

TEACHER-CENTERED APPROACH: STUDY OF PROFILES, NEEDS, AND PRACTICES IN ASTRONOMY EDUCATION IN PRIMARY IN FRANCE

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Abstract. This thesis engages in the exploration of astronomy education in France within primary schools, adopting a perspective centered on school teachers. Its primary objective is to analyze the profiles, needs, and pedagogical methods of teachers working in this field. The thesis initiates an approach to create a state-of-the-art review and to characterize profiles primarily.

Keywords: Astronomy, Education, France, Teacher, Primary school

1 Introduction

I will present the initial results of my first year of doctoral research, focused on the teaching of astronomy at the primary level in France. The main aim of this study is to provide a detailed overview of the profiles, needs, and teaching practices of primary school teachers. In this article, we will discuss the initial results of the questionnaire distributed to all schools (36 000) from January to May 2024. To date, over 1730 feedback responses are being analyzed. The goal of this research is to provide a solid foundation for understanding and improving the teaching of astronomy in primary schools. The first step of our research involved conducting a review of previous studies, which revealed a significant gap in the recent literature. Indeed, it is noteworthy that in France, few recent studies have delved into this research area, with the majority of available surveys dating back more than two decades (Girault, Y., & Merle, H., 2003; Frege, V., & Venturini, P., 2006).

2 Methodology

To address this gap, we developed and distributed a detailed questionnaire aimed at collecting data on the perceptions, needs, and practices of current teachers. This questionnaire was specifically designed to target primary school teachers. The questions were crafted to be both quantitative and qualitative in order to capture a comprehensive range of data: The closed-ended questions include multiple-choice questions and Likert R., (1932) scales, a psychometric tool used to measure attitudes such as the degree of agreement or disagreement among individuals. These allow us to obtain quantifiable and easily analyzable data on aspects such as the frequency and type of astronomy-related activities conducted in the classroom. Regarding the open-ended questions, they provide teachers with the opportunity to express in detail their opinions, experiences, and specific needs, thus enriching our data set. The analysis of these responses is currently underway.

The method of distributing the questionnaire was rigorously planned to reach a broad, representative sample of primary school teachers across France:

- Regarding the selection of participants:

To build our participant database, we used a Python script that automatically extracted email addresses from a public school directory. This process allowed us to target approximately 36,000 French primary schools, ensuring comprehensive and balanced distribution of the questionnaire. - On the procedure for sending the questionnaire:

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To maximize the response rate and manage the data efficiently, the questionnaires were sent in a staggered manner over a four-month period, from January to April 2024. Prior to this extensive phase, a test was conducted in the Lyon region in December 2023 to refine and validate our sending and response processing protocol. Managing a data collection campaign of this scale involved challenges and the rigorous implementation of response processing, including daily email dispatch maintenance and return management, ensuring that data was collected systematically and ethically to guarantee the quality and integrity of the data collection.

The questionnaire enabled us to gather data from over 1,700 primary school teachers, providing a rich database for our study.

The collected data is currently being analyzed using advanced statistical and computational tools to ensure accurate and in-depth interpretation: specialized software such as R, Tableau, and specific Python libraries (Seaborn, Plotly, or Matplotlib) are used for the quantitative analysis of the data. These tools facilitate the detection of trends, the establishment of correlations, and the generation of other essential descriptive statistics. As for the qualitative data analysis from open-ended responses, analysis techniques are being implemented to code and interpret the numerous text responses.

We will now present some of the very first analyzed results from this questionnaire. Regarding the questionnaire itself: it contains 64 questions and it is structured into four distinct sections, each targeting complementary aspects of teachers' knowledge, attitudes, expectations, and teaching practices.

3 First results

3.1 First section: General Information

This section collects data on the affiliated educational region (académie), the type of school, years of teaching experience, and other basic demographic information (Fig. 1). The aim is to contextualize the responses within a variety of geographical and institutional frameworks. Although sub-sampling by educational regions or demographic data is considered, it has not yet been carried out. 81% of the responding primary school teachers are women. The official statistic from government data is 84%. Thus, the gender distribution in our sample aligns with the national population primary school teachers (Chi-squared test).

