



STYLE GUIDE ON INCLUSIVE SCIENCE EDUCATION

TOWARDS PROMOTING AN INCLUSIVE APPROACH IN SCIENCE EDUCATION



C4S

Communities for Sciences



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1. Executive summary

The following document corresponds to a Style Guide on Inclusive Science Education that is especially addressed to communicators, journalists and disseminators, as well as educators, among other potential users. The aim is to provide a tool for those experts in science communication and science education who are interested in inclusion but who may also want to take into consideration a set of guidelines when publishing or disseminating communications about science and science education from an inclusive perspective.

With this aim, this document provides some recommendations taking into consideration especially those communications that could affect the target groups of the C4S project. Namely, communications involving members of communities in vulnerability risk situations such as: members of the Roma community, people with migrant backgrounds, persons with a disability and women and girls who are members of these communities. Additional information is also provided to those users of this guide who are interested in networking with other journalist associations or similar association experts in the field.

2. Acknowledgements

These guidelines have also been elaborated with the support of journalists who are experts in inclusion, communicators working in the field of photography, science education, academia as well as scientists. These experts have collaborated at different levels of involvement tackling some of the issues presented here about inclusive communication in science. We want to especially acknowledge the support of the following experts in the conceptualisation of some of the topics presented in this document.

Special thanks should be addressed to Zinthia Alvarez Palomino.

Journalist and promoter of the project "[Black women who changed the world](#)" and author of the book "Black women scientists". ([Instagram profile](#)) for her support, as expert journalist, in the general conceptualisation and organisation of some sections of this Style Guide. Also for her support in summarising some of the contents in this guide resulting from the workshop on Inclusive Science Communication that she coordinated.

We also are grateful for the support in providing ideas and feedback from the following experts:

- **Sheddad Khaid-Salah Ferron.** Scientist, expert in science communication, author of children's books about science concerning different topics (Electricity, Quantum mechanics,...). ([Professional profile](#))
- **Dr. Isidora Saez Rosenkranz.** Serra i Hunter Programme Lecturer in History, Geography and Social Sciences, University of Barcelona, MA in Latin American Studies, Expert in Applied Didactics, PhD in Social Sciences and Heritage Teaching. Member of the *Ciutadanes working group* of the Catalan Institute of Anthropology. ([ResearchGate Profile](#))
- **Laia Gómez-Franco Estrella.** Educator and facilitator of participatory communication processes with documentary images. Responsible for educational projects of RUIDO Photo. Director of MiRu (Mirada Rumiant Association). PhD Student in Education and Society of the University of Barcelona. ([Linkedin Profile](#))

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- **Diana Reinoso.** Project Manager in Science for Change. Sociologist, Senior Agricultural Technician and MA in Environmental Intervention and Management (University of Barcelona). ([Linkedin Profile](#))
- **Andrea Cerroni.** Sociologist of Knowledge at the University of Milano-Bicocca (Milan, Italy). ([Academic Profile](#))
- **Carlo Antonini.** Laurea in Aerospace Engineering (2004) and Magistrale Laurea in Aeronautical Engineering (2007) from the Politecnico di Milano, PhD in Technology for Energy and Environment from the University of Bergamo (2011). ([Academic Profile](#))
- **József Hegedüs.** Primary School Teacher, expert in teaching SEN Special Education Needs' children, vulnerable children and Roma children.
- **Andrea Mangiatordi.** Researcher at the University of Milano-Bicocca. Expert on Accessibility in the areas of Online Communication and of Educational Content Design, with a specific interest in the sustainability of the application of Universal Design frameworks in educational contexts. ([Academic Profile](#))

3. Considerations

This guide about Inclusive Science Communication has also been elaborated taking into consideration other similar publications addressing issues of *inclusive communication* and *science communication*. However, as far as we are aware, there is no style guide addressing the **intersection** of both aspects *specifically*, that is, of **science communication from an inclusive standpoint**. Given this, we have taken special care to provide useful guidance on Inclusive Science Communication practices that address specific viewpoints such as antiracism, antisexism, and antiableism. Nevertheless, we aim to avoid duplicating the excellent work already undertaken by others and their recommendations in the field of inclusive communication or science communication guides.

Hence, our intention is to complete and enrich the current work by providing recommendations that address issues concerning inclusive science education. These cases are presented to ensure that science communication reaches a wider audience. Our goal is to reinforce the message that inclusive communication of science and of science education are also means to equip societies with better awareness, resources, and strategies to learn more about science in order to make informed decisions for a better and brighter future together.

HOW TO USE THIS GUIDE

This style guide has been devised with the aim of becoming a **practical tool** for those journalists, communicators and educators who are already interested in communication science and science education from a more inclusive approach but are not sure how to do so. We offer here some **ideas or orientations** on what may be useful or recommended to take into consideration **without expecting that these are the only possible options**.

4. General introduction

To make this guide practical, the reader might want to either read all the sections one after another or prefer to go directly to the section they want to focus on. There are **sections dedicated to more general tips** or to **guidelines related to the organisation of public events (venues, exhibitions, conferences, ...)**. There are also sections dedicated to providing tips and orientation regarding how to establish an inclusive approach to science communication when we are focusing our communication in relation to one of the following groups: **science communications about /involving contexts of ethnic-cultural diversity, science communications about/involving persons with a disability** and finally **science communications about / involving women or girls**. Each of these sections contains one subsection concerning **writing recommendations** and another one giving **recommendations regarding the use of images**. The recommendations are organised **in alphabetical order**. In addition to this, a **blank box is provided** towards the end of each section so that, in your printed version, you can fill it in with your own tips, recommendations or ideas. There are also **links to other recommended resources or to other journalist associations** or related networks in case you think you need extra support or guidance from them when writing an article which relates to a particular target group. Finally, **you will find a larger library of resources at the end of this document** for you to consult if you wish to search for more tools or networks beyond those presented in the previous sections.

At the end of this document, you will also find **a schematic table** that summarises **all the recommendations** presented in this guide. This table is designed to provide a more concise and accessible resource for conducting inclusive science or science education communication tasks.

Scientific understanding is fundamental in the current societies of the 21st century. Our world has grown, and we have now a better understanding of the different phenomena that surround us, from those that affect our daily lives (such as, for example, weather forecasts, technology use, and health) to those that extend far beyond our senses and enclosed labs (Funtowicz & Ravetz, 2000) (such as, for example, the origin and evolution of galaxies and nebulae, and phenomena occurring in quantum mechanics). It is therefore essential to provide tools that allow us to rationally understand such phenomena and to better comprehend the causal relations in our natural world. This is not only important when pedagogically working with children and young people, but also when communicating and disseminating such information to the adult public through different pedagogical or communicative strategies (documentaries, science news, science books or exhibitions in science museums, etc.). Moreover, it is important to bear in mind that, even though science is vital for our current societies and understanding of our surrounding phenomena, it is not a simple transparent activity but, on the contrary, is also embedded in many social and institutional practices which are often not officially acknowledged or made explicit (Chalmers, 2010).

An inclusive approach to science education (and hence also to science communication) is very important because, in addition to this, nowadays we live in plural societies. These societies have grown bigger and more complex but at the same time have also become richer in cultural and social opportunities. This new context offers many chances to engage in stimulating encounters and provides moments of mutual knowledge, recognition, and opportunities to learn together. Nevertheless, living in such a diverse context, also facilitates the appearance of misunderstanding and of the misuse of media when disseminating any kind of knowledge, including scientific knowledge. During the COVID19 pandemic which occurred during the scope and deployment of the C4S project, we have been witnesses in real time of the resurgence through social networks and other media, of the “fear of the other”

and xenophobic discourses (Wang et al., 2021; Chaudhuri, 2021; Cholera et al., 2020) with the excuse of the pandemic. Similarly, the use of pseudosciences communicated with a scientific *mise-en-scène* was fostered to gain credibility to wider audiences and thus influence (often using racist tropes under the disguise of science – as so often happens with pandemics – Sontag, 2020; Devakumar et al., 2020) to large groups of misinformed citizens. This highlights the importance of promoting not only an inclusive approach to science education (to avoid misunderstanding and mistrust of science), but also to inclusive science communication to strengthen the public sphere and provide the general public with better tools to avoid misuse, fake news and the spread of hatred, through the media or similar information channels, by misusing scientific findings. The importance and strength of an inclusive communication approach in science education (and science in general) is its function to address and elevate these issues to pedagogical instances. It also has the capacity to act as a tool to give visibility to those experts in science who are necessary for the new generations of children to be able to refer to as a role model. In this sense it is important to have in mind the main role of education providers with enough awareness of these inclusive communicative issues in science from any level, from preschools until higher education institutions. In order to increase the student engagement in STEM, students need to see in themselves the potential to pursue STEM interests and careers. One way to achieve this is by exposing them to relevant images of STEM professionals who represent the cultural diversity of our global community throughout instruction. Educators must broadly recognise who has participated in science, for what range of purposes, and to show how diversity enriches science. Teachers should carefully weave subject matter with activities and images within relevant contexts that make visible the contributions of individuals from diverse cultural backgrounds. However, to do so, educators need to reach the work of professionals of communication who are actively working for an inclusive non-sexist, non-racist and non-ableist (among others) use of images and texts in science communication.

