

Chapter # 10

SCIENCE COMMUNICATION AS A FIELD OF PRAXIS: A theoretical model of converging domains

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ABSTRACT

Science Communication (SC) has expanded across multiple formats and platforms, but it lacks a theoretical consensus on its nature and purposes. This chapter proposes a theoretical model that understands SC not as a process or an instrument, but as an autonomous field of praxis. The model argues that SC materialises its practice at the convergence of four fields—the scientific, the communicational, the educational, and the technological—and operates through a process of negotiated autonomy. This praxis-based approach opposes traditional paradigms of discursive reformulation and genre, which reduce it to a merely instrumental view. Instead, we consider SC as an intentional and reflective action that redefines itself, its object, and its purpose. The model suggests that SC must present science in action, aim to expand the public's conceptual profile, and foster a relationship of mutual enrichment between science and society. This approach seeks to strengthen trust in science, recognising it as a pillar of a more just and democratic society. The model also offers conceptual guidance for the design, analysis, and evaluation of communication practices across diverse institutional and social contexts.

Keywords: science communication, field theory, otherness, conceptual profile.

1. INTRODUCTION

Science Communication (SC) occupies an increasingly prominent space in contemporary society. Driven by both new information and communication technologies, as well as social demand, its production expands into multiple formats and platforms. Paradoxically, this practical expansion contrasts with a persistent lack of theoretical consensus on its fundamental nature (Lima & Giordan, 2021). Faced with this scenario, this chapter aims to propose a theoretical model that understands SC not as a process, discourse, or tool, but as an autonomous field of praxis interconnected with other fields. Our proposal aligns with an emerging sociopolitical turn in Science Education (Moura, 2021), contributing to the field of SC toward values of social justice and collective well-being.

Historically, attempts to define SC have been dominated by two main interpretations. The first, and most traditional, conceives of it as a discursive reformulation—a kind of translation or simplification of a specialised source discourse, such as the scientific one, into a language familiar to the public. More recently, a second perspective proposes SC as its own distinct discursive genre, characterised by relatively stable thematic, stylistic, and compositional features. Despite both definitions being relevant, we consider that these views are insufficient, as they limit SC to a communicational or discursive perspective that neglects its practical complexity (Lima & Giordan, 2021).

The proposal defended here is that SC should be understood as an autonomous field (Bourdieu, 1989, 2004) that materialises its praxis at the intersection of multiple spheres of human activity (Bakhtin, 2011). According to this idea, SC is formed in the dialogue and tension between the scientific, communicational, educational (Grillo, 2006b; Lima & Giordan, 2021), and technological spheres. All these spheres exist and operate under the influence of a larger context, the social, political, and economic instance. In turn, the internal and external dynamics of these fields are animated by the active participation of the public.

Advancing this definition requires rethinking its objectives. We propose articulating the purpose of SC praxis in relation to the Conceptual Profile model (Mortimer, 1996). We argue that SC should aim to expand the public's scientific capital (Archer, Dawson, DeWitt, Seakins, & Wong, 2015). This model seeks to reinforce the relationship between science and society by embracing the genuine nature of science (Marras, 2016).

This chapter adopts a theoretical-analytical approach grounded in critical literature review and conceptual synthesis. The proposed model was developed through the systematic articulation of contributions from Science Communication, Science Education, Sociology of Science, and Science and Technology Studies (STS). The selection of references followed three criteria: (i) theoretical works that explicitly problematise deficit, transmission, or instrumental models of SC; (ii) authors who conceptualise science, communication, or education as socially situated practices; and (iii) contemporary contributions that address public trust, scientific culture, and sociopolitical dimensions of science. Rather than aiming at an exhaustive review, the chapter seeks to construct an interpretative synthesis that critically contrasts historical paradigms and integrates convergent theoretical insights into a coherent model of SC as a field of praxis.

2. SC AS DISCOURSE: FROM DISCURSIVE REFORMULATION TO DISCURSIVE GENRE

To advance this discussion, it is essential first to examine the interpretations that have historically underpinned the field.

