

# Science teachers who reflect their teaching: developing the Pedagogical Content Knowledge (PCK) of Evolution and Nature of Science

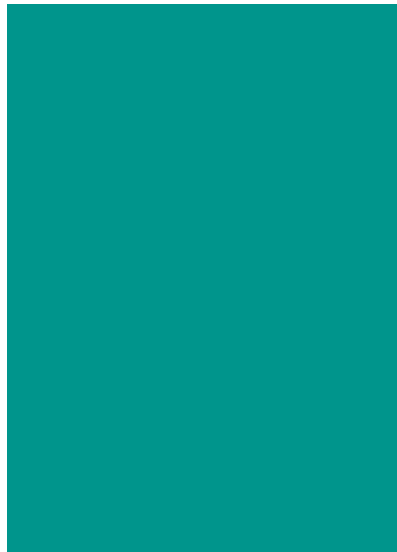
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# CONTEXT



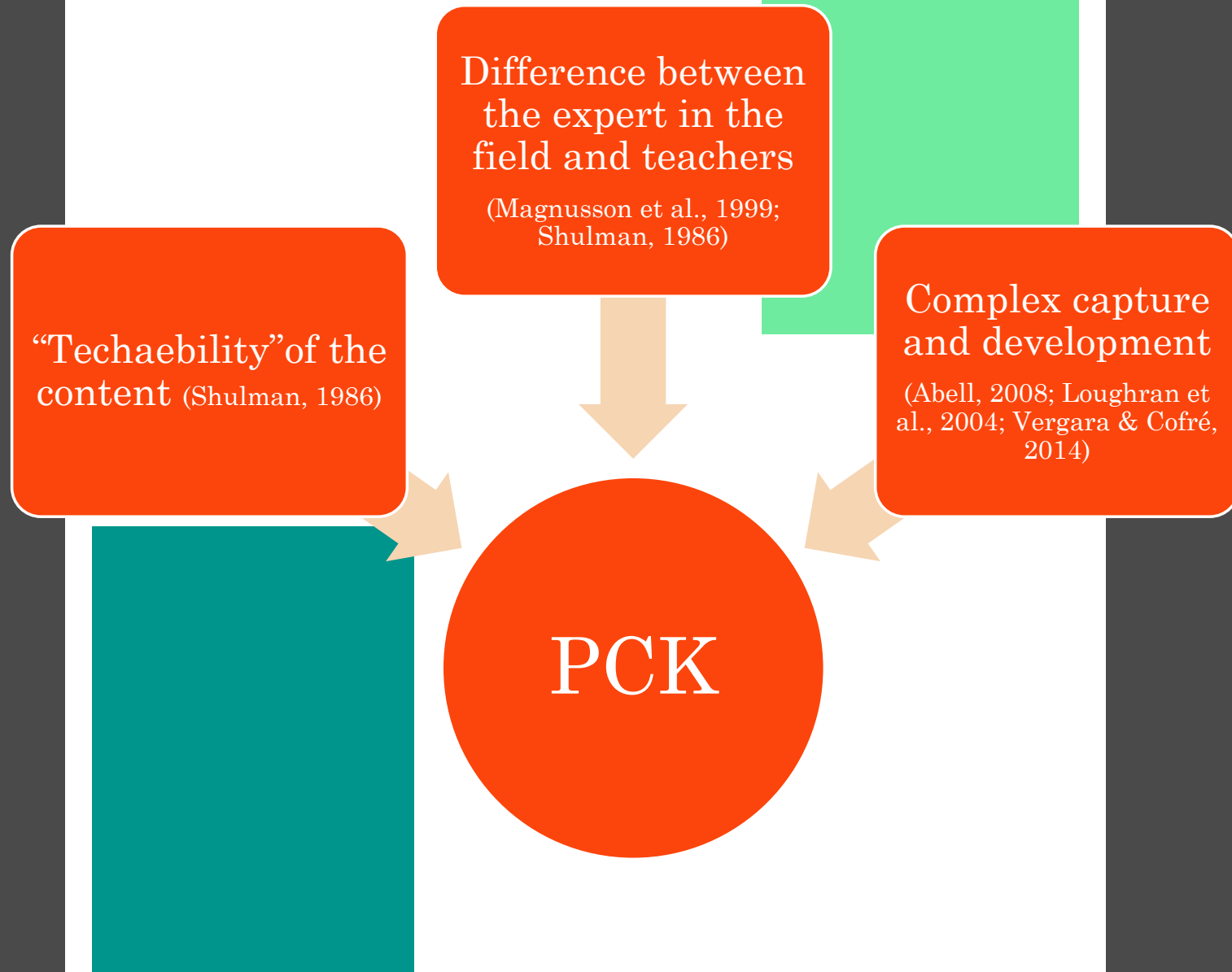
## Main ideas

- Developing PCK
- Teachers' collaboration in a PDP
- New comprehension of teaching



It has been suggested that professional development programmes (PDP) that consider teachers' PCK may further improve this knowledge (van Driel and Beijaard 2003; Loughran et al. 2012).

