

Ensinando astronomia em línguas de sinais

Teaching astronomy in sign languages

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Recibido el 15 de junio de 2021 | Aceptado el 1 de septiembre de 2021

Resumo

A falta de vocabulário científico em Línguas de Sinais se torna cada vez mais evidente com o avanço da inclusão de Surdos em espaços formais e informais de educação. Apesar de muitos neologismos surgirem da necessidade imediata de comunicação, muitos não correlacionam corretamente Língua e Ciência. É importante que os neologismos surjam de forma consciente e correlacionando as percepções linguística e científica com o mesmo nível de importância principalmente para temas relacionados ao nosso dia-a-dia e percepção de mundo para que todos tenham acesso às informações importantes de forma adequada, além de estimular o interesse das comunidades Surda pelas ciências. A parceria entre comunidade Surda e profissional bilíngue aponta ser o melhor caminho para tal, buscando equidade de respeito às duas áreas de conhecimento. Analisando e comparando sinais de astronomia em Libras e em LGP, ao analisarmos cada Signo Visual e compararmos as duas línguas, verificamos que algumas características visuais são mais evidentes para os Surdos, e assim confirma-se a importância de um glossário científico pensado por profissionais capacitados, para evitar a manutenção de concepções errôneas e o respeito a cultura visual dos Surdos.

Palavras-chave: Astronomia; Ensino acessível; Línguas de sinais.

Abstract

The lack of scientific vocabulary in Sign Languages becomes increasingly evident with the advancement of the inclusion of Deaf people in formal and informal educational spaces. Although many neologisms emerge from the immediate need for communication, many end up not correctly correlating Language and Science. It is important that neologisms emerge consciously and correlating linguistic and scientific perceptions with the same level of importance, especially for topics related to our daily lives and world perception so that everyone has access to the important information in an appropriate way, in addition to stimulating the interest of the Deaf community in the sciences. The partnership between the Deaf community and the bilingual professional points out to be the best way to do so, seeking equity of respect between for the two areas of knowledge. Analysing and comparing astronomy signs in Libras and in LGP, when analysing each Visual Sign and comparing the two languages, we find that some visual characteristics are more evident for the Deaf, and thus confirms the importance of a scientific glossary thought by skilled professionals, to avoid the maintenance of erroneous conceptions and respect for the visual culture of the Deaf.

Keywords: Astronomy; Accessible teaching; Sign languages.

I. INTRODUCTION

The main objective of this work is to make the concepts of sciences in Brazilian sign language (Libras) as clear as possible to improve communication and understanding of this theme by deaf students. In this case we will make a clipping focusing on Astronomy considering the importance that everyone needs to have access to this important information that is part of our daily life in an appropriate way, in addition to stimulating the interest of the Deaf community in the sciences.

For this communication to be indeed efficient it is necessary to remember that in order to perform a good translation as well as it is extremely important that the Sign Language Translator Interpreter (SLTI) has a good knowledge of both Libras and the Language to which it will be translated, it is also extremely necessary that for the creation of scientific neologisms (sign-terms), this work must be done in partnership with a professional who has a good knowledge of both the Sign Language to be worked on and the area of knowledge to be represented. The partnership between deaf community and bilingual professionals points out to be the best way to offer new sign-terms, so that there is equity of respect for the two areas of knowledge and in addition to preserving the coherence between both of them.

These neologisms in sign languages should be perceived as an important representation, which should remain to enable an adequate communication of scientific concepts and not only as mere facilitators of communication. The daily need in the classroom, for example, leads the TISL, together with the deaf students, to create signs to quickly fulfil this need, however this practice, many times, leads to the creation of signs based on erroneous conceptions due to the lack of specific training, or specialization, of these same TISL and deaf students. This type of error can also occur when a non-Libras user professional conducts researches in the area and creates proposals for sign-terms, without the knowledge of the language it is not possible to evaluate the possible misconceptions that may arise from it. There are a lot of researches on scientific neologisms in sign languages, but due to the lack of specialization of both interpreters and professionals in the areas worked, there are many signs-terms based on misconceptions as well as some with visual references meaning the opposite to what it was desired to be represent (Ferreira, Santos and Neves, 2019).

