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ETHNOGEOMORPHOLOGY IN GEOGRAPHICAL RESEARCH AND TEACHING: A METHODOLOGICAL PROPOSITION FOR INTERPRETING THE RELIEF BETWEEN SCIENTIFIC KNOWLEDGE AND POPULAR KNOWLEDGE

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ABSTRACT
The present article aims to reflect on the applicability of ethnogeomorphology in geographical research and teaching, highlighting its potential as an integrative methodological approach between academic and popular knowledge. The proposal is developed through field activities carried out in the semiarid region, across three distinct geomorphological compartments, enabling the reading and interpretation of landforms from the perspective of local residents. Furthermore, the study relates General Systems Theory to ethnogeomorphology, emphasizing the interrelations between natural processes, social dynamics, and ways of perceiving the landscape. Finally, it presents a sequence of experiences that values the perspective of local communities, linking their empirical knowledge with scientific understanding, thus contributing to more contextualized, critical, and sensitive pedagogical practices in relation to socio-environmental realities.
Keywords: Ethnogeomorphology; Geography Teaching; Research; General Systems Theory; Local Knowledge.

ETNOGEOMORFOLOGIA NA PESQUISA E NO ENSINO DE GEOGRAFIA: PROPOSIÇÃO METODOLÓGICA PARA A LEITURA DO RELEVO ENTRE O SABER CIENTÍFICO E O SABER POPULAR

RESUMO
O presente artigo tem como objetivo refletir sobre a aplicabilidade da etnogeomorfologia na pesquisa e no ensino de Geografia, destacando seu potencial como abordagem metodológica integradora entre saberes acadêmicos e populares. A proposta é desenvolvida em atividades de campo realizadas no semiárido, em três compartimentações geomorfológicas distintas, permitindo a leitura e a interpretação do relevo a partir da vivência dos moradores locais. Além disso, o estudo articula a Teoria Geral dos Sistemas à etnogeomorfologia, evidenciando as inter-relações entre processos naturais, dinâmicas sociais e formas de percepção da paisagem. Por fim, apresenta-se uma sequência de vivências que valoriza a visão dos sujeitos locais, associando seus conhecimentos empíricos ao conhecimento científico, de modo a contribuir para práticas pedagógicas mais contextualizadas, críticas e sensíveis às realidades socioambientais.
Palavras-chave: Etnogeomorfologia; Ensino de Geografia; Pesquisa; Teoria Geral dos Sistemas; Saberes Locais.

ETNOGEOMORFOLOGÍA EN LA INVESTIGACIÓN Y EN LA ENSEÑANZA DE LA GEOGRAFÍA: PROPUESTA METODOLÓGICA PARA LA LECTURA DEL RELIEVE ENTRE EL SABER CIENTÍFICO Y EL SABER POPULAR

RESUMEN
El presente artículo tiene como objetivo reflexionar sobre la aplicabilidad de la etnogeomorfología en la investigación y en la enseñanza de la Geografía, destacando su potencial como enfoque metodológico integrador entre los saberes académicos y populares. La propuesta se desarrolla a partir de actividades de campo realizadas en la región semiárida, en tres compartimentaciones geomorfológicas distintas, lo que permite la lectura e interpretación del relieve desde la vivencia de los pobladores locales. Además, el estudio articula la Teoría General

de los Sistemas con la etnogeomorfología, evidenciando las interrelaciones entre los procesos naturales, las dinámicas sociales y las formas de percepción del paisaje. Finalmente, se presenta una secuencia de experiencias que valoriza la visión de los sujetos locales, vinculando sus conocimientos empíricos con el conocimiento científico, y contribuyendo así a prácticas pedagógicas más contextualizadas, críticas y sensibles a las realidades socioambientales.
Palabras clave: Etnogeomorfología; Enseñanza de la Geografía; Investigación; Teoría General de los Sistemas; Saberes locales.

INTRODUÇÃO

One of the geographer's fundamental skills lies in going beyond appearances and the visible. Their gaze is not limited to the punctual or the immediate; even when starting from a specific point, it is capable of establishing relationships, interpreting causalities, and engaging with what is observed. The geographer thus becomes complicit with the reality they analyze, since they describe and interpret it based on their understanding, their theoretical frameworks, and their territorial embeddedness especially when they listen to the community. In this process, ethnoscience emerges as a field of dialogue between scientific knowledge and the knowledge constructed by local communities. It recognizes that each people develops its own readings of space, time, and nature, and that such perceptions constitute legitimate ways of understanding and managing territory. By incorporating ethnoscience, the geographer broadens their listening and sensitivity, valuing empirical and symbolic forms of knowledge that also produce geography and reveal invisible dimensions of the landscape. As Lévi-Strauss (1962) states, this enables the recognition and existence of multiple rationalities.

From this perspective, this article proposes reflections grounded in the reading of relief, which is visible but not tangible, through an approach that incorporates the lived knowledge of communities that is, interpretations of landforms based on the perceptions and knowledge of a people and of traditional communities. Such a reading of relief, guided by ethnogeomorphology, inseparably considers the dimensions of time and space, foundational categories of geographic science, since landforms express long-term historical processes and materialize in specific spatial contexts. All of this is intended to contribute to the teaching and research of geographic science.

This is therefore an essay grounded in ethnogeomorphology, an emerging field within the geographical sciences dedicated to understanding relief through the knowledge of local populations. In this field, relief is understood as the result of natural and social processes that unfold over time and are organized in space, with these categories being essential for interpreting landscapes and the territorialities constructed by communities. As argued by Wilcock et al. (2013), ethnogeomorphology opens a dialogue among ethically engaged geomorphological practices that are place-centered and focused on sentient landscapes (including human and non-human beings) as agents of connection, change, and meaning.

This approach recognizes that relief is not merely a physical component but also a symbolic component of the landscape lived, named, felt, and interpreted by communities. Over time, these interpretations are transmitted across generations, endowing landforms with historical and cultural meanings that are expressed in lived space. In this article, relief is taken as the starting point for an analysis aimed at integrating the components and elements of the geographical landscape, articulating academic and popular knowledge as complementary forms of understanding. Another objective is to reflect on the pedagogical potential of this perspective for the teaching of Geography.

It is important to emphasize that, in the teaching of Geography, relief should be understood not only as a physical structure of space, presented in a non-material, abstract, and

immaterial way, but as a dynamic expression of interactions between nature and society over time and within geographic space. There is, therefore, integration, and a systemic approach should be considered, as it makes it possible to reflect on what components of nature are interconnected and how they interrelate, and, more importantly, how they articulate with society through its movements, rhythms, and actions, enabling a systemic analysis within the social context.

By recognizing relief as the stage of human activities and as the result of endogenous and exogenous processes in constant dialogue with natural components: rock, climate, soil, vegetation, and water resources the educator can promote an integrated and critical approach to the landscape, encouraging students to perceive relief as also a cultural product, historically appropriated and transformed by human actions. Even when these transformations are not directly experienced by a given generation, they remain inscribed in the landscape and in collective memory, transmitted over time, which reinforces the role of ethnogeomorphology in understanding relief as a historical and spatial heritage. This perspective expands teaching beyond the technical description of surface forms, situating relief within the context of everyday life, territorial planning, and environmental management. Thus, the teaching of Geography, both in academic settings and in basic education, is strengthened as a tool for shaping critical and conscious subjects, capable of interpreting and intervening in territory in an ethical and sustainable manner especially by valuing the cultural and perceptual knowledge of the local community.

RELIEF THROUGH THE EMPIRICAL AND ANALYTICAL GAZE OF THE LANDSCAPE

Grounded in the contributions of Ab'Saber (1969), relief came to constitute a central source of inspiration in the exercise of reflecting on the organization and dynamics of landscapes. This reflection is approached in an integrated manner and guided by systemic analysis. It becomes evident that in the curves of relief, in the contours and sinuosity of terrestrial surface forms, landscapes reveal themselves through distinct scenarios and narratives, while also incorporating the individual's own lived experience in expressing forms and their dynamics. This experience was lived intensely in diverse geomorphological environments, especially during my field classes and, more deeply, throughout the course of my research.

Over several years, I was immersed in research, building an investigative path born from the confluence of theory and practice. Through a review of the literature, I sought theoretical deepening while simultaneously working directly in the field. Over time, I realized that the very choice of the object of investigation can be shaped by the constancy of field activities, whether through the monitoring of experiments, the collection of soil samples and plant specimens, or the application of questionnaires and interviews with residentsparticularly in traditional, coastal, and agricultural communities, and, most especially, those that work directly with the land. This latter stage, above all, enables direct contact with local knowledge, with the perception of the lived, felt, and narrated landscape by the communities a true nourishment of ethnoknowledge.

