

Description of personal preconceptions and dispositions about climate change in a group of science teachers in Chile: an exploratory study

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INTRODUCTION

- Climate change is a global issue with clear human influence (IPCC, 2014; UNFCCC, 1992), so it is necessary for people to have climate literacy (U.S. Global Change Research Program, 2009), for which climate change education is crucial (Anderson, 2012; Bhattacharya, Carroll Steward, & Forbes, 2021).
- Despite the increase in available information on climate change education (Monroe, Plate, Oxarart, Bowers, & Chaves, 2017), its **teaching remains complex and challenging.**



INTRODUCTION

- Numerous studies have shown that science teachers lack the necessary knowledge to teach climate change (e.g. Bhattacharya et al., 2021).
- On the other hand, **teachers' preconceptions about climate change have been described as broad and very persistent, even after instruction** (e.g. Jeong et al., 2021).
- While these climate change preconceptions and attitudes toward climate change have been studied in various contexts globally, both in in-service teachers and pre-service teachers **the literature does not find information on the topic in teachers in Latin America and neither in Chile.**



RESEARCH OBJECTIVES

- Considering the impact that preconceptions and attitudes in the teaching of climate change may have on the achievement of the learning requested in the Chilean school curriculum, **this research aims to describe the preconceptions about climate change and the personal dispositions towards its mitigation held by a group of pre-service and in-service teachers in Chile, before and after a professional development program**

Bases Curriculares 3° y 4° medio

Ministerio de Educación
Gobierno de Chile



METHODOLOGY

Study design: exploratory, descriptive, and transversal study.

Participants: A total sample of 46 teachers, pre-service (n=18) and other in-service teachers who teach climate change in the school system (n=28). Of the total participants, 19 teachers took part in a professional development course on Deliberative Teaching of Climate Change.

Data collection: Application of an online Climate Change Questionnaire modified from Tolppanen et al., (2021). The questionnaire consisted of 50 closed-response items. The instrument was administered only once to 27 pre-service and in-service teachers, while a pretest-posttest design was applied to the 19 teachers who participated in the professional development course on Deliberative Teaching of Climate Change.



METHODOLOGY

- The 16-question of **knowledge about climate change**, in which a question-by-question analysis was made considering correct and incorrect answers to know the preconceptions of the teachers and also, the variable knowledge about climate change was created (with a scale from 0 to 19 points). We also include two independent variables: specialty and teaching experience

