The sky of Belém in brazilian sign language: Accessibility in an interactive session

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ABSTRACT

In this text we present the exposition of the production process of an interactive summit session in Libras, aimed at people with deafness who visit the Science Center and Planetarium of Pará (CCPPA). The CCPPA, as a sociocultural asset of mediated visitation (non-formal educational institution), public and of scientific and technological propagation, receives a growing number of visitors with disabilities daily, since its foundation, and recently had to go through a process of adaptation after the pandemic period. In addition, in the face of new accessibility and inclusion legislation, ensuring ease and comfort for all its visitors. Considering the increase in demand from visitors with disabilities, the CCPPA began an intense work of adaptation in its physical spaces, activities, actions, projects, and other practices, starting in 2020. One of these projects was focused on the production of an interactive summit session entirely in Libras, called: The sky of Belém in Libras. The initiative of producing and exhibiting the session had a remarkable public recognition, with a significant contribution to the learning of scientific knowledge related to astronomy and to guarantee the right to accessibility to people with deafness who visit the space.

Keywords: Non-formal Education, Accessibility in Planetariums, People with Disabilities, Summit Session.

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INTRODUCTION

Science and Technology have been considered for decades as fundamental elements for the development of nations. A quality basic scientific education in contemporary society is an important and primordial component for the social, political, cultural and economic development of countries. In this context, Santos (2008, p. 74) agrees that we are currently going through a scientific revolution experienced by this society immersed in new different scientific concepts, with this the paradigm that emerges "[...] It cannot only be the scientific paradigm (the paradigm of prudent knowledge), it must also be a social paradigm (the paradigm of a decent life)." According to the author, it is relevant to think that this revolution and popularization of science can be a means of linking and strengthening the exchange between empirical knowledge and scientific knowledge, improving the quality of knowledge that we multiply in education and in society.

Scientific education, experienced in any environment, school or not, provides opportunities for development at various levels, skills and competences, because situations that instigate investigation, the capacity for observation, understanding, interpretation, reflection, communication and decision-making, are essential for the human being to live in society and exercise his role as a component, citizen.

Science centers, planetariums and museums, according to Marandino (2011), are spaces of non-formal education, extremely relevant for school and social education, because in addition to propagating knowledge, technology, culture and leisure, they can complement and consolidate curricular content based on their instrumentation and organization of unique activities, with dome projections being a separate attraction in these spaces.

Regarding these projections, Romanzine and Batista (2009, p. 5) comment that the summit sessions strengthen "the importance of these places for the process of teaching and learning scientific concepts", through "their technical and pedagogical structures". However, despite all this technological, scientific and pedagogical apparatus, these spaces are still in the fight for greater and better advances in terms of accessibility.

Authors such as Lima and Berquó (2012) and Norberto Rocha et al (2017) state that many of the Brazilian museums, science centers, and planetariums, which are still few in the country and generally have a small capacity, already maintain physical adaptations and mediators in the care of people with disabilities, but the lack of trained personnel and other resources (material and financial) are still problems that hinder the accessibility of these people in these environments. An undesirable consequence of these problems is the low frequency of people with disabilities in these visitation spaces.

As an environment that strives for accessibility for people with disabilities who visit it, the Science Center and Planetarium of Pará (CCPPA), in its institutional project (2020), presented as its

intention "the dissemination, through training, information, entertainment and exchange, of scientific knowledge, having Astronomy as its starting point, for students, teachers, researchers and the community in general, national and/or foreign", and also proposed adaptations and productions to provide accessibility to its users/visitors.

As an institution that disseminates and propagates science and technology, the CCPPA represents an important possibility of integration and relationship between society and science. In this sense, the center reorganized its activities aiming at an inclusive character and its initiatives in accessibility were initially timid, but periodic, marked by the promotion of internal training courses in the area of the specificities of disabilities, for teachers, technicians and trainees; training in Brazilian Sign Language; interpretation in the language of face-to-face, virtual and social media visits; exhibition called Sounds of Science: accessibility and inclusion in a changing world (2020); Sensory Garden (2021), in partnership with the Brazilian Agricultural Research Corporation – EMBRAPA; social media posts with subtitles, interpreter, and audio description; production of Signário de Icons das Ciências (2022/2023) and, more recently, the production of an interactive summit session in Libras for the deaf community (2023).