I thus came to understand that from the readings onward, the field was already being intuited; from the fieldwork, the experiment had already been set in motion; and from the experiment, a reflective stance emerged, sustained by previous readings. One dimension fed into another. It was within this intertwining between academic knowledge and popular knowledge, between the analytical and the empirical gaze that we sought to develop a methodological proposal focused on the Ceará semi-arid region, with relief and landscape as

the articulating axis. Certainly, this proposal is to be revisited, questioned, and perhaps extended to other environments.

From this symbiosis among reading, fieldwork, experimentation, and lived experience with the community it was possible to consolidate the methodological proposal we titled "Relief: the stage of integrated activity." In it, the focus falls on the components of nature interacting systemically with one another, as well as on the cultural landscape, understood as a collective, symbolic, and material construction that transforms over time according to the social uses of nature. Therefore, the exercise of research, rooted in the academic ground, must reflect its efforts on the ground of the field, to be placed at the service of Geography teaching in both academic settings and basic education. I understand that their rhythms and practices are specific, yet essential to dialogue.

RELIEF AS THE STAGE OF INTEGRATED ACTIVITY AND A CONTRIBUTION TO THE TEACHING OF GEOGRAPHY

Establishing a methodological framework is an endeavor first undertaken in 2006 and further developed in 2024, which is revisited here with some additions, mainly by associating ethnogeomorphology with the teaching of Geography. We consider the landscape as both the point of departure and the point of arrival, which implies assuming the risk of facing difficulties in data collection. This occurs because, by taking the landscape as the guiding element of research, it becomes necessary to understand it both in its historical dimension by recovering the past and in its current configuration, resulting from dynamic and continuous processes. The historical process, far from being passive, transforms the landscape through its movements and, consequently, through its forms.

Such a challenge is already evident in the academic sphere, where scientific rigor and analytical depth are sought. However, it becomes even more complex when transferred to the Basic Education classroom, where the landscape must be translated into accessible language, connected to students' everyday lives and their lived experiences. In this context, ethnoknowledge plays a fundamental role, as it allows local knowledgeconstructed through practical experience and coexistence with the territory to be recognized and valued in the teaching process.

Thus, the teaching of Geography should articulate academic training with school pedagogical practice, integrating scientific knowledge with ethnoknowledge. In this way, the landscape ceases to be merely an object of technical analysis and also becomes a tool for critically reading the world, capable of strengthening citizenship education, valuing cultural identities, and reinforcing students' bonds with their territory.

The second point to consider is the analysis of relief as an integrating element of the landscape, whether under weak or strong human influence. This involves viewing it as the only element regarded as natural that is abstract at least in material terms and therefore immaterial. From this principle, relief is elevated even to a quasi-supernatural element, as it materializes in form and conditions, or is conditioned by, other natural elements, thus exerting strong influence on decision-making related to human actions concerning land use and occupation.

This reflection will be expressed through an organizational chart, which will serve as a visual representation establishing a hierarchical structure of organization, representing different components, elements, and their connections, with relief guiding this dialogue. We hope that this resource incorporates the values of meaningful learning proposed by Ausubel (1968), when he highlights that graphic organizers include concept maps, diagrams, tables, and timelines that help visualize relationships among different concepts and historical facts. They are especially useful for organizing complex information in a clear and accessible way.

In this manner, whether in Basic Education or in academia, this graphic resource assumes additional pedagogical value, as it enables students to visualize interactions between nature and society, fostering a critical reading supported by both scientific knowledge and ethnoknowledge transmitted by their communities. Geomorphic processes are perceived by communities at multiple spatial and temporal scales, depending on lived experiences in similar or distinct places and on the individual's lifespan.

It is also worth emphasizing that relief allows for the identification of connections among components and their elements, natural and/or anthropogenic in the constitution of the landscape. The landscape thus comes to be understood simultaneously from a cultural perspective and through its natural components. It is not merely a matter of measuring or quantifying flows of matter and energy, but of establishing relationships that emerge from perception, materialization, and everyday experience. Here, ethnoknowledge proves essential, as many social groups perceive relief not only as physical data, but as a symbolic, cultural, and practical reference whether in agriculture, fishing, land use, or even in how places are named and interpreted.

In this way, by integrating relief as the structuring axis of the landscape, a possibility is created for methodological dialogue between science and traditional knowledge. In Basic Education, this movement contributes to students not only understanding relief as a geographic category, but also as a living dimension of their territorial identity. Such an approach strengthens interdisciplinarity, critical thinking, and the valorization of local knowledge, consolidating a Geography education that goes beyond abstract theory and becomes grounded in lived spatial experience.

At this point, it is timely to draw on Ab'Saber's (1969) methodological proposal of the geomorphological landscape, which considers landscape from its form (physiognomy), permeating its structure and reaching its functionality—that is, the physiognomy of the landscape. This approach makes it possible to understand relief not only as a physical support, but as the stage of human activities of all kinds, from the establishment of dwellings to land use and exploitation, making it an indispensable element in the organization of human activities. In Basic Education, this perspective offers the opportunity to integrate science and local knowledge through ethnogeomorphology, stimulating students' critical and practical perception of the landscape. This involves seeking the knowledge of long-standing residents who have experienced transformations in the landscape. A similar case occurs in ethnopedology, as argued by Costa Falcão and Falcão Sobrinho (2024), who state that it encompasses an integrative perspective of environmental knowledge of which soil is a part, adding the perspective of those who use it namely, the farmer.

Relief, although an abstract category, materializes as the support for human actions. Its forms influence decisions across multiple activities, such as engineering, agricultural practices in rural spaces, or urban planning. It becomes perceptible through mountains, dune features, or desert environments. Ethnoknowledge complements this reading by revealing how different human groups interact with these forms, recognizing patterns and meanings that guide cultural and productive practices.

The truth is that relief is not characterized as a natural resource like soil, vegetation, rocks, water, or climate. Relief is the "non-resource": not tangible, but visible; not concrete as material, yet decisive for planning decisions whether in the construction of reservoirs, dams, port facilities, tourist architectural expressions, or other structural elements. In the school context, working with this concept allows students to understand how technical and social decisions are articulated with the characteristics of relief, connecting theory, practice, and local knowledge.

In research focused on relief, the notion of scale is essential. At small scales, it becomes unlikely to find homogeneity among landscape elements; at large scales, similarities can be identified. Thus, the concept of place as lived space also gains analytical relevance, allowing connections between natural and human elements, strengthening contextualized Geography teaching and the valorization of ethnoknowledge and ethnogeomorphology.

In this way, relief expresses its incipience in the dynamics of place and lived experience, with its diverse expressions and, consequently, in the organization of the landscape. Whether windward or leeward, even in a small massif in the semi-arid region of Northeastern Brazil, its characteristics become evident through landscape visualization, mobilizing natural and anthropogenic aspects. In Basic Education, this perception can be applied through practical activities such as map analysis, field studies, or accounts of local experiences, enabling students to integrate science, ethnoknowledge, and geomorphological perception in their learning. It is worth emphasizing that this search for knowledge allows students to seek information from traditional communities.

