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Accessible practices in science museums and their impact on the Science Capital of visually and hearing impaired people

Práticas acessíveis em museus de ciências e seu impacto no Capital da Ciência de Pessoas com Deficiência Visual e Auditiva

Prácticas accesibles en museos de ciencia y su impacto en el Capital de la Ciencia de personas con discapacidad visual y auditiva

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Abstract: This study investigates how accessibility in a climate change exhibition impacts the perception, engagement, and scientific aspirations of People with Disabilities, contributing to the construction of Science Capital. It is a case study involving blind and deaf participants visiting a science and technology museum in southern Brazil. Data collection included observations, interviews, and questionnaires, analyzed using Content Analysis. The results indicated that communicational, attitudinal, technological, and institutional barriers affected the participants' museum experience, while accessibility strategies, such as tactile resources, audio description, and Brazilian Sign Language (Libras) translation, enhanced their interaction with scientific content. The study highlights the importance of accessible practices in museum spaces, aiming not only to expand inclusion and a sense of belonging for People with Disabilities in the scientific field but also to strengthen and expand their Science Capital.
Keywords: Accessibility. Science Capital. Science Museums. Scientific Inclusion. People with Disabilities.

Resumo: Este estudo investiga como a acessibilidade em uma exposição sobre mudanças climáticas impacta a percepção, o engajamento e as aspirações científicas de Pessoas com Deficiência, contribuindo para a construção do Capital da Ciência. Trata-se de um estudo de caso com participantes cegas e surdas, visitantes de um museu de ciências e tecnologia na região sul do Brasil. A produção dos dados envolveu observações, entrevistas e questionários, analisados por meio da Análise de Conteúdo. Os resultados indicaram que barreiras comunicacionais, atitudinais, tecnológicas e institucionais impactaram a experiência museal das participantes, enquanto estratégias de acessibilidade, como recursos táteis, audiodescrição e tradução em Libras, potencializaram sua interação com os conteúdos científicos. O estudo destaca a importância de práticas acessíveis nos espaços museais, visando não apenas ampliar a inclusão e o pertencimento das Pessoas com Deficiência ao campo científico, mas também fortalecer e expandir seu Capital da Ciência.
Palavras-chave: Acessibilidade. Capital da Ciência. Museus de Ciências. Inclusão Científica. Pessoas com Deficiência.

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Resumen: Este estudio investiga cómo la accesibilidad en una exposición sobre el cambio climático impacta la percepción, el compromiso y las aspiraciones científicas de las Personas con Discapacidad, contribuyendo a la construcción del Capital de la Ciencia. Se trata de un estudio de caso con participantes ciegos y sordos que visitaron un museo de ciencia y tecnología en la región sur de Brasil. La recopilación de datos incluyó observaciones, entrevistas y cuestionarios, analizados mediante Análisis de Contenido. Los resultados indicaron que barreras comunicacionales, actitudinales, tecnológicas e institucionales afectaron la experiencia museística de las participantes, mientras que estrategias de accesibilidad, como recursos táctiles, audio descripción y traducción en Lengua de Señas Brasileña (Libras), potenciaron su interacción con los contenidos científicos. El estudio resalta la importancia de prácticas accesibles en los espacios museales, con el objetivo no solo de ampliar la inclusión y el sentido de pertenencia de las Personas con Discapacidad en el ámbito científico, sino también de fortalecer y expandir su Capital de la Ciencia.

Palabras-clave: Accesibilidad. Capital de la Ciencia. Museos de Ciencia. Inclusión Científica. Personas con Discapacidad.

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Introduction

The scientific field is still marked by low levels of representation and diversity when it comes to the presence and participation of individuals from different sectors of society, especially historically marginalized communities (Archer et al., 2015). Issues related to equity and inclusion are often discussed in the context of structural inequalities in this field, with a focus on social markers such as race, gender, and social class (Archer *et al.*, 2020). These factors contribute to the ongoing dominance of stereotypical figures in science – most often associated with white, middle/upper-class men perceived as "naturally intelligent." As a result, the exclusion of specific groups from the scientific field can be explained by the deliberate distancing of these individuals, which hinders their identification with and inclusion in science spaces (Archer *et al.,* 2013).