Finally, to reinforce the need for better and more transparent and inclusive scientific communication practices, it is important to acknowledge that science communication and dissemination practices have been used in the

recent past to ideologically justify, foster, and encourage racist, sexist, or ableist practices. For instance, human zoos were once proudly shown and described in newspapers and Leni Riefenstahl's films justified racial discrimination and discourses that ended in the creation of the extermination camps of the Shoah. European illustrators travelled worldwide to document new species of plants and animals that became critical for the international trade of botanical goods and knowledge through the exploitation of entire countries and the use of the slave trade. And botanical expeditions were often undertaken by female scientists (Sistach, 2019) who were never fully acknowledged for their task but rather were often considered as mere illustrators or traders of botanical goods. These biased communication practices and many others were possible because science communication practices and dissemination activities didn't apply a critical view and self-awareness about their ideological, political and cultural bias. It is important to remember that such risks are not far from us. We must not forget nor ignore current biased practices in science communication (Saini, 2021) through different media (newspapers, TV news, official webpages, social networks, etc.), which transmit sexist, racist or ableist claims or reproduce barriers or risks to members of these communities in vulnerability risk situations.

In this sense, we must be aware that, although scientific knowledge is necessary for society's progress according to Dewey (Dewey, 1995; 2004), such science is always undertaken by specific individuals and groups, working in specific institutions with their own beliefs systems, barriers, bias and stereotypes. Moreover, **as communicators or journalists, we should find mechanisms and tools that, when disseminating and communicating advances in science, allow us to detect which elements still reproduce or favour certain sexist, racist or ableist, amongst others, claims or barriers.** There is clearly a lot of work to be done in making women scientists more visible, and in including the presence of scientists from plural backgrounds and conditions without misrepresenting them.

There are many means for maximising inclusion and attention to diversity in science education and communication. Some areas for achieving this include:

- Science journals
- Science sections in the general press

- Public associations and institutions addressing scientific training or disseminating activities
- Science museums / curatorship
- Science books /editorials / children's literature
- Images / dioramas, icons and panels addressing scientific issues
- Scientific panels, round tables and conferences.
- Pedagogical institutions/settings: primary schools, secondary schools, universities...
- Etc.

Inclusive science communication practitioners may include, but are certainly not limited to:

- Journalists (science journalists or general journalists)
- Other media professionals (podcasters, YouTubers, filmmakers)
- Public information and press officers
- Website curators
- Curators of science museums
- Museum staff and volunteers/docents
- Editorial teams (science books, children's books, ...)
- Artists and designers
- Cooperative extension staff and volunteers
- Educators (K-12, post-secondary, after school programmes)
- Government agency staff
- Librarians
- Medical professionals
- Scientists, technologists, engineers, mathematicians
- Community elders and leaders
- Community organizers

Hence, the importance of addressing inclusive science communication issues is because bias in science continues to exist: not only in science books but also in important media (science journals, science sections from general newspapers, social networks, etc.) that disseminates science discoveries and

topics. In addition, it is important to stress that “what cannot be seen, doesn't exist”. This applies to the enormous number of female scientists, scientists from non-white or non-western backgrounds and scientists with disabilities who are nowhere to be found in disseminating or communicative initiatives. These scientists should be presented, acknowledged, or referred to in such proposals. Changes in science communication should be addressed, especially to make it less biased and more open to the real diversity it represents.

This document is devised, thus, with the aim to support a more transparent and inclusive communication of science with the aim to also detect and eliminate those science communication contents and practices with sexist, racist, ableist (and other similar) bias. At the same time, it is equally important to acknowledge the large number of scientists and science communicators who are conducting outstanding work in this area and that should also be socially acknowledged through more inclusive communicative practices in science practices and in science education.

5. Guidelines on inclusion in science communication

5.1. 10 QUESTIONS BEFORE WRITING OR COMMUNICATING ABOUT SCIENCE OR SCIENCE EDUCATION

- (1) Science experts** - Within my science communications, did I take scientists (or experts) from different communities or social groups in vulnerability risk situations sufficiently into consideration as referents?, Or do I always refer to the same type of renowned scientists or white male scientists?
- (2) Monitoring** - Did I conduct enough monitoring strategies to ensure that my science communications present all social groups, in a respectful manner and without bias? How can I ensure that my science communications do not include stereotypes or misrepresent any of these groups (especially those in vulnerability risk situations)?
- (3) Labelling** - Am I sufficiently aware of the risk of labelling social groups if I put too much emphasis on generalisations within my communications? (even if the labelling seems to offer positive generalisations – e.g. all X's are good at sport; all Ys are good at science, All Zs are hard-working people, all Ns are good at maths, ...).
- (4) Voice** - Am I giving sufficient voice in the first person to members of social groups involved as testimonies or referents for this piece of information? Or do I just take all the communicative decisions for them (but without them)?
- (5) Representation** - If members of communities in vulnerability risk situations are going to play a part in my communication: are they going to be presented beyond the traditional way in which they are usually represented? Or do the contents of my communication run the risk of

accidentally reproducing stereotypical forms of representing such social groups?

- (6) Tokenism** - Am I going to include members of communities in vulnerability risk situations in my communication piece because it is coherent with the contents that I am aiming to communicate? Or is it just a tokenistic strategy to better sell/embellish my product/institution/article?
- (7) Biography** - If I am going to produce an interview or a biographical description of a scientist/professional member of a community in a vulnerability risk situation: am I willing to ask them how they prefer to be biographically described? Or am I going to take all the decisions on how to describe their biography? If so, do I have a good criterion on how to do so?
- (8) Archive** - If I am going to use or download images from an archive for my article: what type of images do I have available representing members of such communities? Am I sure that these available archive images are not showing a paternalistic, infantilised, compassionate, egotistical or even sexualised representation? Are there any other available archive images providing a fairer representation of a scientist/expert of this community that could avoid these types of bias?
- (9) Advisors** - To prepare an article involving members of a community in a vulnerability risk situation: am I also involving or consulting, for my work, members of the involved community to ensure a fair representation about their discoveries or issues involved in this informative article?
- (10) Private life** - If I am going to write an article containing an interview or biographical information about a particular scientist: when is it correct to make their private life explicit or explain personal/biographical/physical-phenotypical aspects regarding that person and when is it not? Have I considered this properly? Have I asked this/these person/s how they want to be represented?

5.2. GENERAL TIPS TO MAKE SCIENCE COMMUNICATION MORE ACCESSIBLE FOR ALL

“Science isn’t finished until it’s communicated. The communication to wider audiences is part of the job of being a scientist, and so how you communicate is absolutely vital,” Sir Mark Walport.

How can we make science communication more accessible? To begin with, we would like to present some basic tips/hints to make more inclusive science communication visible in multiple fields, such as science journals or science sections in generalist journals, science museums, festivals, round tables, international conferences, online workshops/seminars, science talks or similar activities. To do so, we are including the following sections to provide some basic guidance with the aim of facilitating your work but without being too exhaustive. We are aware that as a communicator you may already have several tools and practical resources at your disposal. Thus, we are only providing those which we have considered to be critical to help you to make your communicative work more inclusive.

To do so, this chapter is divided into two main sections:

- **Basic writing style tips that will make your communication more inclusive.**
- **Basic organisational tips when conducting a public science communication event.**

We are also leaving a blank space below each section so that you can add your own recommendations or guidelines that you may find useful for your communication activities or events. We recommend filling in these blank spaces in your printed version so that you can keep notes concerning your own suggestions or tips for whenever you may need them. Furthermore, you will find, at the end of the section, additional links with extra resources that you may find useful for your communication tasks.

5.2.1. Basic writing style tips that will make your communication more inclusive

- **Writing style:** Simple writing, short phrases avoiding jargon.
- **Technical vocabulary:** In case you are not sure if the audience is familiar with the language (scientific or local), or if it is possible that there are language difficulties, it can be helpful to provide a basic glossary of STEAM tools and materials for previous reference.
- **Font and size:** Using an easy-to-read font such as Arial font size 12 or 14 or bigger (with a maximum of two different fonts). In case of using subtitles to facilitate reading, use strategies such as colour distinctions or sizes to facilitate the reading.
- **Visual support:** when language can be an obstacle, visual support can give people another way to communicate, instead of relying solely on verbal communication. This approach is appropriate for working with all targets, including those who are not familiar with the local language, or those who may have a language delay. Use of visual support (images, icons, conceptual maps) is important to facilitate understanding especially for those who have difficulty reading. Also consider including sign-translators in your conference (or videoconference) events
- **Tactile-Typhlological support:** consider including materials that allow tactile/ typhlological interactions and/or texts in Braille as an additional support. If publishing a printed article, contemplate sharing an online version for those who don’t rely on visual support, as partially sighted or blind people can rely on text-to-speech or text-to-braille software. If presenting graphs and content tables in a PowerPoint, you may want to share a printed version of the slides in a Braille format for the blind audience.
- **External support:** Use of other types of support which facilitate reading, such as revision by experts in easy-to-read guidelines.

You will find further tips here:

- Inclusion Europe Easy-to-read Guidelines: <https://www.inclusion-europe.eu/easy-to-read-standards-guidelines/>
- Inclusive Communication Manual: https://siem-project.eu/documents/ESN_Inclusive_Communication_Manual.pdf
- Easyread.info document on Accessible information and easy read tips: <https://easyread.info/wp-content/uploads/2019/02/AccessibleInformationandEasyRead.pdf>
- Braille & Tactile Graphics: <https://www.seewritehear.com/services/document-accessibility/braille-tactile-graphics/>

Write here your own additional tips to make your communication more inclusive:

5.2.2. Basic organisational tips when conducting a public science communication event: science panels, events or public exhibitions, etc.