# Introduction



# Problem

## Teaching of Evolution

Lack of knowledge and understanding of Evolutionary Theory among pre-service and in-service biology teachers

(Nehm and Schonfeld 2007; Nehm et al. 2009).



## Teaching the Nature of Science (NoS)

(Cofré et al., 2013; Lombrozo et al., 2008)

How to develop the acceptance and understanding of the theory? What is the teachers' PCK of Evolution? How to develop this PCK?

## Research questions

How is the change on the PCK of Evolution and NoS in two Biology teachers who participated in a PDP?

What can we expect of the teaching of Evolution through NoS?



# Methodology

## Design

Qualitative

Multiple case study

## Participants

Two biology teachers (Andrea and Pedro) interested in NoS

Teachers' experience 10 (Andrea) and 4 (Pedro)

## Context

Professional development programme (6 months)

University-Project government grant

Initial interview (CoRe)



Revisiting concepts (Evolution and NoS)



Joint planning



Lessons' record (6)



Group interview



Final interview (individual-ISR)

# Results



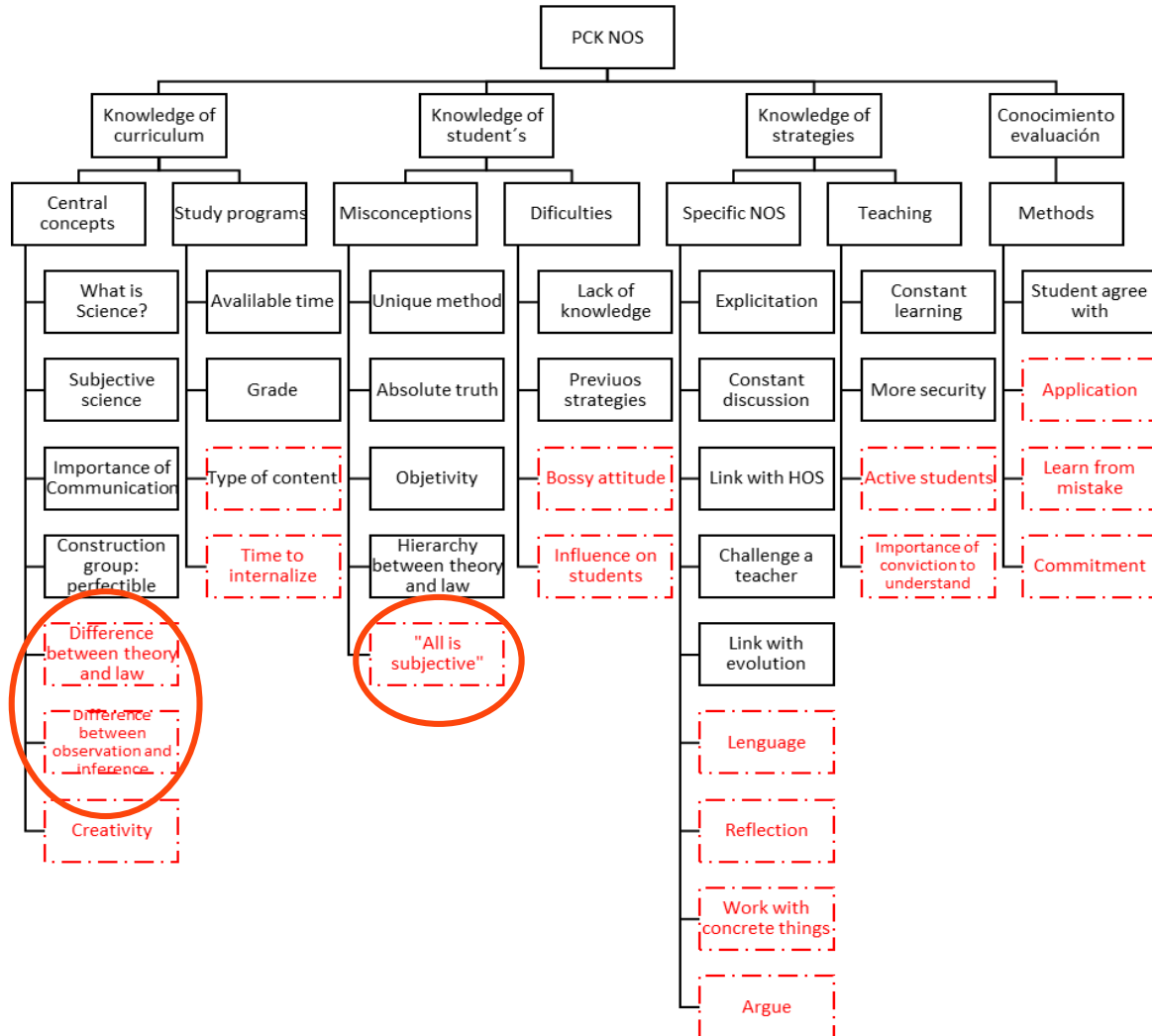
Changes/development of Biology teachers' PCK of Evolution and NoS

