EDUCATION, AWARENESS, AND VALUATE OF FOSSIL HERITAGE: ANALYSIS OF SOCIAL PERCEPTION IN EDUCATIONAL AND COMMUNITY CONTEXTS.

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Abstract

The preservation of fossil heritage constitutes an interdisciplinary challenge that involves geology, education, and the public communication of science. On the campus of the National University of Comahue, where fossils are exposed to the everyday environment, gaps in knowledge and limited dissemination regarding their value and legal protection are observed. In response to this issue, the present study aimed to evaluate the level of awareness and knowledge about fossils among different sectors of the community —university campus users, runners, and high school students— as well as to analyze the impact of an educational intervention on the social perception of fossil heritage.

The research was carried out under a mixed approach, through the application of surveys, interviews, and informative talks. Quantitative data were analyzed using descriptive statistics, while qualitative data were examined through thematic coding. The results indicate that, although adults and university students possess a general awareness of the importance of fossils, their involvement and normative knowledge are limited. In contrast, high school students showed a significant increase in their knowledge and appreciation after participating in a guided educational instance.

Overall, the findings confirm the decisive role of geoscience education as a tool to strengthen social awareness and promote the preservation of fossil heritage. It is recommended to systematically incorporate heritage content into school, university, and community programs in order to foster an informed citizenship committed to its natural and cultural environment.

Keywords: geoscience education; fossil heritage; social awareness.

Nota 1 sobre la traducción
La traducción al inglés de esta investigación fue realizada con la asistencia de ChatGPT (OpenAI, 2025).

1. Introduction

The preservation of fossil heritage constitutes an interdisciplinary field that integrates geology, archaeology, and the public communication of science. At the international level, multiple studies have pointed out that fossils, in addition to their scientific value, play an essential role in reconstructing the history of life, in public education, and in the construction of cultural narratives that connect communities with their territory (Clary, 2021; Hurst, Kosnik, Evans & Brock, 2023; Ugong, Gani, Jambol, Hassan & Mad Ali Abang, 2024). For this reason, fossil heritage is considered an important part of the history of our society, which must be protected for future generations.

However, there are significant limitations in the management and communication of fossil heritage. Ugong et al. (2024), in their analysis of the Niah Caves in Malaysia, demonstrated that the absence of clear conservation plans and the limited community participation hindered their sustainable management. Meanwhile, Hurst et al. (2023), through the *Found a Fossil* project in Australia, noted that although there is social interest in reporting fossil or archaeological findings, barriers persist related to a lack of knowledge of regulations, the absence of accessible communication channels, and confusion regarding the competent authorities. From the perspective of non-formal education, Clary (2021) highlighted how fossil parks in the United States can become key spaces for improving visitors' geoliteracy (Earth science literacy), bringing concepts such as geological time, evolution, and climate change closer to the public. Nevertheless, Clary also emphasized the challenges in content interpretation and site accessibility.

Despite these advances, there is still a gap regarding public awareness and normative knowledge about fossils in everyday contexts, particularly on the campus of the National University of Comahue. Recent research has shown that, although there is public interest in safeguarding fossil findings, factors such as a lack of legislative clarity, limited institutional communication, and the absence of effective outreach strategies hinder the proper protection of heritage. This gap is especially evident on the university campus of the National University of Comahue, where users may come into direct contact with fossils without knowing their value or the proper procedures for their care.

Within this framework, the present research seeks to promote the importance of fossil heritage in society through the implementation of educational and communication strategies aimed at the university community and society in general. The objective is to encourage the social appreciation of the fossils present on the UNCo campus, strengthening shared responsibility in their conservation and demonstrating how paleontological heritage can become a tool for awareness, local identity building, and community engagement.

2. Methodology

The research was developed under a mixed approach, combining quantitative and qualitative tools with the objective of evaluating the level of awareness and knowledge about fossils on the university campus, as well as promoting their appreciation as cultural and scientific heritage.

Data collection was carried out through structured surveys, semi-structured interviews, and informative talks. The surveys, administered through digital forms, provided quantitative information that was analyzed using simple descriptive statistics —frequencies and percentages—, which made it possible to determine the general level of knowledge of campus users. Likewise, these data allowed a comparative analysis to be conducted before and after the educational intervention implemented in secondary schools.