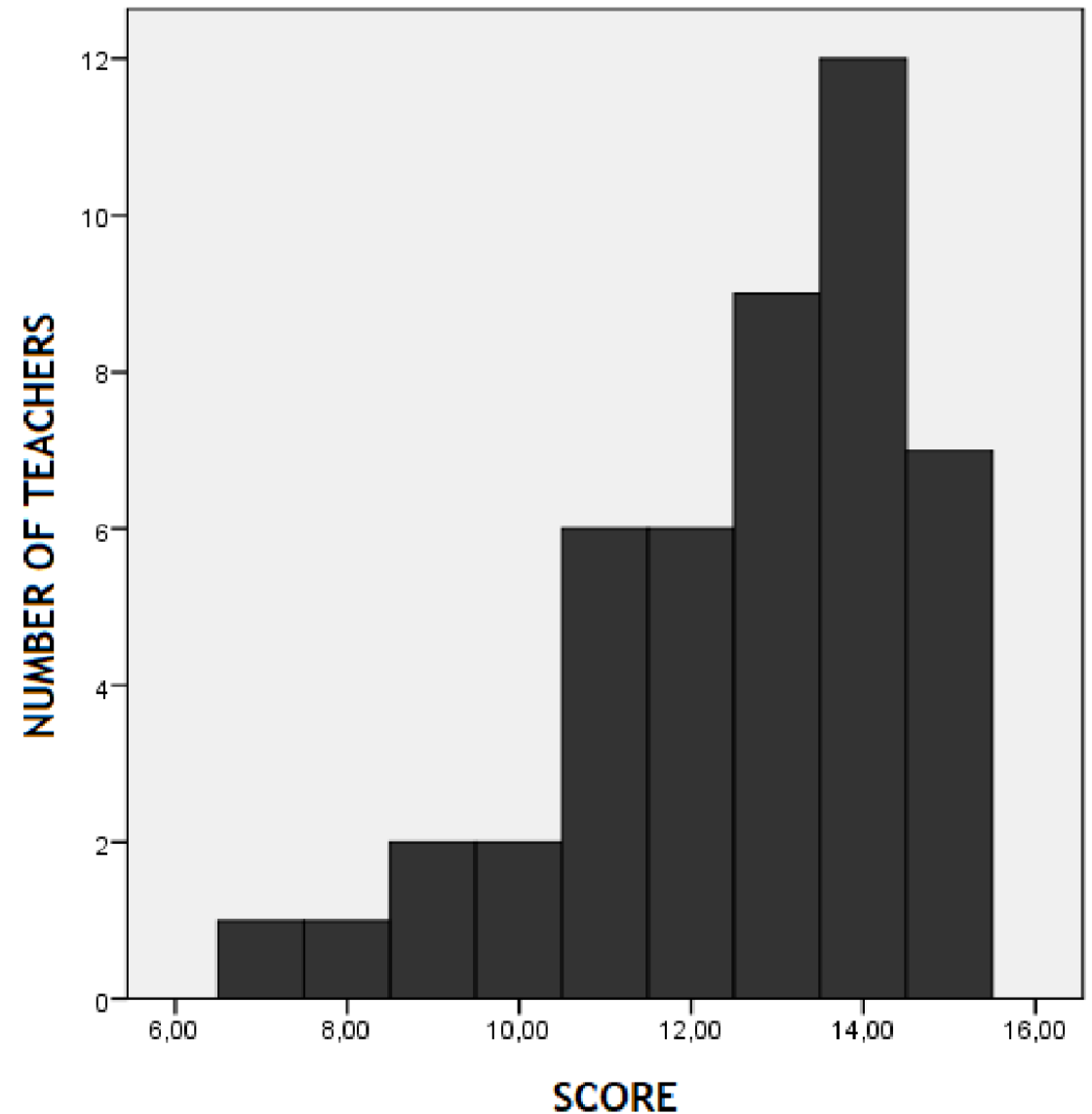


knowledge about climate change (Cronbach's Alpha = 0.6),
attitude towards climate change mitigation (Cronbach's Alpha = 0.72),
willingness to take actions to mitigate climate change (Cronbach's Alpha = 0.75),
attitude towards scientific knowledge (Cronbach's Alpha = 0.68),
science self-efficacy (Cronbach's Alpha = 0.78).

