Scientific Communication in Applied Research Groups: A Methodological Proposal Focused on Digital Media

Ágatha Nataly Reis Moreira[1, *], Filipe Cardoso Brito [2,3], Aloísio Santos Nascimento Filho[2,3]

[1] *UNIFTC, Salvador, Bahia, Brazil*
[2] *Universidade SENAI CIMATEC, Departamento Stricto Sensu, Salvador, Bahia, Brazil*
[3] *Núcleo de Pesquisa Aplicada e Inovação—NPAI, Salvador, Bahia, Brazil*
**agatha.m@ba.estudante.senai.br*

Abstract: Scientific communication within applied research groups faces challenges stemming from diverse audiences, varying resources, and distinct institutional contexts, particularly in digital environments. This article proposes a reference model to guide communication strategies tailored to these specificities. The methodology comprised three stages: mapping current practices, identifying barriers faced by researchers, and structuring the reference model. As a result, strategic pillars were established, encompassing objectives, target audiences, communication channels, resources, and evaluation methods, along with adaptation parameters based on group size, research focus, and project characteristics. Rather than offering a one-size-fits-all solution, the model serves as a flexible and reflective tool to support research groups in developing more effective, critical, and socially engaged communication strategies. Future empirical applications may help validate and further refine its usefulness across different contexts.

Keywords: Scientific Communication, Communication Strategies, Reference Models.

1. Introduction

Communication can be understood as a process involving the transfer of ideas, thoughts, or feelings between a sender and a receiver, through verbal or nonverbal means. It allows for the expression, planning, and development of strategies, including within the scientific domain [1]. An illustration of its relevance emerged during the COVID-19 pandemic, when intense interactions within the scientific community enabled coordinated responses to the virus. This context appears to have underscored the potential of communication in addressing contemporary challenges by fostering the circulation and democratization of knowledge [2–5].

The democratization of knowledge refers to expanding access to scientific information and involving citizens in the construction and use of such knowledge, within the paradigm of open science [6]. Nevertheless, the same pandemic context also revealed significant challenges, such as the spread of misinformation, which contributed to vaccine hesitancy and undermined immunization efforts [3, 7]. These episodes suggest that traditional scientific communication strategies may prove insufficient in digital environments marked by misinformation, echo chambers, and difficulties in distinguishing verified information from fake news [8].

In this context, science communication no longer seems to function merely as a final stage of the research process; instead, it tends to emerge as a cross-cutting dimension that requires careful planning, mediation, and active engagement with target audiences [9]. However, various structural and cultural barriers continue

to hinder this process, including the excessive of technical language, the institutional undervaluing of science outreach, and the lack of specialized training among researchers [10, 11]. In Brazil, a country with deep social inequalities, these challenges may become even more complex, further limiting the social reach of science and its capacity to influence local realities [12, 13]. While companies and research institutes often maintain formal communication structures, applied research groups typically operate with limited resources and fragmented strategies. As a result, their outputs tend to remain confined to academic environments [14–16].

Information and Communication Technologies (ICTs) appear to offer new opportunities for fostering dialogue with diverse audiences. However, their effective use may be constrained by several factors, such as the need to adapt language, unequal internet access, and the absence of robust communication strategies [4, 11]. Despite advances in digital communication, significant gaps still persist in translating scientific content into formats that are more accessible, appealing, and engaging [5]. Initiatives like altmetrics seek to assess the social impact of science through alternative indicators. Still, as Funtowicz and Ravetz [17] caution, such metrics may fall short of capturing the complex interactions between scientific knowledge, social contexts, and citizen participation.

This article seeks to propose a reference model for developing communication strategies tailored to applied research groups. It introduces a conceptual model developed through the mapping of current practices, the identification of key barriers encountered by researchers, and a critical review of relevant literature. The proposed model aims to offer criteria to support the strategic planning of science communication, with the goal of enhancing its reach and social relevance. It is hoped that this approach may help strengthen the social role of science and contribute to the creation of more inclusive and sustainable cities, in alignment with Target 11.3 of the Sustainable Development Goals (SDGs).

2. Methodology

The methodological approach adopted for the development of the reference model was structured into three stages: mapping current practices, identifying barriers faced by researchers, and structuring the reference model.