In sign languages neologisms arise with specific grammatical bases, and may be arbitrary or iconic. A resource of sign languages, and extremely iconic, are the Highly Iconic Expressions (HIE) (Luchi, 2015), also called *transfers*, as they transfer to visual communication characteristics of what is supposed to communicate.

A. Highly Iconic Expressions.

According to Campello (2007) there are five types of HIE:

- 1) Shape and Size Transfer (SST) - Visual representation generally related to the shape and size of what one wants to represent.
- 2) Spatial Transfer (ST) - Representation linked to the arrangement, in space, of what is referred. It refers not only to what one wishes to represent, but also to his relationship with other elements around him.
- 3) Location Transfer (LT) - Representation of location in space, also of the movement of what one wishes to represent, relating intensity and gravitational attraction. At times ST and LT relate or become the same, depending on what one wants to communicate.
- 4) Movement Transfer (MT) - Representation of the movement linked to meaning, either by the way of using an object or the movement of a living being, unrelated to location, but to the details of the movement.
- 5) Incorporation Transfer (IT) - Representation of the relationship of the signifier being incorporated by those who communicate, representing the object itself, and even emotions when representing living beings.

A sixth transfer is reported by Ramos (2017):

- 6) Vibrational Transfer (VT) - Representation of events associated with vibrations/sounds. VT is associated with facial and body expressions. The VT can be associated with short vibrations, Punctual Vibration Transfer (PVT), or with longer vibrations, Continuous Vibration Transfer (CVT). (Ramos, 2017)

These specific features of sign languages are the basis for many signs, where the concept to be represented has a strong visual appeal, showing that contrary to what can be imagined the sign languages are in no way inferior to oral languages. And so, either through an arbitrary sign, without using visual elements that give back to the meaning of what one wishes to represent, or an iconic sign, using transfers to create a signifier, it is possible to express oneself fully in the sign languages.

However, for the new signs to be adequate and efficient, it is necessary to think about the visual construction of the deaf, in their visual perception of the world. For them, the construction of meanings happens through visibility, but the conceptual basis for this process should also be based on science and not only on the linguistic characteristics of sign languages. For all the questions already presented, the need for minimal and robust knowledge of both, sign language and the scientific area to be worked, is emphasized in order to develop proposals for sign-terms.

Such questions are noticeable in some analyses of existing signs where we can perceive the importance of visibility in the construction of meanings in sign languages (Rosa and Luchi, 2010) and how some misconceptions do emerge from the lack of knowledge about one of the areas when proposing neologisms. The particular case of Planet Neptune let this need notorious and will therefore be used to exemplify these issues.

B. Planet Neptune

The planet Earth is known as the "Blue Planet" in science, however by looking beyond in our Solar System, we find the eighth planet from the Sun, Neptune, which looks bluer than Earth. However, the phenomena that cause this bluish colour on these planets are distinct. In addition to the striking blue colour, Neptune also possessed a large storm known as "Great Dark Spot", or "Blue Storm", this being large enough to contain the entire planet Earth, even Neptune being approximately four times larger than the planet Earth, as can be seen in figure 1.a) and figure 1.b). However, this storm no longer exists, as Neptune's storm cycles are relatively short, lasting less than five years. In a more recent image, it is possible to notice that the "great dark spot" has already disbanded and another "dark spot" formed further north of the planet (STSI, 2020), as can be seen in the figure 1.c).

Just as planet Neptune, Jupiter, the fifth and largest planet in our system, also possesses a great storm, the "Great Red Spot" or "Red Storm", currently having twice the size of planet Earth, while Jupiter is eleven times larger than Earth, as can be seen in figure 2. However, in science, the red spot is mentioned much more often than the blue one, because while the red one has a long-life period of more than three centuries, storms on Neptune have very short periods of existence.

