Guidelines for good practice in Science Communication

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Authors:

Manuel Célio Conceição, University of Algarve, task leader, (coord.)

Ulf Evert, Kiel University, task co-leader
Ana Matias, University of Algarve
Anna CohenMiller, Nord University
Daniele Previtali, University of Naples 'Parthenope'
Danielle Martine Farrugia, University of Malta
Edward Duca, University of Malta
Emilia Leszkowicz, University of Gdansk
Enora Leproust, University of Western Brittany
Gabriela Borges, University of Algarve
Juan Lucas Cervera Currado, University of Cádiz
Katarina Vukojevic, University of Split
Massimiliano Lega, University of Naples 'Parthenope'
Mirco Mührenberg, Kiel University
Sasa Mladenovic, Univeristy of Split
Tove Holm, Nord University
Umair Najeeb Mughal, Nord University
Wojciech Glac, University of Gdansk

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1. Introduction

Science communication (SciComm) is a discipline that aims to create methodological and communication frameworks to share scientific knowledge with a large range of possible audiences, from peers to the general public. The objective is to bridge the gap between complex scientific or technological knowledge and the identified target audience, making science understandable, accessible and engaging.

Effective SciComm relies on several basic principles of communication. Clarity is the key; using simple language and terminology without sacrificing accuracy helps in conveying complex ideas. It may involve storytelling, framing scientific discoveries, or theories in narratives that can be linked to people's experiences or curiosity. Engagement is crucial to encourage interactions, questions, and discussions and thus foster deeper understanding. Furthermore, tailoring the message to the audience's interests and prior knowledge enhances the relatability of the scientific information.

Multilingual language policies and competences, and decisions regarding language use are essential to achieve the intended goals and practices of SciComm. It is not just about the linguistic aspects but also about cultural nuances and contexts. Translating terminology into everyday language is essential for reaching diverse audiences. Moreover, language itself can influence scientific thinking and discovery. Different languages offer unique perspectives, and the way language structures concepts can affect how scientific ideas are formed and communicated.

Science and knowledge are intertwined with communication, and effective dissemination of scientific findings shapes our collective understanding. Communicating science effectively allows society to make informed decisions, fosters scientific literacy, and encourages critical thinking. This communication can occur through various media, from traditional forms like books, articles, and lectures, to modern multimodal platforms such as podcasts, videos, or social media.

Through SciComm research, teaching, transfer and governance activities in higher education, and their potential impacts are conveyed to a wide audience It is a vital connection between the scientific community, in this case, SEA-EU alliance and our outside contexts.

After the presentation of the agreed definition of the concept of SciComm, and needs analysis, we present guidelines for SciComm activities of the Alliance, which emerge from the identified needs. Our next step (in 2024) will be to define standards for monitoring the quality of work done in this area.

2. Definition of SciComm

Science is a key element for the development and progress of societies, and humanity overall. Scientists communicate their advancements via scientific journals within their respective fields, often presenting such findings at conferences. However, scientific activity is not conducted "alongside" or "outside" of issues affecting individuals or societies. Therefore, it is necessary for scientific achievements and findings to be known not only by other specialists in their scientific domains, but also in a more comprehensible manner by public and private institutions, public administrators, businesses, and different groups within the public. This is to ensure that all the knowledge generated by the scientific community can ultimately benefit society, which sustains research through taxes in most cases. Therefore, SciComm is important for advancing scientific knowledge, fostering public trust and interest in science, and addressing societal challenges that require public input. SciComm has various purposes, which can be summed up as informing (also about science implications for society), educating, and inspiring. Considering that the majority of research is funded with public funds, and transparency on the part of public funding agencies is increasing, it is crucial to develop plans and policies that allow for clear understanding of how public money allocated to research is invested.

The previously described context has led to the development of the field/discipline known as "Science Communication", and its importance is growing steadily. Thus, this field is concerned with the theory and practice of communicating science effectively and ethically. Activities such as "The European Researchers' Night" have been taking place in major European cities for over a decade, serving as an example of the importance which European institutions place on making knowledge visible and accessible to the public. However, this kind of events is not the only way to communicate science to the general public. Articles in popular magazines, podcasts, videos, or social media posts are other tools which may be used to reach the same objective. SciComm can involve different types of interactions, such as one-way, two-way, or multi-way communication, depending on the level of engagement and feedback between communicators and the audience. Furthermore, in a large portion of scientific project calls, researchers must specify what communication activities they will undertake for disseminating their results beyond publishing them in specialized journals, and presenting contributions at conferences.