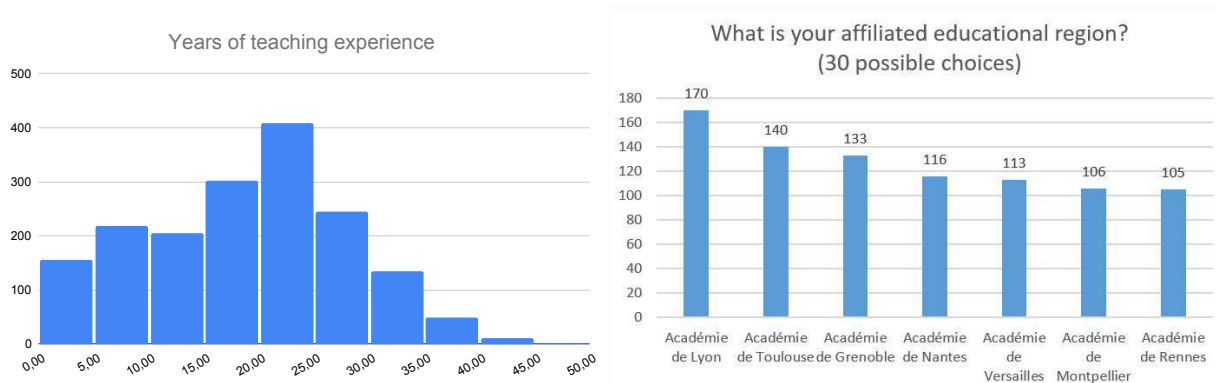


Fig. 1. Left: Years of teaching experience. Right: Region information.

3.2 Second section: Academic Profile and Personal Interests

This section explores the respondents' educational background, including their academic training and personal interest in astronomy and science in general (Fig. 2). It also inquires about their participation in astronomy-related activities (sky observation activities or astronomical events, planetarium, visit of observatory, ...) both in school settings and personally. The section also focuses on basic knowledge of astronomy (for example, explaining the phases of the Moon and the phenomenon of the seasons).

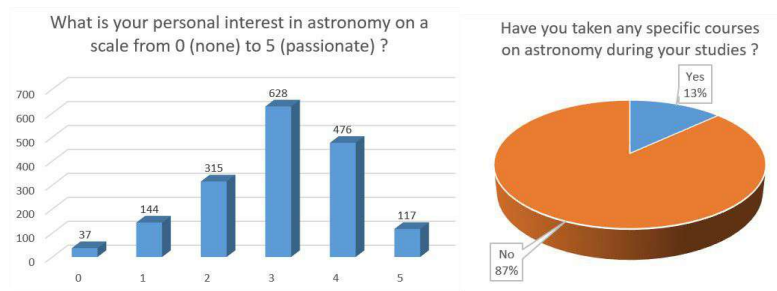


Fig. 2. Academic Profile and Personal Interests

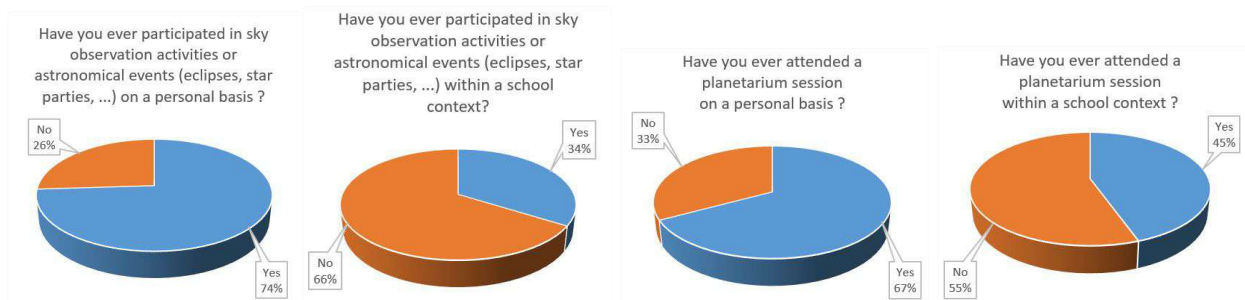


Fig. 3. Reversal of trend between personal and school contexts

This trend reversal shows that while individuals engage in astronomy-related activities in their personal time (like stargazing or visiting planetariums), they don't incorporate these experiences into their classroom teaching (Fig. 3). Several challenges may account for this trend reversal. We plan to conduct follow-up interviews to better assess and understand these difficulties.

3.3 Third section: Teaching Practices in Astronomy

Here, the questions focus on teaching methods in astronomy, assessing the teachers' comfort level with teaching this subject, the frequency of lessons, the resources used, and the assessments conducted with students.