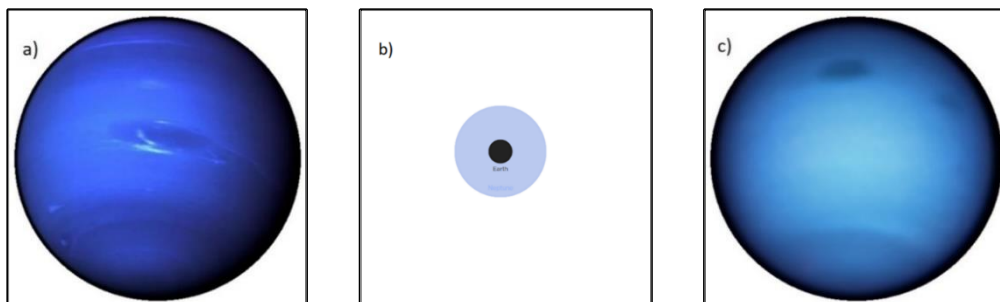


FIGURE 1: a) Image of planet Neptune evidencing the Great Dark Spot, or Blue Storm (1989). (NASA, 2014a). b) Scaled image of planet Neptune in blue and planet Earth in black. (NASA Science, 2021a). c) Image of Planet Neptune where the first storm had already dissipated and another storm further north had already been formed (1994). (NASA, 2020)

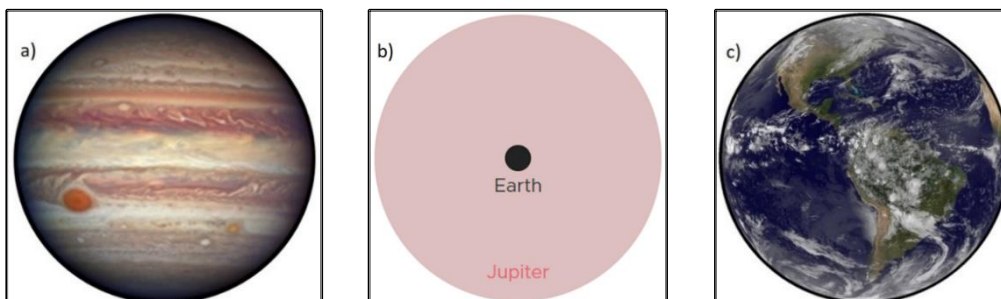


FIGURE 2: a) Image of planet Jupiter with the "Big Red Spot", or "Red Storm", on the left on the planet. b) Scaled image of planet Jupiter in pink and planet Earth in black. (NASA Science, 2021b) c) Image of Planet Earth. (NASA, 2014b)

Combining scientific and linguistic information, a research methodology has been developed and will be presented below.

II. METHODOLOGY

Seeking to understand the representation chosen by Deaf communities, a survey of the signs was carried out through different sources of representations used by the Portuguese and Brazilian communities, considering the knowledge obtained in previous works on both. Aiming to seek the signs used to represent Neptune, in order to analyse: 1) the existence of some pattern, 2) the foundation of this pattern and 3) the possible similarities between the two communities. In the case of Libras, only three sources were chosen for the final analysis and reference, considering their ease of access and their dissemination/knowledge by the Brazilian Deaf community. While for Portuguese a common source was used, given the previous experience obtained in a previous analysis made together with the Portuguese Deaf community (Ferreira et al, 2018). All the planets in our solar system have been analysed, but we will focus on the great contribution that the specific case of Planet Neptune has brought to work.

The sources analysed were:

- 1) Spreadthesign - Online International Dictionary of Sign Languages
- 2) Website of TV INES¹ - "Aula de Libras" Program (Libras Class Program)
- 3) YouTube Chanel "Astronomia em Libras" (Astronomy in Libras)

In the website of Spreadthesign, the specific signs for the Planets Neptune, Jupiter and Earth were researched because of the signs found in LGP of Neptune, and because it is an online dictionary, it allowed the research of the terms individually in each sign language, when it was necessary. On the website of TV INES, videos about planets were searched because it is a platform for disseminating thematic videos, without the possibility of searching for specific signs. And on the YouTube Channel, since it is also a channel for the dissemination of videos with specific themes, the most recent videos were analysed, first from the themes informed and then only those that presented any relation with the planets in question were analysed.