In this section we provide some suggestions on how to make your panels, events and/or public exhibitions more inclusive or, at least, how to detect, whether inclusiveness is considered sufficiently:

Issues to consider before the event:

- **More balanced panels:** Avoid panels with only male participants or without giving an opportunity of more plural perspectives and experts

from different backgrounds and conditions. Whenever possible, invite women experts and persons from a diversity of ethnic-racial backgrounds and with other conditions in your panels. The more plural science teams are, the richer the prism of scientific knowledge which will be provided. This is true especially (but not only!) when the panels/conference topics are centred upon a specific social group in vulnerability risk situations and/or gender issues.

- **Plural working teams:** Try to incorporate in your working teams/organising committees a more gender-balanced and plural ethnic-racial and diverse-condition workforce. This is important not only for the sake of more scientific quality of the team (as this will help to break down barriers and bring other experts capable of increasing the knowledge of your team), but it will also be important for the sake of making the plural workforce behind scientific advances more visible. It will also allow you to detect more barriers that otherwise might have been overlooked.
- **Quantity, quality and location of the scientific information about underrepresented groups of scientists:** Also bear in mind that, at times, we prioritise some information over other types of information depending on the relevance we give to certain informants or social actors who have participated. Before displaying publicly, one has to critically examine if the (visual and written) information involving either female scientists/experts or scientists/experts from different ethnic-racial contexts or with a diverse condition has been prioritised enough. Can we find several images and texts about women (or non-white/non-western male) scientists in several accessible panels/videos/images in your venue/exhibition? Or are all or most of the scientists referred to white men and without any disabilities?
- **Accessibility issues in venues and exhibitions:** When organising events and public exhibitions, you may want to take into consideration various different accessibility issues: from including a diversity of resources and tools to access information, such as Braille texts or other typhological-tactile materials, to the use of subtitles in the videos and of other visual support, use of icons, etc. Consider also using adequate supports and furniture which is accessible for people in wheelchairs or people who are

not able to access the information if it is difficult to reach. Try to detect other possible barriers to accessibility with the support of experts or ask other persons with a disability willing to help.

- **Barriers and inclusive environments in your science communication working areas:** It is important to detect and eliminate barriers that may limit the participation of people with diverse backgrounds in science or science communication. This may include: the elimination of prejudices and stereotypes in your working team, the promotion of an inclusive environment, and the guarantee of fair and equitable treatment for all people. It is important to create an inclusive environment that values and celebrates the richness of diversity of viewpoints, backgrounds and conditions. For example, the adoption of internal policies and practices that promote ethnic diversity. Your science communication will certainly be richer and more universal if you create an inclusive environment in your science communication team.
- **Training opportunities for your working teams:** Provide your working teams with opportunities for training on inclusive science education issues also from an intersectional perspective. This will give them more resources, awareness and strategies for inclusion and will make the efforts of conducting an inclusive science communication approach progressively easier. In addition, they will gain more awareness in avoiding biased practices such as giving more visibility or voice to certain participants over others. For example, regarding how to address the topics in a way that widens the public interests and awareness about inclusion in science, including how to provide equal speaking opportunities for male and female experts during round tables, in the use of images of experts, etc.
- **Ask for feedback from your external experts/advisory board members:** You may also want to establish some assessment team or advisory board with members of other groups or communities who can give you feedback based on their professional expertise and their personal experiences. They may be also willing to support your efforts towards a more inclusive scientific communication and help you in disseminating such an approach.

Issues to consider during the event:

- **Visual accessibility during panels:** During panels and conferences, it is important to consider accessibility issues. You can ask attendees to specify any accessibility needs during the online registration process. If necessary, consider including sign language translators. Also take measures to avoid unnecessary visual barriers that may prevent people with specific disabilities from participating. To make your panel a success, it is important to detect visual barriers before they occur. If you use audiovisual support, include images, icons or conceptual maps that will help follow your explanations.
- **On visibility, hypervisibility & invisibility issues:** Carefully examine if your use of multiple media gives visibility (or enough visibility) to the different members of society, especially to women scientists and to members of minorities or to persons with a disability who also participate in science or are experts related to the field. Often, communication resources about science history and science innovation give hypervisibility to white male scientists without any disability at the expense of women scientists and scientists from non-white/non-western backgrounds and/or scientists with a disability.
- **Take care of the language used:** Pay special attention to the use of an inclusive language that does not reproduce sexist, racist, colonial or ableist tropes. In case of any questions on this point, you may want to consult some external experts in the field to help you examine the meaning behind the use of text and images in your exhibition before its public display.
- **Let plural voices in the first person be heard:** Visual representation is important but so is agency in having a voice in the first person to explain one's area of expertise or discovery. Whenever possible, use images of scientists or experts in the related field that represent the plurality of society. Give them the opportunity also to allow their voice to be heard instead of only talking for/about them. Additionally, when acting as panel chairs or round table moderators, be aware of giving equal time for speech and replies to all panellists, especially women and members of

communities in vulnerable situations who are often interrupted or given less time for voicing their perspectives and professional reflections.

- **Dissemination of the event on your social media:** Dedicate attention to the hashtags you insert. They can be particularly effective for creating messages that reach different people, institutions and networks.
- **Share successful stories/good cases:** It is important to share examples and factors that contribute to the inclusion and successful stories of people from different backgrounds and conditions. You may want to feature examples of these people as providers of expertise, services, assistance and as contributors of support to society. This promotes the message that they are present in the scientific community across the globe, and that they have the same range of interests, talents, skills and professional behaviour as the rest of the scientific population.

Issues to consider after the event:

- **Communication about the event and making social actors visible (after the event):** Once the event has finished, you may want to consider giving visibility to the contributions of the different participants, panellists, working team members, etc. and also to publicly acknowledge their work. This is not only a matter of reciprocal acknowledgment and fair working conditions, but it is also especially important for social groups that are often not acknowledged enough or are not visible enough as social referents. Providing them a platform to be kept visible after the event has finished can provide new opportunities to boost their future contributions as experts in similar events.
- **Consider self-evaluation (regarding inclusive aspects) of the panel or exhibition conducted:** Once the event has finished you may be interested in self-evaluating if the inclusive measures and the initiatives to avoid bias and barriers have been effective or not. Having an internal and/or external evaluation can provide you with tools to detect positive actions towards inclusion, new training opportunities or more inclusive sites for future similar events, etc.

Write here your own additional tips to make your public events more inclusive:

5.3. SCOPE: COMMUNICATING INCLUSIVELY

When contributing to a communicative article, be it a short science review, or a piece of news to be presented in a specific media, a visual panel or a video for a science exhibition, a new entry in your institutional website/blog/social networks, or something else, you will probably be interested in portraying an appropriate view of some of the protagonists of your communicative work. In case you are unsure about how well (or how to) portray members of the social group/s you are referring to this section is devised to facilitate your work by giving you some recommendations or hints on what you could take into consideration. Obviously, these guidelines are not compulsory, but they have been selected with the aim of helping you in case of doubt and / or for the detection of issues that would otherwise not be identified. The following sections have been devised in relation to specific social groups:

- **Communicating about science topics involving ethnic and racial diversity in science.**
- **Communicating about science topics involving persons with a specific disability or disabilities.**
- **Communicating science topics involving women scientists and girls.**

Even though there is a risk of labelling, organising recommendations in terms of target groups can help to better understand the issues that may affect or have special relevance for the specific groups the communicator is addressing.

To help with the organisation, **each section** is subdivided as follows:

- **Recommendations regarding written texts (although this section also include some recommendations regarding oral communications as well).**
- **Recommendations regarding the use of images (including photographs, icons, illustrations, etc.).**
- **Information regarding other journalist networks, associations, or institutions that also are composed of (or work closely with) members of this social group.**
- **Additional information with a basic library of links (additional links may be found in the library of resources at the end of this Style Guide).**

The following recommendations are organised **in alphabetical order**. Some categories in the different subsections bear the same name given that similar problems may apply (although they may not necessarily have the same possible solutions to these problems).

A blank space below each section has also been left so that you can add your own recommendations or guidelines that you may find useful for your communication activities or events. We recommend filling in these blank spaces in your printed version so that you can keep notes concerning your own suggestions or tips for whenever you may need them. At the end of the document, we have included **useful links to other journalist associations or related networks which are** specialised or formed with members of this group in case you want to contact them for further help, support or feedback. Furthermore, you will find additional links with extra resources that you may find useful for your communication tasks.

At the end of this document, you will also find **a schematic table** that summarises **all the recommendations** presented in this guide. This table is designed to provide a more concise and accessible resource for conducting inclusive science or science education communication tasks.

5.3.1. Ethnic and racial diversity in science

WRITING RECOMMENDATIONS

Active social actors rather than passive ones. Traditional representations of people with non-white ethnic-racial backgrounds often depict them as helpless and/or passive individuals in scientific fields. It is important to avoid reproducing this social imaginary and instead show human diversity by showing them as *de facto* active social actors who also contribute to scientific enquiries or initiatives related to science or science education fields. It is necessary to show human diversity by highlighting their active participation in the process of transformation, and showing them as contributors, rather than simply as receivers.