RESULTS

Knowledge and preconceptions about climate change

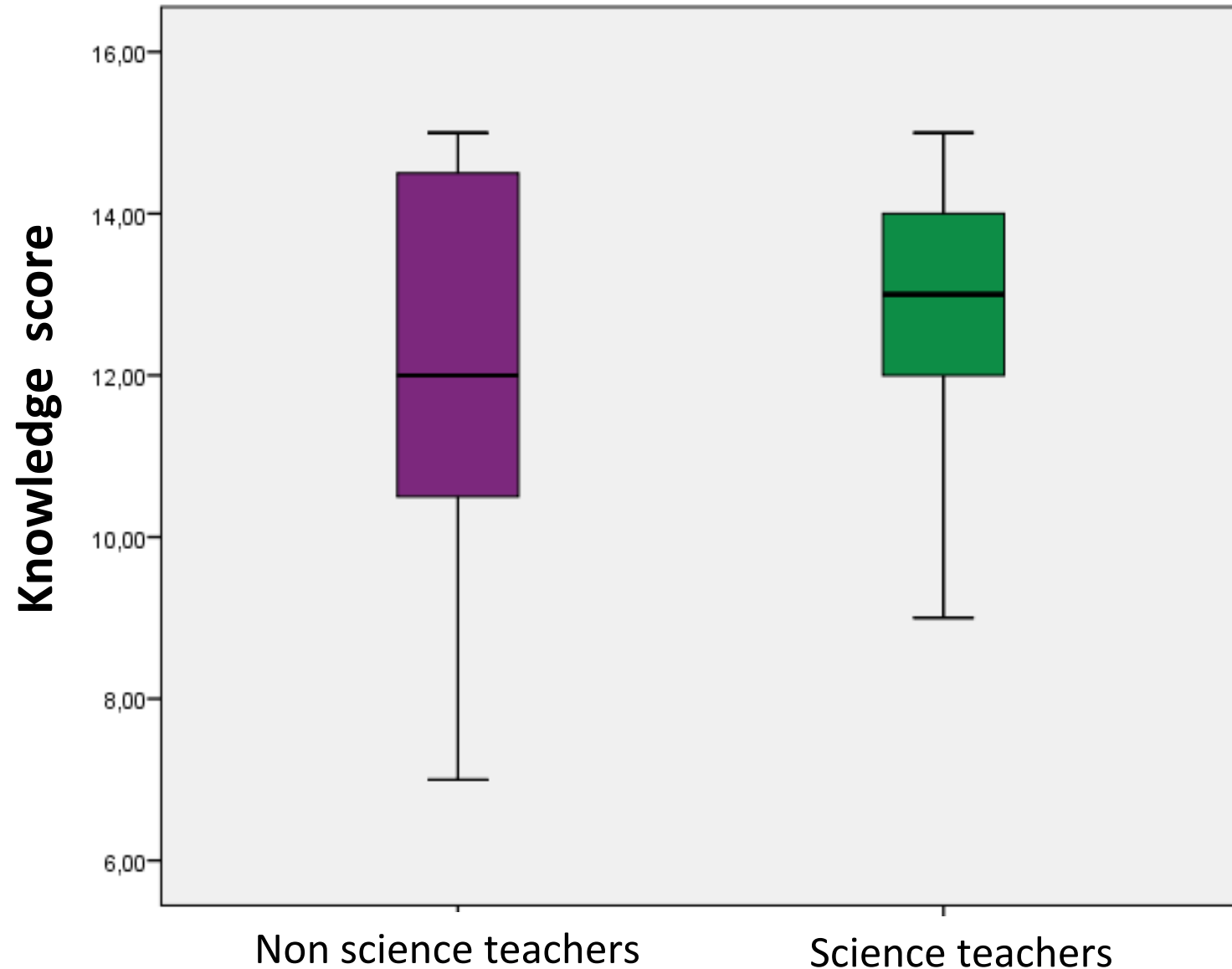
The results show that the whole group of teachers have moderate knowledge about climate change (M=12.6; SD=1.97; n=46)



Distribution of the values of the variable knowledge about climate change. This variable has a range from 0 to 19 points. Therefore, no one in the group of teachers obtained a maximum value or close to it.

