for staff and students

# Key factors in the rise in EME at university

**3.** Students coming up to university through bilingual and English medium school programmes expect to be able to continue their education in English

(Gardner, 2012, p. 257)

# Joining forces

## Bilingual Uniandes – An Initial Proposal

*Anne-Marie Truscott de Mejía*

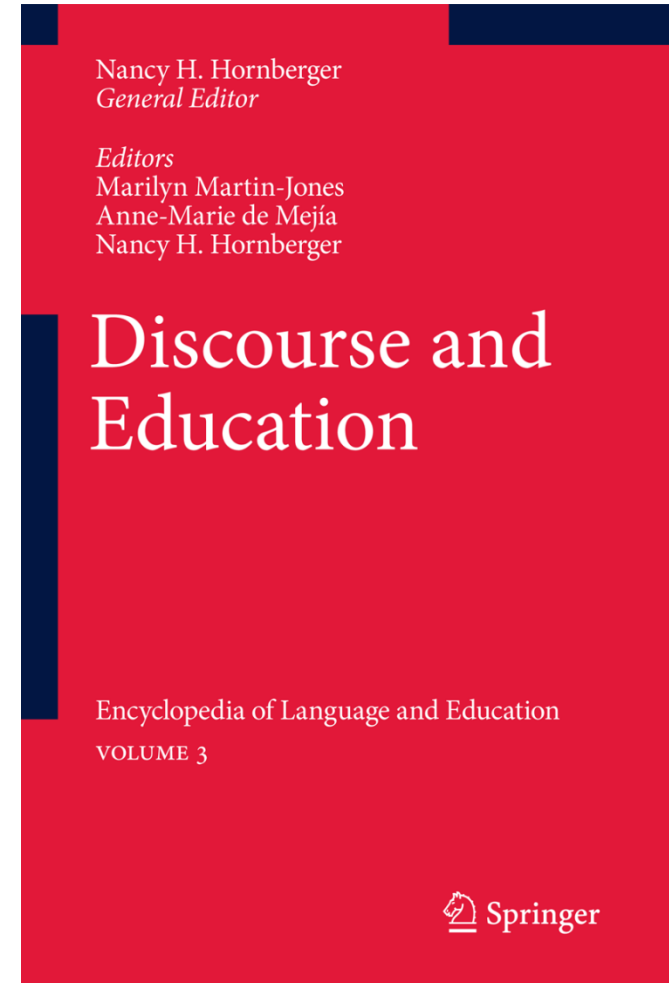
1.4.4	Fortalecer la presencia del idioma inglés en los programas de la Universidad de acuerdo con la naturaleza de estos.
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(PDI 2016-2020, p. 5)