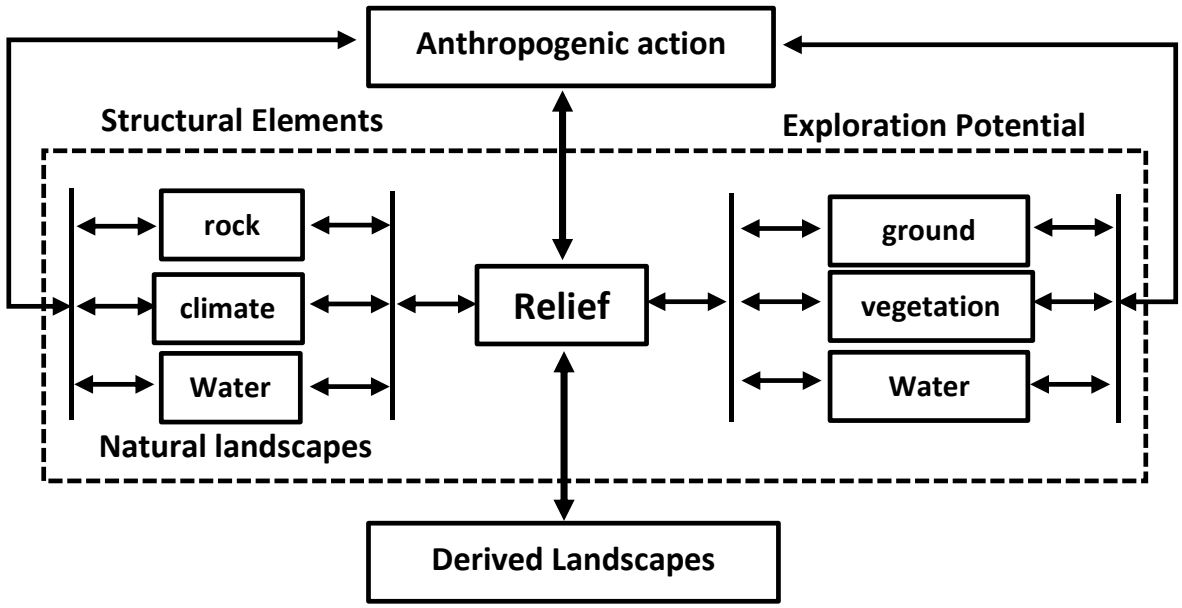
Bertrand (1968), in presenting the geosystem, already highlighted a particular concern with relief within the context of the global landscape.

> "We are thus led to search for the general mechanisms of the landscape, particularly at the level of geosystems and geofacies. A. Chorley's 'erosion system' directly inspired this methodological approach. Why not extend the concept of 'erosion system' to the landscape as a whole? This would move from a narrowly geomorphological fact to the broader, more comprehensive, and above all more geographical notion of a 'general system of landscape evolution.'"
>
> It also adds:
>
> "The geosystem is situated between the 4th and 5th spatiotemporal orders. It is therefore a dimensional unit ranging from a few square kilometers to several hundred square kilometers. It is at this scale that most interference phenomena among landscape elements occur, and where the most interesting dialectical combinations for the geographer evolve."

Bertrand's proposal is situated within topographic compartments, adopting magnitudes compatible with its empirical basis. For this reason, I suggest taking relief as the point of departure for understanding the landscapenot in the sense of claiming that relief precedes the perception of the landscape as a whole, but rather as an element that helps to scale and frame the landscape for analytical purposes, and not merely as an elementary unit.

Through Figure 1, the intention is to position relief as the guiding element of the interactions among natural components and anthropogenic actions. Natural landscapes are understood here as physical elements and are dimensioned according to two approaches: (a) structural elements and (b) potential for exploitation.

Figure 1: Relief, the stage of the integrated landscape



Source: Falcão Sobrinho (2006)

When it comes to structural components (rock, climate, and water), these refer to the natural components that constitute the basis for other components. I do not mean to say that they are or are not independent of the others, nor that they are determining factors. At first, they may be analyzed as structural factors and, therefore, as objects of exploitation. In Geography education, understanding these elements is fundamental so that students can relate natural foundations to the social practices that shape space, incorporating local knowledge that already circulates within communities about the influence of rock, climate, and water, as experienced in their daily lives.

Geological structure is an essential condition for understanding the analysis of the genesis and evolution of terrestrial relief, that is, its morphostructure. However, the fact is that rock constitutes the supporting base of relief. In short, as a structural base, whether crystalline, sedimentary, or metamorphic, relief presents itself according to the structure of these rock components, encompassing various aspects, sometimes covered by soil layers and/or a vegetational mantle. It is important to highlight that the type of rock, its arrangement, and lithological variation determine the type of soil and, consequently, the type of vegetation. All of this is expressed in the relief. In the educational process, these contents can be translated into pedagogical practices that encourage observation of the lived place: for example, when students recognize that the type of stone used in local constructions or even in everyday utensils is directly associated with the geology of the region, this constitutes an exercise in ethnoknowledge that brings science and culture closer together.

With regard to climatic conditions, these determine the effects of weathering, associating mechanical/physical weathering with chemical/biochemical decomposition, which directly reflects on morphoclimatic processes. This relationship is intrinsically linked to the morphosculptural aspects of relief. The elements and processes governed by climate, temperature, humidity, precipitation, and atmospheric movements, maintain the dynamism of the relief-shaping process. In Geography teaching, discussing these relationships based on popular accounts, such as sayings about rain, droughts, or winds, can enhance the value of the

perceptions that communities have regarding the effects of climate on soil, relief, and vegetation.

Relief characteristics promote a direct interference in surface watercourses and fluvial environments, which encompass fluvial and interfluvial domains, the latter being directly associated with the natural and/or occupational conditions of slopes, in addition to their morphological and morphometric conditions. In another sense, flowing waters, whether on slopes or in river channels, move from higher to lower areas, promoting sculpting of slopes and the formation of intrachannel relief features. Such dynamics can be incorporated into teaching through field practices in which students observe, record, and interpret the effects of water in their territory, including the recognition of empirical knowledge held by farmers and fishers regarding water behavior.

The potential for exploitation (soil, vegetation, and water) is related to the basic components for human sustenance, that is, what is required for subsistence. In the school environment, this debate gains strength when traditional knowledge about soil and vegetation use is valued, establishing a dialogue between geographic science and local practices of cultivation, management, and coexistence with adverse relief conditions.

The importance of the relationship between relief and soil can be clearly observed in the studies of Tricart (1977), who offers an understanding of the ecodynamic proposal. This is situated in three units: (a) stable environments, where pedogenetic processes outweigh mechanical processes in the evolution of landforms; (b) intergrade or transitional environments, where morphogenesis and pedogenesis act mutually in landscape dynamics; and (c) strongly unstable environments, characterized by the predominance of morphogenetic processes over pedogenetic ones, whether due to natural factors or anthropogenic causes. In the classroom, these categories can be translated into concrete examples observable in communities, areas of traditional agriculture, unstable slopes, or more fertile soils, allowing students to recognize relief not merely as a concept, but as a lived reality.

With regard to vegetation, and analyzing the geoecological research proposed by Kling (1974), we find that it establishes a detailed investigation of an area, which demonstrates the concept of the geocomplex, comprising the following factors to be analyzed: relief, geological substrate, water balance, climate, vegetation, and fauna. Within this framework, a functional view of nature is evident, or, in other words, a sectoralized one. It is worth emphasizing that relief is expressed as the support for the other elements of the geocomplex, and the expression of the landscape is present in vegetation, which follows the sectoralization of relief. In addition, it should be noted that any action whether natural or human that drastically alters natural vegetation cover, reducing it or promoting its total eradication, triggers soil erosion processes and, in many cases, alters relief forms, generating erosive features such as rills and gullies, and, eventually, even mass movements. In teaching, this articulation allows for discussion of how the perception of environmental degradation is also ethnoknowledge: farmers, for example, identify gullies as “tired land,” establishing a popular reading of relief that dialogues with science.

Anthropogenic action has become the force that exerts a strong influence on landscape modeling, consisting of continuous actions that are expressed either slowly or intensely. Human action is directly related to the dimension of its relationship with place, with the way land is managed, serving as a source of sustenance and/or occupation. In teaching, exploring students’ perceptions of transformations in lived space makes it possible to understand how relief and landscape are permanently shaped by the culture and practices of each community.

Thus, the cultural approach, which is also abstract and closely related to lived experience, materializing as form or as the result of an action, becomes decisive in the

constitution of landscapes. Culture is abstract and manifests itself through human activities, whether in dances, folklore, the act of planting, or in relating to nature through beliefs in plants, animals, and place. Culture here refers to its Germanic origin, which designated the relationship between inhabitants and land, producing their own food. It is important to emphasize that in semi-arid areas, characteristics related to the morphosculptural processes of relief are associated with the erosive power of rainfall, shallow soils, and sparse vegetation cover; morphogenetic processes are easily expressed through erosion, even if incipient. Consequently, responsibility often falls on human action when inadequate soil cultivation practices are employed—a common fact observed in semi-arid regions, inherited from an ancient culture. This dialogue between cultural practices and natural characteristics of relief can be addressed in school Geography as an example of ethnogeomorphology, showing that landscape interpretation goes beyond technique and reaches the memory and experience of each community.

In this context, we can cite the work of Wilcock (2011), entitled *Living Landscapes: Ethnogeomorphology*, which results from human actions consolidating new landscapes and denominated as ethnogeomorphology. In this way, the treatment of culture follows specifically that of rural space, in which agricultural production modes represent a landscape heritage resulting from the human relationship with soil. In teaching, this concept can enrich the debate on relief, allowing students to perceive that landscape form is not only the result of natural forces, but also of historical cultural practices.