In this chapter we will report the experience of producing a summit session in Libras, a project conceived by the professors-coordinators of Accessibility, Biology, Astronomy/Physics and Chemistry. In this activity, we had the participation in the translation and interpretation of the student of the Letters/Libras course at the University of the State of Pará (UEPA) and also an intern at CCPPA.

In this text, we will present a brief description of the Science Center and Planetarium of Pará and the impressions about the stages of the implementation of the project of the summit session entitled "The sky of Belém in Libras", aiming to describe the experience of conceiving, assembling and presenting the planetarium session for the deaf community of Belém do Pará.

THE SCIENCE CENTER AND PLANETARIUM OF PARÁ

The Pará Planetarium was inaugurated on September 30, 1999, and was named after the Pará scientist Sebastião Sodré da Gama (1883 – 1951), who was director of the National Observatory of Rio de Janeiro from 1929 until his death. The "Sebastião Sodré da Gama" Planetarium was the first in the Northern region of Brazil. It has been linked to the University of the State of Pará – UEPA since its foundation, and has as some of its main objectives "to provide leisure and high-level technological learning, stimulate creativity, awaken interest in science and knowledge and expand opportunities among young people to discover their vocations" (Almeida, 2015, p. 80).

Its main mission, until 2011, was the propagation and dissemination of scientific knowledge, culture, tourism and collaboration with education, with great municipal, regional and national

repercussions. In 2012 the Planetarium of Pará changed to the status of science center, from when it was renamed Science Center and Planetarium of Pará "Sebastião Sodré da Gama", adding to its scope new interdisciplinary pedagogical functions and transmitters of scientific knowledge in various areas of activity, such as astronomy, physics, chemistry, mathematics, biology, among other activities aimed at the dissemination of science.

Marked by its relevance in terms of the work developed for the dissemination of sciences in the Amazon, the CCPPA has enormous potential as a tool for the study of astronomy and the recognition of the night sky, from a circular-shaped room covered by a hemispherical dome, where images of stars, constellations, planets and their movements are projected. with astronomical conception, approximate, in size, distance, shapes, materials, etc. In line with an audiovisual system, these projections are called summit sessions, and they are produced on two aspects; the first is related to the specific knowledge of astronomy with other sciences, and the second to the type of audience (children, youth, adults) and accessibility aspect.

In addition to the projection dome, the CCPPA has five spaces for the transmission of scientific knowledge in the areas of natural sciences and mathematics, such as: Astronomy, with telescope and planetary models; Chemistry, with demonstration of experiments; Physics, with the presentation of concepts by means of manipulable instruments; Mathematics, with a diversified conceptual apparatus in a playful format; and Biology, with a didactic zoological collection and cellular, anatomical and evolutionary models, thus composing the science center.

The CCPPA, in its physical structure, also has an exhibition room, aimed at the exhibition of materials produced with themes related to the area of Astronomy and related sciences. All these spaces were organized so that access to the visiting public (students, teachers and society in general) is easy and pleasant, with the possibility of experiencing interactive and unique scientific experiences, arousing and stimulating curiosity and expanding interest in science.

From its structured spaces, the CCPPA is an institution of public visitation (free or monitored) that promotes various activities and actions, such as: lectures, workshops, summit sessions, visualizations of the night sky, visits to the sensory garden, as well as extensive activities of exhibitions of materials in science fairs, shopping malls, schools, squares, etc.

To this end, the center has a body of professionals, composed of professors from multiple areas of higher education, technicians and interns (undergraduate students, from various areas of the sciences and from various higher education institutions in the state of Pará).

The CCPPA, according to the 2023 institutional agenda record, through guided pedagogical visits, served public and private education institutions at the elementary, secondary, and higher education levels, receiving a monthly amount of 500 to 1700 students and teachers from the capital and other municipalities in the state. In free visits to the general public, which take place twice a

week, a contingent ranging from 200 to 1400 people of all ages was registered, among which a considerable number of people with disabilities were counted.

When looking closely at the records of institutional visitation over the twenty-four years of CCPPA's history, the increase in demand from people with disabilities is notorious. These data, together with the new paradigm of inclusion, were determining points for changes in the physical structure, in the organization of spaces and in the activities, actions and projects carried out by the team of professors, technicians and interns that make up the institution, in order to ensure accessibility to its visitors.