On the other hand, the qualitative data obtained through interviews and productions created by students during the activities were analyzed through a process of thematic coding. This analysis made it possible to identify patterns and categories related to heritage awareness, responsibility toward fossil heritage, and appropriate practices in the event of possible findings.

Participants

The study included two main groups.

On the one hand, fifth-year secondary school students, invited through coordination with school management teams.

On the other hand, regular users of the university campus, including students from various majors —except those belonging to the Bachelor's Degree in Geological Sciences, due to their specific training in the subject— and individuals not directly linked to the institution, such as runners.

These participants responded to the digital form online.

In total, 75 people participated in the study: 60 belonging to the group of runners and university students, and 15 secondary school students.

The interviewed teacher was Laura Ávila, professor of the Bachelor's Degree in Geological Sciences and director of the Proyecto Dino Museum, who carries out outreach and awareness activities from preschool to higher education. Her participation made it possible to contrast the obtained results with the perspective of a specialist in the field.

Regarding their characteristics, participants presented age diversity, ranging from adolescents to young adults. All shared a connection with educational environments, which favored the incorporation and appropriation of content related to scientific dissemination. Furthermore, participation was voluntary, anonymous, and did not require prior knowledge of geology or paleontology, ensuring open and voluntary involvement in the research.

Surveys and Interviews Conducted

Anonymous survey via Google Form, administered to Comahue University students and runners at La Barda.

1. *What is a fossil for you?*
2. *What importance do you think fossils have?*
3. *Are you interested in or do you follow news about new fossil discoveries?*
4. *Did you know that there are fossils in the Barda area and the university campus?*
   Yes/No
5. *What would you do if you found a fossil in the Barda or on campus?*
6. *Are you aware that there are laws protecting fossils? If so, what can you tell us about them?*
7. *Do you think there is enough information available about fossils and how to preserve them?*
8. *If not, what would you do to change it?*

Survey administered to 5th-year students from CPEM 23 Secondary School

1. *Do you know that the university campus is a protected area?*
   - *Yes / No*
2. *Do you know that there are fossils inside the university campus?*
   - *Yes / No*
3. *For you, the university campus is located in:*
   - *Shrubland – Barda – Desert – Patagonian Steppe*
4. *Do you think fossils are important for society?*
   - *Yes / No*
5. *What would you do if you found a fossil?*
   - *Take it with you – Take a photo – Notify the University – Do nothing*

Semi-structured interview with Professor Laura Ávila

Axis 1: Institutional role and management of paleontological heritage

Specific objective: To understand the museum's role in the conservation, research, and dissemination of fossil heritage.

Introductory questions:

1. *Could you briefly tell me about your role in the museum and how you came to hold this position?*

Development questions:

3. What do you consider the museum's main contribution to the preservation of local paleontological heritage?

4. What challenges do you face in managing the museum or associated fossil sites (e.g., conservation, funding, accessibility)?

5. Are there joint projects with universities, schools, or other institutions? What results have they achieved?

Closing question:

6. What long-term goals does the museum have regarding the protection and appreciation of fossil heritage?

Axis 2: Education, outreach, and geoscientific literacy

Specific objective: To analyze pedagogical and communication strategies used for teaching and disseminating paleontology.

Introductory questions:

7. How did the idea of giving talks and training sessions at different educational levels arise?

8. Which topics tend to generate the most interest among students and teachers?

Development questions:

9. How do you adapt content and activities according to the age or educational level of the audience?

10. What tools or resources do you consider most effective for fostering curiosity and understanding of geological science?

11. What role do practical activities, such as fossil observation or handling, play in the learning process?

12. How important do you think informal education (museums, workshops, guided visits) is compared to traditional school education?

Closing question:

13. What achievements or experiences would you highlight as the most significant in your educational and outreach work?

Axis 3: Community engagement and social perception

Specific objective: To explore the museum's relationship with the local community and the social impact of fossil heritage.

Introductory questions:

14. How does the local community participate in the museum's activities?

15. What role do visitors or volunteers play in the conservation or dissemination of fossil heritage?

Development questions:

16. Do you think the community recognizes the cultural and scientific value of fossils in the area?

17. In what ways does the museum help raise awareness about the protection of natural heritage and the region's history?

18. What impact do you think the museum has on tourism and local identity?

Closing question:

19. What changes would you like to promote in the relationship between science, the museum, and society?

Axis 4: Professional perspective and projections

Specific objective: To understand the interviewee's personal and professional vision regarding the future of educational paleontology.