Considering the representation of landscape through a cartographic base—an element fundamental to geographic science its contours are not artistic expressions, but scientific ones. Representations of forms related to anthropogenic action must be differentiated when compared to the same form resulting from a natural process. This is not an additional taxon, but rather a representation of a taxon, which can be found in Ross (1992) as the representation suggested for the sixth taxon. This methodological care can be explored in the teaching of school cartography, showing students how maps express relief and how different land-use practices leave visible marks in cartographic representation.

Relief and culture are both abstract and decisive in the constitution of landscapes. They are dynamic and integrative within geographic space. This articulation is essential for Geography teaching, as it allows the integration of scientific knowledge with ethnoknowledge, valuing the reading of relief both through science and through everyday experience.

Thus, landscapes succeed one another as individuals act within their reality, which the place presents through cultural and economic aspects and through its nature as a physical, chemical, and biological element. Geography teaching, by adopting this perspective, enables students to recognize themselves as active subjects in the transformation and understanding of landscapes, articulating relief, culture, and social practices.

ETHNOGEOMORPHOLOGY AND GEOGRAPHY EDUCATION

Ethnogeomorphology, as a conceptual and methodological field, opens up significant possibilities for the teaching of Geography, especially in the context of schools located in territories traditionally made invisible by hegemonic approaches. By considering relief as part of the lived experiences of populations and not merely as a set of forms resulting from natural processes, Geography reconnects with everyday life, sensibility, and culture.

This perspective is particularly powerful for geographic education in semi-arid regions, where populations develop singular forms of knowledge based on their historical coexistence with the environment. Relief is named, classified, interpreted, and managed according to criteria that often escape the categories of academic Geomorphology, yet carry their own rationality, deeply rooted in experience.

Such a perspective can be perceived through relief taxonomy, that is, how relief is understood through the взгляд and lived experience of individuals who have resided in a place for a long time. While academic geomorphology might classify an area as a pediplain with residual inselbergs, local inhabitants may refer to it as a *serrote* or *morro*, further distinguishing whether it is a *morro redondo*, lower and isolated, or a *serra alta*, continuous and more extensive. Likewise, flat areas near temporary watercourses are called *baixios*, recognized as fertile areas for subsistence agriculture, rather than merely as an intermittent alluvial plain.

In this sense, Geography teaching that incorporates ethnogeomorphology is not limited to content transmission, but invites students to share, systematize, and reflect upon local knowledge. Relief thus becomes a bridge between scientific knowledge and community-based knowledge, promoting territorially situated, socially engaged, and epistemologically plural education. Relief therefore becomes a guiding category in Geography teaching, firmly anchored in the incorporation of ethnogeomorphological knowledge.

If we assume that such a proposal can serve as a foundation for ethnogeomorphological studies, we must then reflect on some propositions: when researching farmers in traditional communities, it is observed that their lifetime is imbued with knowledge transmitted from generation to generation. The experiences reported by these farmers, when incorporated into research focused on Geography education, offer a temporal scale that supports interpretations spanning decades, often grounded in their field practices. For example, a farmer may have experienced a process of sheet erosion and noticed the exposure of roots. Although this experience is not technical, the farmer observed and lived through the geomorphological process, constructing empirical knowledge with scientific and educational value.

On the other hand, when we test the applicability of relief-related knowledge in a school context, with students in the 7th grade of elementary school or even in the 2nd and 3rd years of high school, we encounter a different reality. The life span of these students does not allow them direct access to knowledge transmitted across generations. The time scale of an erosive process on a hillside in their city, for instance, may not coincide with their period of observation and lived experience. Thus, students may come to understand that a hill could collapse at any moment due to the absence of pedological cover. This perspective, although limited by the duration of experience, constitutes a form of ethnoknowledge which, when addressed in Geography teaching, approaches ethnogeomorphology. In this sense, school practice enables the articulation of scientific knowledge with students' perceptions and values within a proposal for contextualized education, strengthening critical readings of landscape and relief.

Thus, it can be stated that students construct empirical knowledge about relief which, although not ethnoknowledge in the classic, traditional, and transgenerational sense, can be understood as a form of school-based or contextualized ethnoknowledge especially when Geography teaching values students' readings of the landscape and integrates them with scientific knowledge.

Furthermore, students possess knowledge of their lived space, that is, the space in which they are in motion. As stated by Frémont (1976), lived space is a space-in-motion and a lived space-time. Cultural values are therefore incorporated over the course of an individual's existence.

In this way, the culture of the individual whether farmer or student when addressed in research or case studies within a geographic context, must strongly consider the cultural factor, which varies according to territory. This diversity of cultural perspectives is grounded either in empirical experience or in formal schooling.

Within this logic, lived space is central, whether experienced by the farmer or by the student. Thus, we affirm that each person's reading of landscapes and their components is not

static, but changes over time, following the different stages of life. This variation is deeply related to age, accumulated experiences, everyday practices, and the responsibilities assumed at each phase of existence. At the same time, this way of perceiving and interpreting the landscape is shaped by culture, life horizons, and projected futures, such that relief and landscape in general acquire diverse meanings both utilitarian and symbolic in accordance with lived historical and social contexts. As noted by Chaval (2001), possible forms of contact change with age.

A high school student, even at only 17 years of age, may present forms of ethnoknowledge related to relief and natural processes when embedded in a cultural context that values and transmits environmental knowledge. In the case of a fisher's child who lives daily alongside their parent's practices, one observes the assimilation of perceptions regarding the sea, tides, seabed, and dune movement. These elements, although not the result of technical or scientific experience, constitute knowledge inherited and reworked through community life, configuring a form of ethnoknowledge associated with coastal ethnogeomorphology. This perspective reinforces the importance of Geography teaching in recognizing and articulating students' prior knowledge, establishing bridges between cultural experience and scientific knowledge, while simultaneously promoting contextualized and critical education about landscape and relief.

ETHNOGEOMORPHOLOGY AND GENERAL SYSTEMS THEORY

Ethnogeomorphology emerges as an approach that integrates traditional knowledge about relief with the scientific analyses of Geomorphology, enabling an understanding of the landscape based on the interaction between natural processes and cultural perceptions. When associated with General Systems Theory (GST) (1925), proposed by Ludwig von Bertalanffy, this perspective gains analytical depth, since both are grounded in the ideas of totality, interdependence, and dynamism. Relief can be interpreted as an open system, in constant exchange of matter, energy, and information, in which exogenous and endogenous processes operate. Ethnogeomorphology broadens this view by incorporating the everyday experiences of local inhabitants, who recognize transformations such as the opening of gullies by runoff, the heating of rocks under the sun, or the differentiated fertility of soils according to their position in the relief.

Within this dimension, relief as a component of the landscape is perceived drawing on Verdum's (2012) understanding in which the landscape, as a matrix, reflects relationships among schemes of perception, conception, and action that channel society's relationship with space and nature.

From this perspective, the landscape is composed of interdependent subsystems: geomorphological, climatic, hydrological, pedological, and anthropogenic. Local knowledge, even without scientific formalization, already captures such connections by relating agricultural production to slope drainage, vegetation adapted to landforms, or soil fragility in certain areas. The notion of feedback, central to General Systems Theory, also finds a parallel in popular knowledge: farmers perceive that removing vegetation from slopes intensifies erosion and, conversely, that practices such as contour farming, small retention basins (*barraginhas*), or the use of stones for containment help stabilize the environment.

In this sense, General Systems Theory emphasizes that the whole is greater than the sum of its parts—a principle confirmed by ethnogeomorphology, which shows that relief is not merely a configuration of physical forms, but also a space imbued with meanings, uses, and collective memories. Moreover, geomorphological systems involve not only material flows, such as water and sediments, but also informational flows. At this point, local knowledge

constitutes a flow of information transmitted from generation to generation, forming a distinct taxonomy of the landscape that guides productive practices and ways of life.

Ethnogeomorphological knowledge further carries the articulation of traditional understandings of relief within the broader landscape, comprehending it through the interaction between geomorphological forms and processes across space (perceived/situated) and time (lived). Thus, relief is interpreted in an integrated manner through the eyes and understanding of the local community, sometimes reproducing mistakes and, at other times, reinforcing successful practices.