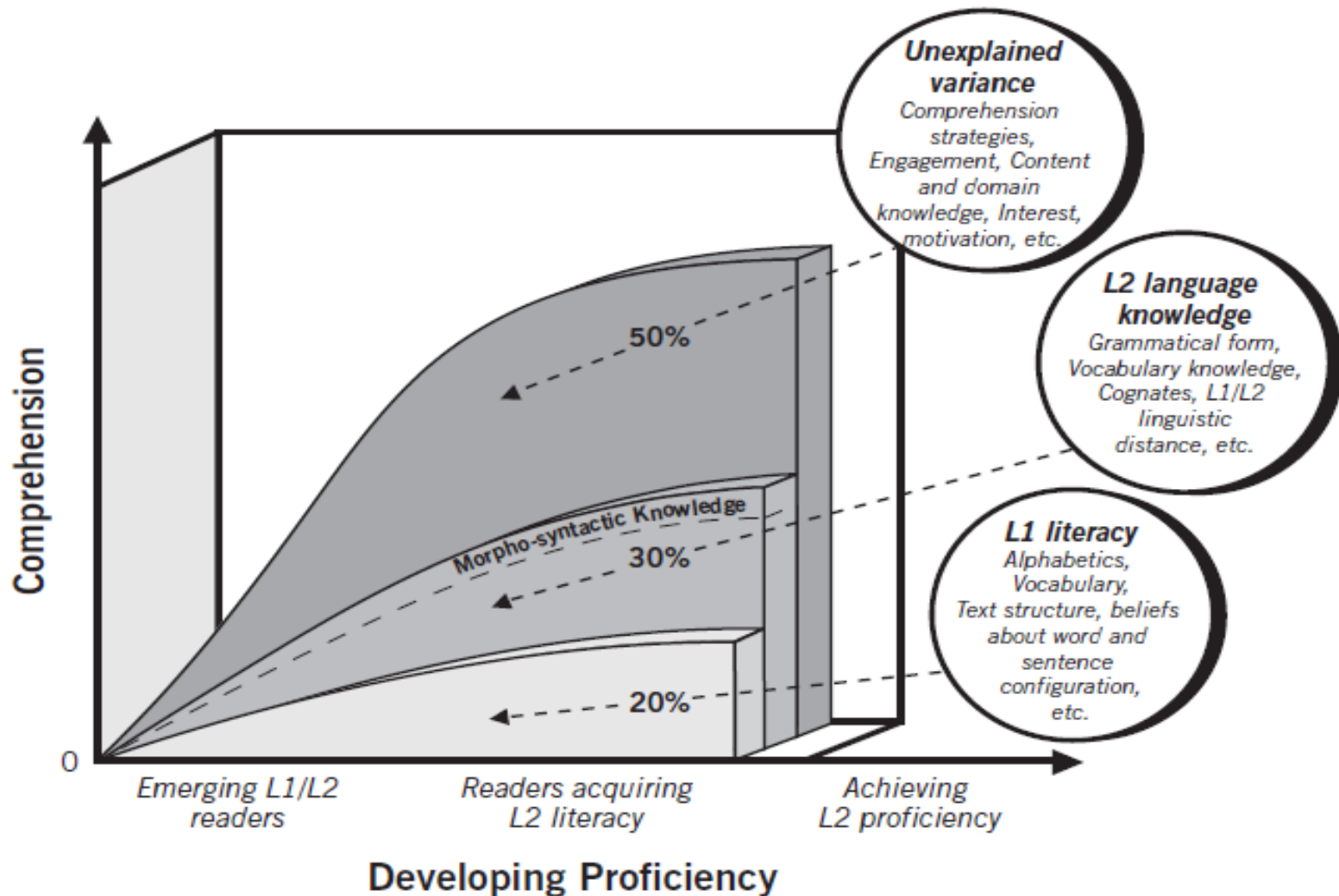
“Teaching mainstream courses in an [English as a Foreign Language] EFL context such as Colombia requires **strategies** in order not to lose content to language and actually simultaneously enhance the learning of both” (Bryan & Habte-Gabr, 2008, p. 2)

# Learning science: Discursive practices

“Language and communication are essential elements in **science learning**” (Kelly, 2008, p. 329)



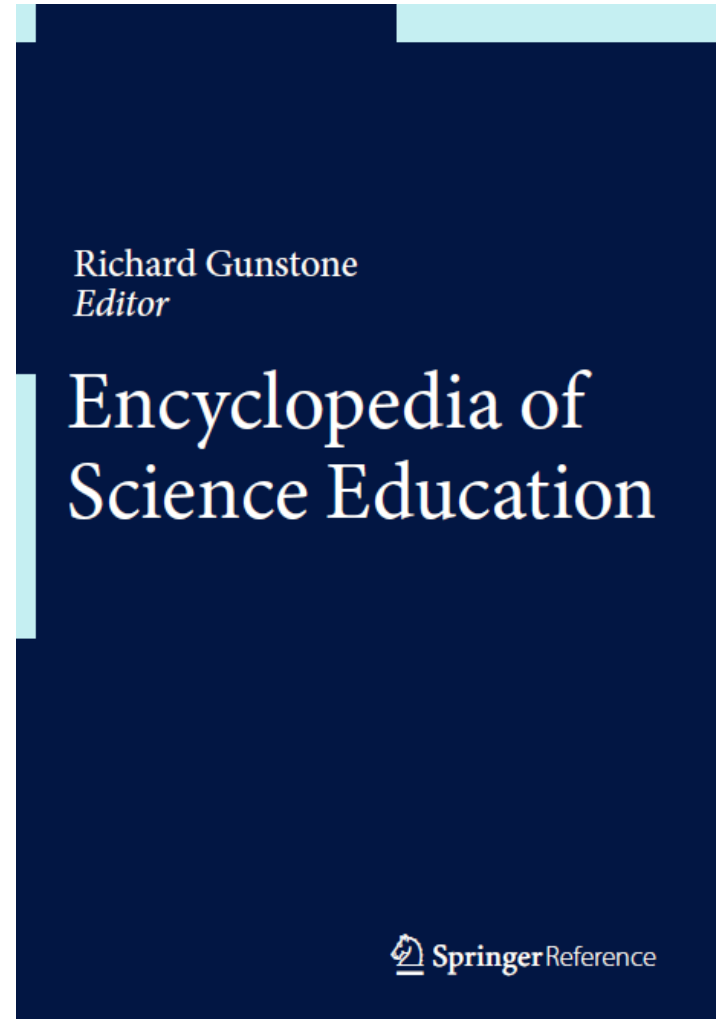
# How could students read and yet not read?