Once the signs were found, the following steps were followed:

- 1) Analysis of signs from Libras parameters - In this stage the signs were analysed considering questions such as: phonological parameters of the sign languages; whether the sign was composed of other existing signs and if so which ones; in the case of neologisms which elements are associated in the creation of the sign; whether there is iconicity or not and in case you see iconicity what characteristics were used for the creation of the signs.
- 2) Record of signs found using Signwriting - The signs found were recorded using the sign language writing technique known as signwriting, aiming to facilitate their analysis as well as future consultations and reproduction of them through static ways.
- 3) Relationship of the sign with its meaning - From the information obtained in the first analysis, the signifiers were analysed in order to infer the relationship between them and their immediate meaning, seeking to understand the possible conceptions that could arise from representations in sign languages.
- 4) Coherence between language and science - The last step was to compare all the information obtained in the first two analyses and verify: if there was a harmonic relationship between the representation in sign languages and the scientific meanings of the signs.

The results and their reflections on these results will be presented below.

III. RESULTS AND DISCUSSIONS

Searching for the signs of The Planet Neptune on the website of Spreadthesign, the website of TV INES and the YouTube channel "Astronomia in Libras" three representations with the same foundation were found, the reference to the "Great Dark Spot" of Neptune, with similar handshapes and movements.

On the website of Spreadthesign, in Libras, only the sign of figure 3 was found. On the website of TV INES, a video called Planetas (planets) was found in an educational program called Aula de libras (Libras class), where the sign of figure 4 was found.

In another, "De olho na ciencia – O sistema solar" (Eye on science – The solar system), the same sign was used, since it is a program of the same platform, and therefore only one image is presented here.

The signs found, on the website of Spreadthesign and in the video of TV INES, both of them use almost all the same parameters, both of them use a classifier for planet with the hand shaping (HS) equal to the letter C and the reference to the cloud line of the blue storm with the HS equal to the letter N, varying only the movement direction. While in

¹ INES is the National Deaf Education Institute, in Portuguese, Instituto Nacional de Educação de Surdos.

the first case the movement is from the right side to the left side, going back and forth, in the second case the movement has only one direction, from the left going right and down.



FIGURE 3: Sign in Libras of the Planet Neptune found on Spreadthesign (STS, 2020). Planet Neptune’s sign, found in Spreadthesign, represented in Signwriting. (Author collection, 2020)



FIGURE 4: Neptune's sign in Libras found on TV INES, captured at 16min and 34s of the video (TV INES, 2020). Neptune’s sign, found on TV INES, represented in Signwriting. (Author collection, 2020)

On YouTube channel “Astronomia em Libras” the sign on figure 5 was found in the video “089 - Descoberta fantástico do planeta Netuno” (Fantastic discovery of Planet Neptune).



FIGURE 5: Sign in Libras for Planet Neptune found in "Astronomia em Libras" YouTube channel, captured at 43s of the video (YouTube, 2018). Neptune’s sign, found in “Astronomia in Libras”, represented in Signwriting. (Personal collection, 2020)

Although the sign used in “Astronomia em Libras” the classifier for planet uses the HS equal to the letter O and the reference to the cloud line of the blue storm with the HS using closed hand with index fingers and thumb open, doing a movement passing in front of the other hand and ending with the index and thumb fingers touching each other.

As the “Great Blue Spot” is perceived by Deaf communities as planet Neptune’s most striking visual feature, on all three platforms we find the signs referring to it, even though it is not so striking in discussions about the planet. Another issue evidenced was the use of the same classifier for all kinds of planets, not differing the rocky planets from the gas planets, in the first two platforms. However, in "Astronomy in Libras" this differentiation was made between the planets, for rocky planets using the same HS as the letter S and as mentioned earlier the same HS as the letter O for the gas planets.

In the case of LGP we found two signs registered for Neptune, the first one referring to the blue storm, using the sign for "Planet" followed by a sign around one "Eye", where the HS used in front of the eye is similitar to the one used in “Astronomia em Libras”; While in the second one there is the allusion to the planets’ colour using the sign for "Planet" followed by the sign for "Blue". Which leads us to make some comparisons.