Therefore, the articulation between ethnogeomorphology and General Systems Theory promotes a more complex and holistic reading of the landscape, recognizing the coevolution of physical processes and human practices (Falcão Sobrinho, 2025a). This understanding adds value by overcoming restrictive ways of thinking in which landscape analysis is based solely on evaluations of forms, processes, and evolutionary adjustments, as well as on the application of these understandings as models of integrating natural components within a system.

General Systems Theory, by proposing an integrated and relational reading of reality, allows us to understand that no environmental phenomenon occurs in isolation, but rather through constant interaction among its physical, biological, and social components. This understanding can be illustrated by an example involving burning practices and planting patterns observed in areas of residual massifs. When walking through these environments, especially in more humid areas, it was common to ask farmers why they planted in rows running downhill, vertically, rather than horizontally along contour lines. The answers were almost always similar: “I learned this as a child, and it’s easier to walk between rows from top to bottom.” From a scientific perspective, when rows are left without vegetation cover, they become susceptible to erosive processes, especially during the rainy season.

This simple statement reflects a practical logic built through experience, in which traditional knowledge organizes labor and the relationship with the land. In the farmer’s view, burning, for example, is understood as a practice that favors planting, since the ash appears to “strengthen” the soil and facilitate plant growth. Indeed, in the first burnings, production tends to be higher due to the immediate release of nutrients, and the soil appears more fertile and clean for cultivation.

However, from a scientific and systemic perspective, this practice is part of a set of interactions that, although offering short-term gains, generate imbalances in the medium and long term. When the soil is exposed after successive burnings, it loses its protective cover and becomes more easily eroded by rainfall. The result is the loss of surface layers richest in organic matter and nutrients, precisely those that sustain natural fertility. Thus, the system enters a negative feedback cycle: reduced productivity leads to new burnings, aggravating soil degradation and compromising the sustainability of local agriculture.

From this perspective, General Systems Theory invites us to view the environment and territory as interdependent networks in which human actions and natural processes mutually affect one another. Understanding the agricultural system in its totality means recognizing that the farmer’s empirical knowledge and scientific knowledge are not opposing dimensions, but rather complementary ones that, when brought into dialogue, can foster more harmonious and sustainable land management practices.

This integration values traditional knowledge as a constitutive part of the system, broadens the scientific understanding of relief, and contributes to education, management, and environmental planning in an inclusive and systemic manner.

ETHNOGEOMORPHOLOGY: A JOURNEY ACROSS RELIEF AND THE PERCEPTION OF LANDSCAPE THROUGH THE EYES OF THE COMMUNITY

I now invite the reader to view the semi-arid region through the narratives of Falcão Sobrinho (2006), with the aim of understanding relief as seen through the eyes of the local community and their lived experience. We chose to undertake this journey in two distinct moments: the first through an empirical and sensitive approach, rooted in the voices of farmers from the Acaraú Valley; the second through an analytical approach that seeks to illuminate, using geographic tools, the dynamics that structure this landscape.

I recall that one of the geographer's skills is to see beyond appearance and the visible. Geographic analysis is not punctual; even when starting from a fixed point, it quickly establishes relationships, interprets causalities, and becomes complicit with what it observes, as it describes and analyzes reality through attentive listening to social actors and a critical reading of lived reality. Supported by this way of thinking and teaching Geography, I will outline some situations observed in the Acaraú Valley, in the state of Ceará, which, far from being merely scientific records, also constitute narratives of local knowledge.

I do not fear committing the error of a superficial description, for Carl Sauer (1925) already warned, when addressing systematic description, that Geography historically began as a science of description and empirical observation. If this is the path to be followed, then the descriptive vocabulary must be expanded based on the concrete lived experience of subjects. For didactic purposes, we express here the perspective of those who interact directly with natural components, namely, the farmer. The components of nature, relief, soil, vegetation, water, and climate, are, after all, foundational contents in Geography education, and their critical approach requires consideration of both technical data and knowledge constructed through direct contact with the environment (Falcão Sobrinho, 2025a).

Thus, we trace a trajectory of walking, hearing, listening, and narrating along the 352 km extension of the Acaraú River, from its source to its mouth in the municipality of Acaraú. Along this route, which covers an area of 14,427 km², numerous watercourses and sub-basins meander across the landscape, shaping a geographic scenario deeply marked by natural and social dynamics. Relief, in its multiple forms, constitutes the physical support for the other components and elements of the landscape: soils, vegetation, and water resources all conditioned, to varying degrees, by the action of the semi-arid climate. For many farmers, vegetation, especially the "green of the forest" or the "gray of the caatinga",is what most impacts their gaze, serving as a sensitive reference for reading time and land.

Within this inseparable set of natural elements, social action is decisive for configuration and transformation. It is within this interweaving that we seek to understand the landscapes of the Acaraú Valley. For this reason, we adopt a geomorphological compartmentalization that, while recognizing the constant interaction among environments, allows us to highlight their particular characteristics. We emphasize, however, that the information presented here emerges from a strong empirical basis, constituting an essential moment for geographic studies and for teaching–learning processes that recognize territory as lived and interpreted space.

In the mountainous environment of the municipality of Monsenhor Tabosa, located in the Serra das Matas, the river's source, known locally as fio d'água, already presents itself as a point of concern for the community, especially regarding the definition of which of the three springs is the true source: Serrote Dois Irmãos, Sobradinho, or São Gonçalo. This doubt, although seemingly a mere issue of naming, gains symbolic and practical density when one considers how farmers perceive and relate to the territory. For them, the source is not defined

simply by the most distant point of the watercourse, but by the one that "never dries," ensuring continuity of life and production even in the driest periods.

These areas are embedded in a context of family farms, with a strong presence of traditional subsistence crops such as maize and beans, which compose not only the agricultural landscape but also the dietary and symbolic daily life of local families. Farmers' readings of the landscape reveal a living territorial memory: in their accounts, references to "plots of land where coffee once grew" or to "cotton lands" are common areas now marked by abandonment or alternative uses. These narratives coincide with places where remnants of these crops can still be observed, such as old coffee plants rooted in the soil or remaining structures from cotton production, confirming the persistence of temporal marks in the organization of rural space.

Currently, the intensive use of forage cactus (*palma forrageira*) stands out, cultivated as a strategic alternative in the face of climatic uncertainty. Farmers recognize it as a "plant of resistance," capable of sustaining livestock during prolonged droughts. This adaptation is not merely technical, but deeply rooted in local know-how, demonstrating how soil and water management, as well as crop selection, continue to be guided by environmental perceptions attuned to semi-arid dynamics and collective memory of land use.

Associated with this productive land use, the occurrence of sheet erosion in the mountainous environment is notable. Soil profiles reveal stepped deposition patterns, indicating successive processes of fine-particle displacement that accumulate in lower areas. In colluvial zones, agricultural use is significant, evidencing changes in land use that follow the rhythm of natural dynamics.

It is important to highlight that farmers empirically recognize these processes, as also observed by Ribeiro (2012). They note that the land "gets thinner" or "loses strength" in higher areas, especially after heavy rains an indication of their perception of sheet erosion. At the same time, they identify that "good soil" tends to accumulate in lowlands or at the "foot of the mountain," where soils are darker, more humid, and deeper, often corresponding to colluvial areas. This local knowledge guides the selection of new cultivation areas, revealing continuous interaction between landscape reading, practical experience, and farmers' productive logic.

On the windward side of the mountain range, in areas approaching what local farmers call "cool land" or "humid land," patches of denser vegetation are identified, with the presence of forests true remnants of a more humid environmental past, now perceived by residents as distant. These vegetative remnants are interpreted by farmers as signs of "strong land," where crops once thrived with less dependence on rainfall. From a geomorphological standpoint, this environment reflects the action of intense chemical processes in landscape formation, with more developed soils and greater vegetation cover, composing what may be characterized as a brejo serrano feature.

On the leeward side, where dry winds sweep the slopes and solar radiation is more intense, shallow, rocky soils prevail, with caatinga vegetation advancing across the relief. This is a landscape well known to farmers, who have learned to manage it cautiously. Despite water limitations and rugged relief, these areas are often used for cultivation, particularly through traditional practices such as burning, management strategies that, although environmentally impactful, are locally perceived as ways to "clean the land" and prepare it for planting, especially on slopes.

From the top of the mountain range considered among the highest in the state of Ceará, he view reveals a succession of residual massifs emerging across the sertão landscape. This visual perception leads to criticism of the term "sertaneja depression," for rather than a lowered and homogeneous surface, what emerges is a vigorous, dissected sertaneja surface marked by residual features and inherited forms that challenge simplistic relief classifications.