2.1. Discursive Reformulation

One of the most widespread interpretations understands SC as a linear process of discursive reformulation. In this model, SC is essentially seen as an activity of translation or recodification (Lima & Giordan, 2021), in which a specialised language, hermetic and restricted to peers (Chassot, 2003), is translated into a non-specialised language accessible to a broader audience. The science communicator thus assumes the role of a mediator-translator (Marras, 2016), transposing the source discourse of science into a language familiar to the public. Historically, this perspective has rendered SC a synonym for the simplification of knowledge produced by specific fields, but directed at the masses, comprising supposedly ignorant individuals (Lewenstein, 2003).

The first weakness of the model is its formal infeasibility. The discourse of SC rarely maintains the form or compositional structure of scientific discourse. For example, in science journalism, one of the most recognised modalities of SC (Bueno, 2010), the structure of a scientific article is often inverted. The focus is on applications and results, aiming to capture the reader's interest (Grillo & Olímpio, 2006). Additionally, SC discourse systematically employs resources such as metaphors, analogies and stylistic tools, which are used more restrictively in standard scientific discourses (Lima & Giordan, 2021).

Second, there is the incompatibility of principles between the languages to be translated. Scientific language strives to be univocal, meaning it seeks to establish a systematic terminology in which each concept has a single, precise meaning within its theoretical framework, thereby avoiding ambiguity. In contrast, everyday language is polysemic and contextual by nature. Its words carry multiple meanings, connotations, and an inherent vagueness that, while functional for social life, does not withstand rigorous logical analysis (Lima & Giordan, 2021). The translation between these two symbolic universes cannot be a process of simple term substitution, but necessarily implies a complex recreation of meanings.

Finally, the most forceful critique lies in the ontological and epistemological rupture between science and SC: their objects of reference are not the same. While science has the purpose of understanding the Universe in its concrete conditions, SC should have scientific culture itself as its object. Therefore, SC discourse is not systemic, but referential and contextual (Lima & Giordan, 2021). It only points to a concept or result, without requiring the reconstruction of the entire scientific theory that supports it.

2.2. The Discursive Genre

In response to the translation paradigm, an interpretation emerged that sought to grant greater autonomy to SC, proposing it as a distinct discursive genre. This perspective argues that SC fits the definition of genre as a relatively stable type of utterance, characterised by three elements: thematic content, compositional construction, and verbal style. According to this view, SC would meet these requirements: its theme would be science and technology; its composition would be based on specific structures, such as information segmentation; and its style dispenses with the esoteric language of science by employing analogies, generalisations, and simplifications (Zamboni, 2001). Although this approach represents an advance by moving SC away from the condition of a byproduct of scientific discourse, it also has limitations.

The first limitation lies in the diversity of formats through which SC materialises, such as documentaries or museum exhibitions. Therefore, SC is not a particular genre, but rather an activity that takes place within various genres (Grillo, 2006a), and each of them has its own rules, stylistic, and compositional constraints. Framing such a vast range of practices as a single and stable discursive genre is therefore problematic. The second limitation, which deepens the first, is the influence of multiple fields on the constitution of SC. SC is an activity that transits and suffers coercion from different fields, such as the scientific and the communicational (Grillo, 2006b; Lima & Giordan, 2021), being, therefore, a fundamentally hybrid product molded by the forces and logics of the fields with which it interacts.

3. SC AS FIELD AND PRAXIS

The critical analysis of the translation and discursive genre understandings reveals their insufficiencies in accounting for the complexity of SC. To overcome these views, we support the understanding of SC as praxis, as proposed by Lima & Giordan (2021). This change shifts SC to an intentional, conscious, reflective, and transformative social action. Under this definition, SC must have clear objectives and seek to transform society's relationship with science. This statement prompts communicators to reflect on their practices, the impact of their messages, and the public's needs.