Among the groups that are consistently underrepresented and systematically excluded from science are people with disabilities. The lack of accessibility – across its many dimensions – reinforces the perception that science is "not for everyone," further restricting their participation. Although Brazilian legislation guarantees the right to quality education through the Statute of the Child and Adolescent (Brazil, 1990) and the Brazilian Law for the Inclusion of People with Disabilities (LBI) (Brazil, 2015), science education still faces major challenges in this context. Many educators report difficulties adapting scientific language and overcoming barriers that prevent the development of an accessible and inclusive curriculum (Vilela-Ribeiro; Benite, 2013).

The lack of accessible science education directly impacts academic and professional engagement and aspirations in the scientific field. It also influences each of the eight dimensions of Science Capital, limiting opportunities to build a meaningful relationship with science (Archer *et al.,* 2015).

In this context, informal science education spaces such as science museums emerge as strategic allies in promoting inclusion and fostering a sense of belonging and engagement with science (Fernandes, 2020; Heck, 2021; Carmo, 2021; Marinho, 2023). By adopting accessible practices, these spaces can act as catalysts in expanding Science Capital among people with disabilities, contributing to knowledge democratization and strengthening equity in access to science (Heck, 2024).

This paper presents a segment of a doctoral research project conducted within the Graduate Program in Education at the Pontifical Catholic University of Rio Grande do Sul (PUCRS). The study investigated how accessible practices in science museums can contribute to the construction of Science Capital among people with visual and hearing disabilities. Specifically, it examined how accessibility in a climate change exhibition impacted the perception, engagement, and scientific aspirations of these participants, contributing to the development of their Science Capital.

Science Capital and Accessibility

The factors that influence an individual's engagement with scientific discourse may include their accumulated science knowledge throughout life (what they know about science); their attitudes and dispositions toward science (how they think about science); the ways in which science is understood and applied (what they do with that knowledge); and the relationships they establish with people who work in the field (who they know in science) (Godec, King, & Archer, 2017).

The construction and accumulation of these elements – considered "resources" – give rise to what is known as Science Capital, a concept that encompasses scientific forms of cultural and social capital, as well as science-related behaviors and practices (Bourdieu, 2007; DeWitt; Archer; Mau, 2016). Each individual develops their own Science Capital based on everyday experiences, and the higher this capital, the greater the likelihood of developing positive attitudes and habits toward science, including aspirations for careers in the field (Edwards *et al.,* 2015).

Science Capital is composed of eight dimensions: (i) scientific literacy; (ii) attitudes, values, and dispositions toward science; (iii) knowledge about the transferability of science; (iv) consumption of science-related media; (v) participation in science learning activities outside of school; (vi) family science-related knowledge, skills, and qualifications; (vii) knowing people who work in science; and (viii) talking to others about science in everyday life (DeWitt; Archer; Mau, 2016).

Thus, Science Capital serves as a conceptual tool and theoretical lens for analyzing inequalities in science aspirations and educational participation among youth (Archer; DeWitt; Willis, 2014). It allows us to question and understand why certain groups, despite having an interest in science, do not feel they belong in the scientific field and do not develop related aspirations.

In addition to capital accumulation, scientific aspirations and engagement are influenced by individual dispositions (habitus), the educational environment (field), peer expectations and opportunities, and the recognition and validation of young people's resources and ways of thinking (Godec; King; Archer, 2017).

Engagement with science can be thought of as the flame of a candle: the wax represents one's capital and habitus – internalized, individual factors – while the air around the flame represents the environment (field), which determines whether the flame stays lit or is extinguished. To ignite the flame, an external stimulus is required – this could be a teacher or a science-related encounter.

In this analogy, capital and habitus feed the flame of engagement, but without favorable environmental conditions or external stimulus, the flame may fade. For students whose experiences, resources, and dispositions are valued and supported, the flame will burn steadily. For those whose contributions are not valued, the flame may struggle to ignite or may extinguish altogether.