INTERACTIVE SUMMIT SESSION IN LIBRAS

The Brazilian Inclusion Law – Law No. 13,146/2015, which establishes the Statute of Persons with Disabilities – guarantees the access of people with disabilities to "monuments and places of cultural importance and to spaces that offer cultural services or events [...]", and has every right to culture, sports and leisure with equal opportunities with other people. (BRAZIL, 2015, p. 27-28)

Therefore, there is an understanding that people with disabilities, when they have the support of accessibility in the physical and communicational structure, can overcome the difficulties of abstraction and production of knowledge, enabling new exchanges of knowledge and sociocultural interactions.

Pivetta, Saito and Ulbricht (2014, p. 148) state that any and all accessible instruments should be used for the process of abstraction/construction of knowledge, because a person's difficulty should not be observed "as a disability, but as a linguistic and cultural difference". The authors also emphasize that visual activities with the use of sign language, as a tool, for deaf people, help in various abstractions of the sciences and increase the condition of sociocultural interaction and communication.

Ribeiro (2013, p. 12) agrees with the authors by accepting that planetariums and museums have undergone and are still undergoing paradigmatic changes in relation to inclusion, and that unlike decades of existence, these places had to adapt and provide structural, organizational and communicational accessibility in their practices, based on the identification of different audiences. According to the author, there is in the museum's statute a "universal accessibility" that must be achieved by all audiences in these spaces.

In order to create opportunities to mediate in the process of abstraction and production of knowledge for people with disabilities, several different activities, actions and projects accessible in the area of Astronomy and other sciences were designed, idealized and produced.

The new inclusive stance, idealized by the accessibility coordinator (Prof. Ivanete Moreira) and adopted by the multidisciplinary teaching team and technical staff of the CCPPA, led to the challenge of producing an interactive session in sign language for people with deafness who visit the planetarium. Previously, the reception of deaf people had as a specific barrier the fact that the dome projections could not be translated simultaneously, because the astronomical projection environment, the dome or dome, must be dark for these projections to occur with clarity and precision, so it was practically impossible to interpret it in Libras during the projections.

As an initial attempt to solve this demand, a summary of the session that would be shown was interpreted in Libras before the deaf visitors accessed the projection room and, when leaving, there was the possibility of asking questions about the doubts of understanding, together with the interpreters. However, it was noticeable that several pieces of knowledge were lost during this process, and in some cases, the deaf person chose not to ask questions after reporting that they did not understand anything from the session. Episodes like this were potentially motivating for the CCPPA team to start a project to produce a session entirely in Libras to serve the public.

Considering that Astronomy is an essentially visual science, and that sign language is based on this same principle, it was possible to outline the planning of the actions that would be developed in the production of the session, having as important foundations the right of people with disabilities to accessibility, as well as the recognition of the need for the planetarium, as a sociocultural asset of great potential, to conform to that right.

The interactive summit session entitled "The sky of Belém in Libras", will be described below in a brief presentation of the stages developed over two years, clarifying the experiences we went through from its conception, assembly to the culmination of its exhibition for the deaf community that was invited especially for this moment.

AN ORDERLY AND DISORDERLY STEP-BY-STEP OF CREATION

First of all, we must initially clarify a few points. The first of these concerns the idealization of the session. As previously mentioned, this idea did not come about by chance, it came from situations experienced within the planetary environment, where the disabled individuals themselves gave their opinions and *feedback*, which led us to reflect on our practices, actions, interactions and especially on the accessibility we were offering to support visitation.

The second was to see what challenges we would have to overcome in order to achieve our goal of producing a session entirely in sign language for people with deafness. The third refers to the audiovisual production itself, with all the necessary planning for the session to achieve its objectives.

TECHNICAL AND PEDAGOGICAL CHALLENGES DURING PRODUCTION

Considering that this action would be unprecedented for the CCPPA, it was necessary to create specific strategies in the planning so that the projection of the inclusive session at the summit would be feasible to meet the demand.

Then the first challenges arose, such as: the need to create an adequate script to adapt to the reality demanded; the duration of the session; whether subtitling would be used for communication in/of the session, in addition to sign language; and whether or not the session would have sound.

Initially, our team thought of producing an inclusive session, but we had to keep in mind factors such as age and previous knowledge of the visiting group with deafness, in order for it to be successful. Subsequently, the script began to be created from the positive experiences observed during exhibitions of interactive sessions of free observation of the sky projected on the dome, a text prepared by the technical team of planetarists and executed by interns, based on the night sky observable from the municipality of Belém.