# Learning science: Discursive practices

“In order to understand Education, one has to understand two fundamental actions, the **teaching action** and the **learning action**, both in their conceptual structure and their empirical unfolding here and now”

(Sensevy, 2015, p. 11)





# Research questions: *First stage*

What **learning actions** do undergraduate Biological Sciences students use when they try to achieve comprehension and production (oral and written) in English at Universidad de los Andes?

What **teaching actions** do Biological Sciences professors use when they foster bilingualism at Universidad de los Andes?

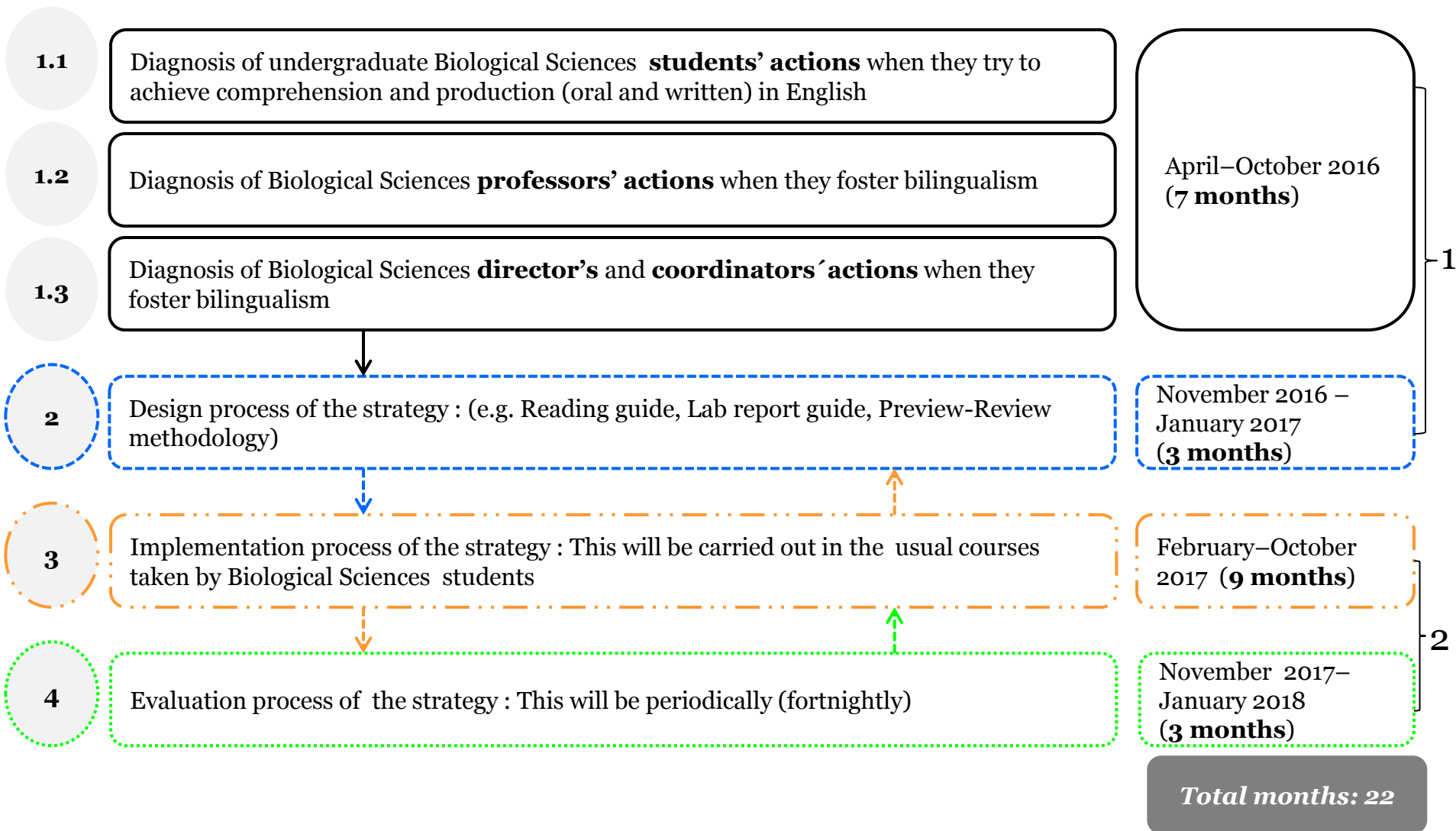
The most crucial issue is how to design a **learning and teaching actions-based strategy** to foster bilingualism (Spanish–English) in undergraduate Biological Sciences students at Universidad de los Andes