In light of all this, SciComm can be defined as follows:

"Science communication describes many ways, including dissemination, in which the processes, results and implications of science and knowledge – broadly defined – can be shared or discussed among scientists, as well as with public and private institutions/administrations, policy makers, enterprises, and the general public within the framework of open and democratic science and knowledge."

3. Needs analysis

SciComm plays a crucial role in bridging the gap between researchers and the wider public, facilitating knowledge dissemination, and fostering collaboration between academia and society.

This document focuses on the needs analysis for improving SciComm within the SEA-EU Alliance.

1. Increasing Awareness: Raising awareness among single entities of the Alliance about the importance of SciComm is vital. A SciComm Expert Group should be established in each Alliance entity. The Expert Group signals the need for SciComm training programs for:

- Faculty members;
- Communication offices, and other concerned offices.

These programs should focus on explaining and training participants on:

- SciComm benefits for the professional career (especially for faculty members), university and society;
- communication skills;
- understanding target audiences (their needs, expectations, limitations, etc.);
- use of appropriate communication tools and channels.

2. Incentives for science: Often researchers think it is not worth doing SciComm because (in most cases) it is neither evaluated for professional growth (both in terms of national regulations and internal competition) nor connected to incentives, not only of a monetary nature. If researchers are expected to commit to SciComm, there is a need to link SciComm to some incentives.

3. Support for Researchers: Researchers require assistance in effectively communicating the results of their research to diverse audiences. This is because, often, they have neither enough time to dedicate to SciComm nor adequate skills for making effective SciComm. In the absence of incentives that encourage researchers to commit to SciComm, it is essential to establish a dedicated office (specifically trained) to provide support in SciComm. This office would offer guidance on various communication strategies, tools, and platforms tailored to different disciplines, and help faculty members to deliver appropriate SciComm initiatives.

4. Allocation of Resources: To strengthen SciComm across the SEA-EU Alliance, allocating resources at both the individual entity and alliance levels is crucial. The Alliance can support initiatives such as workshops, conferences, and public

engagement by dedicating specific funds and infrastructure. Additionally, collaboration between single entities within the Alliance should be encouraged to pool resources and expertise, and in consequence foster a more coordinated approach to SciComm.

5. Development of Institutional SciComm Policy/Guidelines: Institutional SciComm policies and guidelines can provide a framework for effective SciComm practices at the SEA-EU level (SEA-EU guidelines). However, these SEA-EU guidelines should ensure that SciComm practices comply with national regulations of SEA-EU members. . Although SciComm needs be guided at the SEA-EU level, room should be left for the Alliance members to tailor their institutional SciComm guidelines.

6. Coordination: A university designated as a SciComm leading university within the Alliance should take responsibility for coordinating the development and implementation of these guidelines at the SEA-EU level.