In elevated massif environments known as *serranos*, such as those of the Serra das Matas in Monsenhor Tabosa, relief asserts itself as a structuring element of local life. Steep slopes, springs protected by forest cover, and more fertile soils contrast sharply with the aridity of the lower areas of the so-called sertão (Falcão Sobrinho, 2025b). It is in this space that farmers construct an empirical reading of the landscape: they distinguish deeper soils, recognize the importance of slope forests for water preservation, and identify erosion risks when slopes are deforested.

This ethnoknowledge, transmitted across generations, functions as a living cartography of relief. The farmer who observes soil color, slope inclination, and water pathways is, in practice, mobilizing applied geomorphological knowledge, even without technical terminology. For Geography education, this popular repertoire is a valuable pedagogical resource: teachers can articulate concepts of morphostructure and morphosculpture with students' everyday experiences, demonstrating that science dialogues with tradition and that relief is not merely an abstraction from textbooks, but something lived and interpreted daily.

Thus, when studying massif environments, it becomes possible to demonstrate how the interaction among geological structure, climate, and vegetation cover results in specific relief forms, as well as how these forms are culturally perceived. Ethnogeomorphology, in this sense, is not only a research field, but also a didactic instrument that values place-based reading, strengthens territorial identity, and broadens understanding of landscape as both natural and cultural construction.

The sertaneja surface, occupying about two-thirds of Ceará's territory, is therefore more than a technical concept: it is a lived reality, marked by natural and social heterogeneities that must be critically understood in school-based geographic education. This reading integrates ethnogeomorphology by recognizing how relief and natural processes are perceived, interpreted, and managed by local communities, constituting knowledge that complements scientific understanding.

Extensive livestock farming, which historically shaped settlement in the Northeast, continues to exert strong influence over the Ceará hinterland, especially across the vast sertaneja surface. Cattle remain a traditional symbol of this way of life, but in recent decades sheep have also gained prominence, valued by farmers for their hardiness, ease of management, and resistance to dry conditions. However, farmers themselves recognize, through their practices and narratives, that extensive grazing without proper management contributes to soil exhaustion and vegetation thinning, especially in sparse caatinga areas. This local perception, rooted in ethnoknowledge, aligns with academic studies such as Sá (1994) and Mendes (1986), which identify sheep farming as one of the activities directly impacting desertification processes offering concrete examples for Geography teaching.

In addition, remnants of the former cotton cycle remain visible on some properties. These "plant remains" or "wild cotton stalks," as older farmers describe them, are traces of a productive past that left not only material marks but also affective and technical memories in territorial organization. Observing these marks, when incorporated into Geography teaching, allows ethnogeomorphology and territorial memory to be addressed as central elements for critical understanding of rural space.

In the Acaraú Valley, across the sertaneja surface, residual relief features stand out as contrasting forms amid a gently undulating expanse characteristic of the semi-arid region (Falcão Sobrinho, 2025c). These features isolated hills, small *serrotes*, and dissected elevations are well known to local farmers, who name them based on utility, form, or history ("Serrote do Meio," "Morro do Cacimbão," "Serrinha do Vento"). Altimetric variation is perceived not only numerically, but through practice: lower hills, around 300 meters, are used for extractivism or

small plots; higher ones, near 500 meters, are feared due to difficult access and torrential rains that quickly generate rills and gullies. Erosion is understood as something that "carries the land away," a recurring expression among farmers that directly connects with the concept of environmental degradation taught in Geography classes—an applied example of ethnogeomorphology, where empirical knowledge of relief guides land use.

Drainage in these environments is also interpreted through practice. Farmers know that "rivers dry up early" or that "water really only flows in winter," recognizing the intermittent nature of watercourses and rainfall irregularity. This lived experience with time and climate reinforces the importance of adaptive practices such as water storage in shallow wells, cisterns, or small reservoirs community solutions that can be discussed in classrooms as strategies for coexistence with the semi-arid environment, articulating ethnoknowledge and Geography education.

Within the sub-basins of the Acaraú Valley, shallow soils, exposed rock blocks, and stony ground are elements of farmers' daily landscape reading. They distinguish between "strong land" and "weak land" based on productivity. Caatinga vegetation, in turn, is a vital resource, used as firewood, for charcoal production, or as animal forage. It is simultaneously a biome, a way of life, and a source of income. These local understandings of land and vegetation use constitute concrete examples of ethnogeomorphology and are fundamental for building a critical Geography that dialogues with everyday life.

Agricultural cycles follow rainfall seasonality, which farmers say "arrives unexpectedly and leaves early." Three to four months of concentrated rainfall define the planting calendar for maize, beans, and cassava crops that structure food security for most families. However, in regions such as Varjota and Lower Acaraú, irrigation has transformed the agricultural landscape, enabling year-round cultivation of fruits and vegetables, revealing contrasts in land use and production possibilities.

For Geography teaching, this mosaic of practices, landscapes, and perceptions represents a rich learning source. Integrating farmers' perspectives and ethnoknowledge into school content broadens students' understanding of their lived territory, breaks with homogeneous views of the *sertão*, and values local knowledge as a fundamental component of critical geographic education. By working with concepts such as relief, climate, vegetation, and land use through lived experience, school Geography gains meaning, form, and belonging, allowing students to recognize ethnogeomorphology as a bridge between science and traditional knowledge.

The coastal zone appears in the landscape as an area of constant accumulation, shaped by river action, waves, tides, and wind dynamics. Running parallel to the coastline, it presents an extensive belt of fixed and mobile dunes. Initially considered an area of little value during early state occupation, it is now viewed differently, as lobster fishing and tourism have given it high speculative value, generating inadequate and disordered occupation and the displacement of local communities.

Within the coastal zone, coastal plateaus (*tabuleiros litorâneos*) are present, characterized by elevated surfaces, gentle relief, and sandy soils. Traditionally covered by carnauba palm groves, these areas have undergone significant transformation, as older farmers recall a time when carnauba wax supported entire families and structured seasonal labor rhythms. Today, carnauba palms are increasingly replaced by extensive cashew plantations, driven by nut markets and incentives for monoculture. In irrigated areas closer to the coast, melon cultivation has expanded significantly, altering not only natural landscapes but also local ways of life. Farmers note that "the land has changed" and that "the brush gave way to fences,"

revealing sensitive perceptions of economic and ecological transformations imposed by export-oriented agricultural models.

Along the Acaraú Valley coast, relief assumes other expressions, marked by mobile dunes, *restinga* fields, subtle cliffs, and mangroves spreading through estuarine areas. This is a space where natural dynamics manifest intensely and daily: wind shaping dunes, tides advancing and retreating, rivers discharging sediments into the sea, and mangroves renewing themselves as nurseries of life. For fishers and shellfish gatherers, each feature of this landscape holds specific meaning, imbued with experience and memory.

Local coastal knowledge constitutes a true coastal ethnogeomorphology. The fisher who reads dune positions to predict winds, observes sandy or muddy seabeds to decide where to cast nets, or follows tidal oscillations to determine fishing times is practicing applied geomorphological knowledge, orally transmitted and lived in practice. These knowledges guide survival and structure a worldview in which sea, sand, and mangrove form an integrated whole.

In Geography education, the coast can be addressed as a privileged space for articulating natural processes and social practices. Concepts such as aeolian transport, sedimentation, tidal dynamics, and coastal ecosystems can be explained through students' everyday experiences, especially those whose families depend on fishing and extractivism. Bringing these empirical readings of the landscape into classrooms values community cultural identity and strengthens critical territorial understanding.

Thus, the coastal zone presents itself not only as a physically dynamic and beautiful environment, but also as a space for knowledge production that challenges and complements science. Recognizing and integrating these knowledges into education broadens landscape interpretation, making school Geography more meaningful, place-based, and open to diverse ways of knowing the world.

As a zone of intersection among different environments, mountains, sertaneja surface, and coastal zone. I highlight fluvial environments, which can be understood through both scientific observation and local knowledge. These environments follow watercourses longitudinally and vary in width according to geomorphological compartments. Farmers living along riverbanks know these dynamics precisely: they know where the river "is deeper," where it "swells first," and where waters "correct the channel" during harsher rainy seasons. From headwaters, where rivers begin as trickles, to near their mouths, where they widen, fluvial valleys become axes of life, production, and ethnogeomorphology, revealing how relief and water are perceived and managed by local communities.