From this, Archer *et al.* (2020) identified intersecting structural inequalities related to gender, ethnicity, and social class that shape scientific identity and aspirations, considering factors such as capital, educational practices, and dominant educational and social representations in science. However, their analysis did not account for the inequalities faced by people with disabilities, who – on top of these barriers – also face a lack of accessibility across all these dimensions (Heck, 2024).

A theoretical analysis of the eight dimensions of Science Capital by Heck, Ferraro, and Gallon (2024), and Heck (2024), identified potential accessibility barriers within each dimension, including architectural, attitudinal, methodological, instrumental, and programmatic barriers. Among these, attitudinal and communicational barriers stand out, reflecting the lack of representation and inclusion of people with disabilities in the media and educational spaces, perpetuating stereotypes and prejudices, and significantly limiting access to scientific content and environments.

These findings demonstrate that access to science – and consequently, the construction of Science Capital – does not occur in an equitable or accessible manner for all. In this sense, science museums emerge as valuable allies in promoting inclusion and engagement with science through their visual nature and the development of accessible and inclusive practices that enable the participation of diverse audiences.

Science Museums and the Democratization of Knowledge

Experiences in science museums and other science and cultural spaces comprise one of the eight dimensions of Science Capital: (v) participation in learning activities outside of school. These environments are responsible for conveying messages about the many ways individuals can engage with scientific discourse, while also emphasizing its usefulness and relevance – factors that can spark scientific aspirations among young people.

Additionally, these spaces play an essential role in scientific literacy, the development of positive attitudes and dispositions toward science, and in connecting visitors with professionals in STEM[3] fields (DeWitt; Archer; Mau, 2016). In this way, they contribute to the construction of Science Capital, influencing how visitors perceive and relate to science, playing a fundamental role in the democratization of knowledge and expanding opportunities for participation in science.

Accessibility in these spaces becomes imperative when museums are defined as institutions that serve society – open to the public, accessible, and inclusive (ICOM, 2022). Museums must guarantee the right of every visitor to be "welcomed, remain, participate, and return to the museum, without relying on special assistance that may lead to discrimination" (Sarraf, 2008, p. 47, our translation), ensuring autonomy throughout all museum services and areas.

By developing accessibility strategies, museums not only include people with disabilities but also enrich the experience for all visitors, democratizing access to communication and science communication. Therefore, these spaces must be prepared to welcome and provide meaningful experiences to the public, reflecting the plurality of society and its members (Norberto Rocha *et al.*, 2020).

Thus, science and cultural spaces must move beyond the role of merely transmitting specialized and often inaccessible information, recognizing themselves as active agents capable

[3] Acronym for Science, Technology, Engineering, and Mathematics.

of "stimulating the development of new awareness within their spaces – that is, a new 'culture' through education for diversity" (Morais, 2019, p. 43, our translation). This perspective positions museums as spaces of resistance against a society marked by segregation and exclusion, and affirms the need to value diversity, disseminate knowledge, and include different ways of existing.

Methodology

To understand how accessibility in a climate change exhibition could impact the perception, engagement, and scientific aspirations of visitors with disabilities – contributing to the development of Science Capital – a case study (Yin, 2018) was conducted based on the experiences of blind and deaf visitors in an exhibition on climate change.

The exhibition is part of a permanent display in a science and technology museum located in southern Brazil and presents the impact of human (anthropogenic) actions on global climate. Its content explores the natural release of greenhouse gases, as well as natural processes of planetary warming and cooling, grounded in scientific evidence. The exhibition was developed in Portuguese and English and included accessibility features such as Brazilian Sign Language (Libras) translation and audio description.

A guided visit was conducted with two Deaf participants and three blind participants, divided into two groups. During the visit, data were collected through observation of the participants' interactions with the exhibits and previously identified accessibility resources; interviews conducted before and after the visit, recorded in audio and video with the support of a Libras interpreter; and a questionnaire designed to assess the participants' Science Capital (Appendix I).

The data produced were analyzed using Content Analysis (Bardin, 1977), aiming to identify patterns and perceptions related to the accessible experience in the science museum.