Attention to language. Care should also be taken when choosing words. Of course, you may be aware that your texts may convey more meaning than expected, but although this is clear in relation to general contents, it is not so evident when writing about science or when addressing scientific facts to a wider audience. Given that scientific explanations are often presented as objective facts without conveying any additional implicit meaning whatsoever and given also that science has an authoritative role in our society, this topic is especially sensitive to consider *at all levels*. For example, in relation to texts referring to non-white/non-western communities, biological or naturalist terms or descriptions are often used to describe such social groups conflating social or cultural factors with biological facts (e.g., with certain type of sociobiological reductionist theories). Be especially careful always when using scientific terminology that may be conflating (or leading the readers to conflate) naturalistic facts and social/cultural factors. Also, try to be aware that words can betray us and so avoid using specific terminology that portray these ideas of helplessness or passivity such as with the word “disadvantaged”. These terms should be avoided, because they specifically imply a disadvantageous situation, and thus it may be incorrect to use it in the context of a specific person.

Avoid a heroic and individualistic portrayal. Important scientists have often been portrayed as individual heroes who have fought against all odds to become victorious in their discoveries. This is a misrepresentation of science and, in our willingness to give visibility to a certain scientist from a non-white/non-western background, we may be willing to also exaggerate their feats to portray them as geniuses. Always carefully balance the scientist's achievements with the role of other co-participants and team members of the discovery. In any case, portraying a heroic and individualistic approach of your protagonist is a misleading representation of the scientific enquiry processes as a whole. Furthermore, in this specific instance, it may also convey paternalistic and caritative weight that you may want to avoid if you want to be fairer in the representation of diversity and plural teamwork in science from a non-colonial perspective.

Avoid generalisations, acronyms and vague terms. When writing about specific science communities or related experts in the field, try to avoid too wide geographical generalisations, acronyms or vague terms that may not represent your social actors. For example, it is preferable to use the term "Nigerian" instead of "African" and try not to use umbrella terms, such as "Black, Asian, and Minority Ethnic" (BAME)". Mentioning and grouping a community through an acronym can cover the huge differences and individualities of these subjects and can also foster the dehumanisation and labelling of entire groups.

Avoid pan-culturalist approaches. When members of a specific social group behave or react in specific ways, explanations such as "this is part of their culture" or "this is who/how they are" are frequently used. But such behaviour is often due to social or contextual factors (e.g., low economic income, academic tradition within the family, etc.) not because of any cultural or ethnic factors. This often applies when referring to scientists from specific ethnic or cultural backgrounds, where references to their ethnic group and their academic success are made through pseudo-naturalist/pan-culturalist explanations. Although in appearance, claiming that members of this or that cultural or ethnic group are better at this or that academic specialisation (i.e., that are cleverer/more intelligent *per se* than members of other cultural or ethnic groups regarding: maths, physical science, etc.) and might sound praiseworthy, in fact this may lead to dangerous overgeneralisations,

biologisation /naturalisation of social factors (and even implicit claims about the racial superiority of this specific ethnic group over others). Thus, it is important to avoid such an approach even if the aim seems to merely give visibility and praise the scientific contributions of members of a specific social group.

Avoid Tokenism. Whenever referring to a scientist or related expert in the field as a member of a particular community, carefully examine if you are doing so because such information is relevant to the information to be communicated or not. Are you highlighting their condition to show that you also care about diversity and to show that they play an actual central role in your informative piece? Or is it just to make your piece of work more politically correct or more aesthetically pleasing? Be aware that Tokenism is always a risk that we must avoid as experts, as nobody wants to be used as a background decoration to make the information more appealing or more exotic. Ask yourself (and as mentioned above, ask the protagonist/s if possible) if it makes sense to make their cultural background explicit as part of the information or not.

Compatibility of religious beliefs and science. Do not make assumptions by considering that a religious person from a specific ethnic or racial context cannot as such be a scientist or related expert in the field (e.g., health expert, technologist, etc.). Conversely, do not presuppose that a scientist (or related expert in the field) does not have religious beliefs or that these religious beliefs are *per se* in contradiction with their expertise. In addition to this, try not to conflate notions about a person's religious beliefs and their ethnic or geographical context.

Consider geographical decentralisation. Decentralising your geographical representation of scientists or experts in science related areas is an effective way to avoid the image of the *white saviour*. It is essential to recognise the work of scientists and experts in non-western countries, where equally valid work is being carried out to solve problems. To achieve this, consider representing local places, such as the work of scientists or experts in related fields (e.g., health, technology, etc.) in non-western countries. You can support decolonising views of science and the scientific academy by focusing beyond Europe and the United States (or other western countries) and drawing from sources and academies from other regions.

Give voices a chance. Whenever writing about scientists from a non-white/non-western background do not only talk about them. Whenever possible give them the opportunity to talk by themselves in the first person to your audiences through cited text (or audio). In this way, we can avoid reproducing part of our colonial past by pretending to talk about them without them. Try to make them co-participants of your communicative piece of work.

Identity and self-representation. Social groups are not homogenous, they have intracultural diversity and they may not have a singular view or opinion regarding their identity or specific issues. Neither do they all have the same interests regarding general as well as scientific areas of enquiry. You can help to break with a uniformist view of non-white/non-western scientists by showing them in their diversity of scientific fields, areas of expertise, professional and personal preferences and beliefs, etc. Also bear in mind that they may not want to have an ethnic-racial label imposed upon them by us without giving their own opinion. When writing about someone, it is best to ask how they self-identify or what their preferred terms are (e.g., some Roma people prefer the term “Gypsy”, while others find it offensive). It is important to talk about matters related to race and ethnicity using terms that the community prefers and uses to self-identify rather than defaulting to what is generally accepted by dominant power holders and structures. This may require questioning and reimagining terms that have been historically used in favour of those identified by and for specific communities. Additionally, when offering descriptive characteristics of the protagonists of your science communications, consider carefully whether mentioning explicitly the characteristic in question is necessary to the scientific fact or science education story. Would the same information be included for someone from a non-western/non-white context in a similar situation?

Practise public recognition. It is important to acknowledge the contributions of scientists or experts from non-European or non-white backgrounds who have participated in your research or have collaborated in the design of your text. One way to do this is to ensure that they are acknowledged as co-authors or as relevant information sources/supporters. Doing so publicly acknowledges and recognises their contribution and role in the information provided.

Promote plural representation. It is essential to be fair with the plural reality of science and scientists. Hence the representation of people from non-white/non-western contexts in the field of science is critical to ensure they do not become socially invisible. You can promote the inclusion of people with different ethnic origins by presenting them as experts in their respective levels and domains of science (including research, management, decision-making positions and scientific communication teams), instead of considering them only as subjects of a scientific study. Similarly, you can highlight, as well, how past and present contributions of people from diverse communities have influenced STEAM knowledge production until today.

Revise your sources. Be aware that your sources may often come from a framework which may already convey implicit or latent racist tropes, Eurocentric and/or neo-colonial bias in the scientific reports or science communication materials. Think about the sources which your own bibliographical references depend upon and consider reviewing them. In addition, consider putting a mirror on the professional work of journalism/communication. You may want to abandon the current framework from where you do your work and look for other frameworks where these issues are being worked on.

Seek a balance of testimonies. Whenever writing about an event related to natural phenomena (or phenomena of a scientific nature) affecting members of communities in a vulnerability risk situation (e.g., a flood, a nuclear accident, pollution spill in the sea, etc.) do not only refer to the official versions and the governmental institutions involved. Try to reach also the voices of those affected by it or of those representatives from the affected communities who may have something to say as well. Avoid the “parachute-journalist” approach and try to learn more about the concerned community and their leaders to give them the opportunity to hear their voice.

Unbiased content structure (document, website, newsletter, etc.). When conducting systematic presentations of different science experts (or experts in the related fields), consider using a template that allows you to follow the same, or similar, structure in each case, regardless of their actual background. This will allow you to use a more general template without the need to place particular emphasis on the person's origin or ethnic affiliation (unless the social

actor/scientists tell you otherwise). It can be emotionally reassuring to know that there is no need to emphasise or share one's ethnicity unless they want to.

Add here any other recommendations you may have for writing inclusively in relation to this group:

VISUALISATION RECOMMENDATIONS

Avoid erotisation or sexualisation of bodies: Often people with a specific skin colour or origin are associated with stereotypical tropes such as being exotic (in aesthetically pleasurable terms) or being more prone to sexuality. In the use of images, especially of black women or women scientists of certain non-European or minority groups, be careful in accidentally depicting exotic and/or sexualised (or gender-biased) poses or actions. Convey images of non-white/non-western scientists that do not portray them as sexualised/exotic passive objects of scopical contemplation but rather as active subjects who are experts in their scientific arena. Moreover, the same will always apply when portraying non-white or non-western women who may not be scientists for science news or publications.

Avoid pitiful or paternalistic images. When showing images about a specific social or cultural context related to a scientific phenomenon (e.g., drought, pollution, climate change) avoid paternalistic or pitiful images depicting non-European or minority groups as being passive or unable to act. Remember that images often reproduce our own bias and can help to perpetuate this same bias. Also avoid *pathos* when contextualizing ethnic affiliation (or supposed affiliation) with a stereotypical environment/

background: for example, when referring to the Roma minority, by showing images with a crowd of children, or backgrounds of urban poverty (including classrooms or houses that look poor or very rural).

Compatibility of religious belief and science. Religious faith is part of many people's lives regardless of whether they are experts in non-scientific fields or in science (or related fields – e.g., health practitioners, technologists). Therefore, it is not a contradiction to show images of people working in a sphere related to science and wearing religious items at the same time. Additionally, you may want to dispel some bias regarding the stereotyped conflation of certain religious faiths and radicalism or irrational behaviours. Therefore, in this case showing images of people wearing religious items while working in science related areas might help in demystifying certain bias regarding these communities or religions.