2.1. Mapping Current Practices

This stage involved a survey and exploratory analysis of how applied research groups communicate their scientific outputs and activities through digital media. Platforms such as LinkedIn, Instagram, YouTube, Twitter/X, institutional websites, open-access repositories, and scientific blogs were considered.

The objective was to identify patterns, gaps, formats, and recurring strategies, with particular attention to the type of language used and the level of engagement with non-specialist audiences. The analysis aimed to understand how these groups adapt their content across different platforms and for various audiences, as well as the communication resources they employ.

2.2. Identifying Barriers Faced by Researchers

This stage was based on a literature review focused on the challenges researchers face when translating scientific knowledge into formats that are accessible and comprehensible to broader, non-specialized audiences.

The review considered the following barriers frequently highlighted in the literature on science communication:

- Insufficient communication training;
- Time constraints;
- Lack of institutional support;
- Limited awareness of the importance of science communication;
- Limited proficiency with digital tools.

This analysis was informed by the critical perspectives of several authors [18, 19] who examine traditional models of science communication and explore the evolving challenges involved in mediating between science and society. These authors underscore the need for more dialogical approaches—those that are sensitive to sociocultural contexts and capable of fostering meaningful citizen engagement.

2.3. Structuring the Reference Model

This stage aimed to define two sets of core elements for the construction of the reference model, based on the systematization of observed practices and the barriers identified in the literature:

- Strategic axes – representing the structural components of science communication within applied research groups;
- Adaptation parameters – serving as contextual variables that guide how the model may be applied according to the characteristics of each group and project.

The organization of these elements followed a modular and flexible structure, intended to facilitate the model's adaptation and replication across diverse institutional, thematic, and operational contexts.

3. Results and Discussion

Based on the methodological approach outlined, this section presents the main findings from the development of the reference model for communication strategies in applied research groups. The results reflect the decisions and

analyses conducted in the previous stages, showing how the strategic axes and adaptation parameters were integrated into the proposed model. Additionally, the discussion explores current challenges in science communication, such as the structural dynamics of social media that often hinder rational discourse, and the phenomenon of clickbait, which can lead to the trivialization of scientific knowledge.

3.1. Results

This section outlines the findings from each of the three stages that informed the development of the reference model. First, it presents insights from the mapping of current communication practices, followed by the identification of key barriers faced by researchers. Finally, it details the model's core elements, strategic axes and adaptation parameters, that reflect the synthesis of earlier results.

3.1.1. Mapping Current Practices

The mapping of communication practices across various digital media revealed that each platform has distinct characteristics and affordances, shaping both the type of content produced and audience engagement strategies. Social networks like Instagram and YouTube favor visual and interactive formats, while institutional websites and repositories are more focused on delivering formal and structured content.

In addition, platform algorithms follow specific logics that directly influence content visibility. For example, LinkedIn tends to prioritize posts with strong initial engagement and topics deemed relevant to professional networks, whereas Instagram and YouTube reward posting frequency, audience retention, and the use of native features such as Reels and Shorts [20–22]. These dynamics affect the organic reach of posts and call for platform-specific strategies that consider both content type and algorithmic expectations.

As such, applying a uniform communication strategy across all platforms is neither effective nor desirable, reinforcing the need for a flexible and context-sensitive reference model. Another important finding concerns group size: larger research groups typically have access to dedicated communication resources, whereas smaller groups often face operational constraints that limit both the scope and quality of their outreach efforts.

3.1.2. Identifying Barriers Faced by Researchers

The literature review highlighted that communication barriers vary according to disciplinary field and target audiences. Applied research in areas such as health, environment, and urban planning often requires more accessible and participatory communication

approaches, yet these frequently collide with limitations such as insufficient training, excessive workloads, and lack of institutional support [23].

Project-specific factors also emerged as relevant. Initiatives with strong community engagement or public policy relevance tend to require inclusive and collaborative formats, while more exploratory or technical projects often rely on traditional academic dissemination channels [23]. These distinctions underscore the importance of tailoring communication strategies to the contextual specificities of each research initiative.

Moreover, barriers aren't limited to researchers or institutions alone. The digital platforms themselves introduce structural challenges. Platforms such as Instagram, YouTube, and Twitter/X operate on algorithmic models that privilege content with viral potential, emotional resonance, or polarizing narratives—factors often at odds with the principles of scientific communication. As noted by other authors [24, 25], scientific visibility in such environments depends not only on content quality but also on the ability to conform to fast-paced, entertainment-driven formats. This tension between clarity and scientific rigor can lead to the oversimplification or distortion of knowledge.