science teachers vs. elementary or non-science teachers

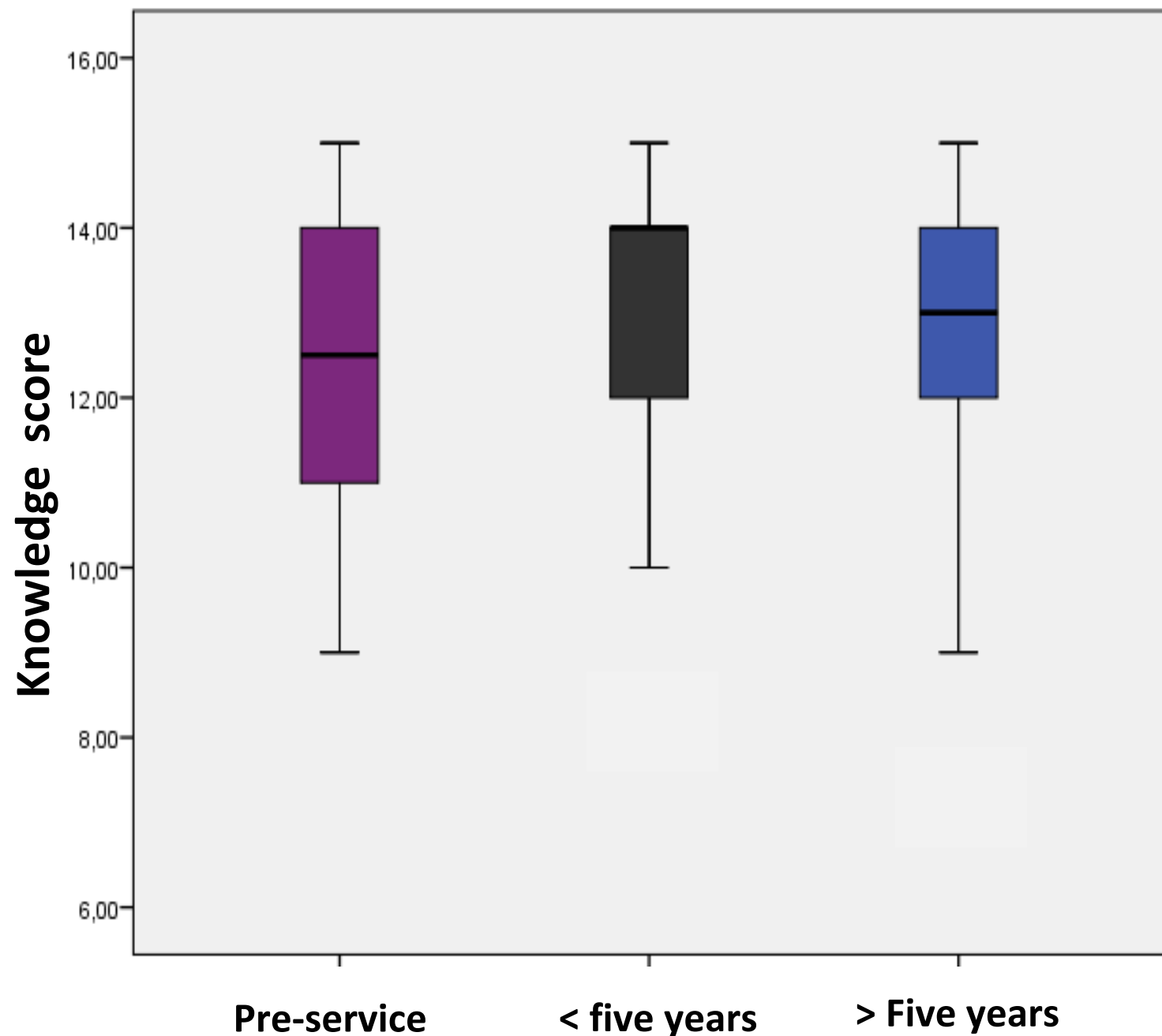
- there is no statistically significant difference between the knowledge score of teachers without a science background (mostly elementary teachers) (n=11) and those with a science major (n=35)
Mann-Whitney U test (Z=-0.79; p=0.43)