Figure 1 Photo by: Ketut Subiyanto
Source: www.pexels.com



Figure 2 Photo by: [Jakayla Toney](#)
Source: www.unsplash.com

Illustrations and icons to support inclusion: There are members of other non-EU and non-white groups who are also scientists and experts in the related field. Whenever possible, through photographs, illustrations or icons try to make them visible and depict them acting as active social agents and scientists, not only as patients or passive elements in the images of scientific discoveries.

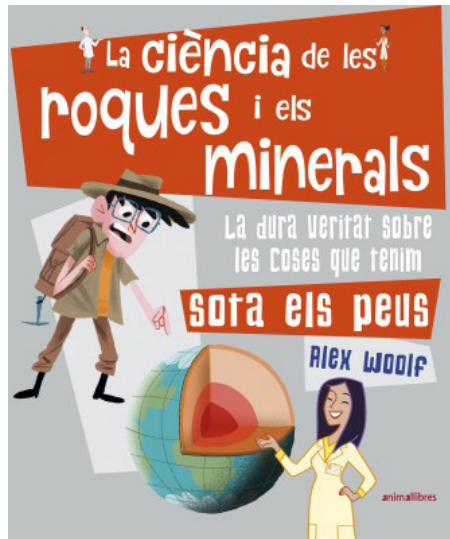
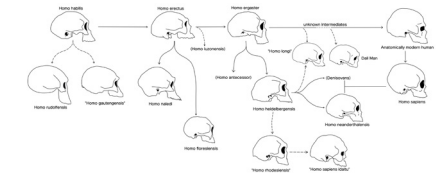
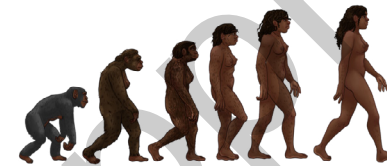


Figure 3 Children's Book "The Science of Rocks and Minerals" (Author: Alex Woolf; Illustrator: Paco Sordo). Ed. Brumerà

Furthermore, science books often portray illustrations in which the examples shown are always white males of Caucasian origin and without a disability. It is important to consider if such depictions are the only possible ones and if they are scientifically correct. For example, is the evolution of hominids inevitably leading to the disappearance of melanoma and hence to the predominance of whiteness? Do only white men evolve? Or ask yourself if there are other (more scientifically correct) images to show human evolution without such a racial and colonial or Eurocentric bias?



Figure 4 Illustration from the children's Book: "Black Women Scientists" (Author: Zinthia Alvarez Palomino; Illustrator: Nina Sefcik). Ed. Diputació de Barcelona



Figures 5, 6, 7 and 8 Different representations of human evolution. Source: Wikipedia (Wikicommons License)

There is also a tendency to hypervisibilise white bodies in health books (or in other media conveying images of human beings) without considering representing a plurality of bodies and skin colours more akin to human diversity. This hypervisibility of the white body leads also to the invisibility of certain non-white skin diseases given that some of these conditions appear differently in people with white and non-white skin (although medical books tend to represent only the former). It is important to reflect on this and consider if in certain cases illustrations of non-white/non-western bodies can (or should) be used in the science fields.

Promote plural representation. Images should represent this diversity of STEM efforts that all cultural communities undertake in the present and in the past, in relation to science and technology advances. Scientists' backgrounds, values, theoretical commitments, and fields of endeavour influence the nature of their findings. Thus, it is imperative to guide the audience in recognising that science is a transcultural human enterprise inexorably linked to individuals from different cultural and social contexts who have the power

to define what counts as science and what knowledge is worth pursuing. This critical understanding of the enterprise of science can help students recognise the importance of being scientifically literate and active citizens. Moreover, these scientists may conduct their research inside and/or outside the laboratory and it is essential to show them conducting their research in the field so as to normalise scientific diversity in environments where white dominance has been the normal currency. This is especially relevant given recent complaints of black scientists (e.g., Black Birders or Black Geophysicists associations) who have felt exposed or even monitored by authorities and locals when conducting their scientific research in white predominant natural environments.



Figure 9 Example of how science can be plurally represented.
Photo by: ThisisEngineering RAEng.
Source: www.unsplash.com



Figure 10 Example of how science can be plurally represented.
Photo by: Institute of Cancer Research.
Source: www.unsplash.com



Figure 11 Example of how science can be plurally represented.
Photo by: [ThisisEngineering](http://www.pexels.com)
Source: <http://www.pexels.com>



Figure 12 Example of how science can be plurally represented.
Photo by: [Monstera](http://www.pexels.com)
Source: <http://www.pexels.com>

Add here any other recommendations you may have for using images inclusively in relation to this group:

Other journalist associations or networks of reference you may want to contact for further support:

- More Color Media: <https://borgenproject.org/tag/more-color-media/>
- Media Diversity Institute: <https://www.media-diversity.org/>
- Native American Journalist Association (NAJA): <https://najanewsroom.com/>
- National Association of Black Journalists (NABJ): <https://nabjonline.org/>
- Afroféminas: <https://afrofeminas.com/>

- The Authority Collective: <https://authoritycollective.org/>
- Color Positive: <https://www.color-positive.com/>
- Diversify Photo: <https://diversify.photo/>
- The Everyday Projects: <https://www.everydayprojects.org/>
- MFON: Women Photographers of the African Diaspora: <https://www.icp.org/events/mfon-women-photographers-of-the-african-diaspora>
- Natives Photograph: <https://indigenousphotograph.com/>

Other resources:

- Inclusive Communication Guidelines (European Parliament): <https://www.europarl.europa.eu/contracts-and-grants/files/grants/media-and-events/en-annex-9-inclusive-communication-guidelines-of-the-european-parliament.pdf>
- NAHJ Cultural competence handbook: <https://nahj.org/wp-content/uploads/2020/08/NAHJ-Cultural-Competence-Handbook.pdf>
- Guide to Inclusive Photography, The authority Collective: <https://resources.photoshelter.com/photographers-guide-inclusive-photography/>
- British Muslim Media Guide: <http://www.salaam.co.uk/british-muslims-media-guide/>
- Conscious Style Guide: Design + Images: <https://consciousstyleguide.com/design-images/>
- Humaaans: Free mix-and-match illustrations featuring a wide range of skin tones, hair styles, and abilities: <https://www.humaaans.com/>
- The racial equity in data visualization checklist: <https://www.urban.org/sites/default/files/2021/06/08/do-no-harm-guide-checklist.pdf>
- Despora Photo Collection: Images of South Asian people (free): <https://www.theunmistakables.com/despora>
- ACS Inclusivity Style Guide: <https://www.acs.org/about/diversity/inclusivity-style-guide/diversity-and-inclusion-in-images.html#how-to-choose-images>

5.3.2. Persons with a disability

WRITING RECOMMENDATIONS

Accessibility is the key. Make the text visually accessible¹. Bear in mind that if the scientific information conveyed can be complemented with other means that make the experience more accessible, it may be useful to include them (e.g., Typhlological-sensorial material, subtitles in a video, use of schemes, flowcharts or supporting visual information that complements the texts, etc.).

Active social actors rather than passive ones. Ask yourself if you only report about science and disability news concerning science discoveries or products which benefit people with a disability (as patients or users). At the same time, consider if there is any possibility of publishing communications in which people who are also scientists with a disability are an active part of the scientific team making a scientific contribution in general. Ensure the visibility of people with disabilities in science projects. This allows also for unique and valuable insights for scientific advancement and ensures that research teams also normalise the participation in equal terms and the visibility of people with disabilities. In addition, this generates a change in the collective imagination of society where people with disabilities are often conceived as passive spectators or simple service-users.

Attention to language. Care should also be given when choosing words. Of course, you may be aware that your text may convey more meanings than expected, but although this is clear in relation to general contents, it is not so evident when writing about science or when addressing scientific facts to a wider audience. Given that scientific explanations are often presented as objective facts as if they were not conveying any additional implicit meaning whatsoever and given also that science has an authoritative role in our society,

¹ See section: "10 questions before writing about science or science education"

this topic is especially sensitive to take into account *at all levels*. Regarding persons with a disability, there may be a tendency to use terminology that betrays certain conceptions about positive/negative conceptions of these social actors (and this also includes scientists/experts in the field). Having “a disability” doesn’t mean that one is globally “disabled”. Hence, it is better to use the former term than the latter. Other terms such as “handicapped” carry strong negative connotation as well and this is the reason why this term has been discarded from current vocabulary. In this sense, a good practice example would be: Professor Rossi is a biologist with a disability, whereas a bad practice example would be: Professor Rossi is a disabled / differently abled/ handicapped biologist. It is thus important to keep examining the implicit connotations in the use of our daily words (that we may have normalised and naturalised) but that nevertheless may carry a heavy weight in our efforts to generate a less biased and more inclusive society.

Avoid generalisations. There are many types of disability (in science and elsewhere) although often the most iconically represented / the most visible in the media is that of people with wheelchairs or with behaviours that some people might find exaggerated (e.g., disability in science is often represented with well-known figures such as Stephen Hawking or Sheldon from a well-known TV show). Take into consideration, however, that there is a broad spectrum of disabilities with different realities and needs and that every disability has its own set of challenges and requirements (e.g., autism). Given this fact and the diversity of intersecting realities of each individual, it is crucial to avoid generalising when talking about the needs of a scientist or expert in the field with a particular disability.