Teaching evolution through NoS

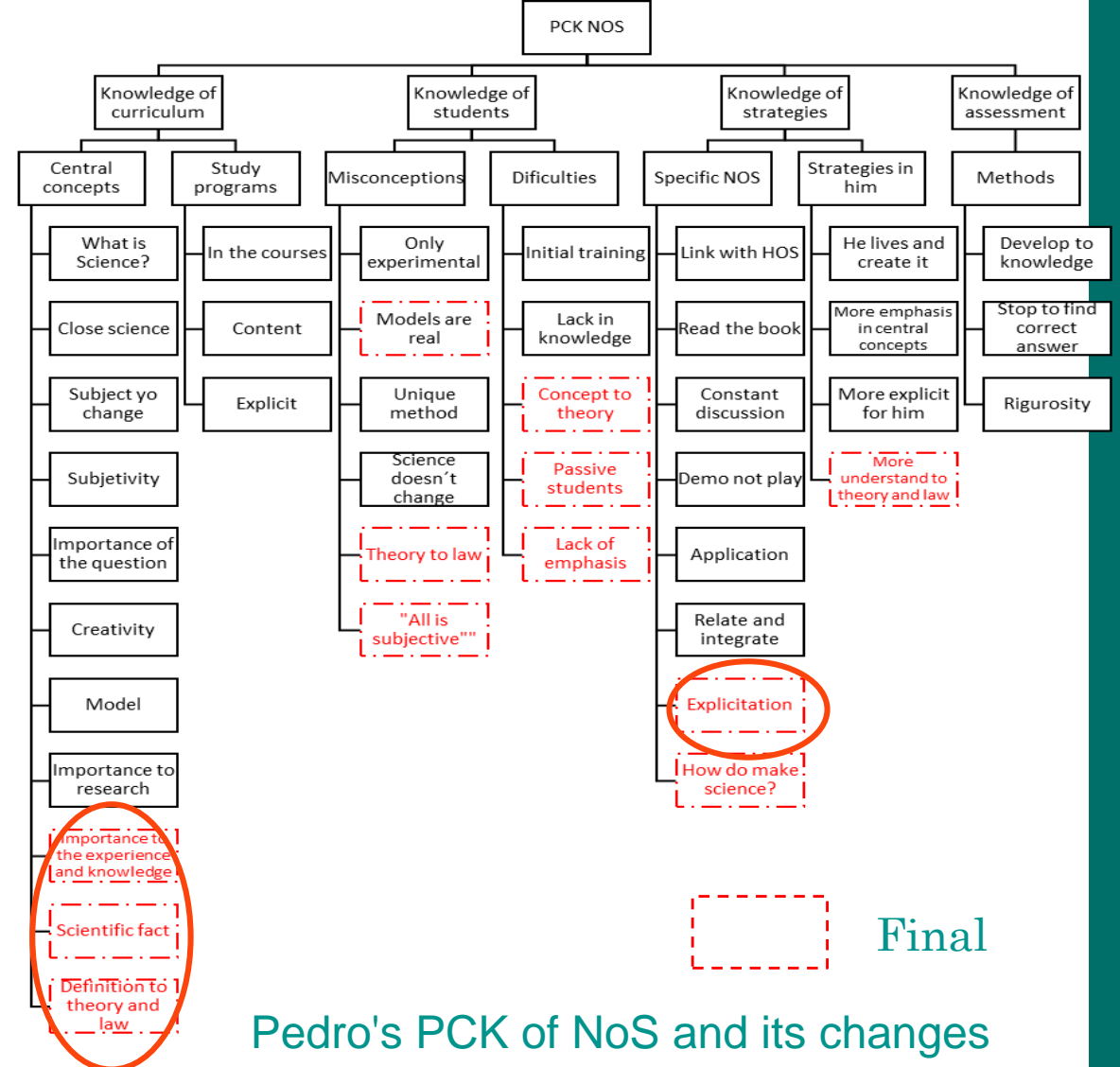
# Results

## Changes/development of Biology teachers' PCK in Evolution and NoS

Initial



Andrea's PCK of NoS and its changes



Pedro's PCK of NoS and its changes

Final



Misconception:  
everything is subjective

Language: she can  
develop misconceptions



Central concept:  
Importance to work the  
difference between theory  
and law and between  
observation and inference

For both of them an important link to understand evolution is the  
difference between theory and law.