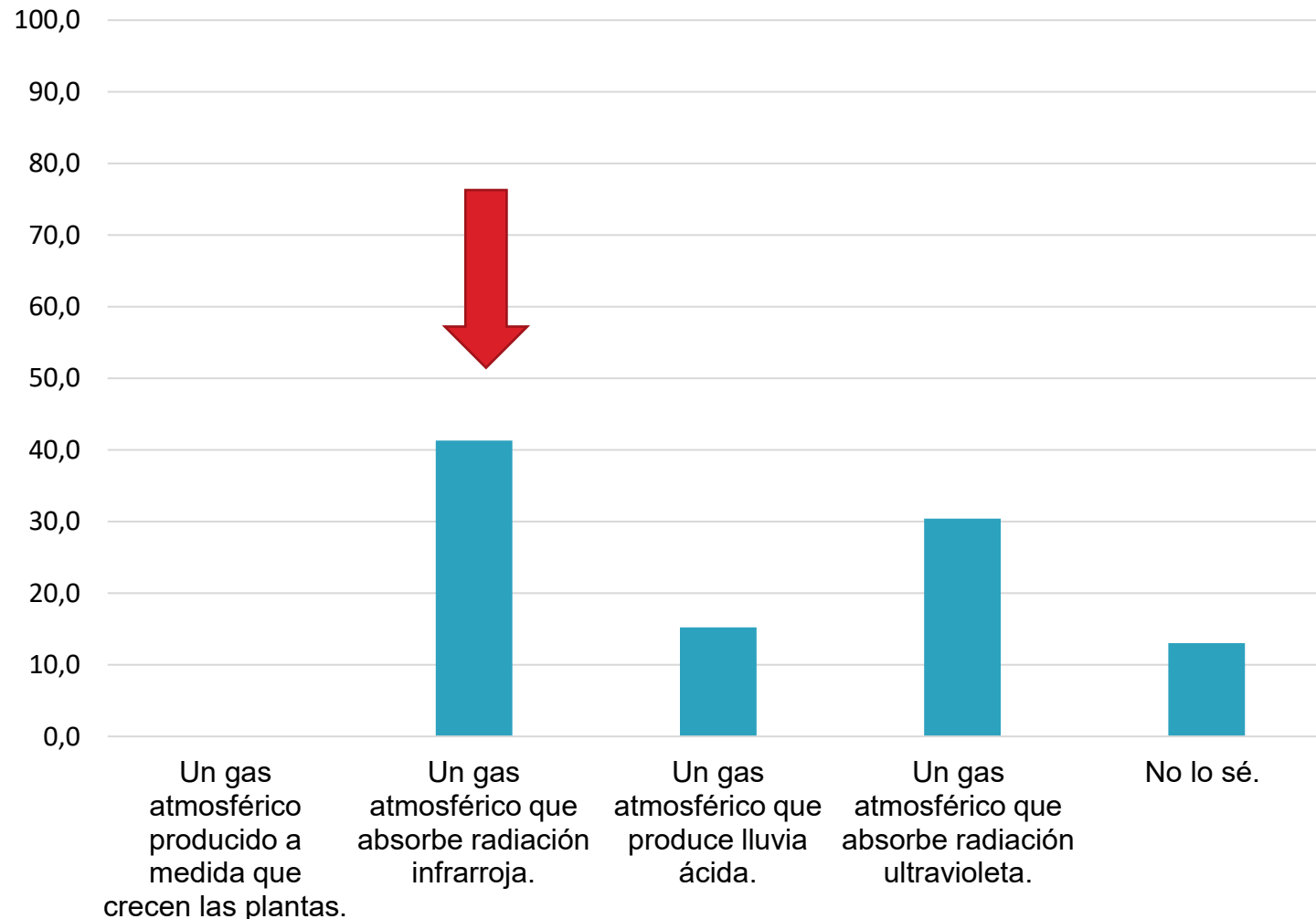
By teaching experience

- there is also no statistically significant difference between the score of teachers in training (n=18), those with less than 5 years of experience or novices (n=13) and those with more than 5 years of experience (n=15).

Kruskal-Wallis test ($X^2=0.37$; $p=0.58$)