# Context and participants

Biological Sciences: **Biology** and **Microbiology** undergraduate programs at Universidad de los Andes

- Biological Sciences students: 1<sup>st</sup>, 3<sup>rd</sup>, 5<sup>th</sup> and 7<sup>th</sup> semester
- Biological Sciences professors: 1<sup>st</sup>, 3<sup>rd</sup>, 5<sup>th</sup> and 7<sup>th</sup> semester
- Biological Sciences director and coordinators

# Research plan



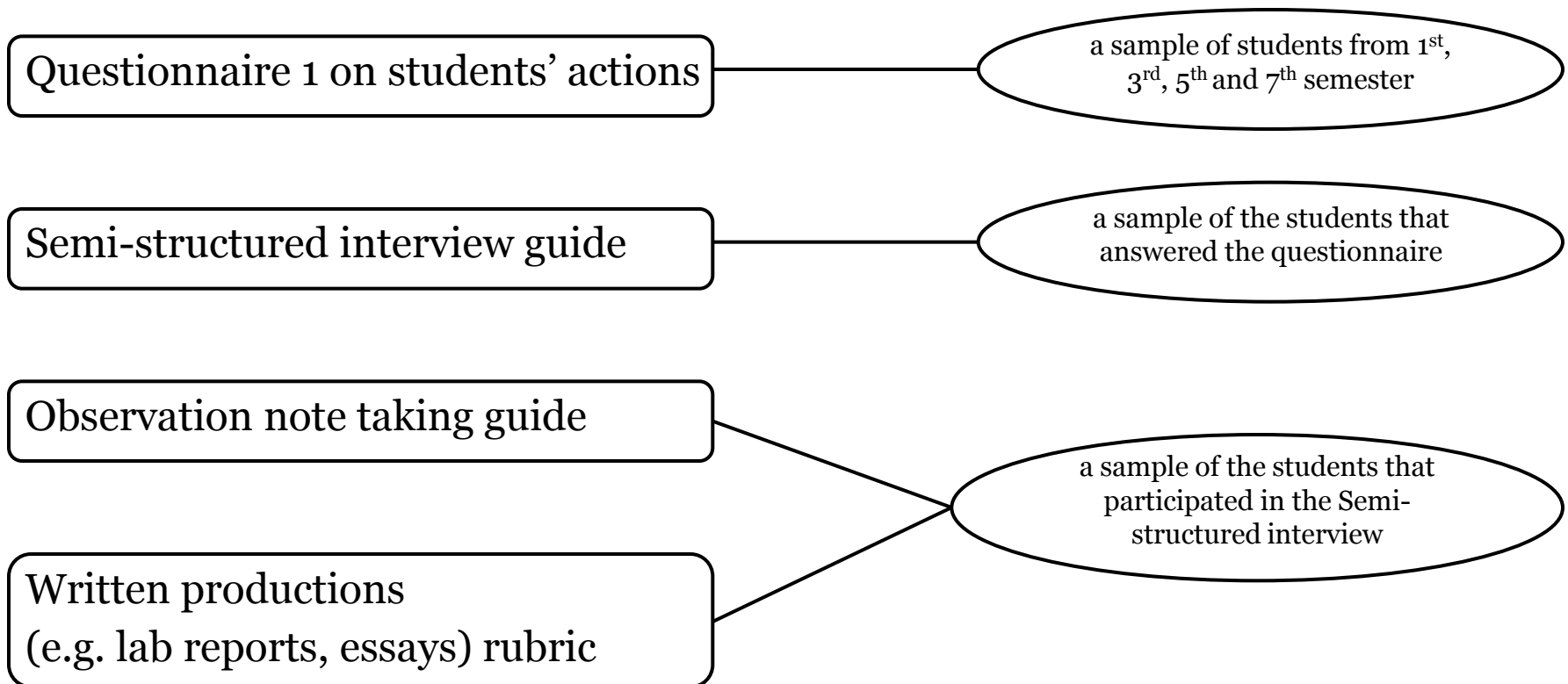
# Document analysis

Analysis process will be enriched by documents such as laboratory reports, essays, readings, and workshops

This type of documents are assumed to be **class assignments** in the sense that each one has educational implications (Garbett, 2007; Hand, 2007; Lederman and Lederman, 2012)