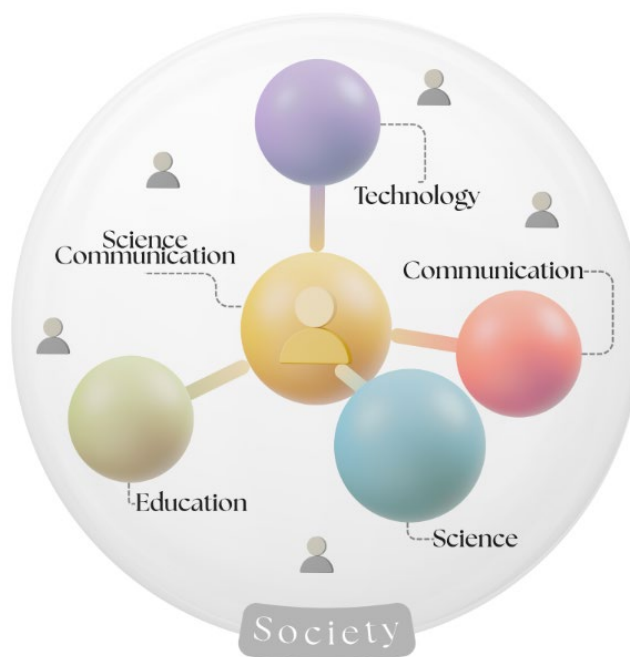
This praxis emerges at the complex intersection of multiple spheres that have specific internal dynamics and discursive practices (Bakhtin, 2011). In this sense, it is necessary to ground SC as an autonomous field, a social space of struggle (Bourdieu, 1989, 2004).

The SC can be understood as an autonomous field that produces discursive genres with specific purposes as they approach their spheres of intersection. That is, SC has its own rules and professional identities, appropriating and integrating the logics and capital of adjacent fields. It is thus constituted in the dialogue and tension between the scientific, communicational, and educational spheres (Grillo, 2006b), as well as the technological sphere.

4. THE FOUR SPHERES THAT DEFINE THE SC AS A FIELD

The autonomous and interconnected nature of SC can be visualised as a central sphere surrounded by four spheres (Figure 1), creating a five spheres model. Each of these spheres is a field of action with its own logic and capitals (Archer et al., 2015; Bakhtin, 2011), including the central sphere, which is the SC. It is essential to understand that this structure is not isolated; on the contrary, it is immersed in a larger system—the social, political, and economic context—that sustains and influences the entire structure. Funding interests, public science and technology policies, social agendas, and dominant ideologies shape what is considered science worthy of being communicated and how it should be expressed. Thus, the model reveals SC as a field that, although autonomous, is deeply anchored in its historical, cultural, and political context.

Figure 1.
The Five Spheres Model of Science Communication (SC).



The autonomy of SC signifies that SC is not a passive conduit for other domains. Instead, it utilises specific knowledge from each of its intersecting spheres, transforming it to characterise its own internal rules, validation mechanisms, and forms of symbolic value,

which the actors within it uphold. Furthermore, no field possesses absolute autonomy—not science itself, nor politics, nor the media, nor education. The strength and resilience of the SC field, therefore, lie not in achieving isolation but in its constant capacity to negotiate its autonomy with these intersecting domains. Because of this, SC avoids being merely subservient or instrumental to other fields. Viewing SC through this lens, we are compelled to examine the broader conditions of its production, circulation, and reception.

4.1. The Scientific Sphere

The scientific sphere, in this model, provides SC with epistemic capital, that is, the content, establishing a relationship of mutual importance. It is necessary to consider that this sphere, far from being merely a body of knowledge and a homogeneous block, is a field of disputes traversed by distinct interests and worldviews (Moura, 2021). Science itself has been driven by the imperatives of competition and productivity, going against the grain of slower and more reflective scientific practices that are attentive to their consequences (Stengers, 2023). Therefore, SC should not dialogue with “The Science” as a single entity, but positions itself in the midst of this plurality of practices, choosing which voices and which models of science it will bring to the public arena.

Given this, what science should be presented? One of the biggest mistakes of traditional SC is to focus exclusively on the results, consensuses, and cold certainties of science. An alternative is the presentation of science as a cultural process “entangled in its mediations and controversial conditions, full of uncertainties and fragilities” (Marras, 2016, p. 99). This proposal highlights science in action (Latour, 2012) that breaks down the walls of the “sacred enclosures” (Marras, 2016) and exposes the true nature of science.