Participant recruitment was conducted through the snowball sampling method, using invitation videos in Libras and voice narration distributed via social media platforms (Instagram, Facebook, and WhatsApp). Interested individuals contacted the researchers and were encouraged to refer others. The inclusion criteria required participants to be at least 18 years old, with no upper age limit, considering the challenge of finding volunteers for the study.

As a result, five participants were selected, all women, presented here with fictional names: Padden, 25 years old, Deaf woman, white, undergraduate student in Business Administration, working in internal auditing and compliance; Sullivan, 24 years old, Deaf woman, mixed-race, high school graduate, currently unemployed; Bower, 50 years old, blind woman, white, degree in History (teaching credential), works as a Braille teacher; Wanda, 50 years old, blind woman, white, degree in Economics, currently unemployed; Geerat, 18 years old, blind woman, white, high school graduate, works as an Information Systems Programmer and is also a writer.

All participants received and signed the Informed Consent Form (ICF), which was made available in multiple formats to ensure accessibility. The document outlined the research objectives, potential benefits, and any possible challenges associated with participating in the study. With participants' consent, interviews and guided visits were recorded in video and audio and later transcribed for analysis, ensuring the anonymity and privacy of the participants in accordance with Resolution No. 510/2016 of the Brazilian National Health Council (*Conselho Nacional de Saúde* - CNS) (Brazil, 2016).

This study is part of the research project "Science Communication: Access, Accessibility, and Experiences of Diverse Audiences" (*Divulgação científica: acesso, acessibilidade e experiências dos públicos diversos*), approved under CAAE (*Certificado de Apresentação para Apreciação Ética*) No. 47557021.0.0000.5241.

Results and Discussion

Based on the guided visit and interviews, this analysis sought to identify how accessibility in a climate change exhibition could impact the perception, engagement, and scientific aspirations of the participants, contributing to the development of their Science Capital.

In this context, the category **Inclusion/Exclusion in Museums and in Science** was identified. It describes various aspects of accessibility in museum and science contexts from the participants' perspectives, considering the following dimensions: Communicational, Attitudinal, Technological, Programmatic, and Institutional.

Communicational Dimension

Within the communicational dimension, both challenges and opportunities were identified in how accessibility influenced participants' perception and engagement. The presence of auditory and tactile resources was considered essential for the experience of blind visitors, as the absence of tactile materials made it difficult to understand the content of the exhibition. As reported by participants:

> The sensory aspect, the touch, to better understand the process is very important (sic) (Geerat).
> About the video with the graphs – aren't they tactile? Because I really wanted to see the graph, right? I love graphs (sic) (Wanda).

Participants emphasized the importance of tactile graphics and three-dimensional models to allow greater interaction with the scientific data presented. These statements are in line with Burgstahler (2009), who highlights the importance of tactile resources in conveying concepts that would otherwise be presented only visually.

Likewise, audio description, although a fundamental resource guaranteed by the Brazilian Law for the Inclusion of People with Disabilities (Brazil, 2015), showed significant limitations, as it did not describe all visually relevant elements of the exhibition. In museums, which often rely heavily on visual components, audio description becomes an indispensable tool, enabling blind or low-vision visitors to fully comprehend and engage with the exhibits and proposed activities (Fernandes, 2020).

Deaf participants indicated that subtitles alone are not sufficient, as many Deaf individuals have difficulty reading Portuguese, since it is not their first language (Carmo, 2021; Heck, 2021). Therefore, the presence of Brazilian Sign Language (Libras) interpreters, either in person or integrated into the exhibition through videos, was considered essential to ensure an accessible and meaningful experience:

> The only accessibility in media now is subtitles, but Deaf people really won't understand them (sic) (Padden).
> If the guide is there saying something, it's important to have the interpreter too (sic) (Padden).
> If there were no accessibility, in some cases there would have to be someone who could explain things to me (sic) (Sullivan).

Thus, communicational accessibility – through tactile resources, audio description, and Libras translation – not only facilitates content comprehension, but also promotes inclusion and engagement with the scientific field, ensuring not just experimentation, but a more equitable experience (Ferraro, 2017) within the museum space.