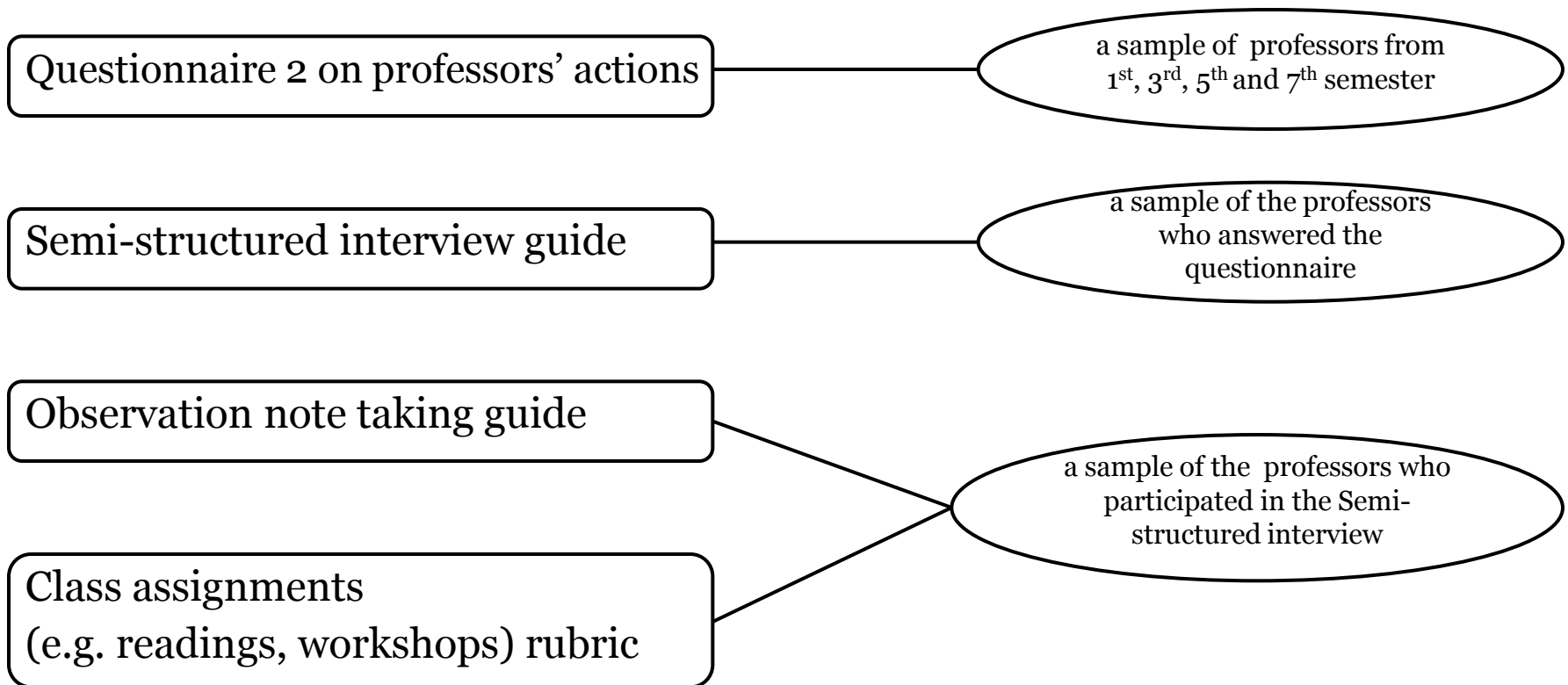
# First phase: Students

## *Diagnostic instruments*



# First phase: Professors

## *Diagnostic instruments*



# First phase: Professors

Teachers need “to understand [....] **how** to implement pedagogical strategies which will allow **all** their students **to make full use** of their **bilingual** and multilingual repertoires” (de Mejía and Hélot, 2015, p. 279)