At this point, a pertinent objection can be raised: wouldn't we be providing ammunition to its detractors by exposing the hesitations of science? The answer lies in the understanding of the constitution of trust. The historical insistence on operating under the motto of science, which seeks to prove facts, may have produced an unexpected rebound effect in the digital age. By presenting itself as a distant and infallible authority, it may have fostered an estrangement and repulsion from a public that did not participate in its construction process. Furthermore, the first sign of revision can unsettle the conception of science as absolute truth. This scenario leaves a space readily filled by denialist movements—which, ironically, mimic this same language of authority to gain prestige (Germano, 2011).

Trust in science should not be justified by a single infallible method or by the genius of individuals, but by its character of critical scrutiny. Knowledge becomes trustworthy when it withstands the evaluation of a diverse community of experts, generating a consensus (Oreskes, 2019). Its strength lies not in a central dogma, but in its distributed self-correction mechanism: peer debate, replication of experiments, revision of theories, and so on (Harari, 2024).

By opening the sacred enclosures to expose the controversies, science is not showing weakness; on the other side, it can demonstrate that a network designed to self-correct is different from an echo chamber, which, like denialism, is intended to self-affirm. This opening of the process is a political act. A society that understands that science progresses through doubt and debate will be better equipped to identify the false certainties of anti-scientific discourse.

Furthermore, the refusal to disclose the process not only fuels mistrust but also creates conditions for the fallacy funnel—the mechanism by which rational people are drawn to irrational beliefs (Ariely, 2024). This funnel can begin with a seed of doubt regarding an authority or scientific knowledge, which traditional SC can plant. Instead of offering a decree, the proposal to show science in action provides an invitation to understand the scientific process. By making the reasoning transparent and showing the debate, SC occupies a space that misinformation would fill.

4.2. The Communicational Sphere

SC is associated with the communicational sphere beyond its vehicles and strategies for communication. The focus here is not only on the media aspects, but on the very nature of the communicative act: the dialogue, the negotiation of meanings, and the recognition of the other as an interlocutor. This sphere provides SC with the logic and tools necessary to perform its role. This dynamic moves away from the transmission paradigm. It delves into the praxis of dialogue, where the message is built not on a one-way street, but in the continuous interaction between the speaker and the listener. The success of SC, therefore, depends on the ability of its agents to operate within a two-way logic, using communication tools to establish a relationship of otherness with the public.

4.2.1. The Role of the Public: From Passivity to Otherness

This model repositions the role of the public, abandoning its conception as an indistinct multitude or passive recipients (Marras, 2016). The public has its own active cultural repertoire, a set of knowledge and values that mediates the way any message is received, understood, and resignified. An individual's Scientific Capital (Archer et al., 2015) is unequally distributed socially, which explains why specific publics feel more or less at ease with science. It is not due to a simple lack of scientific knowledge, but rather to a complex web of life experiences, practices, and social relationships.

Communication with the public is not a benevolent concession of science, but an intrinsic need for its own constitution as a social practice. It is through encounters with others that science can reflect on itself and build meaning. The mechanism for this relationship occurs in a process of otherness. The science communicator needs to put themselves in the public's place to, upon returning to their own, obtain a broader perspective that allows them to understand their own field in a new way (Fetter, 2023).

This dynamic transforms communication from a unilateral transmission into a relationship of mutual enrichment. One might argue why the scientific community should care about this enrichment. The justification unfolds in three essential dimensions, presented below, which update traditional arguments for the contemporary scenario and introduce a new perspective.

In societies where research is extensively funded with public resources, accountability is a non-negotiable ethical duty. Access to knowledge produced collectively is a citizen's right and a prerogative of democracy (Fetter, 2023). Additionally, there is a growing disinterest among young people in pursuing academic sciences (Marras, 2016). Dialogue with the public is essential to inspire future generations, ensure social legitimacy, and provide continuous support for scientific activity in a world with multiple competing sources of information.