Introductory questions:

20. What motivated you to dedicate yourself to paleontology and scientific outreach?

Development questions:

21. How do you perceive current interest in paleontology at different educational levels?

22. What aspects should be strengthened in teacher training to improve Earth science education?

23. What role do you think museums can play in the environmental and scientific education of the future?

Closing question:

24. If you had to define in one sentence the main purpose of your work as a paleontologist and educator, what would it be?

3. Results

Once the surveys were analyzed, a comparison was made between the groups of runners and students from the National University of Comahue, who did not participate in any prior informational session.
The purpose of this comparison was to evaluate the level of autonomous knowledge about fossils and their legal protection, in contrast to the group of secondary school students who did receive a specific educational talk.

In general terms, both groups demonstrated basic knowledge of the topics investigated: they recognize what fossils are, consider them to have scientific and heritage importance, and most identified the presence of fossils both in the *barda* (hillside) and on the university campus.
Likewise, most respondents stated that they would notify the appropriate authorities if they found a fossil and that they were aware that fossils are protected by law.

However, a certain lack of interest regarding fossil findings was observed: 46% of university students and 43% of runners indicated that they were not interested in the subject.

On the other hand, the survey administered to secondary school students was carried out in the context of an informative talk on local fossil heritage. Two data collection stages were conducted: one before the talk and another after it.
The results showed a significant improvement in the level of knowledge: after the talk, 100% of participants stated that they recognized the presence of fossils in the area, and 93% reported understanding the importance of informing the relevant authorities in the event of discovering a fossil.

		Survey 1	Survey 2
1	Knowledge about fossils	67,57%	78,26%
2	Importance of fossils	59,46%	39,13%
3	Interest in fossil discoveries	46%	43,48%
4	Knowledge of local fossils	84%	95,65%
5	Reporting fossil findings to authorities	70,27%	60,87%
6	Knowledge of protection laws	54%	43%

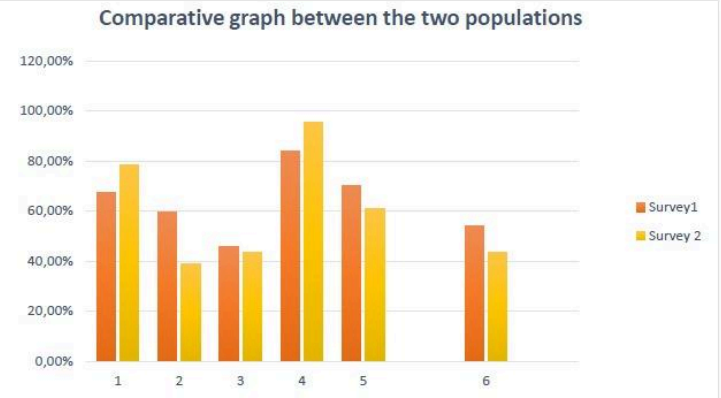

Table and Figure 1. The most frequent responses (mode) for each question in each survey are shown. Survey 1 corresponds to UNCo students, and survey 2 corresponds to running groups.

		After information session	Before information session
2	Knowledge of local fossils	81,30%	100%
3	Importance of fossils	93,80%	87%
5	Reporting fossil findings to authorities	37,50%	93,30%