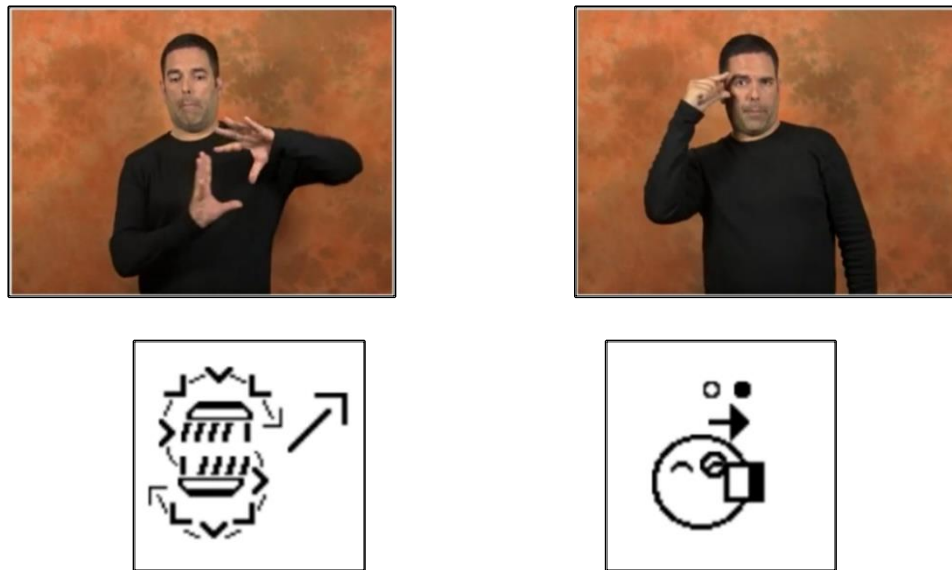


FIGURE 6: Sign found on Spreadthesign of Planet Neptune in LGP, variation 1. (StS, 2020). Planet Neptune’s sign, found on Spreadthesign, variation1, represented in Signwriting. (Author collection, 2020)

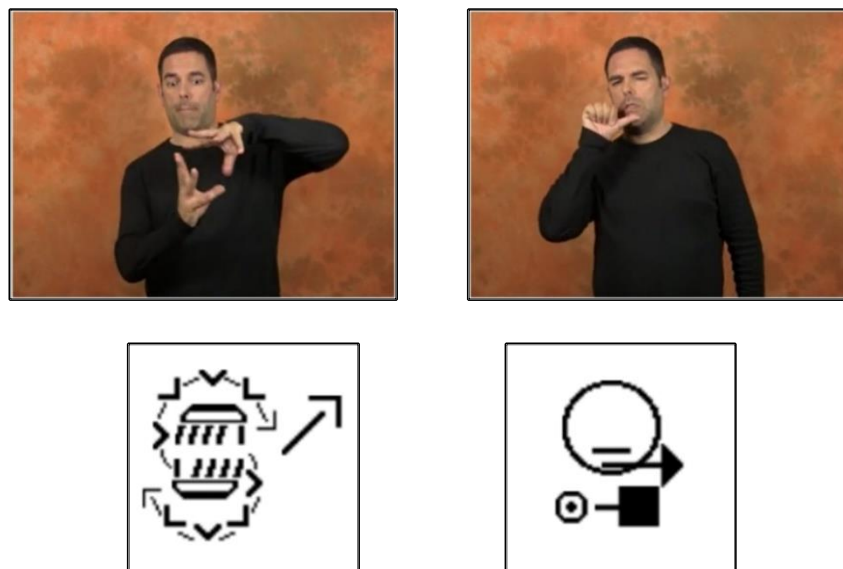


FIGURE 7: Sign found in The Sign Spread of Planet Neptune in LGP, Variation 2 (StS, 2020). Neptune’s sign, found on Spreadthesign, represented in Signwriting. (Author collection, 2020)

Checking the signs for Jupiter, none of the platforms, in both Libras and LGP, have a reference the Red Storm in the sign for Jupiter. They do references, in Libras to the clouds, and in LGP to size of planet Jupiter. For the Portuguese deaf community, the Blue Storm is an evident element in the image of the planet, because it does not have many different elements on its surface and so it stands out, but in Jupiter the Red Storm is not perceived as an element of the highlight because the planet's surface has many different elements, winds and storms, and so there is an excess of visual information where the Red Storm is perceived only as another element of the various that exist on the planet's surface. That's why the Blue Storm was referenced in the creation of Neptune’s sign, but there was no reference to the Red Storm for the signs of Jupiter.