Avoid infantilisation. The infantilisation of the “other” not only occurs often when talking to or about persons with a disability in general, but it especially happens when referring about/talking to women with a disability, especially in terms of knowledge and self-regulation etc. In the area of science, we should not assume that scientists with a disability are less mature than others. Sometimes such portrayal of infantile behaviour is used in comic TV shows about scientists or where scientists /children passionate about science appear being represented with overtly exaggerated expressive and impulsive infantile behaviour. Be aware of such societal bias and consider ways to redress this.

Disability in daily life. Even though they might not be mediatic figures, there are many scientists with a disability who conduct their activities with normality and efficiently on a daily basis. When talking with or about those individuals, remember that disability is a condition not a disease, and so does not define the scientist. Therefore, it is important to avoid using forms such as “suffers from”, preferring the term “person with a disability”, because disability is not synonymous with suffering. Furthermore, this point of view misleadingly conceives people with a disability as passive subjects (e.g., in science) rather than as active subjects and contributors to advances in society.

Identity and self-presentation. When presenting a scientist or an expert with a disability, take into consideration their self-representation: maybe that person only wants to present themselves as a scientist rather than as scientist with a disability. Mention the disability only when it is relevant to the context you are discussing and, if at all possible, consult them, to see if the individual concerned agrees with the used descriptions.

Look for referents in science/science education. When looking for scientific experts, it is important to consider the barriers that some scientists with disabilities might encounter, which may cause them to be less well-known or visible or mediatic. An intersectional approach to experts with a disability, such as women with disabilities, is also important. Seeking experts who have a disability is enriching for science and education, as they can provide additional information as persons who experience some realities that others may not. Take these invaluable sources of scientific knowledge into account as well.

Give voices a chance. Whenever possible, scientists or experts in the field may show interest in explaining their work or ideas by themselves. Even if the person may have a disability that makes it difficult to express their ideas, it does not mean that they cannot do it. You can try to find ways to include their voice and own ideas instead of just talking about them in the third person.

Add here any other recommendations you may have for writing inclusively in relation to this group:

VISUALISATION RECOMMENDATIONS

Active social actors rather than passive ones. We may often carry a mental image or a social imaginary of persons with a disability as being dependent or not capable of being as active as other persons without such a disability. This conception does not correspond with the daily behaviour of persons with a disability. In relation to the science fields, there is a tendency, when conducting science communication (in scientific journals, science museum exhibitions or else) to either not use images of scientists with a disability, or if they are engaged in a scientific activity, they tend to be represented as the passive subject of a scientific investigation, rather than as the scientists who produced it or participated in the scientific working team. Take this into consideration when you can choose between an image in the science field, representing the person/s with a disability as a mere patient (or passive) and an image representing the person/s as part of the working or decision-making scientific team.



Figures 13-14 Examples of a change in an image from patient (Fig. 13) to agent (Fig.14)
Photo by: [ThisisEngineering](http://www.pexels.com). Source: <http://www.pexels.com>

Avoid paternalism, sensationalism and/or infantilisation. On a daily basis, scientists with a disability, conduct their work successfully, although they may not be mediatic figures or may not be visible enough. When using images about people with disabilities, avoid using images that represent them in a situation of need and dependency. If you can choose among different images, you may want to use images showing them conducting their work or daily activities independently and as an active agent. In addition, be aware that often women with a disability comment that they are infantilised by others. Therefore, try to avoid using images showing them in a context that seems to infantilise them or showing them as passive and dependent social actors.

Illustrations and icons to support inclusion. In order to communicate in an efficient way without the use of photos, you may want to use icons in the scientific field (e.g., for graphs, science illustrations, etc.). Icons are a powerful resource to communicate but can also convey implicit biased meanings that may distort our conception about (in this case) persons with a specific disability. For example, the traditional International Symbol of Access (IAS – see image below) not only does not represent all types of disability but also represents the subject as static/passive. It is for this reason that there are teams of illustrators who are working on the design of more inclusive non-ableist or non-biased icons representing persons with a disability (see below). You may

prefer to use these icons whenever possible as they try to modify or even subvert traditional ableist conceptions that tend to depict them as passive subjects.



Figures 15-16 From the traditional International Symbol of Access (IAS) (Fig. 15) to a more inclusive active icon design (Fig.16). IAS (International Symbol of Access) Source: Wikipedia (Wikicommons license) / Photo by: [ThisisEngineering](https://www.thisisengineering.com/)
Designed by Sara Henden & Brian Glenney (The Accessible Icon Project)
Source: <https://accessibleicon.org/>

When using scientific illustrations, you may also want to consider including various types of illustrations of people with a disability undertaking daily activities, in the same way as anyone else does. You may even want to show them as lead actors of a scientific enquiry and/or a scientific team (e.g., as science teacher, active research scientist, laboratory director). They can also be depicted as active and positive social actors in the images selected. Consider also sharing intersectional example of persons with a disability (person with disabilities, of different ethnic origin, men and women...).

Visibility in daily contexts. When using images in scientific reports, documentaries, videos or in the news to depict daily situations, it is important

to include persons with a specific disability undertaking daily actions like everyone else does. Not making persons with a disability visible in the science media (and in the media in general) may carry negative connotations about these people as if they were unable to carry out daily activities in the same way as any other person. Allow them to be seen as regular social actors undertaking daily activities, so as to make their existence visible as social agents and active citizens that want to be considered as part of society. Bear also in mind that not all disabilities have equal visibility. Some are very visible (being in a wheelchair) and others are more invisible (e.g., autism spectrum).



Figures 17, 18 and 19 Photo by [ELEVATE](https://www.pexels.com/). Source: www.pexels.com / Photo by [ELEVATE](https://www.pexels.com/). Source: www.pexels.com / Photo by [ShotPot](https://www.pexels.com/). Source: www.pexels.com

Add here any other recommendations you may have for using images inclusively in relation to this group:

Other journalist associations or networks of reference you may want to contact for further support:

- National Center on Disability and Journalism: <https://ncdj.org/>
- National Union of Journalists – Journalists with a disability: <https://www.nuj.org.uk/about-us/equality-diversity-and-inclusion/disabled-members.html>
- Disability Journalists Association: <https://www.discojournos.com/>
- Disability visibility project: <https://disabilityvisibilityproject.com/>

Other resources:

- Reporting on Disability – Guidelines for the Media: https://www.unipd.it/sites/unipd.it/files/2018/ILO_Guidelines%20for%20Media.pdf
- Inclusive communication Guidelines (European Parliament): <https://www.europarl.europa.eu/contracts-and-grants/files/grants/media-and-events/en-annex-9-inclusive-communication-guidelines-of-the-european-parliament.pdf>
- Accessibility Handbook: A practical handbook for designers: <https://www.accessibilityuxdesign.cc/>
- ACS Inclusivity Style Guide: <https://www.acs.org/about/diversity/inclusivity-style-guide/diversity-and-inclusion-in-images.html#how-to-choose-images>

5.3.3. Gender (women and girls)

WRITING RECOMMENDATIONS

Attention to language. Care should also be taken when choosing words. Of course, you may already be aware that your text may convey more meaning than expected, but although this is clear in relation to general contents, it is not so evident when writing about science or when addressing scientific facts to a wider audience. Given that scientific explanations are often presented as

objective facts without conveying any additional implicit meaning whatsoever and given also that science has an authoritative role in our society, this topic is especially sensitive to take into account *at all levels*. Use inclusive language, in all publications, to reflect the equity and diversity of gender tropes and stereotypes. This can be achieved with the use of inclusive pronouns and by enforcing mechanisms or assessment that ensure the removal of sexist language in all publications and in pedagogical material to disseminate. It is important to not take for granted the use of certain pronouns when considering issues of gender.

Avoid a heroic and individualistic portrayal. Important male scientists have often been portrayed as individual heroes who have fought against all odds to become victorious in their discoveries. This is a misrepresentation of science, as science is essentially a communitarian enquiry and discoveries often occur due to serendipity rather than through rationally guided experimental steps. Thus, in our willingness to make certain female scientists visible, as if struggling to get recognised despite the gender barriers and stereotypes they found in their way, you may be portraying exaggerated feats by showing them as geniuses who won against all odds. Such a portrayal of female scientists may, however, generate a barrier for girls who would only be able to mirror themselves upon women geniuses (e.g., Marie Curie) instead of upon closer referents who might be more accessible and inspirational for them. Hence, always carefully balance the feats achieved by these female scientists (as you should also do when portraying male scientists' feats) with the actual role that they and other co-participants and team members may have had in the scientific discovery. Portraying an exaggerated heroic and individualistic approach of your female protagonist may convey paternalistic, caritative and even a sexist weight that you may want to avoid if you want to be fairer in the representation that teamwork plays in science. Moreover, avoiding such practice may show girls interested in science that they do not need to be like Marie Curie to be professionally acknowledged as such and become successful in the science fields.

Avoid stereotypes regarding gender-related scientific predisposition. In scientific publications and texts referring to science, it is important to avoid gender stereotypes. For instance, it should not be suggested that female

scientists are more emotional than their male counterparts, or that male scientists are more rational than female scientists. Similarly, it is incorrect to suggest that women are less enterprising, independent, or courageous than men. It is also important to avoid hierarchy and the attribution of different roles or tasks to different scientific professions based on gender. For example, it is important to avoid suggesting that women are more suitable for caring professions such as nursing, while men are more interested in research. Nor is it appropriate to prejudge or make claims that women would be less suitable for certain scientific areas in which more male colleagues work, such as experimental physics, or computer science.