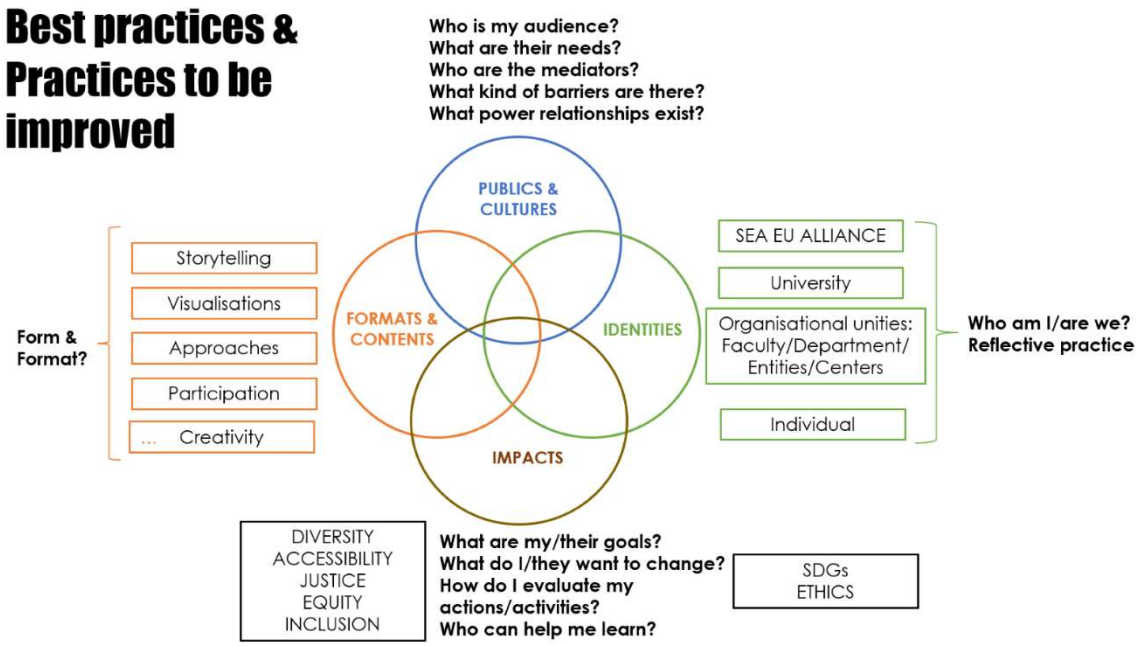
Coordination among different actors within the SEA-EU Alliance is essential. A designated coordination body at the SciComm leading university should facilitate collaboration, knowledge sharing, and exchange of best practices among entities within the Alliance.

In addition, there is a need to coordinate SciComm with choices strategic for the identity and brand of the Alliance. SciComm is very important to make all stakeholders recognise the Alliance in the market. What type of science is communicated will characterise the identity and brand of the Alliance.

7. Measurement of Impact and Evaluation: To assess the quality and effectiveness of SciComm efforts, impact measurement tools and methodologies should be developed. These metrics should be aligned with national regulations while providing comprehensive understanding of the impact of SciComm initiatives. Regular evaluation and improvement of SciComm practices is necessary to adapt to changing contexts and emerging trends. Feedback mechanisms and follow-up evaluations can ensure continuous refinement and enhancement of the guidelines.

8. Engagement: The Alliance should identify and engage ambassadors to enhance its presence and recognizability. Moreover, student engagement at all levels should be prioritized to nurture a culture of effective SciComm within the academic community.

4. Proposed guidelines



In the scheme above, we identify four areas of good practice in SciComm:

Publics & Cultures

Formats & Content

Impacts

Identities

These four areas are not separate but intertwined. They are explained in more detail below.

Publics & Cultures

<u>Who is my audience?</u>

When it comes to communicating science to others, a distinction is often made in advance between experts and laypeople. However, this line is rarely clear-cut. Scientists can be laypeople when it comes to a field of research other than their own, even if they are experts in their own field. Conversely, non-academics can also be experts in something to a certain extent. For example, they can contribute to scientific knowledge in citizen science projects. Robust and traditional knowledge of indigenous peoples could also be considered expert knowledge. Factors such as age, education and professional background also influence the level of knowledge or prior knowledge of a scientific topic. The extent to which a particular section of the public is unfamiliar with an issue can therefore vary widely. The more complex and/or abstract my scientific topic is, the more important is the question: What does my audience know about it?

What are their needs?

The answer to this question can be as varied as, and closely related to, the previous one. Does my audience have a basic interest in learning more about a scientific topic? Is there a topic they are interested in, but no one has been able to explain it to them in a way they can understand? Is the audience aware of different points of view on an issue and needs guidance to make up their own mind? Are there concerns or even fears about possible risks in everyday life or in research? Does my audience have pressing questions that affect their life and daily routines that they want scientists to answer?

It is also about addressing the audience through target group and needs-oriented communication. This also includes emotional needs: The more unfamiliar a topic is to an audience, the more likely I am to make a connection if I help them to understand even complex or abstract content, for example by using everyday references or understandable comparisons. Describing key (personal) experiences that paved the way to a research topic can also increase a scientist's credibility. Conversely, the more prior knowledge an audience has, the more analytical parts they are likely to expect and need.