The relationship of otherness with the public forces science to leave its sacred enclosures and gives SC greater recognition. When confronted with the questions, concerns, and logics of the non-specialist world, the scientist is compelled to reflect on the assumptions, limits, and ethical implications of their work. This dialogue can generate new research questions and promote a renewal of the sciences themselves (Marras, 2016). Interaction, therefore, is a mechanism of refinement for scientific practice (Fetter, 2023).

4.3. The Educational Sphere

If the relationship with the public is one of otherness, then what should be the purpose of this dialogue? We propose that SC offers a scientific perspective as a new lens for reality, without nullifying other forms of knowledge, thereby increasing the complexity and versatility of individuals' cognitive and cultural repertoires.

4.3.1. The Conceptual Profile as the Objective of SC

Traditional SC models tend to view the public as a “lay”, that is, a homogeneous mass of people who lack scientific knowledge (and need it) or have a distorted and inadequate knowledge that needs to be restored. These views ignore the public’s knowledge and, consequently, how the scientific knowledge communicated will be understood and make sense to them. These conceptions can be associated with a Banking Education (Freire, 2013; Germano, 2011) or a conceptual change (Mortimer, 1996) regarding Science Education (SE). If SE itself, which aims to teach science to the public, has solidly criticised these ideas and given up on them, then why should SC still take them as its objective?

Based on the Conceptual Profile (CP) model (Mortimer, 1996), we argue here that SC should aim to offer its audience opportunities to expand their repertoire. The CP model suggests that learning does not occur by eliminating prior ideas, but by the evolution of a profile of conceptions. It means that the scientific ideas (coming from SE or SC) coexist with the previous conceptions, originating from common sense, with each of them being activated in the context that is most appropriate for it.

In this way, the purpose of SC should not be to supplant the public's everyday, cultural, or traditional knowledge, but rather to provide an opportunity for enriching their CP. The praxis of SC, therefore, must favour the scientific perspective as a new zone in this profile, which begins to coexist with other forms of knowledge, increasing the complexity and versatility of individuals' cognitive and cultural repertoire. The implications of this paradigm shift are highlighted.

First, this model is based on respect and empowerment of the public. By not treating the pre-existing repertoire as an error to be corrected, it recognises the public as an active interlocutor and holder of valid knowledge in their own contexts. Second, this approach promotes a genuine democratisation of knowledge. The idea of filling the public with scientific knowledge, which is the expression of the deficit model’s philosophy (Lewenstein, 2003), by seeking to impose the scientific view as the only correct one, operates under a logic of epistemic imperialism (Latour, 2019; Marras, 2016). In contrast, the CP model offers the scientific perspective as an addition, not an imposition. It thus contributes to an ecology of knowledge (Santos, Meneses, & Nunes, 2006), recognising the possibility of a multiplicity of cultural natures and valuing intellectual pluralism instead of seeking uniformity.

At this point, a pragmatic question arises: can a specific SC action catalyse the development of an individual's CP? So, we believe that the answer is yes. A successful SC action does not exhaust a scientific theory. But it can introduce a new dimension to the profile, generate awareness about the profile itself, and evoke interest in science (Marras, 2016). For many, a single SC action can be the first contact with a scientific approach to a particular subject, laying the groundwork for future learning. A single SC action can spark the curiosity that leads the individual to seek more information on their own, thereby continuing the development of the profile.

From a practical perspective, this can be illustrated by considering, for example, a public communication initiative on climate change. An SC activity grounded in the CP model would not aim to replace everyday explanations - such as seasonal weather perceptions or local experiential knowledge - but to introduce scientific perspectives (e.g., probabilistic climate models, long-term data trends) as additional interpretative zones. These perspectives may later be activated by individuals when engaging in public debates, interpreting news, or making civic decisions, without requiring the abandonment of other forms of knowledge. In this sense, the role of SC is not instructional mastery, but epistemic expansion.

4.4. The Technological Sphere

The fourth sphere, essential in the contemporary scenario, is the technological one, which is not just a channel, but a field with its own logic and capital. The logic of this sphere is driven by factors such as algorithms, engagement metrics, virality, and monetisation. SC, as an autonomous field, needs to appropriate these platforms and tools, subverting their intended purposes.