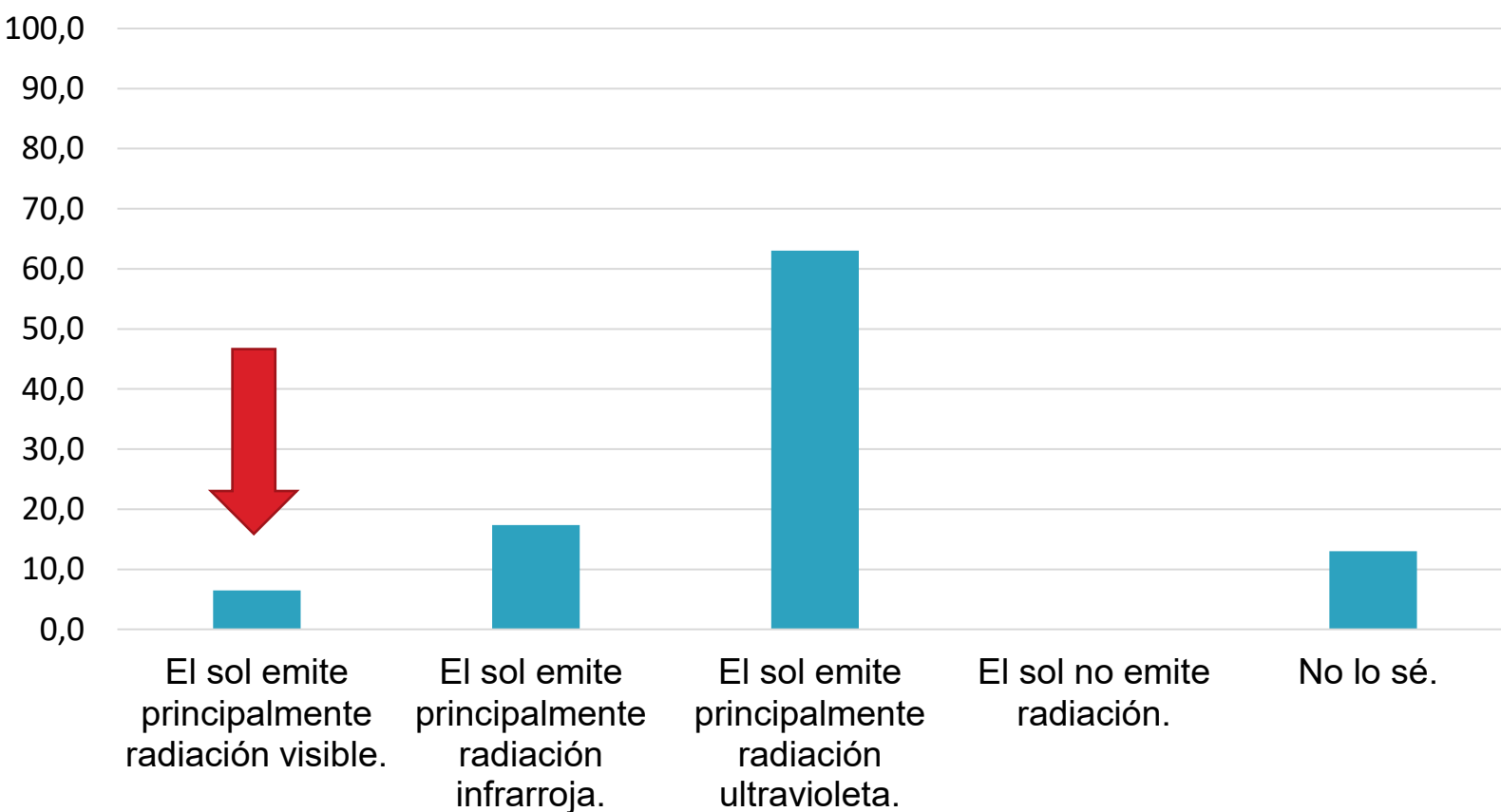


Knowledge and preconceptions about climate change



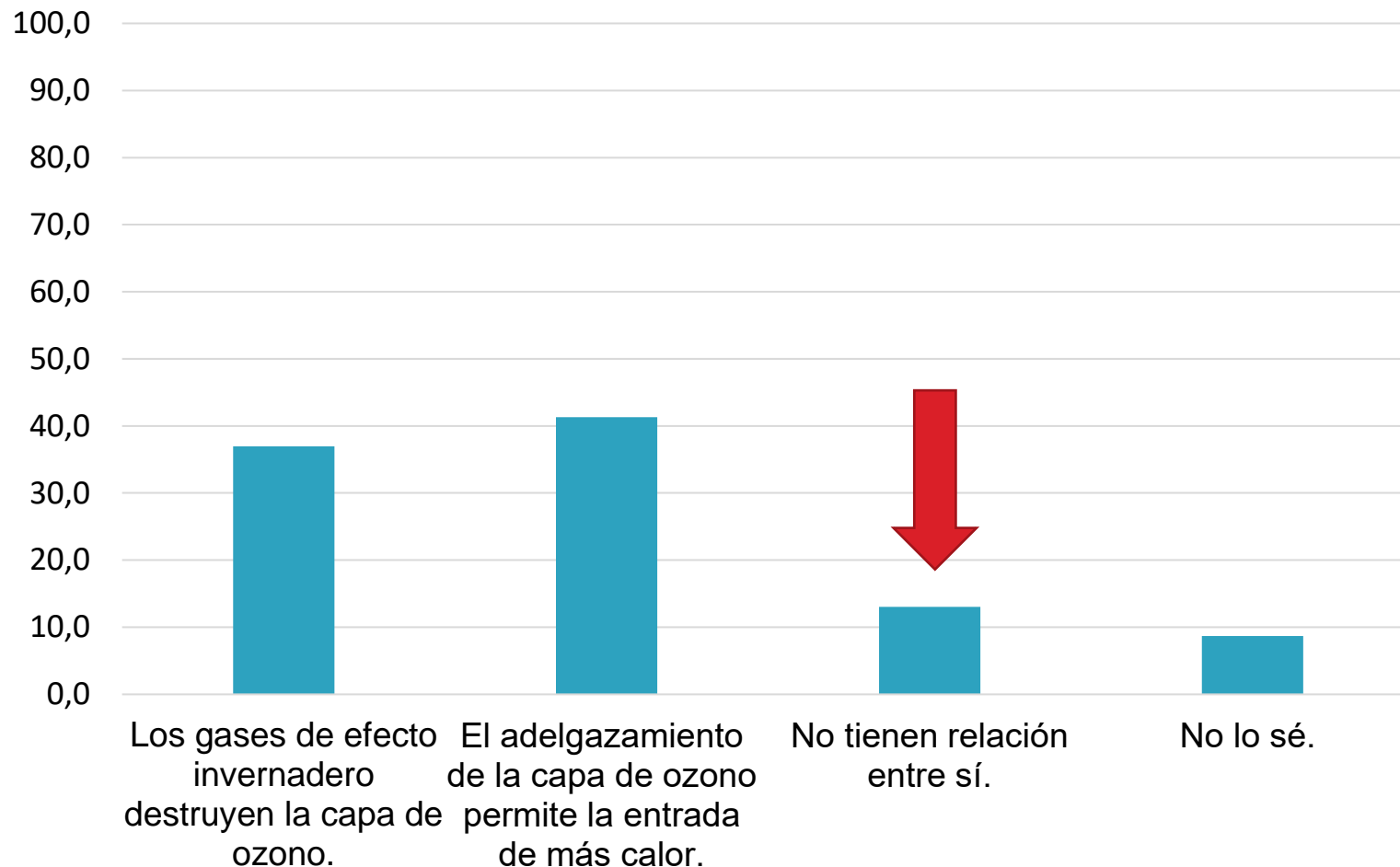
There is some confusion about the definition of a greenhouse gas.

Knowledge and preconceptions about climate change



Misconception about the ***sun emits mainly ultraviolet radiation.***
Correct = "The sun emits mainly visible radiation".

Knowledge and preconceptions about climate change



Most of teachers establish a false cause-effect relationship between the greenhouse effect and the thinning of the ozone layer, either considering that greenhouse gases destroy the ozone layer or that the thinning of the ozone layer allows the entry of more heat.

Correlation between knowledge about climate change and other variables

- There is a slight positive correlation between the knowledge that teachers have about climate change and their willingness to carry out actions that contribute to mitigate this problem.

(Spearman's correlation index: $r=0,34$; $p<0,05$)