Once this step is over, we move on to the next one, which would be the definition of how long the session in Libras should last. For this we had to think first of all about the deaf person, who according to Luria and Yudovich (1989), deafness does not only cause difficulties in communication, it also brings difficulties related to the development and understanding of abstract concepts, the identification of nuances of personality and recognition of feelings and social integration, most of the time coming from being part of families of hearing and without having a common language to the sociocultural environment of which they are part and having a conception of the world completely different from the listening group of which it is a part.

This concept guided the decision-making regarding the temporal issue, in which an average time of 15 to 20 minutes was agreed and also fostered dialogue about the type of communication that would be used, whether the subtitle or the interpreter in the corner of the video, or even using both together in the projection. The discussions and reflections on this difficulty took a little more time, with statements such as those of the accessibility coordinator emerging: "if we use both forms of communication, there may be a conflict in the deaf person, about which language or language to pay attention to during the session, which can generate difficulties in understanding what is being projected".

Reflecting on this aspect, we agreed that it would be better to use only one of the forms of communication, without the use of subtitles or the image of the performer moved to the corner of the video, but rather a session where the performer would interact directly with the sky, in the format of the protagonist of the action.

Once this stage was overcome, the focus became on the question of whether or not to sound the session, and based on the fact that the interpreter would be immersed in the action,

communicating in sign language, it would be more practical for there to be no sound, even because some deaf people use hearing aids, which could lead to some discomfort.

The next steps followed were the finalization of the script, the filming of the interpreter and the synchronization of the projection of the sky with the interpretation. It took hours, days, weeks, months, making and redoing, translations, interpretations, recordings and synchronizations to handle this stage.

Considering that the interpreter would interact with the projection of the sky, during the session, several positioning rehearsals and recording tests were necessary, based on the projection time and movements that would be necessary according to the laterality, since the interpreter should at certain times point to the stars presented by the projection.

In order for the interpreter to be able to perform this feat, there was also the need for her training in the astronomy themes used by the script, such as the general characteristics of the planets of the solar system, moons, stars, constellations and knowledge about mythology. To this end, a training routine was developed to provide didactic-pedagogical training to the interpreter and to the trainees who assisted in the recordings.

At the end of this process, in order to align the video produced with the synchronized projection of the starry sky, by the planetary system of the *Skymaster ZKP-3* type, of the *Zeiss* brand, the interpreter also needed to guide the planetarists as to the signs in Libras that were being used by the session during the representation of the concepts of astronomy, since that the session did not have audio or subtitles that could guide the synchronization of sky and video information in a clear and practical way.

Rehearsals and simulations were carried out inside the dome so that everyone could become familiar with what would happen during the projection, in relation to the positions and movements that should be presented and highlighted in the sky. At that moment, the lack of sound of the projection caused some strangeness in the team, but as these simulations of video presentation and projection of the sky were repeated countless times until everyone involved had mastered all the dynamics that would occur in the dome, the lack of sound in the session became something normal and to a certain extent reassuring.

After dialogues and tests, choosing the location and setting up lighting for the recordings, unforeseen problems with the planetarium's equipment, it was possible to finalize the interactive dome session for deaf people, so that everything was accessible for clear observation of the signs and expressions, as well as the scientific information that was being passed on.

VALIDATION OF THE INTERACTIVE SESSION IN LIBRAS

On June 23, 2023, the summit session entirely in Libras entitled "The sky of Belém in Libras" was ready and included in the CCPPA collection, but it was inaugurated only at the 17th Spring of Museums that took place from September 18 to 24, 2023, this event is held by the Brazilian Institute of Museums (IBRAM), with the participation of all Brazilian museums, planetariums, science centers and observatories.

The session was shown to a group of the deaf community, disseminating contextualized scientific knowledge about the solar system, some constellations with their mythological stories and stars, such as Spica, a binary star that stands above the banner written "Order and Progress" on the Brazilian flag, representing the State of Pará.

The session ended after this night and planetary journey with the sunrise, the deaf spectators were taken to a unique experience, and the fact that the session was all in Libras, aroused in the group interest in astronomy and satisfaction for the initiative. At the end of the session, questions were asked about what the group thought of the session, what were the positive and negative points in a conversation circle, which brought an unprecedented validation to the session developed by the CCPPA.