Central concepts: importance  
of experience and prior  
knowledge and the difference  
between theory and law

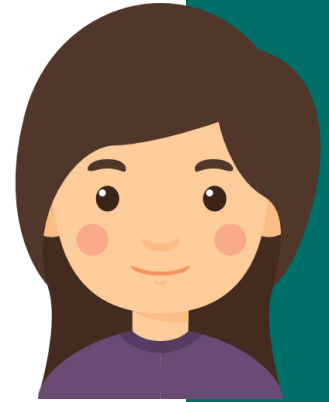
Strategies: explicit concepts, how powerful  
and robust a theory can be.

# Results

## Teaching evolution through NoS

### Relation between Evolution and NoS

Andrea recognised that to make the relation between evolution and **NoS improved the understanding of evolution**. She believes that the first class about **NoS without context** help the students to work NoS's aspects such as **theory and law, subjectivity and models in science**.



Pedro also recognised the **importance of this link**. However, he is aware that in the future he needs to make more **explicit this relationship**, for example, talking more about **theory and hypothesis** and how the different phylogenetic tree is a hypothesis.



In general:

- They acknowledge the link between evolution and NoS as important.
- They suggest that NoS should be taught from early levels of schooling, because the understanding of NoS influences the acceptance of evolution (Großschedl et al., 2014)

## Discussion and conclusion

### From the teachers' perspective

As a strategy:

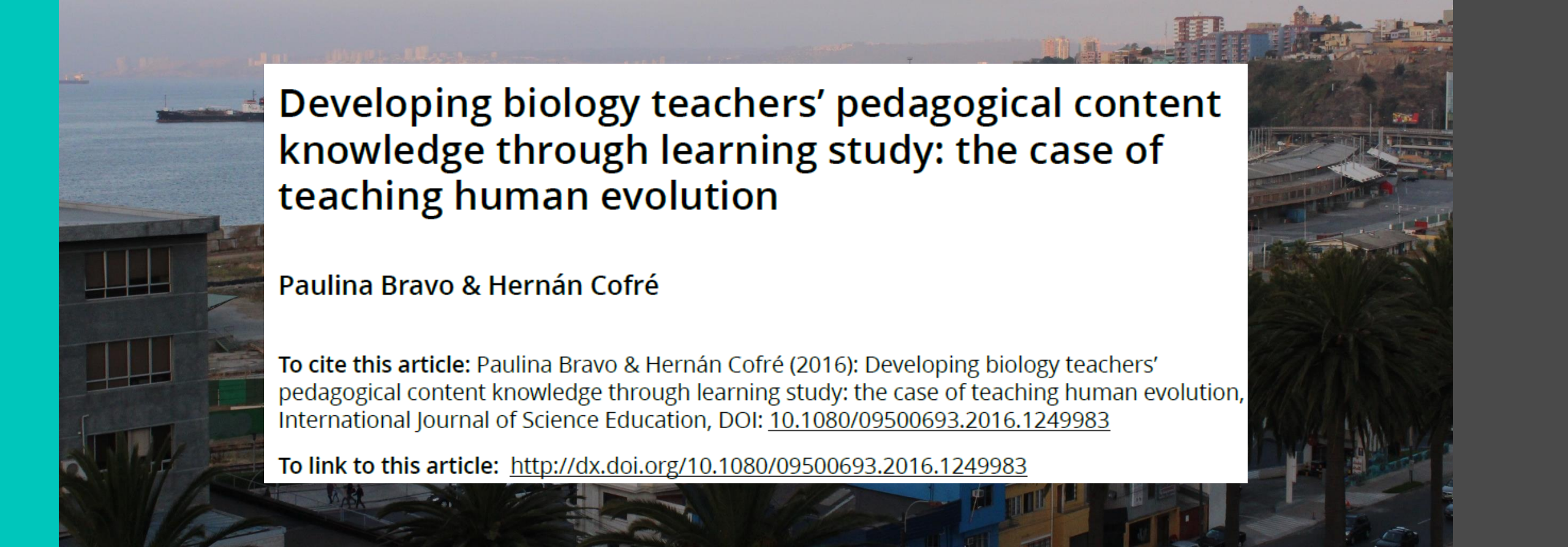
- Teaching the Nature of theories (what they are and how they are) and the importance of scientific facts and evidence.
- Aware about the language: "why" questions might imply the existence of an end or objective (Kampourakis, 2014)

New comprehension

Acknowledge  
the programme



Pedro: “This is very important because I am **reflecting my practice**, I am observing myself I am seeing **what things I can do much better and what things I definitely should not do** and what things I can improve or incorporate and that is like the benefit of this, and in fact immediately I have things that I have to do because many of these things are important for the children’s life”



# Developing biology teachers' pedagogical content knowledge through learning study: the case of teaching human evolution

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Muchas gracias  
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