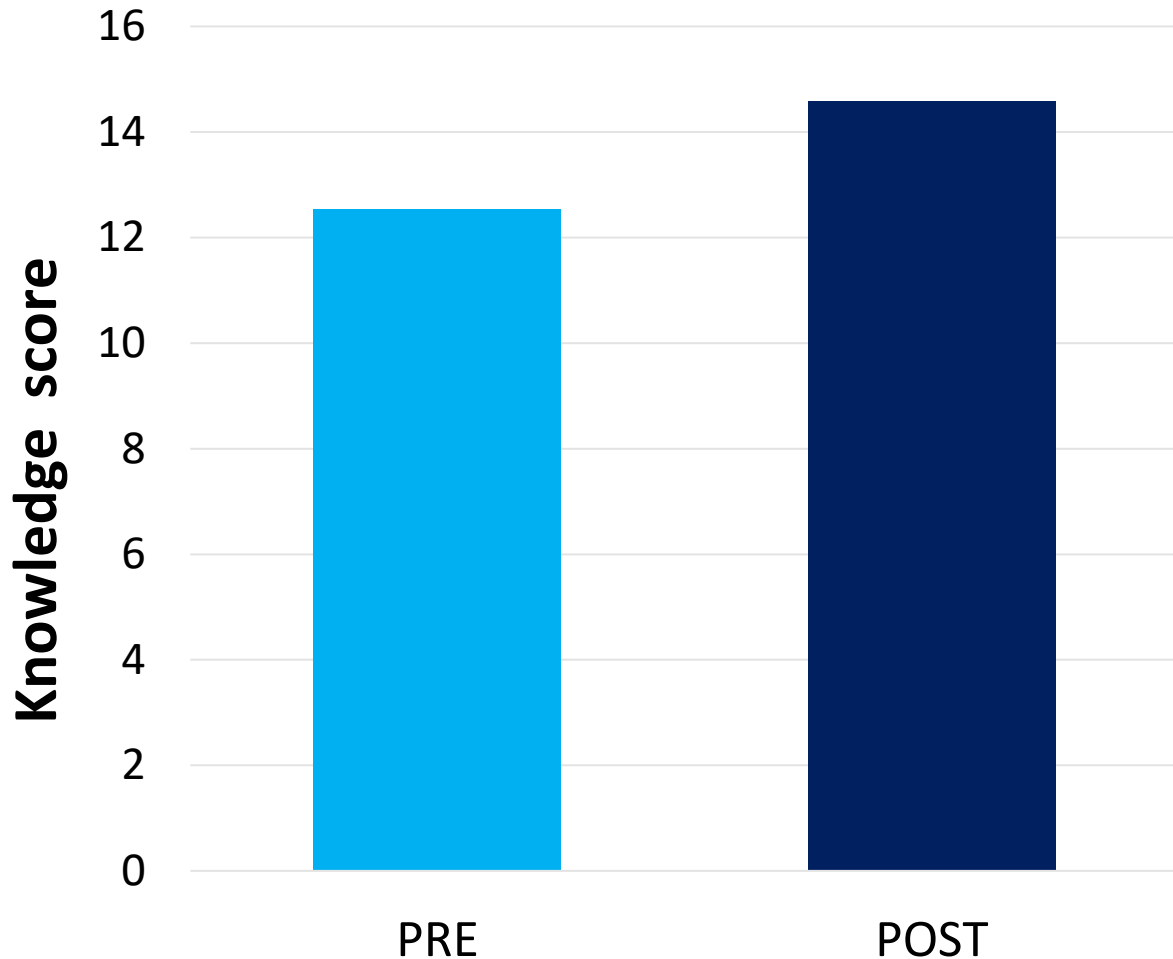
- There is also a positive correlation between teachers' knowledge of climate change and the variable measuring self-efficacy in science.

(Spearman's correlation index: $r=0,47$; $p<0,01$)

- There is no statistically significant correlation between knowledge of climate change and the rest of the variables studied (disposition to mitigation actions, dispositions to mitigation behaviors, and attitude towards scientific knowledge).

Impact of the Deliberative Teaching course on Climate Change knowledge

Wilcoxon test ($Z=-3.34$; $p<0.001$)



- The course reinforces the knowledge about the evidence of climate change and improves their understanding of the greenhouse effect
- It fails to challenge preconceptions about the ozone layer, nor about the nature of the rays emitted by the Earth and the Sun.

CONCLUSIONS

- The teachers in the group know some aspects related to scientific evidence on climate change, energy transfer and carbon cycle that were evaluated in the questionnaire.
- The knowledge possessed by the teachers in the sample correlates respectively with other aspects analyzed, such as the dispositions towards actions that mitigate climate change or the self-efficacy in science presented by the study participants.
- Some of the main preconceptions mentioned in the literature are also present in this group of teachers.
- The Climate Change Deliberative Teaching Course contributed to the improvement of the participating teachers' knowledge on some of the topic of CC, but failed to challenge some of the most persistent preconceptions described in the literature.

ACKNOWLEDGMENTS

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Thank you very much for your attention,
any questions?