This unprecedented initiative in the North region opens the door for other communities and institutions in the area of Special Education to visit the planetarium, in addition to the deaf community. The session "The sky of Belém in Libras" is now part of the CCPPA collection, and enters the program on the last Saturday of each month.

UNDERSTANDINGS AND REFLECTIONS

By presenting this report of the process of designing, producing and applying an interactive session entirely in Libras, which is part of the collection of projections of the Science Center and Planetarium of Pará, we demonstrate that the challenge of accessibility is great, with numerous obstacles, but it can be accomplished from the collaboration of all.

This challenge led the CCPPA team to be challenged in a long process of research, planning, training, information, recording, and video editing, steps that led to the development in practice of an interactive summit session on night sky observation, presentation, and interaction with a specific audience, with a public premiere that took place in September 2023, This month is marked by events of the deaf community, focused on legal achievements and awareness about culture, language and accessibility for these subjects, as well as a month of celebrations for the anniversary of the CCPPA.

Throughout the production, the performance of the planetarists was essential, in each stage of the process, from the conception of the script, organization of the astronomical projection, dialogue

with the interpreter and teachers, manipulation of the projection machinery (planetarium and data-show), adaptation of the lighting, until the completion of the entire set of work.

For the validation of the interactive session "The sky of Belém in Libras", and subsequent analysis of positive and negative points, aiming at improvements, an evaluative form was produced in *Google Forms*, with questions about the theme of Astronomy, the communication used, projection time, among other points of a personal nature. This form was applied after the inauguration session, for deaf and hearing students of the Letters/Libras course at the State University of Pará (UEPA) and for the deaf community of Belém in other CCPPA programs.

Three applications of the form were carried out, which generated relevant analyses and opinions for changes and new productions, which are in progress.

The analysis of the answers to the forms indicated some contributions in the process of reassessing what possible changes and improvements for the new productions can be thought of, in relation to scientific concepts of Astronomy, and other areas of the sciences.

It was also possible to perceive in the visitors, who had the experience of immersion in the interactive session in Libras, basic knowledge about Astronomy, vocational interests focused on this area, stimulus to know more about the universe, about the possibility of biological signatures beyond our system and about black holes.

The impact of the session was extremely satisfying. Some of the statements constantly externalized by the deaf visitors stood out, such as: "This was the first time I was able to attend a session in the planetarium and I was able to understand the entire presentation"; "Astronomy is fascinating"; "Do you have other sessions in Libras?". Taking into account the novelty of the session, these speeches can be considered of great relevance on several important aspects that concern significant contributions to the academy; better understanding of accessibility precepts; scientific and technological recognition; apprehension of knowledge; and dissemination and visibility of the Science Center and Planetarium of Pará.

This project of producing an interactive session entirely in Libras proved to be favorable and essential for communication, interaction and teaching of scientific concepts, highlighting that it promotes scientific knowledge and leisure for deaf visitors, contributing to a better understanding of accessibility in public visitation environments that carry out non-formal teaching activities.

The elaboration of the summit session was a long and laborious process, which required several interventions by the expert professionals who made up the team, so that the results were satisfactory. The lack of studies and productions in this field made the work more time-consuming and difficult, but on the same scale pleasurable and rewarding.

We add to everyone the importance of this audiovisual production, emphasizing that the elaboration of this type of activity for the teaching of scientific concepts in planetariums effectively collaborates with the process of construction and transformation of scientific knowledge.

We also highlight the importance of recording the difficulties encountered during the production of the session, with regard to all stages of this construction. However, we recognize that the result of this project was effective, which was reinforced by the results presented by the forms used. We developed this session even with all the scarcity of bibliographic material and technological limitations available, initially considering the importance of accessibility in the process of constructing scientific knowledge.

In addition, it is important to emphasize again the performance of all professionals and interns involved in the construction and improvement of the interactive summit session in Libras, highlighting the importance of multidisciplinary and teamwork work, aiming to enhance scientific dissemination in the north of the country.

In view of this, we ratify that new projects need to be carried out for the construction of sessions focused on the existing diversity in the area of inclusion, in which we aim to continue our investigations of influence, contribution and teaching potential on scientific concepts and contents, which the summit sessions can provide to society.

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