In the Acaraú Valley, despite the absence of large natural water accumulations along most of its course, except during rainy periods anthropogenic action stands out in the construction of large reservoirs, fundamental for water storage in a region of irregular rainfall. Reservoirs such as Forquilha, Acaraú Mirim (Massapê), Farias de Sousa (Nova Russas), Edson Queiroz (Santa Quitéria), Carão (Tamboril), and especially Araras (Varjota), the basin's largest, testify to semi-arid populations' adaptive capacity. Farmers understand their strategic importance, stating that "without reservoirs, there's no farming and no livestock that can endure." This knowledge, rooted in empirical experience and ethnoknowledge, can be incorporated into Geography teaching to discuss strategies for coexistence with the semi-arid region.

Along rivers, riparian vegetation and carnauba palm groves lend a green tone to the landscape, contrasting with the gray-yellow caatinga dominating the hinterland. These carnaubais are not merely natural elements; they are spaces of gathering, shade, grazing, and memory. Children learn from elders to "read" trees, identify water levels, wait for harvest times, and carefully manage floodplain soils where subsistence crops, beans, maize, squash, and

watermelon—are planted after waters recede. This learning embodies ethnoknowledge, articulated with Geography teaching content to understand interactions among relief, water, and agriculture.

Finally, fluvio-marine plains are highlighted, marked by mangrove soils and appearing longitudinally near river mouths, often obstructed by sandbars during dry periods. Farmers and artisanal fishers in these areas deeply understand these ecosystems' dynamics. They refer to mangroves as the "nursery of fish" or "salty forest," recognizing their vital role in aquatic species reproduction and shoreline protection. They also know that when tidal flow is blocked by siltation, fish and shrimp decline, compromising livelihoods. This traditional knowledge is a living example of applied ethnogeomorphology and of how ethnoknowledge can be integrated into Geography education.

Seasonal variations in tides and river levels are precisely observed by these populations, who synchronize water time with work time, whether shellfish gathering, trap preparation, or managing small plots on terraces near mangroves (Souza et al., 2024a; 2024b). When tides are high and river mouths open, they say "the water is alive"; when bars close, they know they must wait or open channels with simple tools, demonstrating continuous interaction with the natural environment.

From the perspective of Geography education, this scenario offers rich opportunities to address topics such as coastal dynamics, fluvial–marine interactions, hydromorphic soil formation, and climate change impacts on coastlines. Moreover, valuing fishers' and farmers' knowledge is essential for building a critical and inclusive territorial reading. What may appear in textbooks as a simple coastal plain is, for the community, a living environment with rhythms, names, uses, and histories a true Geography lesson rooted in ethnogeomorphology and ethnoknowledge, taught with feet in the mud and eyes attentive to the water cycle.

RESULTS AND DISCUSSION

From an analytical standpoint, theoretical and methodological readings contributed to a more careful view of the Acaraú Valley, not only as a physical object but as a lived space, interpreted and transformed by the communities that inhabit it. The literature addressing landscape and relief presents multiple methodological approaches, and coexistence with local farmers further broadened the understanding of the territory. It is within this intertwining of science and experience that Geography teaching finds fertile ground, allowing students to understand that knowledge is not produced only in laboratories, but also in the everyday life of the countryside, in the fields and brush, through the hoe, in soil erosion, as well as in the observation of rainfall and landslides.

The landscape often appeared as a dichotomous concept, fragmented in the literature, treated sometimes as background and at other times as an adjective. However, farmers in the Acaraú Valley perceive it in a continuous manner, as something that "changes clothes" with the seasons, that "screams" when the ground cracks, and that "breathes" when greenery returns. The theoretical dialogue with authors such as Bertrand (1968) was enriched by these voices from the countryside. While traditional Geography once proposed a rupture between the natural and the cultural, farmers demonstrate that such a rupture is illusory: what we call nature is the ground that is walked on, cultivated, and known through lived experience. Bertrand, in turn, by treating landscape as a point of imagination, broadens our perspective: farmers' imagination also shapes space, guides land use, and names places. Geography teaching can and should begin from these viewpoints in order to dialogue with the school territory and its subjects.

Relief, a central figure in maps and school representations, becomes more intelligible when interpreted as the stage of human practices. The theory of relief cartography, with its

taxonomy of landforms, is enriched when placed alongside farmers' readings, who precisely identify the "backs of hills," the "lowlands," the "slope lands," the "hard grounds," and the "trapped waters." This awareness, expressed in ways of naming and using the land, constitutes the empirical foundation upon which a critical and situated geographical pedagogy is built thus, a social cartography of relief.

The current landscape, as seen and lived by farmers, reveals land use shaped by territorial memory. Repeated names, re-signified places, remnants of forests, and rocks that have "grown" over time form a living narrative an inventory of resistance and adaptation. In this sense, the cultural landscape of the Acaraú Valley is affirmed in the calloused hands of male and female farmers who have shaped and continue to shape this territory.

The materiality of the landscape, whether fire, axe, or charcoal,reveals traces of human action that are visible in erosion grooves, especially on steep slopes. Teaching Geography also means reading these marks and understanding that each landscape feature is the result of a historical–natural process. The name "Acaraú," which etymologically combines *acará* (fish), *guaçu* (large), and *hy* (river), carries within it this fusion of nature and culture, of water flow and life flow.

In the humid enclaves of the Serra das Matas, where forest persists, green remains even during long droughts. The same occurs in the fluvial plains of the coastal zone, where carnauba groves frame watercourses. Relief expresses itself strongly, even amid the gray tones of the hinterland surface. This diversity of features demands from educators an integrated approach that values the complexity of landscapes and their multiple temporalities and uses.

Relief, as emphasized by farmers, directly influenced the permanence of families in mountainous and coastal zones, to the detriment of the hinterland surface, which is more exposed, drier, and harsher. This highlights how physical elements condition—but do not determine, human occupation. Affection for the land persists even in the most difficult spaces, revealing an emotional bond that Geography teaching must recognize as part of territorial education.

Land use in massifs and coastal areas is more diversified, reflecting both natural potential and farmers' adaptive capacity. Even with rudimentary tools, fire, sickle, hoe,these subjects reinvent space, often with environmental impacts. It is the school's role to address these contradictions critically and sensitively, fostering debates on sustainability, public policies, and alternative land-use practices.

The landscape of the Valley shows that, even in the face of adversity, residents remain, resist, and recreate their lives amid climatic unpredictability. Reservoirs, although dotting the map, are often underused, revealing shortcomings in efficient water management. This reality can serve as a starting point for classroom discussions on coexistence policies in the semi-arid region, popular water knowledge, and alternatives for water capture and reuse.

The proposal to consider land rest or fallow as part of sustainable use reinforces the importance of time in Geography. Areas with vegetation cover show less erosion, a fact also perceived by farmers, who recognize that "rested land" is what "gives more strength" in the next harvest. Physical and chemical soil analyses, therefore, should be complemented by these empirical readings, as both speak to care for the land.

Slope gradient proved decisive in the magnitude of erosive processes: the steeper the slope, the more intense the leaching and nutrient loss. This content, often addressed abstractly in textbooks, can come alive when associated with field experiences, interviews with farmers, and readings of the local landscape. Thus, relief ceases to be merely a representation and becomes an experience.

Erosivity and the topographic factor are directly related to relief type, expressing the close relationship between relief and soil (Castro, 2021). The greatest volumes of eroded material occurred in humid residual massifs, followed by the hinterland surface and the coastal zone. This finding reinforces the role of relief as the anchor of the landscape, a concept that needs to be pedagogically explored, as it expresses the links between form, process, and use.

Caatinga vegetation, sometimes foreign to the coast or humid massifs, advances as a reflection of degradation, replacing original species. This floristic transition can be analyzed as an indicator of landscape dynamics, human action, and climate change—topics that should be incorporated into the Geography curriculum based on local evidence.

The interdependence between relief, rock, soil, vegetation, and climate was evident in the studied landscape scenarios. These components, more than isolated data, constitute a totality that guides farmers' lives in each environment, whether in fluvial plains with their carnauba groves, in the caatinga of the hinterland surface, or in the remnant forests of the highlands. Teaching Geography means teaching how to read these connections, situating subjects within their territories and giving meaning to school content. It is therefore opportune to reflect on relief in Geography teaching through its most diverse approaches (Fonseca, 2019).