## *The Handbook of* **Bilingual and Multilingual Education**



*Edited by*  
**Wayne E. Wright, Sovicheth Boun,  
and Ofelia García**

WILEY Blackwell

# First phase: Director and Coordinators

## *Diagnostic instruments*

Questionnaire 3 on Director's and Coordinators' actions

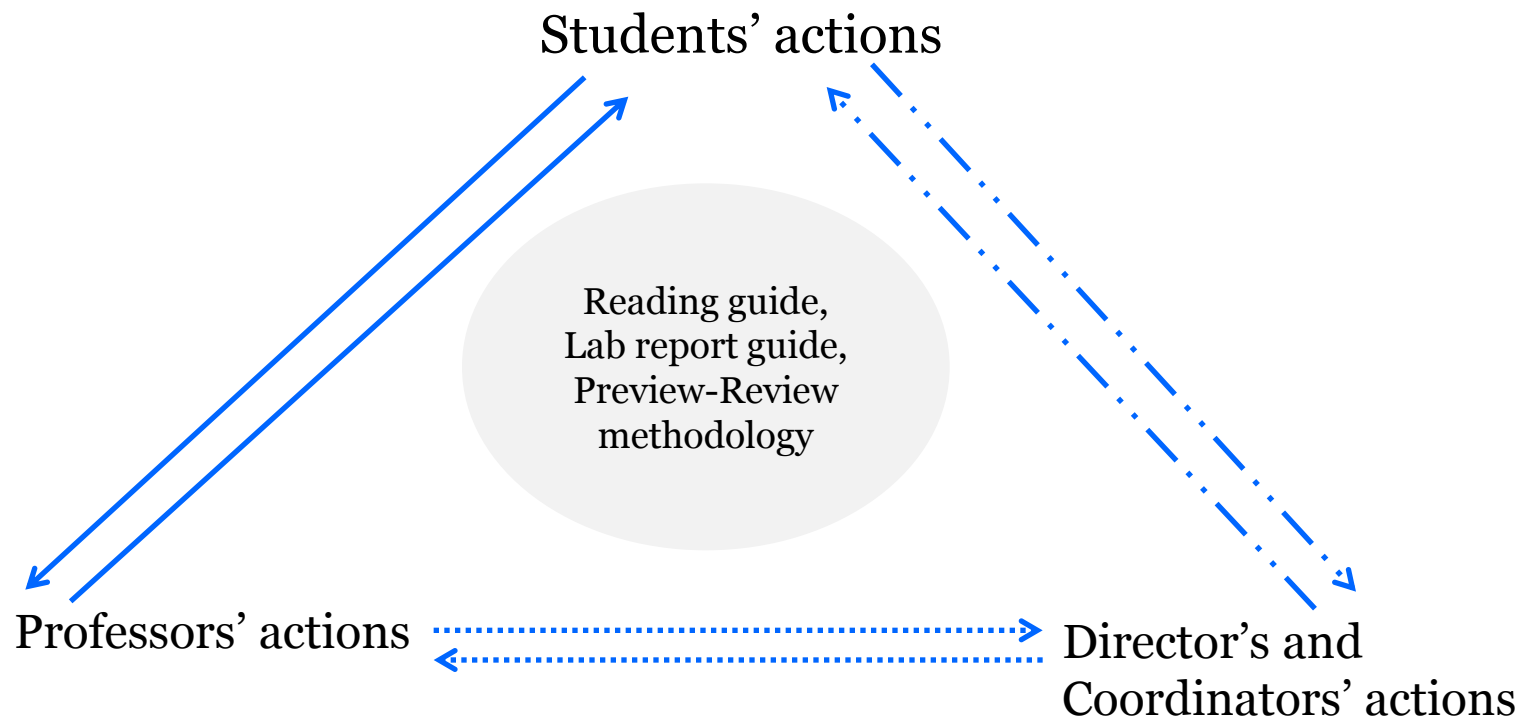
Semi-structured interview guide

Director and Coordinators

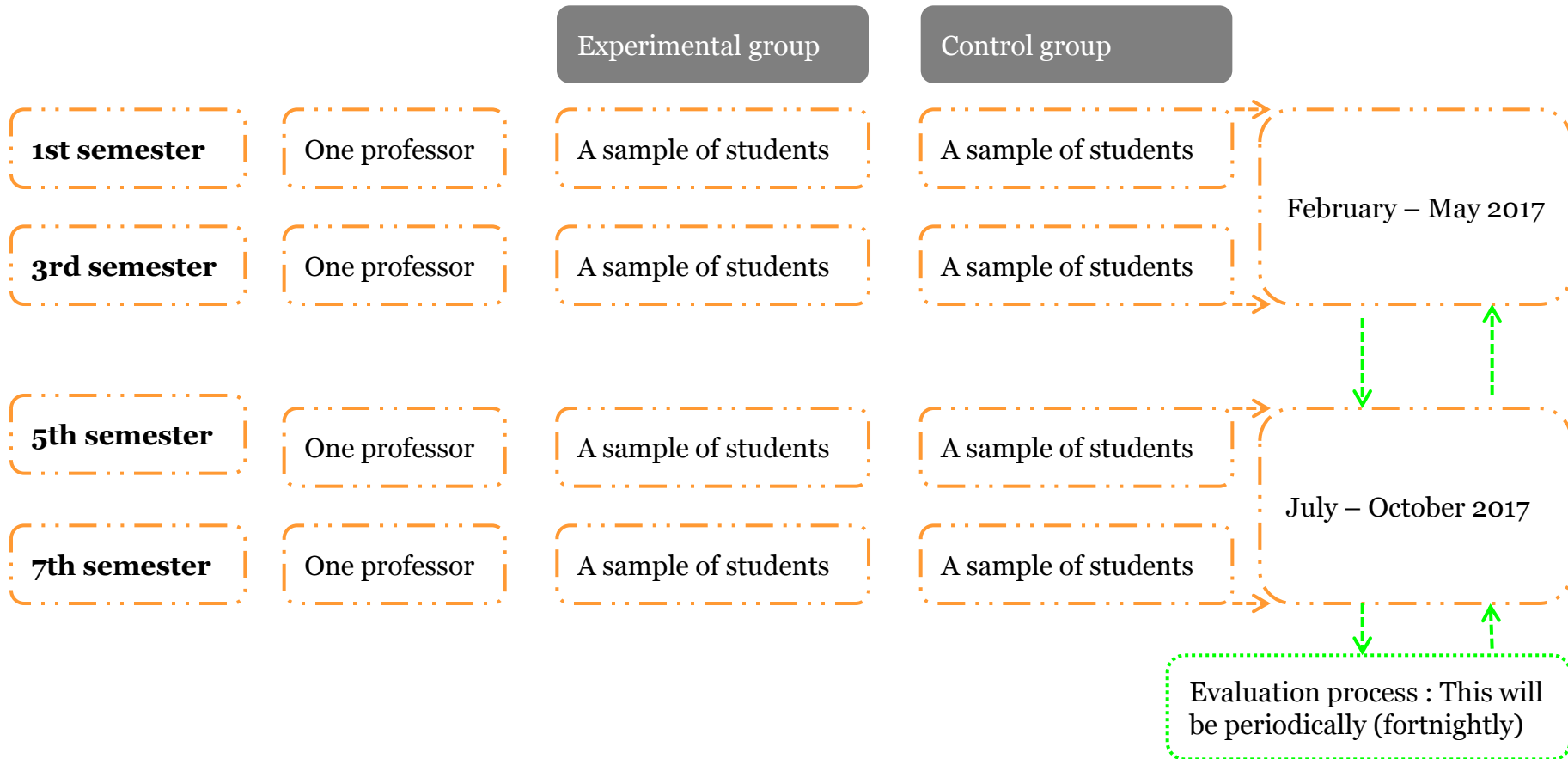
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graph LR; A[Questionnaire 3 on Director's and Coordinators' actions] --- B(Director and Coordinators); C[Semi-structured interview guide] --- B;