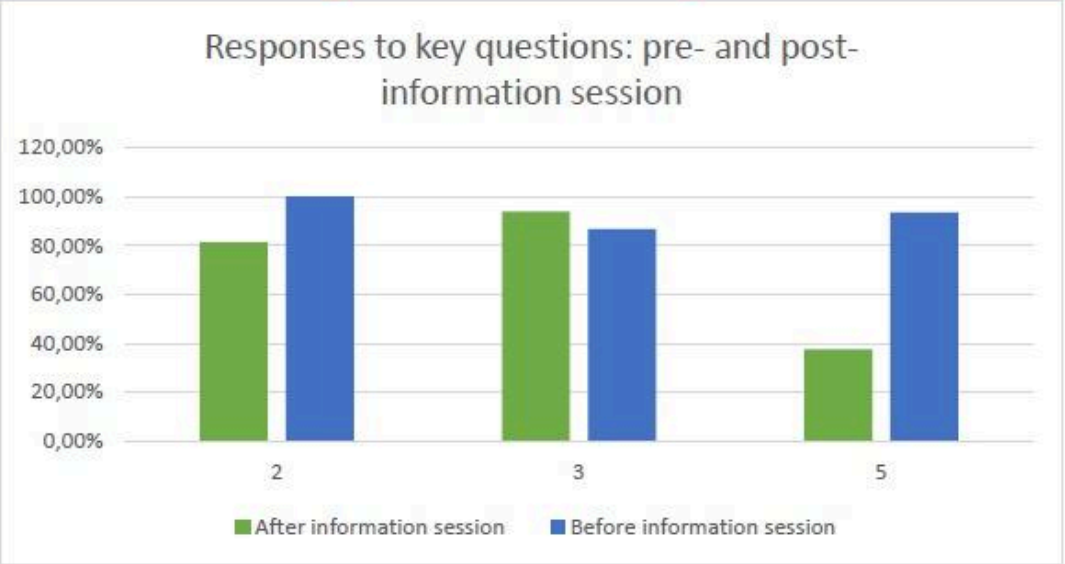

Table and Figure 2. The most frequent responses (mode) to the most relevant questions are shown, collected before and after the information session at CPEM 23 High School.

Note 2. The complete interview results are presented in Appendix A.

4. Discussion

The analyzed data show that most of the young and adult participants surveyed —both runners and university students— possess general knowledge about fossils and their scientific and heritage importance, as well as their legal protection. However, despite this recognition, there is limited motivation to become involved in the topic or to expand their knowledge. This trend reveals the existence of a basic but still superficial heritage awareness that does not always translate into genuine appreciation or protection.

In contrast, the results obtained from the group of secondary school students reflect a greater educational and transformative potential. Although their initial level of knowledge was lower, the informative talk had a positive and measurable impact: the students showed greater interest and willingness to learn about fossils and their heritage value.

This change demonstrates that short but meaningful educational experiences can significantly increase the level of awareness and social responsibility toward fossil heritage.

The comparison between both groups —one with educational intervention and one without— allows us to infer that heritage education plays a key role in building social knowledge about fossils. While adults and university students seem to have acquired some information through their environment or informal means, adolescents show greater receptivity to guided learning experiences, reinforcing the importance of integrating the topic of fossils into school spaces.

These results are consistent with the observations of Laura Ávila, geologist and director of *Proyecto Dino*, who maintains that the current interest in fossils is concentrated mainly in schools and among children and adolescents, as these groups motivate families and adults to participate in scientific outreach activities, museum visits, and educational projects related to heritage.

In this regard, the findings highlight that information and formal education are fundamental tools for strengthening heritage awareness. Nevertheless, the persistent lack of interest observed in part of the adult and university population suggests the need to expand communication and awareness strategies, especially in public and academic spaces, where everyday contact with fossils —such as in the city of Neuquén— does not always translate into knowledge or appreciation.

Overall, the results of this research allow us to affirm that scientific and heritage education has a direct effect on the social perception of fossils, and that its systematic incorporation into school, university, and community programs fosters the development of a more informed citizenship committed to the preservation of local fossil heritage.

5. Conclusion

The results obtained allow us to answer the research question posed: the people who inhabit and move through the university campus possess a general level of awareness regarding the existence and importance of fossils, although their specific knowledge and active involvement in the topic are limited.

In contrast, the educational experiences implemented at the secondary level demonstrated that heritage education has a direct and positive impact on strengthening knowledge and social awareness. This shows that guided learning experiences can transform perceptions and create a deeper connection with fossil heritage.

The research, therefore, partially refutes the initial hypothesis by showing that, although there is some misinformation, there is also a basic awareness and a latent interest that can be enhanced through educational and scientific outreach strategies.

In summary, this study demonstrates that education is an essential tool for strengthening heritage awareness. Including the topic of fossils in learning spaces promotes understanding of their scientific and cultural value and fosters more responsible attitudes toward their conservation.

Encouraging these experiences in educational and community settings can boost the interest of new generations and transform the way society connects with its natural heritage.

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Appendix A

Supplementary Research Folder

A digital Google Drive folder is included with supporting materials related to the research: full survey result records.

Link: https://drive.google.com/drive/u/1/folders/1Hfk7W5sD3GD_moGhbMitqd_a3CDPGaJ5

Note. Access is restricted for academic purposes only.