Full name and surnames. Whenever writing about female scientists or experts in the related field, you should try to include their full name and surnames. Often women are addressed by their nickname, or by only their first name. At times images of female scientists portrayed side by side with their male peers have been shown without even specifying either their name or their science expertise, (contrarily to their male peers who are presented with their full name and as science experts in their respective fields). You should avoid this by treating both male and female scientists equally and by making them known by their full names rather than minimising their role by using only their nicknames.

Give voices a chance. When writing a piece of news or information involving women scientists or girls, it is important to also consider what they want to say about it. Such practice not only provides more opportunities to communicate in the first person but can also promote the representation of female leaders and referents in science. In order to facilitate making women scientists more visible in other media or in communication initiatives, you can also help in the creation of a directory of women scientists, who are leaders in a specific topic, accessible to schools, institutes, universities or other institutions so that it is easier for the media, scientific journalists or conference organisers (amongst others) to access these female voices and allow them to reach wider audiences.

Identity and self-presentation. Traditional descriptions of women in their professional fields have often portrayed them carrying heavy stereotypical tropes: from being presented as inspirational muses, to over-emphasising

their private life or their emotional aspects or trivialising some of their personal opinions or scientific (or political!) struggles. Moreover, representations of female scientists as geniuses or superheroines fighting against all odds in their fields may carry paternalistic and sexist connotations that do not help in trying to portray a faithful representation of how this scientist wants to be presented or known. When writing a piece of information that may involve a woman scientist (or a girl conducting science) try to ask her how she wants to be presented or if she agrees on how she is professionally described. If this is neither possible or practical, you can always try to seek an external opinion from an expert in gender equity issues, to know if your description may indirectly bear any of the traditional tropes that we have often naturalised without being aware of this.

Opportunities to generate gender-discrimination awareness. When writing science-related communications, if your topic deals about female scientists or about gender in science, consider this as an opportunity to widen the social awareness of gender barriers in science and to educate about gender inclusivity. This may be used as an opportunity to provide information about gender diversity and the barriers that people of different genders face in science fields through research and publications or through processes of exclusion/inclusion in society, including working sites.

Private vs public life. Conversely to the case of men, women are often presented in relation to their private life or situation (married to, mother of, lover of...). This also occurs in biographies of female scientists and in science narratives where female scientists appear. Ask yourself if such a presentation of their private life is essential to comprehend their scientific contributions, and if this is not the case, such an approach should be avoided. Also, when interviewing women scientists or experts they tend to be asked, differently from their male partners, excessively about their personal balance between professional and domestic life. Unless the interview is about such a specific topic, avoid mixing up professional and private issues. In case of doubt, ask them what topics they want to share with their public or if they wish to focus more on their professional aspects or they want to comment for any reasons (e.g., feminist claims, professional demands, etc.) about aspects related to the balance between their professional and private life. Furthermore, if you decide

in specific cases to associate emotional stories with the professional life of female scientists, consider doing so in the case of male scientists as well.

References and publication. When writing a science-related communication that requires citing scientific referents or experts, it is important to also include female scientists or experts in the field as referents. This is not only to promote gender balance but also to ensure that their valuable insights are taken into account in the field. One way to achieve this is by refining the percentage of publications that include female scientists as authors. Not just because of seeking balance but because they are also experts who, as such, deserve to be taken into account in the field and acknowledged as referent scientists. Another approach is to highlight underrepresented gender scientists in scientific research and publications. This may include examples of their research in presentations and publications, or the promotion of their work through social networks and other channels.

Add here any other recommendations you may have for writing inclusively in relation to this group:

VISUALISATION RECOMMENDATIONS

Active social actors rather than passive ones. Images of women or girl scientists, when shown next to a male colleague, often portray them as mere assistants or passive observers of what their male colleagues are researching, instead of showing them as actively engaging in the research activity. Alternatively, (or in combination with such representations) women scientists (or girls conducting science) are presented in the background

in relation to their male colleagues, who often take a foreground position in the image. Such representations of women scientists (or girls conducting science) in the background is a bias that mirrors and conditions how women (and girls) are often perceived at a societal level, as if their work is essentially that of assistance and is of less importance than their male colleagues. When choosing a photo or image / illustration representing female and male scientists, you may want to consider a different approach to this traditional representation, with one in which women or girls conducting science play a more active role and have a more central position in the foreground of the image.



Figures 20-21 Figures 20 to 21: Examples of the change from a scientist depicted in the background as passive observer or assistant (Fig. 20) to a female scientist depicted in the foreground as an active observer (Fig.21). Institute of Cancer Research

Source: www.pexels.com

Avoid erotisation or sexualisation of bodies. Representations of women in their professional fields often convey implicit meanings and bias/stereotypes, especially with objectifying and sexualising connotations. The way female bodies are represented form part of the tradition of denoting women as muses to be scopic objects of aesthetic or pleasurable contemplation rather than as creative and rational subjects that are more than a body to be examined. Therefore, male scientists are often photographed in the foreground (focusing

more on the face of the subject talking) while women are often represented in a full-body image that accidentally may reproduce the traditional objectifying and sexualising practices of depictions of women. It is for this reason that you may want to consider, as well, if for your communication a full body representation of the female scientist/s is essential or if a close-up of the person's face would be enough? What would you do if the scientist/s were male? Maybe you should consider using differently the images of women instead (in the same way you would with male colleagues in science), focusing more on the female scientist as a scientist researcher and subject of active discovery rather than as an object of aesthetic contemplation. In case of doubt, you may want to ask the scientists photographed how they prefer to be shown or ask an external expert in gender equity to see if, in the case of your science communication, you should avoid a general body frame or not of the female scientists. Alternatively, or complementarily to this, apply systematically the same criteria to both men and women in their visual presentation.

Beyond the reproductive role. In depicting women through historical images, dioramas, documentaries, etc. ask yourself if the representation is fair with the current knowledge which we have of the role of women in this historical context. Did women only or mainly work within the domestic household doing the chores? Did they have only a reproductive role or did they also play more productive/societal/political roles within such societies? In addition to this, when representing the reproductive role and other domestic roles: are you giving enough importance to the reproductive aspects of society? Or are you following the traditional "productive versus reproductive roles" = "important versus less relevant roles" criteria? If you have any indication that this is so, ask yourself what you can do to redress this male-centric and reductionist perspective to provide a broader and fair representation of the role of women and men in society beyond the traditional association of "men = productive role" and "women = reproductive role". Remember to consider or underscore the important societal aspects of the latter role, rather than only of the former one. Alternatively to this, you can use an image that contains strong bias in this sense so to explicitly address this bias to create awareness about these gender stereotypes. Furthermore, it may be advisable to disrupt the traditional conception and images of "female = caretaking tasks" versus

"Male = non-caretaking tasks" by presenting images of male scientists (or men in general) conducting these caretaking activities.



Figures 22-23 Examples of two different depictions of women in prehistory: as a caretaker (Fig.22) and as a creator of a tool (Fig. 23). Figure 22. A prehistoric woman taking care of her child. Source: Wikipedia (Wikicommons License) / A prehistoric woman making a tool for hunting. Source: Wikipedia (Wikicommons License)



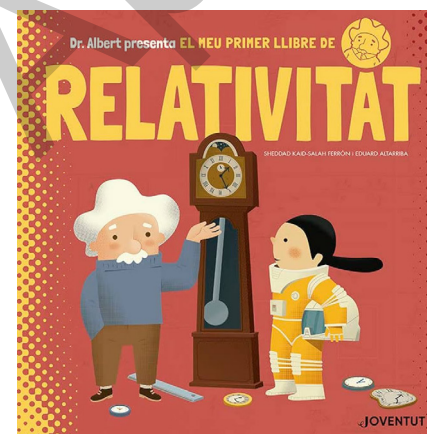
Figures 24 A man undertaking caretaking activities. Photo by: [Monstera](#)
Source: <http://www.pexels.com>

Full name and surnames. Whenever an image of a woman scientist or expert in the related field is shown, include her full name and surnames under the photograph. Often women are addressed by their nickname or only by their first name. At times, images of female scientists portrayed side by side with their male peers have been shown without even specifying their name or their area of science expertise (conversely to their male peers who are presented with their full name and as science experts). You should avoid this by treating both male and female scientists equally and by making them known by their full names, rather than minimising their role by only using their nicknames.

Use of icons and illustrations in science. You may want to use icons or illustrations when representing scientific data (graphs, charts, data flows, etc.) or when illustrating a particular scene (e.g., scientists in a science news piece or in a science book, depiction of prehistoric life in a Diorama, etc.). Icons and illustrations are powerful alternatives to the use of photographs but may also tend to reproduce traditional stereotypes about women. Beyond those aspects already summarised, it is also important to bear in mind that often, when using body images representing persons, what is presented as a neutral body (for example in anatomical descriptions of the human body in general or in a depiction of a person representing citizens), male bodies are depicted as the neutral form. This carries an enormous bias regarding what the norm and a neutral body may be. Thus, you may be interested in countering such conception of the “neutral body” by periodically interchanging male and female bodies in these types of charts or iconic images. In the case of using icons, be aware that there are working teams designing more inclusive non-gender biased icons such as in the initiative called “the noun project” (<https://thenounproject.com>).