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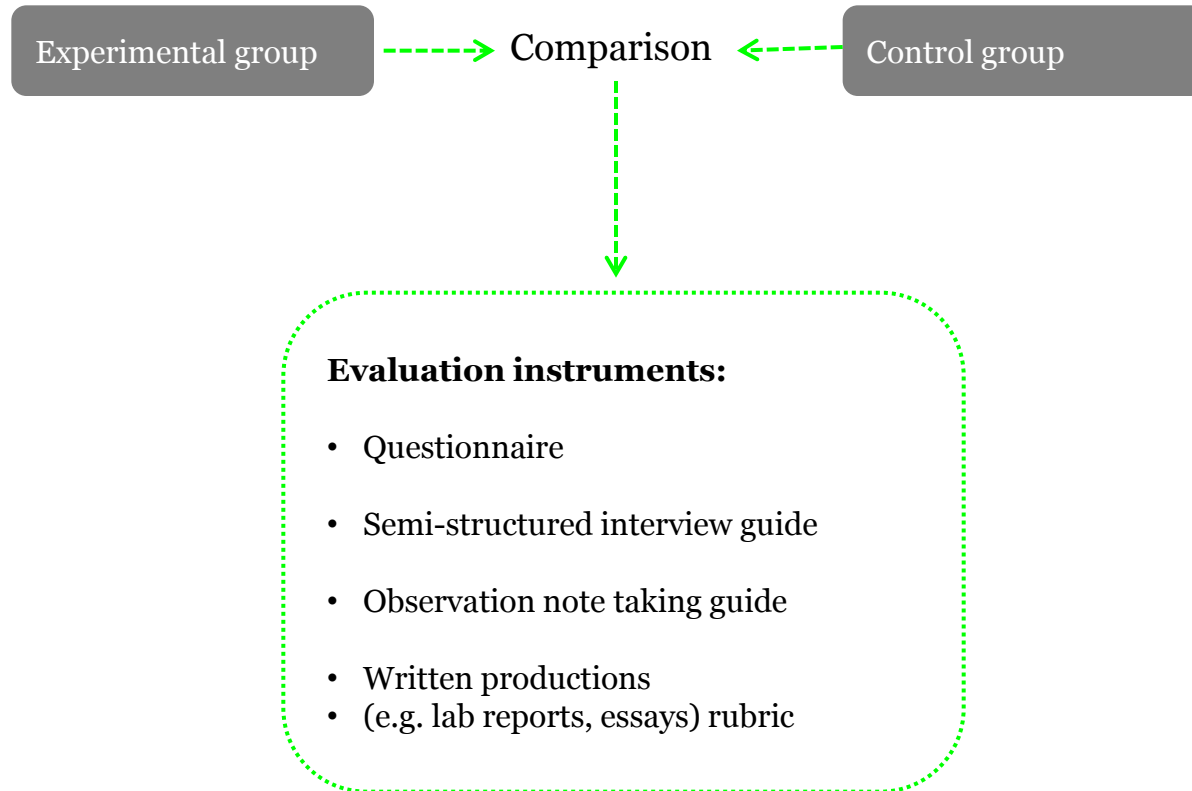
# Second phase: Design process



# Third phase: Implementation process



# Fourth phase: Evaluation process



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