The influence of this sphere is transversal and extends beyond digital formats. For example, museum exhibitions permeate this sphere in the dissemination of events on social networks, ticket sales, the use of augmented reality, or interactivity. Technology is also essential for collecting engagement data and audience analysis, favouring a reflective and evidence-oriented praxis.

As an illustrative case, digital platforms can be used not merely to disseminate scientific results, but to expose elements of scientific process, uncertainty, and debate. Formats such as short explanatory videos, interactive visualisations, or comment-mediated discussions allow science communicators to foreground controversy, methodological limits, and revision processes. When strategically appropriated, these tools can counter algorithmic simplification by fostering reflective engagement rather than passive consumption.

Instead of submitting to the logic of click and profit, SC must act in these channels to promote the transparency of science and invite the public to understand the scientific process, instead of just accepting its results. This approach fosters a more resilient trust and facilitates a sense of otherness with the public. Therefore, the technological sphere operates as a system that offers, at the same time, an unprecedented reach infrastructure for SC and imposes coercions that the science communicator needs to manage.

4.5. The Construction of Professional Identities

The understanding of SC as an autonomous field interconnecting the four spheres also requires an analysis of the agents that constitute it. Science communicators are professionals with a distinct identity, shaped by their trajectory, capital, and the position they hold in the field. They should develop competencies related to the four spheres, and their identity is, therefore, hybrid.

To effectively perform SC actions, science communicators must possess a strong understanding of scientific methodologies and knowledge, yet rigid academic formalities should not constrain them; use communication strategies without submitting to the logic of immediacy and unilateral communication; master pedagogical and didactic strategies without being limited to the coercions of formal education, seeking to broaden the CP of the public; and understand the architecture of the technological sphere without being hostage to its platforms.

The struggle for capital in the field of SC manifests, for example, in the search for recognition of its practice as a legitimate expertise, rather than just a hobby for scientists or a subgenre of journalism. Far from being translators who limit themselves to presenting undeniable scientific results disconnected from the realities of the public, the success of the communicator's action lies in showing science in action (Latour, 2012).

5. FINAL CONSIDERATIONS

Throughout this chapter, we sought to deconstruct traditional views of Science Communication (SC) and, in their place, systematise a theoretical approach that understands SC in its complexity and autonomy. SC should be conceived not as a translation process or a unified discursive genre, but as an autonomous field of praxis. This praxis materialises at the

intersection of four spheres—the scientific, the communicational, the educational, and the technological—appropriating their logics and capitals without, however, submitting to any of them.

From the scientific sphere, SC inherits the object of its work—scientific culture itself, with its processes and uncertainties—and the need for rigour and legitimacy. From the communicational sphere, it appropriates the channels, the strategies and discursive genres, subverting the logic of mere transmission to establish a genuine dialogue with the public. From the educational sphere, SC extracts the purpose of acting to expand conceptual profiles, offering a different lens to see the world. Finally, the technological sphere provides the infrastructure and digital logic that SC uses to amplify its voice and encourage the public to participate more actively.

The model proposed here redefines the conceptual pillars of SC. Its object should not be science as a final product, but science in action, with all its uncertainties and controversies. Likewise, its relationship with the public should not be one-way knowledge transmission, but rather one of mutual enrichment, a dialogue that aims at mutual understanding. Finally, its goal should not be the substitution of everyday knowledge nor to fill the public with scientific knowledge, but to promote intellectual pluralism and an ecology of knowledge. Therefore, the scientific communicator should be understood as a professional who has the specific knowledge necessary to perform this SC.

Beyond this theoretical contribution, this model can inform reflective practices in multiple contexts, such as science journalism, museum education, public engagement initiatives, institutional communication, and digital science platforms. Rather than prescribing methods, it offers analytical lenses to guide decision-making, clarify objectives, and critically assess the relationship between science, publics, and mediation technologies.

Ultimately, this model invites SC to definitively abandon the one-way street that has so long marked its history. By recognising the diverse logics of its constituent spheres and the public as a legitimate interlocutor, SC moves towards building a more resilient and profound trust in scientific culture. Transforming science communication into a pillar for a more just, critical, and democratically engaged society with science is the ultimate hope of this chapter.

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