Figures 25-26 Created by Eucalyp. Source: <https://thenounproject.com/> /
Icon representing female aeronautic engineers. Source: <https://thenounproject.com/>



Figures 27 Children's Science Book
“Relativity” (Illustrator: Eduard Altarriba;
Author: Shedad Khaid Salah-Ferron).
Ed. Juventud. Source: <https://www.editorialjuventud.es/autores/kaid-salah-ferron-sheddad/>

Science specialities & participation in outdoor spaces. Science fields are very diverse and plural, some do occur in laboratories while others take place mainly in the field or in natural environments. During centuries, women's spaces were restricted (with very few exceptions) to those of the private sphere or enclosed within four walls with difficult access to public spaces and to those in which men had a preeminent place. The fact that women currently have the possibility of conducting science work in the field and in natural environments is a fact that should also be considered when using images of female scientists specialised in certain scientific fields that relate to conducting their science activities in locations outside the enclosed lab (e.g., engineering, astronomy, geology, marine environments, etc.). This will help to normalise their place also in public spaces and in areas outside the limiting walls of the private sphere/household/work. This may also apply in some cases to female lab scientists who maybe do not need to be depicted inside their own labs but perhaps there is also the possibility (or willingness on their side) to show themselves as active agents in different outdoor (public, private or natural) spaces.



Figures 28, 29 and 30 Foto de Bruna Fiscuk en [Unsplash](#) / Photo Foto by ThisisEngineering RAEng in [Unsplash](#) / Photo by: NOAA. Source: www.unsplash.com

Add here any other recommendations you may have for writing inclusively in relation to this group:

Other journalist associations or networks of reference you may want to contact for further support:

- International Women's Media Foundation: <https://www.iwmf.org/>
- Women in Journalism: <https://womeninjournalism.co.uk/>
- World Association of Women Journalists and Writers: <https://uia.org/s/or/en/1100062918>
- Alliance for Women in Media: <https://allwomeninmedia.org/>
- Female Journalist Association: <https://wise.org.af/female-journalist-association/>

Other resources:

- Gender Decoder: Tool to detect gender biased language (originally built for job ads) <http://gender-decoder.katmatfield.com/>
- Toolkit on Gender sensitive communication: <https://eige.europa.eu/publications-resources/publications/toolkit-gender-sensitive-communication>
- Diversity, inclusiveness and gender equality style manual <https://eunice-university.eu/research/wp-content/uploads/sites/2/2022/09/D-6.3.-REUNICE-Diversity-Inclusiveness-and-Gender-Equality-Style-Manual-FINAL.pdf>
- Council of Europe Gender mainstreaming toolkit for co-operation projects: <https://rm.coe.int/final-gender-mainstreaming-toolkit-february-2019/168092e8f9>

- UN WOMEN Gender-inclusive language guidelines: <https://asiapacific.unwomen.org/sites/default/files/2022-11/Gender%20Inclusive%20Language%20Guidelines.pdf>
- UNITED NATIONS - Gender-inclusive language: <https://www.un.org/en/gender-inclusive-language/guidelines.shtml>

6. Conclusions

This document has been developed with the aim of becoming a useful resource for those communicators who aspire to elaborate more inclusive communications. We hope that this resource can be of reference for future communicators and also that other better and more detailed inclusive science education guidelines can be elaborated after this one.

To the educator or communicator who is reading these lines, we would like to say, THANK YOU! We can only hope we have been able to add this small grain of sand to build a better and brighter future together.

Pending Approval

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- Accessibility Handbook: A practical handbook for designers [<https://www.accessibility.uxdesign.cc>].
- Conscious Style Guide: Design + Images [<https://consciousstyleguide.com/design-images/>].
- Data Visualization Resources and Tools [<https://guides.lib.uw.edu/datavisualization/home>].
- Digital Accessibility Toolkit [https://www.cbm.org/fileadmin/user_upload/Publications/CBM-Digital-Accessibility-Toolkit.pdf].

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8. Summary of recommendations

10 questions before writing or communicating about science or science education

(1) Science experts: As referents in my science communications, did I take scientists (or experts) from different communities or social groups in vulnerability risk situations sufficiently into consideration?

(2) Monitoring: Did I conduct sufficient monitoring strategies to ensure that my science communications present all social groups in a respectful manner and without bias?

(3) Labelling: Am I sufficiently aware of the risk of labelling social groups if I put too much emphasis on generalisations within my communications?

(4) Voice: Am I giving sufficient voice in the first person to members of such social groups involved as testimonies or referents for this piece of information?

(5) Representation: Are members of communities in vulnerability risk situations going to be presented beyond the traditional way in they are usually represented?

(6) Tokenism: Am I going to include members of communities in vulnerability risk situations in our communication piece because it is coherent with the contents I am planning on communicating, or is it rather a strategy to simply embellish or present a “politically-correct” informative article?

(7) Biography: Am I willing to ask the expert/s how they prefer to be biographically described?

(8) Archive: Am I sure that the archive images available are not showing a paternalistic, infantilised, compassionate, egotistical or even sexualised representation?

(9) Advisors: Am I also involving or consulting for my communicative work, group members of the affected community to ensure a fair representation about their discoveries or issues involved in this informative piece?

(10) Private life: When is it correct to make explicit the private life or personal/biographical/physical-phenotypical aspects of that person and when is it not? Have I asked this/these person/s how they want to be represented?

Basic writing style tips that will make your communication more inclusive

Writing style: Simple writing, short phrases avoiding jargon.

Technical vocabulary: In case you are not sure if the audience is familiar with the language (scientific or local), or if it is possible that there are language difficulties, it can be helpful to provide a basic glossary of STEAM tools and materials for previous reference.

Font and size: Using an easy-to-read font such as Arial font size 12 or 14 or bigger (with a maximum of two different fonts). Use strategies such as colour distinctions or sizes in case of using subtitles to facilitate reading.

Visual Supports: when language can be an obstacle, visual support can give people another way to communicate, instead of relying solely on verbal communication. This approach is appropriate for working with all targets, including those who are not familiar with the local language, or those who may have a language delay. Use of visual support (images, icons, conceptual maps) to facilitate understanding especially for those who have difficulty reading. In addition, consider including sign-translators in your conference (or videoconference) events.

Tactile-Typhological support: consider including materials that allow tactile/ typhological interactions and/or texts in Braille as an additional support. If publishing a printed article, contemplate sharing an online version for those who don't rely on visual support, as partially sighted or blind people can rely on text-to-speech or text-to-braille software. If presenting graphs and content tables in a PowerPoint, you may want to share a printed version of the slides in a Braille format for the blind audience.

External support: Use of other types of support which facilitate reading, such as revision by experts in easy-to-read guidelines.

Basic organisational tips when conducting a public science communication event: science panels, venues or public exhibitions, etc.

> BEFORE THE EVENT

Organise balanced panels

Boost plural working teams

Ensure enough quantity, quality and location of the scientific information about underrepresented groups of scientists

Ensure accessibility issues in venues and exhibitions

Detect and dismantle barriers and inclusive environments in your science communication working areas

Boost training opportunities for your working teams

Ask for feedback from your external experts/advisory board members

> DURING THE EVENT

Ensure visual accessibility during panels

Be aware about issues on visibility, hypervisibility & invisibility of social actors in science

Take care of the language used

Let plural voices in the first person be heard

Boost dissemination of the event on your social media

Share successful stories/good cases

> AFTER THE EVENT

Ensure of boosting communication about the event and making social actors visible after the event

Consider self-evaluation (regarding inclusive aspects) of the panel or exhibition conducted

> SCOPES: COMMUNICATING INCLUSIVELY

WRITING RECOMMENDATIONS

ETHNIC & RACIAL DIVERSITY	DISABILITY	WOMEN AND GIRLS
Active social actors rather than passive ones	Accessibility is the key	Attention to language
Attention to language	Active social actors rather than passive ones	Avoid a heroic and individualistic portrayal
Avoid a heroic and individualistic portrayal	Attention to language	Avoid stereotypes on gender-related scientific predisposition
Avoid generalisations, acronyms and vague terms	Avoid generalisations	Full name and surnames:
Avoid pan-culturalist approaches	Avoid infantilisation	Give voices a chance
Avoid tokenism	Disability in daily life	Identity and self-presentation
Compatibility of religious beliefs and science	Identity and self-presentation	Opportunities to generate gender-discrimination awareness
Consider geographical decentralisation	Look for referents in science/science education	Private vs public life
Give voices a chance	Give voices a chance	References and publication
Identity and self-representation		
Practise public recognition		
Promote plural representation		
Revise your sources		
Seek a balance of testimonies		
Unbiased content structure (documents, websites, newsletters, etc.)		

IMAGES

ETHNIC & RACIAL DIVERSITY	DISABILITY	WOMEN AND GIRLS
Avoid erotisation or sexualisation of bodies	Active social actors rather than passive ones	Active social actors rather than passive ones
Avoid pitiful or paternalistic images	Avoid paternalism, sensationalism and/or infantilisation	Avoid erotisation or sexualisation of bodies
Compatibility of religious belief and science	Illustrations and icons to support inclusion	Beyond the reproductive role
Illustrations and icons to support inclusion	Visibility in daily contexts	Full name and surnames
Promote plural representation		Use of icons and illustrations in science
		Science specialties & participation in public venues

Pending Approval



C4S

Communities for Sciences