Thus, beyond the well-documented institutional and individual-level challenges, it is critical to recognize that digital media dynamics have become an additional layer of inequality in the communication of science. This underscores the urgency of developing communication strategies that are critically informed, adaptive, and capable of navigating these environments thoughtfully.

3.1.3. Structuring the Reference Model

Drawing on the previous stages, the reference model was structured around two core components: strategic axes and adaptation parameters.

Strategic Axes define the main dimensions that should guide the planning and implementation of science communication efforts in applied research groups:

- Communication objectives – Clarifying the goals (e.g., dissemination, engagement, education);
- Target audiences – Identifying the segments with which the group intends to communicate;
- Channels and formats – Selecting appropriate media and languages for each audience;
- Capacities and resources – Assessing the team's capabilities, infrastructure, and time availability;
- Evaluation and impact – Establishing metrics to monitor and improve communication outcomes.

Adaptation Parameters serve as contextual filters that allow the model to be adjusted according to the specific conditions of each group or project:

- Group size – Relating to operational capacity and resource availability;
- Research focus – Linked to the scientific and societal objectives of the research;
- Project characteristics – Encompassing complexity, methodology, and intended audience(s).

The interaction between these axes and parameters enables the design of communication strategies that are both flexible and contextually responsive, ultimately aiming to expand the social impact of science.

3.2. Discussion

This study aimed to propose a reference model to support the development of science communication strategies in applied research groups. It argues that such strategies should be guided by well-defined structural components and contextual parameters to ensure alignment with the particular institutional, thematic, and operational contexts of each group. In parallel, the analysis draws attention to the digital environments in which scientific communication now largely occurs. These environments are shaped by platform-specific logics that may interfere with the credibility, clarity, and social relevance of scientific content. Effective science communication today, therefore, requires not only technical competence but also a critical understanding of the political and symbolic dimensions of these platforms.

Rather than offering a one-size-fits-all solution, the proposed model acknowledges the heterogeneity of contexts in which science is produced and communicated. By integrating mapped practices with a critical review of persistent barriers, it aims to enhance strategic decision-making in science communication, especially in terms of public engagement, digital inclusion, and broader knowledge appropriation.

Despite its practical contributions, the model doesn't claim to resolve deeper epistemological tensions within science communication, such as the illusion of neutrality or the limits of the deficit model [18, 26]. Nor does it fully address the structural inequalities that hinder science communication in Brazil, including exclusionary language, low levels of scientific literacy, or institutional resistance to dissemination practices [10]. These limitations do not undermine the model's relevance; instead, they highlight important avenues for future research, including empirical validation and theoretical refinement.

In the immediate term, however, the model offers a conceptual and operational foundation for applied research groups seeking to structure their communication efforts in a more intentional, reflective, and socially engaged manner. By recognizing that science communication is a situated and contested practice, this model contributes to the broader goal of strengthening the public presence of

science and its role as a driver of social transformation.

4. Conclusion

The development of a reference model for scientific communication strategies in applied research groups aimed to provide both a conceptual and practical foundation to support researchers in designing more effective and contextually grounded communication actions. Drawing on a three-stage methodological process, the model introduces a structure composed of strategic axes and adaptation parameters, which together account for the diversity of audiences and communication channels, as well as the operational realities of research groups, their fields of activity, and the specific characteristics of their projects.

Rather than offering a purely technical or prescriptive solution, the model acknowledges that science communication is embedded in symbolic struggles, political choices, and ethical dilemmas, particularly within digital environments shaped by algorithmic mediation, visibility pressures, and the spread of misinformation. In this regard, the proposal engages with critical literature by advocating for a situated, dialogical, and strategic approach to science communication, positioning it as an integral, not auxiliary, component of the scientific process.

By systematizing elements that guide the planning and contextual adaptation of communication strategies, the model offers an initial step toward enhancing the communication practices of applied research groups, improving their effectiveness in reaching appropriate audiences with content that is both relevant and accessible. While its empirical implementation remains a subject for future study, the model's immediate contribution lies in providing a practical and adaptable framework that encourages more deliberate, reflective, and socially aligned communication decisions. Future research can help to validate, refine, and expand this model across different institutional, thematic, and disciplinary contexts, contributing to a more inclusive and impactful communication of science.

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