Finally, farmers' adaptation, through the repetition of inherited practices such as the use of fire and the sickle, shows how culture shapes space. Nature, however, responds through processes: soil moves, vegetation changes, and the landscape transforms. This is the dynamic of the landscape and of life itself. Relief thus becomes the stage of the integrated landscape—a concept that emerges from experience, curiosity, and attentive listening to the visible and invisible phenomena that make up the world.

SYSTEMIC AND INTEGRATIVE VIEW FROM ETHNOGEOMORPHOLOGY		
Observable fact/form/ living world	**Processes and elements/ perceived**	**Elements in formal education based on lived experience**
Dry slope	lack of rain	- Relationship between semi-arid climate and relief dynamics - Role of vegetation in soil protection - Erosion processes associated with the absence of vegetation cover
Lack of vegetation on the banks of a river	deforestation	- The role of vegetation in bank stability and erosion control
The river is shallow	River full of sediment	- Dynamics of the water cycle and the importance of riparian forests in infiltration and water quality
Cracked stone in the yard	Intense heat from the sun that cracks the stone	- Physical weathering associated with temperature variation in the semi-arid region
Sand accumulated at the gates after the wind	Strong wind that carries sand from one place to another	- Aeolian transport and formation of sandy deposits in caatinga and open field areas
Holes and small gullies in the cultivated field	Runoff that washed the soil away	- Water erosion and soil loss in agricultural areas.
Smooth stone at the bottom of the stream	Water that 'rubs' and 'sands' the stones during the floods	- Fluvial abrasion action and intermittent channel dynamics in the semi-arid region.
Light-colored, salty soil in some parts of the land	Parched land due to lack of rain and excessive sun	- Soil salinization and degradation processes in arid and semi-arid environments.
Wide cracks in the field's soil during the drought	The soil cracked because it's thirsty.	- Soil shrinkage due to moisture loss and drying processes typical of semi-arid regions.
The stones are growing	The stone was smaller when I was a child.	- Sheet or accelerated erosion processes

FINAL CONSIDERATIONS

The appreciation of ethnogeomorphology as a perspective for analysis and teaching reaffirms the importance of a Geography committed to popular territories and to the diversity of knowledge produced within them. By integrating landscape interpretation with community knowledge, the possibilities for constructing more meaningful, sensitive, and critical pedagogical practices are expanded.

In the context of the Vale do Acaraú, a region marked by environmental, social, and educational challenges, this approach has proven to be especially relevant. It allows the relief to cease being merely an object of technical description and to be understood as a structuring component of identities, survival strategies, and territorial narratives.

Thus, by recognizing the value of empirical knowledge in the interpretation of relief and landscape, we contribute not only to the advancement of geographical knowledge but also to the construction of a more just, plural, and transformative geographical education.

APOIO:

CAPES 2023 – PROEXT/PG. Project on Territorial Development in Rural and Peripheral Areas: Solidarity Actions Against Poverty and Hunger. Proext/CAPES, 2023.

CNPq – 309651/2025-5, Call Notice CNPq No. 18/2024.

FUNCAP – Notice No. 07/2023 – FUNCAP PRO-HUMANITIES. Ceará Foundation to Support Scientific and Technological Development – FUNCAP

REFERENCES

AB'SABER, A. N. Um Conceito de Geomorfologia a Serviço das Pesquisas sobre o Quaternário. In: **Geomorfologia.** São Paulo. IGEOG-USP, n. 18.1969.

AUSUBEL, D. P. **Educational Psychology: A Cognitive View**. New York: Holt, Rinehart and Winston, 1968.

BERTRAND, G. Paysage et Geographie Globale: Esquisse Methodologique. **Revue Geographique de Pyinées et du Sud-Quest-** 1968.

CASTRO, S. S. Solo e relevo: pontos para um resgate histórico sobre o estudo das interrelações. **William Morris Davis - Revista de Geomorfologia 2 (1), 1 – 36, 2021**

CLAVAL, P. **A Geografia cultural**. Florianópolis: Ed UFSC, 2001.

COSTA FALCÃO, C. L.; FALCÃO SOBRINHO, J . Educação em solos: abordagens teóricas e metodológicas. **Acta Geografica**, v. 18, p. 97-116, 2024.

FALCÃO SOBRINHO, J. **O relevo, elemento e âncora, na dinâmica da paisagem do vale, verde e cinza, do Acaraú, no Estado do Ceará**. Tese de doutorado. FFLCH/USP. São Paulo, 2006.

FALCÃO SOBRINHO, J. Educação contextualizada com o semiárido e os componentes naturais no ensino da geografia. **International Journal Semiarid**, v. 8, p. 23-53, 2025a.

FALCÃO SOBRINHO, J. **Evolution of Geomorphological Knowlwdge: theoretial and Methodological Aspects**. In: SALES, V.C.; FALCÃO SOBRINHO, J.Geomorphology of the Northeast Region of Brazil. Springer, 2024a

FALCÃO SOBRINHO, J. Ethnoknowledge and Field Class Activities in Landscape Understanding. **Journal of Education and Learning**, v. 14, p. 194-204, 2024b.

FALCÃO SOBRINHO, J. **Geografia e o estudo da Natureza: bases teóricas e metodológicas**. 1. ed. Sobral: Edições UVA, 2025b. v. 1000. 110p .

FALCÃO SOBRINHO, J. O que vem a ser o Semiárido?. **International Journal Semiarid**, v. 8, p. 133-149, 2025c.

LÉVI-STRAUSS, C. **La Pensée Sauvage,** Paris, Éditions Plon. 1962 (Traduzido por Tradução de Tânia Pellegrini. São Paulo: Companhia Editora Nacional, 1970).

FONSECA, C. N.. **Ensino de Geografia a partir da temática relevo: uma abordagem escalar, utilizando a metodologia de trabalho de campo para encaminhamentos didáticos no ensino médio**. 287 f. Tese (Doutorado em Geografia) - Universidade Federal de Goiás, Goiânia, 2019.

FRÉMONT, A. **A Região, Espaço Vivido**. Coimbra: Almedina, 1976.

KLINK, H. J. Geocologia e Regional. in: **Biogeografia.** IGEO/USP. N. 17. São Paulo. 1974.

MENDES, B. V. Desertificação do Semi-Árido. In: **Seminárido sobre desertificação no Nordeste/SEMA,** Brasília, 1986.

ROSS, J. L.S . O Registro Cartográfico dos Fatos Geomórficos e a Questão da Taxonomia do Relevo. In: **Revista do Departamento de Geografia**. São Paulo. USP/FFLCH. 1992. p. 17-29.

RIBEIRO, S. C. **Etnogeomorfologia sertaneja: proposta metodológica para a classificação das paisagens da sub-bacia do rio Salgado/CE.** 278 f. Tese (Doutorado em Geografia) – Universidade Federal do Rio de Janeiro. 2012.

SÁ, I. B. de. Degradação Ambiental e a Reabilitação natural no Trópico semi-árido Brasileiro**.** In: **Conferência Nacional e Seminário Latino Americano da Desertificação**. Fortaleza. 1994.

SAUER, C. O. **A Morfologia da Paisagem.** 1925. In. ROSENDAHL, Z; CORRÊA, R.L. Paisagem, Tempo e Cultura. Ed. UERJ. Rio de Janeiro1988. p. 12-74.

SOUSA, R. M. L.; FALCÃO SOBRINHO, J.; LIMA, E. C.; ARAÚJO., R. L. The Ethnogeomorphological Vision of Artisan Fishermen from the Guriú Community, Camocim-Ceará. **Global Journal of Human-Social Science**, v. XXIV, p. 2-44, 2024a

SOUSA, R. M. L.; FALCÃO SOBRINHO, J. A visão etnogeomorfológica dos agricultores da comunidade de Amarelas do município de Camocim/CE. **Revista Internacional de Direito Ambiental**, v. 16, p. 131-147, 2024b.

TRICART, J. **Ecodinâmica**. Rio de Janeiro: SUPREN, 1977

VERDUM, R. Paisagem: Construção de conceito e métodos. In: VERDUM, R. et. al (orgs) **Paisagem: leitura, significados e transformações**. Porto Alegre: Editora UFRGS, 2012.

WILCOCK, D. **Living landscapes: 'Ethnogeomorphology' as an ethical frame of communication in environmental decision-making**. PhD thesis. Co-tutelle PhD – York University, Canada, and Macquarie University, Australia. 2011.

WILCOCK, D.; BRIERLEY, G.; Howitt, R. Ethnogeomorphology. **Progress in Physical Geography**. 1–28 (2013).