Finally, a person may simply ask: How can I benefit from (a certain type of) research? How much does it relate to my personal and everyday life? We may not always be able to make a direct connection between a research topic and people's lives. But even the comprehensible presentation of a topic can possibly trigger recognition and fascination.

Who are the mediators?

If we are approaching a particular community from an academic perspective and want to reach them, it can be very helpful to talk first to people (mediators) who know that community well; for example, because they are involved with its members professionally or as volunteers. It is advisable to get to know these members beforehand and talk to them about the community to be reached. In the best case scenario, the mediators can already tell a lot about the needs, habits and questions of a given community, and together with researchers they can develop a strategy for science communication with its members.

What kind of barriers are there?

Language barriers

This can be caused by technical jargon. Technical terms that an audience is unfamiliar with or has only a vague idea of need to be explained at least in an understandable way. If this is not enough, for example because it is an abstract concept or a complex method, figurative comparisons or metaphors can help. Again, caution is advised, as suboptimal visualisation can also lead to misunderstandings among an audience, even if they think they have understood everything correctly. This (newly) created misconception can then become a barrier.

Cultural barriers

Depending on the cultural background, there may be fundamental differences in the way people communicate with each other. This can easily lead to misunderstandings. What I say may not come across as I mean it to my counterparts. A well-intentioned openness on my part may well be perceived as irritating or even intrusive by my counterparts. Getting to know each other's cultures and exchanging views on common ways of thinking and communicating can be very helpful, even before the actual science communication begins. It is about nothing less than finding common ground before delving into (scientific) depth.

Inclusive communication

Inclusive science communication (ISC) is an approach that goes beyond mainstream models of SciComm. ISC aims to acknowledge historical oppression, inequalities and biases in order to foster a sense of belonging for marginalised communities in STEM (science, technology, engineering, mathematics) and to improve the perspectives of these communities. Moreover, it is essential that all members of society have the opportunity to develop skills in STEM so that they can be well prepared to make informed decisions and actions.

What power relationships exist?

Power relationships can be real or perceived as such. Either way, they can influence how people perceive themselves and others, or how they perceive themselves in relation to others. An expert may be perceived by non-experts as unreachable, distant or even arrogant. A scientist may be perceived by non-scientists as a decision-maker in some science-based democratic processes, while they feel that they are not involved in such processes and have no say. These situations may occur, for example, due to lack of expertise/knowledge or low/not high social status. This makes the following question all the more important: Who feels that they are not involved in science-based processes and decisions and why? How can these people be heard? How can we involve these people so that they do not feel excluded, even if they *are* excluded and disconnected?

Formats & Contents

Formats

Choosing the form and format we want to use for a topic can be difficult these days because of the almost unlimited possibilities. Here it is helpful to put this question in the context of the other areas of the scheme:

Is there a format that seems particularly suitable for a community? Is a certain format particularly suitable for my current topic? Does a certain format support my communication goals better than other formats? Do I/we like the handling and design of a certain format better than others? Where can I get inspiration from already existing formats?

Content

Purpose/main message

A question to ask yourself at the beginning of choosing content to communicate is as follows: Why do I want to communicate or discuss a particular issue? More on this in the Impacts section.

Comprehensibility

What is the right balance between scope and depth when communicating and conveying a topic? Where is my focus? Trying to cover both scope and depth to the same extent can easily lead to my audience being overwhelmed by the wealth of information and eventually switching off because they lose track. Even if we care about a topic in its entirety and find it difficult to limit ourselves to certain parts because of our closeness to it, this art of restraint can help sharpen the core of what we want the audience to take away.

Clarity

As described in the section on audiences and cultures, the way we explain content plays an important role. Language needs to be clear and understandable, and technical terms need to be explained in an understandable way.

Reliability

It goes without saying that the data must be comprehensible and collected according to internationally accepted scientific guidelines. Preliminary or uncertain data must be identified as such, as must subjective comments.

Impacts

What are our/my/their goals?