Attitudinal Dimension

In relation to the attitudinal dimension, barriers emerged regarding the lack of visibility of people with disabilities in both museums and science, affecting their perception of belonging in the scientific field. Participants emphasized that science is still perceived as an inaccessible space, where there is little to no representation of people with disabilities:

> Science is zero accessible for Deaf people (sic) (Padden).
> Unfortunately, I think [blind people] are a very poorly represented group, right? they say it's an audience that doesn't visit museums (sic) (Bower).
> We are rarely seen (sic) (Geerat).

Because the scientific field has historically been marked by stereotypes, it often appears inaccessible to certain groups due to the lack – or complete absence – of representation (Archer *et al.,* 2013). In the case of people with disabilities, this lack of inclusion can generate feelings of discouragement, causing them not to see themselves as part of this space or as potential scientists (Burgstahler, 2009).

These statements demonstrate how this absence contributes to the exclusion of people with disabilities from such spaces, creating a cycle of invisibility – and how the museum experience allowed participants to reflect on this context and propose more effective ways to promote inclusion.

Ableism also emerged as a critical issue, manifesting in the lack of preparedness and knowledge among staff to deal with visitors with disabilities, as well as the frequent need for the participants themselves to create their own solutions to make the exhibition accessible:

> The biggest barriers for visually impaired people are attitudes (sic) (Bower).
> Sometimes, it's really just a lack of willingness – people who simply don't welcome us (sic) (Geerat).
> It's no use if someone wants to help you but doesn't know anything and just starts pulling you around (sic) (Bower).

The lack of adequate training within the museum environment – both among professionals and at the institutional level – reinforces the argument made by Prema and Dhand (2019), who state that many educators and employers in STEM fields carry unconscious biases. These biases often result in lowered expectations regarding the abilities of students and professionals with disabilities, thereby limiting their learning and development opportunities.

On the other hand, in some situations, participants felt genuinely welcomed, demonstrating that when there is genuine interest and goodwill, accessibility can be implemented more effectively:

> There are places where we are very well received, where we find great access and support (sic) (Geerat).
> The most important thing is goodwill (sic) (Bower).

While challenges remain, these positive experiences show that goodwill and staff preparedness can make a significant difference in how visitors with disabilities are welcomed. Thus, the attitudinal dimension revealed that investing in professional development and fostering a culture of accessibility are essential steps toward breaking the cycle of exclusion and ensuring that all visitors feel valued and a sense of belonging in the scientific field.

Technological Dimension

The challenges faced in using the IDA[4] accessibility app highlighted the importance of well-planned technological solutions and were captured within the technological dimension. Key issues included the requirement to download a temporary-use app, incompatibility with iOS, difficulties using screen readers for blind users, and the desynchronization of the Libras (Brazilian Sign Language) interpretation with the exhibition videos:

> Imagine, I'm going to use it once and never again – then I leave here, and that's it? (sic) (Padden).
> There could be a QR code for access; it would be better than an app (sic) (Padden).
> If there were Wi-Fi here, even if someone didn't have mobile data, they could still download it (sic) (Padden).

[4] IDA App: Mobility and Access Intelligence (MAI) (MoverTech).

As alternatives, participants suggested integrating accessibility resources directly into the museum's website, using QR codes for easier access to content, and embedding Libras interpreters directly into the exhibition videos to avoid fragmenting the experience.

The technological dimension revealed that, to ensure the effectiveness of accessibility practices, digital tools must be intuitive, compatible with different devices, and practically integrated into exhibitions, minimizing unnecessary barriers and providing a smoother and more inclusive experience for all visitors.

Programmatic and Institutional Dimension

Within the programmatic and institutional dimension, budget cuts and lack of investment in accessibility were identified as key factors limiting the implementation of inclusive actions in museums. Norberto Rocha and Marandino (2017) describe how the cultural sector has faced difficulties in maintaining inclusive initiatives, which undermines efforts to democratize access to science and culture. This highlights the need for public policies that ensure the sustainability of cultural and scientific initiatives in the country (Fialho, 2020).