Checking other sign languages available in Spreadthesign, it’s noticeable that most of them use a sign for “Planet” followed by the word Neptune spelled or just the letter N, just a few signs refer to the Sea God in Roman mythology, Neptune, by representing the Trident or signing "Sea" and one it’s not perceivable the signs used on its conception. On the Spreadthesign website there are a total of seventeen countries with at least one sign associated with its sign language.

All these analyses are very important:

Since signs are always culturally agreed units, all semiotic mediation is charged with social and cultural nuances. Thus, the subject, even in his uniqueness, when appropriating the meanings, appropriates something that was produced by the collective of which he is a part as an active subject. Thus, semiotic mediation takes place in a singular and social dimension at the same time, placing the subject in contact with the symbolic world, which produces this subject as a being who humanizes himself in and through symbolic activity and who is simultaneously producer of this symbolic world, o the mediated action according to Vygotsky (1991, p.130). (Campello, 2007, author translation)²

IV. CONCLUSIONS

The Deaf community, in most cases, is deprived of many knowledges due to the lack of linguistic accessibility in formal teaching spaces, something that is even more recurrent and serious in non-formal spaces. In order to actually have access to information, it must be disclosed in any Sign Language that is necessary. However, it is not enough just someone who knows how to communicate in a sign language it is necessary professionals who know how to communicate science in these languages. For this communication to happen it is necessary to use an adequate and clear scientific vocabulary to transmit the information in a timely manner and especially without any loss of content.

Analysing each linguistic sign and comparing the two languages, we confirm that some visual characteristics of the planets are more evident to the Deaf than to the listeners, and thus confirms the need for bilingual professionals working on projects to create sign-terms. In this way, it is evident the importance and urgent need for a scientific glossary consciously thought by trained professionals, to turn the teaching in sign languages clearer and thus prevent any misconceptions from being propagated through the Language at different levels of learning.

In the cases exposed on the sign-terms of Neptune, in reference to the blue storm, these must be respected in both Sign Languages, since the storm, for the visual perception of the Deaf, is a prominent element. Moreover, this representation does not cause any information conflict nor propagate any kind of misconception about this planet. It is not a problem to have small variations in the signs in Libras, it is part of the characteristic of any language to present small variations for some signifiers. To respect these variations is to respect the sign languages and the visual culture of the Deaf. However, in LGP a sign meaning "Blue Planet" for Neptune could not be accepted, as it would be conflictive with a scientific reference usually made to Earth. It can be said that Neptune is a blue planet, but not that it is **the** blue planet. Therefore, variation 2 in LGP should not continue to be used, and only Variation 1 should be maintained. For respecting scientific concepts and nomenclatures is equally important.

For these reasons, the process of creating sign-terms must be conscious, based on both linguistic knowledge as well as associated to scientific knowledge. Worked by bilingual professionals specialized in order to through a clearer communication, bring information to deaf communities and encourage these people not only to be interested in the different areas of science but also to pursue careers in any of them. Science should be a concrete option for the deaf communities, not pursuing in the area should be a decision by choice and not for lack of it. We have records of Deaf, woman and man, scientists who have made great contributions to science, how many brilliant minds may be neglected by the language barriers imposed on the Deaf. If they are willing to learn we need to be prepared to teach.

ACKNOWLEDGEMENT

Vanessa Ferreira thanks to Santander Universidades Program for the partial financing of the exchange for the Universidade do Porto, the support given by the Grupo de Investigação em Ensino e Divulgação da Física – FCUP and the Group Spreadthesign Portugal. Viviane Morcelle thanks the partial support from CAPES. The authors also thank the support given by the Group Cultura Visual – Imersão na Libras, the Group Meninas do Radium: A periferia também faz ciência and from ProExt-UFRRJ.

² Como os signos são sempre unidades convencionadas culturalmente, toda mediação semiótica está carregada de nuances sociais e culturais. Assim o sujeito, mesmo em sua singularidade, ao apropriar-se das significações, apropria-se de algo que foi produzido pelo coletivo do qual ele faz parte como sujeito ativo. Assim, a mediação semiótica se realiza numa dimensão singular e social ao mesmo tempo, colocando o sujeito em contato com o mundo simbólico, que produz este sujeito como ser que se humaniza na e pela atividade simbólica e que, simultaneamente é produtor deste mundo simbólico, o da ação mediada segundo Vygotsky (1991, p.130).

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