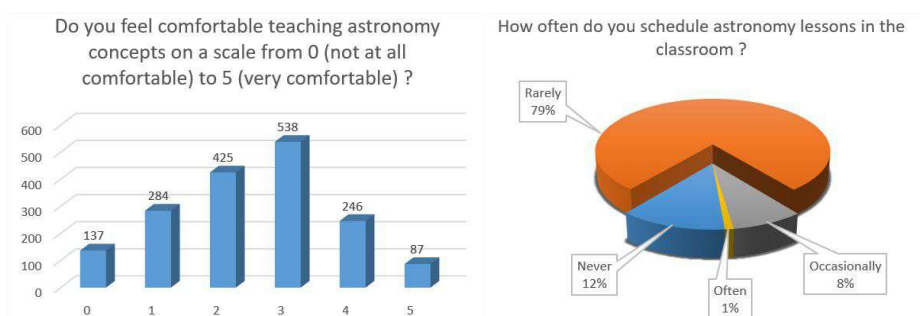


Fig. 4. Comfort level and frequency of lessons

Interviews are being scheduled with teachers to investigate the frequency with which astronomy is taught in the classroom. This study aims not only to gather quantitative data on how often astronomy is integrated into the curriculum, but also to delve deeper into the underlying reasons why some teachers may choose not to offer pedagogical sequences centered on this subject (Fig. 4). By engaging in open discussions, we hope to uncover various factors that may influence their decision-making processes, such as perceived difficulties in the subject matter, lack of resources, or insufficient training. Understanding these barriers is crucial for developing effective support mechanisms that can enhance the teaching of astronomy.

3.4 Fourth section: Needs and Expectations for Continuing Education

The final section focuses on teachers' needs and expectations regarding continuing education and specific educational resources for astronomy. It aims to determine opportunities for improving teacher training.

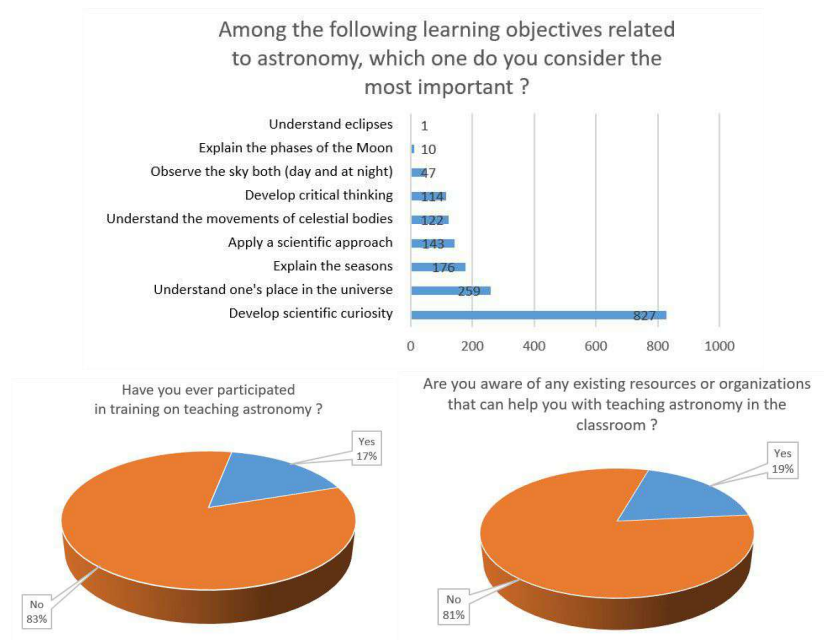


Fig. 5. Training and resources for Astronomy education

Numerous resources and a diverse range of stakeholders are available to support the teaching of astronomy in the classroom. Despite this wealth of support, only one out of five teachers is aware of these resources (Fig. 5). To address this issue, we plan to engage with primary school teachers next year to identify the underlying reasons for this lack of awareness. Through structured interviews and surveys, we aim to uncover the barriers that prevent teachers from accessing these valuable resources and to explore their perceptions of the stakeholders available to assist them in their teaching practice. This investigation will not only enhance our understanding of the current landscape of astronomy education but also inform strategies to improve resource dissemination and teacher engagement in the subject.

4 Perspectives

The methodological approach of this research combines strategies to provide a deep and nuanced understanding of astronomy teaching practices at the primary level in France. It ensures the validity and reliability of the data, thereby supporting the main objective of developing tailored educational resources that meet the real needs of teachers. The preliminary results of this survey will allow us, by next years, to propose, develop, and analyze tailored educational materials aimed at improving the quality of astronomy teaching in French primary schools. The continuation of this study will focus particularly on examining the numerous resources already available. We will question their accessibility and how they are appropriated by primary school teachers. Many teachers have contacted me following the questionnaire and have expressed interest in further experimentation. The development of a research protocol is currently underway.

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