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Visual Media in Geoscience Education for the Deaf

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Visual Media in Geoscience Education for the Deaf

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Abstract

The production of accessible educational materials for the deaf community requires more than merely translating content into Brazilian Sign Language (Libras). It is necessary to consider the visual structure of the language, conceptual clarity, the use of plain language, and the incorporation of graphic resources that support visual-spatial learning. This study aims to discuss key criteria for developing accessible materials focused on teaching Geoscience content, with an emphasis on Geophysics, taking into account the linguistic and cognitive specificities of the deaf community. The research is based on a literature review and an analysis of educational materials such as videos, booklets, and glossaries in the field. The goal is to contribute to the development of more inclusive and effective resources in the teaching-learning process of deaf students within the Geosciences.

Introduction

In everyday life, we often receive printed materials aimed at promoting products, services, or general information. Upon analyzing these materials, certain elements stand out: the clarity of the subject matter, the visibility of the main message, the inclusion of images that support comprehension, legible fonts, adequate color contrast, and, most importantly, the language used. Educational materials, however, require even more rigorous evaluation criteria, as they are essential tools in the mediation and construction of knowledge. When planning a class or lecture, it is crucial to start by considering the target audience. If the material is intended for a British audience, it should primarily be prepared in English; if it targets a Chinese audience, it should be in Mandarin. But an important question arises: "If the audience consists of deaf individuals, in what language should the materials be produced?" This question guided the objective of this study, which is to discuss key aspects in the development of accessible materials, assessing whether they meet the visual and linguistic accessibility principles required for deaf audiences.

Methodology

For many students, sciences such as Physics appear to be nothing more than codes and mathematical formulas to be memorized (Heckler et al., 2007). Therefore, methodologies incorporating images in educational materials provide better development for both deaf (Galasso et al., 2018; Campello, 2008) and hearing students (Crispim & Albano, 2016; Rego & Sousa, 2010). Perlin (2010), Gesser (2009), Prado and Antonio (2023), Lebedeff (2017), Hora Correia and Neves (2019), and Quadros (2003) also emphasize the use of graphic-based methodologies (images and videos) in the production of educational materials for the deaf. Quadros (2012) further details the enhanced visual nature of Deaf individuals beyond the hearing worldview. That is, although graphic resources are important for all learners, Deaf individuals—due to their visual-gestural/spatial communication—engage with these resources more naturally and effectively. This research methodology involves a literature review on the use of images as didactic resources and linguistic accessibility in the context of deaf education. Additionally, it includes a critical analysis of educational materials in Geophysics, such as videos, booklets, and glossaries.

Expected Results and Discussion

Portuguese has a complex grammatical structure, and Libras follows a distinct syntactic logic, which makes full comprehension difficult for many deaf students. Beyond the language barrier, each field of knowledge has specific terminology that must be adequately mediated to be

understood. It is important to note that mediation, often performed by interpreters, must be supported by familiarity with the specific subject matter. Studies emphasize the use of plain language combined with contextualized images, Libras videos, and visual schemes, which enhance comprehension for deaf students. Given that their primary form of communication is visual-gestural, visual resources become central tools in the teaching-learning process. Images play a fundamental role in mediating content for the deaf community, contributing in multiple ways to knowledge construction. First, they offer contextualization by placing the content within a known or visually understandable reality. Additionally, they serve as a form of semantic translation, making it easier to understand difficult words, technical terms, or expressions without direct equivalents in Libras. Images also relate to the linguistic iconicity of Libras, in which the visual aspect influences the creation of sign-terms.