Various accessibility initiatives were discontinued under the argument of low demand, creating a cycle of exclusion: without accessibility, people with disabilities do not visit museums, and low attendance is then used to justify not investing in accessibility.

> Unfortunately, accessibility resources are also seen as dispensable, when they should be the foundation, the base (sic)(Sullivan).
> If there's no demand from this audience… if there's no demand, they shut it down (sic) (Wanda).

Furthermore, the lack of trained staff to assist visitors with disabilities was identified as a major issue. In this sense, Prema and Dhand (2019) emphasize that promoting effective inclusion requires that museum staff and administrators receive appropriate training to understand the specific needs of people with disabilities. Without this training, institutions risk perpetuating attitudinal and systemic barriers, further limiting access to the scientific field.

Participants stressed that staff trained in audio description and Libras could significantly improve the museum experience and contribute to a more inclusive environment:

> It’s really important to have someone with that training [in audio description] (sic) (Geerat).
> Even if they didn’t know much Libras, having someone to help with the basics would make a difference (sic) (Sullivan).

The discussions presented by the participants regarding the programmatic and institutional dimension highlighted the impact of limited investment and lack of trained personnel on the continuity and effectiveness of accessibility initiatives in museums.

Impact of Accessibility on the Construction of Science Capital

Based on the analysis conducted – which is part of a broader research project – it was possible to identify evidence of how accessibility in a climate change exhibition at a science museum influenced the perception, engagement, and scientific aspirations of the participants, contributing to the promotion of their Science Capital. The challenges and opportunities identified across the analyzed dimensions demonstrated that the lack of accessibility impacts the engagement of people with disabilities with scientific discourse at various levels, while inclusive practices tend to foster a more equitable and stimulating environment for their participation.

Accessibility thus becomes a critical factor in the understanding and appropriation of scientific knowledge. The general absence of communication resources – such as tactile materials, sufficient audio description, and Libras (Brazilian Sign Language) translation – restricted participants’ full interaction with the scientific content. When such resources are implemented, participants experience a more enriched interaction, leading to deeper knowledge appropriation and increased interest in science.

Furthermore, the lack of representation and the presence of ableism in scientific spaces affect the sense of belonging among people with disabilities, which may discourage them from engaging with science or developing scientific aspirations. The museum experience, by providing moments of welcome and inclusion, showed that when mediation is possible and trained staff are available, participants’ perceptions of scientific spaces improve. This contributes to the accumulation of experiences and content that support the development of Science Capital, especially by influencing participants’ motivation to pursue academic and professional paths in science.

In the technological dimension, the challenges faced when using the accessibility app further demonstrated that digital accessibility is also a key factor in the inclusion of visitors with disabilities. Participants highlighted the need for intuitive, compatible, and well-integrated tools, suggesting alternatives such as the use of QR codes, direct implementation of accessibility resources on the museum's website, and inclusion of Libras translation in the exhibition videos themselves. These strategies can facilitate content interaction, reduce barriers, and ultimately make scientific experiences more accessible.

Finally, lack of investment and discontinuation of inclusive initiatives reinforce the cycle of exclusion for people with disabilities in both museums and the broader scientific field, hindering the development of their Science Capital. The frequent justification of "low demand" for cutting accessibility resources fails to consider that the lack of accessibility itself is what prevents participation. Moreover, the shortage of trained staff to assist visitors with disabilities negatively affects the quality of the museum experience, limiting opportunities for autonomous and meaningful engagement with science, shaped by the richness of visitor-content interactions that these spaces can offer.

Conclusion

From this perspective, it becomes evident that accessibility is not merely a facilitator of physical and communicational access to knowledge, but rather a structural element in the development of Science Capital. When museums choose to implement accessible and inclusive strategies, they enable people with disabilities to interact with scientific discourse in complex ways, develop a sense of belonging, and expand their aspirations regarding the opportunities available within the scientific field. In contrast, the absence of such practices reinforces the historical exclusion of this public from science.

