

# Reflections about Nature of Science in Physics Teacher Training

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**Abstract.** This work aims to present a paper review in international journals about the nature of science in physics teacher training, analyzing two categories: keywords and research characterization. The papers analyzed allow us to state that there is a trend in research on the nature of science in teacher education regarding contextual and methodological aspects.

## 1. Research

Our aim in this research was to present a paper review in international journals about the nature of science (NOS) in physics teacher training. Therefore, based on a process of searching and selecting papers in a specific journal portal [1], we analyzed 26 papers of different nationalities published in international journals in terms of two categories. The categories keywords and research characterization generated a more in-depth discussion, aiming to obtain a manifestation by researchers in the area of how research using the NOS for Teacher Education in an international context is carried out. Using qualitative data analysis software [2] and making use of Content Analysis [3], each paper was coded according to two categories, culminating in other subcategories, which sought to deepen the understanding of the plurality of contexts and how research is carried out in this field of knowledge around the world. Thus, since this is a state of knowledge survey [4], quantitative and qualitative data were obtained, which refer, for example, to the characterizations of the sample group of this research, through the analysis of the most eminent justifications for the use of NOS and the main teaching and research methodologies used, as well as the perception of which contexts receive this researches.

## 2. Results

From 26 papers, only 14 (53.8%) presented keywords in the abstracts. In the analysis, we identified 66 keywords that formed 8 subcategories: nature of science; teaching/education in science and nature of science; teacher training; context of teachers' performance; teaching and learning methodologies; research instruments and research methodologies; pedagogical knowledge content; and others. The most frequent keywords were related to the 'nature of science' and 'teacher education'. The 'nature of science' subcategory is composed of keywords that refer to the debate on epistemological aspects of scientific knowledge and 13 papers (92.9%) mention the term to synthesize the central ideas of the text. The subcategory 'teacher training' is present in all articles (100%) and is composed of keywords that refer to teacher training in different contexts, whether in initial training, continuing education or complementary, or refer to teacher training in a more general way. The research characterization category aimed to identify, in each paper, the nature and scope of each research carried out, the instruments used, the application and analysis methodologies adopted, and the research development contexts. Most of the papers were categorized as qualitative research (73.1%) that aim to understand, describe, classify and explain existing relations between the variables found in the research. The other part of the paper is of a quali-quantitative nature (26.9%) that combine qualitative research with some collection and analysis of numerical data. The predominant instruments for conducting the surveys were questionnaires (80.8%) and interviews (65.4%), followed by materials produced by the research subjects (38.5%), the use of dairy board (19.5%) and video recordings (19.5%) and classroom observation (11.5%). Most papers carry out research using more than one data research instrument, and thus involving, in different degrees and methods, some type of triangulation. Research focuses were coded into three subcategories. The first consists of those in which scope is to develop and apply a model for assessment of didactic proposals or participants' knowledge about the NOS, whether they are teachers in training, experienced teachers or even evaluating changes in these conceptions during an applied course (73.1%). The second consists of those in which scope is

to elaborate and analyze a didactic proposal intervention with research subjects after a period of studies and appropriation of aspects of the NOS (23.1%). The third consists of those in which scope is to use the history of science to teach about the NOS (3.8%). We analyzed the research application context presented in the papers, both concerning the environment in which they were carried out, as well as the group of participants involved. The research proposals were developed in complementary or continuing education courses such as postgraduate and extra courses (65.4%), in subjects of an initial training course in the general sciences or physics (23.1%), or with groups of in-service teachers, but do not participate in any specific complementary course (11.5%). Out of the 26 articles, most explain analysis methodologies in their investigations (65.4%), and some of these studies have more than one analysis methodologies. A smaller part of the papers (34.6%) did not present elements that allowed them to be classified with some standardized analysis methodology. However, the analysis we carried out allows us to state that these investigations, despite not specifying a standard analysis methodology, develop a kind of interpretative analysis in their research.

### 3. Conclusions

In summary, the papers analyzed allow us to state that there is a trend in research on the NOS in teacher education regarding contextual and methodological aspects. The papers present qualitative or quali-quantitative research, the scope of the papers is the application and development of didactic proposals for teaching the NOS in teacher education, the papers tend to use questionnaires and interviews as research instruments and value data triangulation.

### References

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