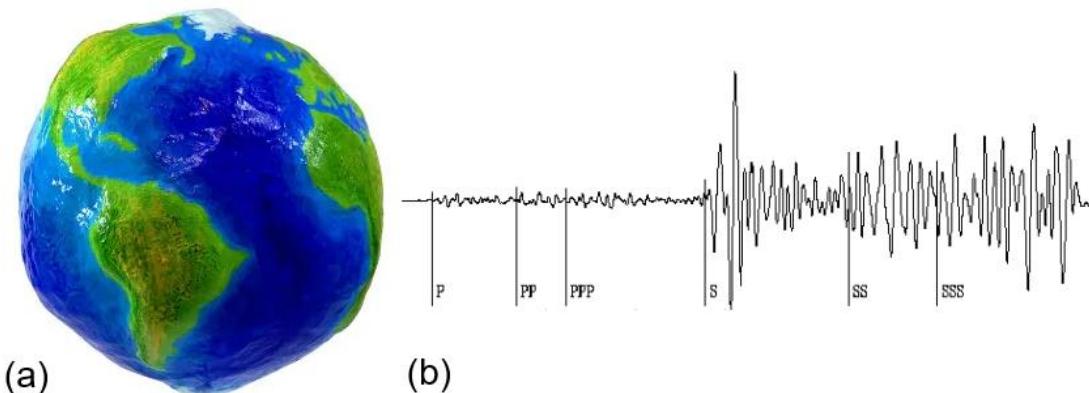


Figure 1 – (a) Planet Earth (Matias, 2025); (b) Seismogram of the 1906 San Francisco earthquake (Trindade & Molina, 2003)

The Figure 1 shows an image of the planet Earth (a), alongside a record of seismic anomalies from an earthquake (Trindade & Molina, 2003). These figures represent key elements of geophysical studies: Earth and anomaly. Based on these, Figure 2 proposes a visual-based creation of a sign-term incorporating simplified conceptual meaning.

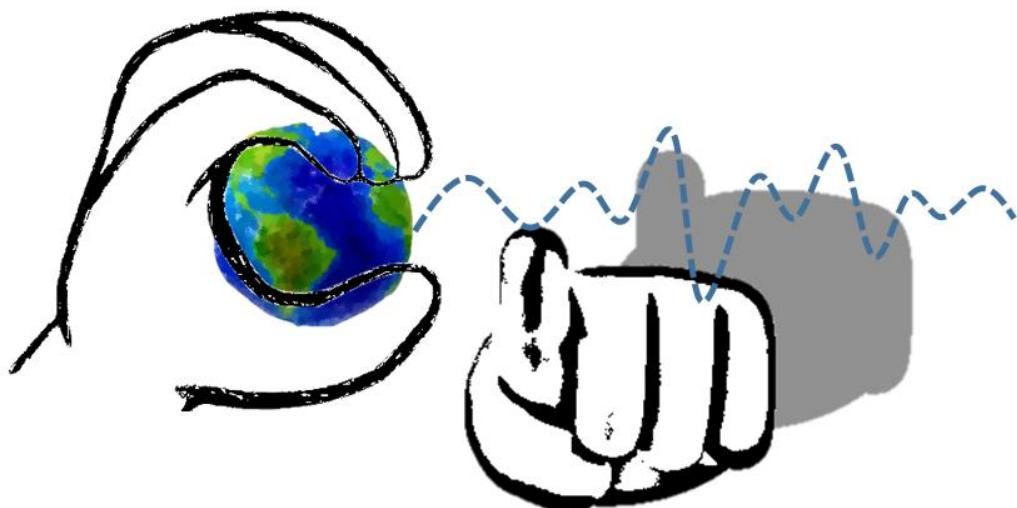


Figure 2 – Proposal for the creation of the sign-term “Geophysics” based on selected visual characteristics of the field.

Another important aspect is the reduction of linguistic load. Well-chosen images allow for less Portuguese text, which benefits deaf readers, considering the challenges they face with Portuguese as a second language. Images also aid memory retention by visually representing key concepts, thus reinforcing learning. Finally, visually appealing images—through attractive colors, good organization, and aesthetic design—promote attention and engagement, which are crucial for effective learning.

Conclusion

Images and videos are not merely complementary tools—they are central in the teaching-learning process for the deaf community. In accessible educational environments, these elements respect the language, culture, and learning style of deaf individuals. Visual resources are not just recommended—they are essential for content access. Additionally, images serve multiple pedagogical and cognitive functions in the learning process, and well-produced videos are among the most effective accessibility tools for the deaf community. Therefore, the production of accessible educational materials for the deaf must go beyond content translation into Libras. The analysis of existing materials in Geosciences, especially in Geophysics, highlights the urgent need for adaptations that promote equity in access to scientific knowledge.

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