Therefore, for museums to become spaces that actively promote Science Capital – and to ensure that this construction is truly accessible – a continuous commitment to inclusion is essential. This involves adopting accessible technologies, training qualified professionals, developing adapted pedagogical strategies, and ensuring and encouraging the representation of people with disabilities in the scientific domain. These strategies help to promote a science that is more inclusive and less exclusionary, allowing diverse audiences to see themselves as potential and engaged agents within the scientific field, and contributing to a more diverse and equitable landscape in the production and dissemination of scientific knowledge.

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Appendix 1 – Science Capital Index

1. A science qualification can help you get many different types of job?
   - ☐ Strongly disagree.
   - ☐ Disagree.
   - ☐ Neither agree nor disagree.
   - ☐ Agree.
   - ☐ Strongly agree.
2. I know how to use scientific evidence to make an argument?
   - ☐ Strongly disagree.
   - ☐ Disagree.
   - ☐ Neither agree nor disagree.
   - ☐ Agree.
   - ☐ Strongly agree.
3. My teachers have specifically encouraged me to continue with science after GCSEs?
   - ☐ Strongly disagree.
   - ☐ Disagree.
   - ☐ Neither agree nor disagree.
   - ☐ Agree.
   - ☐ Strongly agree.
4. My teachers have explained to me science is useful for my future.
   - ☐ Strongly disagree.
   - ☐ Disagree.
   - ☐ Neither agree nor disagree.
   - ☐ Agree.
   - ☐ Strongly agree.
5. It is useful to know about science in my daily life.
   - ☐ Strongly disagree.
   - ☐ Disagree.
   - ☐ Neither agree nor disagree.
   - ☐ Agree.
   - ☐ Strongly agree.
6. One or both of my parents think science is very interesting.
   - ☐ Strongly disagree.
   - ☐ Disagree.
   - ☐ Neither agree nor disagree.
   - ☐ Agree.
   - ☐ Strongly agree.
7. One or both of my parents have explained to me that science is useful for my future.
   - ☐ Strongly disagree.
   - ☐ Disagree.
   - ☐ Neither agree nor disagree.
   - ☐ Agree.
   - ☐ Strongly agree.
8. When you are NOT in school, how often do you talk about science with other people?
   - ☐ Never or rarely (once a year)
   - ☐ Occasionally (a few times a year)
   - ☐ Sometimes (about once a month)
   - ☐ Regularly (about once a week)
   - ☐ Always (Almost every day)
9. When not in school, how often do you read books or magazines about science?
   - ☐ Never or rarely (once a year)
   - ☐ Occasionally (a few times a year)
   - ☐ Sometimes (about once a month)
   - ☐ Regularly (about once a week)
   - ☐ Always (Almost every day)
   - ☐ Sempre (Quase todos os dias)
10. When not in school, how often do you go to a science centre, science museum or planetarium?
    - ☐ Never or rarely (once a year)
    - ☐ Occasionally (a few times a year)

- ☐ Sometimes (about once a month)
- ☐ Regularly (about once a week)
- ☐ Always (Almost every day)

11. When not in school, how often do you visit a zoo or aquarium?
    - ☐ Never or rarely (once a year)
    - ☐ Occasionally (a few times a year)
    - ☐ Sometimes (about once a month)
    - ☐ Regularly (about once a week)
    - ☐ Always (Almost every day)
12. How often do you go to after school science club?
    - ☐ Never or rarely (once a year)
    - ☐ Occasionally (a few times a year)
    - ☐ Sometimes (about once a month)
    - ☐ Regularly (about once a week)
    - ☐ Always (Almost every day)
13. Who do you talk with about science?
    - ☐ Friends
    - ☐ Siblings
    - ☐ Parents or caregivers
    - ☐ Relatives
    - ☐ Directly with scientists
    - ☐ No one
14. Do you know anyone (family or friends) who works in science? Who are they?
    - ☐ Friends
    - ☐ Siblings
    - ☐ Parents or caregivers
    - ☐ Relatives
    - ☐ Directly with scientists
    - ☐ No one