The Golden Circle described by Simon Sinek contains, read from the outside in, the questions WHAT? HOW? WHY? The title of the corresponding book is “Start with Why” (Sinek, 2009). WHAT is our (scientific) topic? HOW describes the process, the scientific way of working. In science communication it can also stand for the type of communication (see section Formats & Content).

Why is a topic important to me/us? Why might it be important, interesting and/or relevant to others? These goals are of course closely linked to the issues described in the Publics & Cultures section.

What do I/we/they want to change?

The level at which change is sought can vary greatly. It can range from disinterest to interest or even fascination. It may be about increasing knowledge or correcting misconceptions. It may be that I/we want to see things like behaviours or laws changed, or certain actions taken based on scientific facts. I may want to reduce prejudice or scepticism towards science or increase understanding of scientific points of view. Perhaps it is also about giving people active access to scientific processes or facilitating the decision to pursue an academic career.

How do I evaluate my actions/activities?

In order to continuously improve one's own science communication or to increase its effectiveness, standardised and internationally tested and recognised evaluation methods are a powerful tool. In addition, a good feedback culture should be cultivated. Feedback and evaluation are not only about improvement possibilities and wishes, but also about the qualities you already have. The fact that you are already good at something in the eyes of others does not necessarily mean that you are aware of it, let alone sure of it.

Who can help me learn?

Are there any training opportunities within or outside my university where I can improve and develop my science communication skills? Are there trainers and programmes available? This can be very helpful, especially in the context of effective feedback (see above). A test audience or test persons can also help. These can be friends and relatives who have little or nothing to do with your own research. They can often be the first people to give feedback on whether your way of trying to communicate and achieve a particular goal is working.

Identity

All the potential actors within SciComm from an individual to the Alliance are a particular type of person(s) or organization. SciComm policies and initiatives should respect the qualities that make a person or an organization different from others. What more, they should strengthen their sense of identity.

5. Synthesis

In conclusion, the comprehensive exploration of SciComm in this document underscores its pivotal role in bridging the gap between the scientific community and the broader public within the context of the SEA-EU Alliance. The proposed guidelines, emerging from the needs analysis, provide a framework for enhancing SciComm practices within the Alliance.

The definition of SciComm presented in this document encapsulates the multifaceted nature of the discipline, emphasizing its importance in making scientific knowledge accessible, understandable, and engaging to diverse audiences. The document underscores the intertwining of science, knowledge, and communication, portraying SciComm as a vital activity inside scientific community but also as a dynamic link between the scientific community and external contexts.

The needs analysis sheds light on critical aspects, including the imperative to raise awareness, incentivize scientists for SciComm efforts, support researchers in effective SciComm, allocate resources strategically, and establish institutional SciComm policies and guidelines. These considerations, accompanied by the call for coordination, measurement of impact, and continuous evaluation, lay the groundwork for a comprehensive and sustainable SciComm strategy within the SEA-EU Alliance.

The proposed guidelines further delve into four interconnected areas—Publics & Cultures, Formats & Content, Impacts, and Identities—providing a nuanced approach to SciComm. By addressing questions about audiences, their needs, potential barriers, and the power dynamics involved, the guidelines offer practical insights into tailoring communication strategies effectively. The emphasis on content clarity, reliability, and suitable formats aligns with contemporary communication challenges, where diverse channels and formats abound.

The Impacts section introduces a thoughtful approach by encouraging communicators to start with the fundamental question of 'Why,' aligning with Simon Sinek's Golden Circle (Why? How? What?). It prompts communicators to identify the importance of their topic, while fostering a deeper connection with audiences. The presence of inclusive science communication and the need for continuous evaluation reflects a commitment to adaptability, responsiveness, and equity in SciComm practices.

In essence, the proposed guidelines provide a first holistic and adaptive framework for effective science communication within the SEA-EU Alliance. As the Alliance moves forward, the integration of these guidelines into its communication strategy will not only enhance the Alliance's visibility and recognition but also contribute to fostering a culture of scientific literacy and engagement within the broader community. The commitment to ongoing evaluation and improvement ensures that the science communication practices remain dynamic, responsive, and aligned with the evolving needs of both the scientific community and the public it serves.