Systematic literature mapping: research on scientific divulgation/popularization in the field of Linguistics /

Mapeamento sistemático da literatura: pesquisas sobre divulgação/popularização científica na área da Linguística ‑

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ABSTRACT
The text presents a systematic literature mapping focusing on research related to scientific divulgation in the field of Linguistics, using data from CAPES Thesis and Dissertation Database to answer the following questions: "(1) Does the research address scientific divulgation (SD), scientific journalism (SJ), or another type of science popularization?; (2) Does it differentiate between these concepts?; (3) Is it linked to a master's or doctoral program?". This study aims to provide a foundation for future research. The mapping covered the period from 2020 to 2024 and prioritized studies with the keyword "divulgação científica" or similar terms in the title. After applying the filters, 18 studies were selected, including 10 Master's dissertations and 8 Doctoral thesis. The results highlight the recurrence of studies analyzing objects related to SJ and the categorization, conducted during the systematic literature mapping, of new science popularization practices, such as the mediatization of science by expert influencers.
KEYWORDS: Systematic Literature Mapping; Scientific Divulgation; Scientific Journalism; Science Popularization; Linguistics.

RESUMO
O texto apresenta um mapeamento sistemático da literatura com foco em pesquisas sobre divulgação científica na área da Linguística, tendo como fonte dados o Banco de Teses e Dissertações da Capes, a fim de responder às perguntas: "1) a pesquisa aborda a divulgação científica (DC), o jornalismo científico (JC) ou outro tipo de popularização da ciência?; 2) faz a diferenciação entre esses conceitos?; 3) está vinculada ao Mestrado ou ao Doutorado?". A justificativa que move este trabalho é a necessidade de levantar dados para subsidiar pesquisas futuras. Os aportes teóricos são estudos que discutem a popularização das ciências como uma prática social. O mapeamento compreendeu o período de 2020 a 2024 e privilegiou pesquisas com a palavra-chave "divulgação científica" ou similares, no título do trabalho. Após aplicados os filtros, foram selecionados 18 trabalhos, sendo 10 de Mestrado e 8 de Doutorado. Como resultados destacam-se a recorrência de pesquisas cujos objetos de análise pertencem ao JC e a categorização, feita durante o MSL, de novas práticas de popularização da ciência, como a midiatização da ciência por influencers especialistas.
PALAVRAS-CHAVE: Mapeamento Sistemático da Literatura; Divulgação científica; Jornalismo científico; Popularização da ciência; Linguística.

1 Introduction

This study is part of the integrated macro-project - teaching, extension and research - of an inter-institutional nature, the Integrated Laboratory of Scientific-academic Literacies (LILA), which develops actions in favor of academic-scientific literacy. The objective was to conduct a systematic literature mapping (SLM) focused on research about scientific divulgation in the field of Linguistics[1], in order to answer the following questions: 1) Does the research address scientific divulgation, science journalism, or another type of science popularization? 2) Does it differentiate between these concepts? 3) Is it linked to a Master's or Doctoral program? The justification behind this study is the need to gather data to support future research on the topic. For the intended purposes, the research selected the CAPES (National Council for the Improvement of

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[1] We emphasize that the mapping carried out by Cristovão *et al*. (2023) differs from the present one, as this study is based on dissertations and theses. Moreover, although we map dissertations and theses in the field of Applied Linguistics, the object of SD or SJ in these works may address any topic or area of science.

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Higher Education) thesis and dissertation database as the search source and established a time frame from 2020 to 2024. In the first section, we discuss the concept of science popularization and differentiate between scientific divulgation and science journalism (Rojo, 2008). The methodology section presents the research steps, defines systematic literature mapping (SLM), and distinguishes it from the systematic literature review (SLR). The following section describes the proposed SLM, addressing the three initial research questions. In the final section, we present our conclusions.

2 Science popularization as a social practice

In this section, we discuss the concept of scientific divulgation, also called science popularization by some researchers - an expression adopted by Motta-Roth and Scherer (2012). To this end, we bring theoretical propositions from Rojo (2008); Grillo, Giering and Motta-Roth (2016), Martins, Cassab and Rocha (2011) and Leal (2018).

The phenomenon of scientific divulgation originated, according to Rojo (2008), with encyclopedism. Encyclopedias (which use the entry genre) are, therefore, the canonical mediums that initiated this literate practice. However, such practice was restricted to the elite, who had the financial means to acquire these works, which served as tools for accessing scientific information, although adapted for a non-expert audience.

Rojo (2008) draws a distinction between scientific divulgation (SD) and science journalism (SJ), which we adopt in this study. According to the author, SD is a social practice carried out by scientists, whose goal is to communicate knowledge resulting from scientific research to a non-expert audience in a broader and more accessible way. Therefore, in SD, the information found in academic-scientific texts is transmitted directly from the expert to the target audience, without any form of mediation.

In the case of SJ, according to Rojo (2008), it differs from SD in terms of its sphere of production: journalistic rather than scientific. For the author, unlike SD—where research findings are disseminated by the scientists themselves or their peers to a non-expert audience without mediation from another field of knowledge—SJ involves clear mediation. In the latter, the information contained in scientific source texts undergoes intervention by an agent from another social sphere (the journalistic sphere) in order to reach the non-expert audience. However, in this

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case, the target is not just any lay public, but specific readers of a particular journalistic media outlet.

Although SD shares a common goal with SJ – that of transforming a scientific discovery into more accessible information for the general public – , the fact that the two literate practices belong to different spheres of production means that they naturally diverge in terms of communicative purposes and, consequently, in their discursive and stylistic features. Regarding the style of the texts, in SJ texts "there is less concern with scientific rigor when compared to what occurs in scientific divulgation texts" (Rojo, 2008, p. 594).

The following figure illustrates the distinction adopted between scientific divulgation (SD) and science journalism (SJ).

Figure 1: Difference between scientific divulgation and science journalism
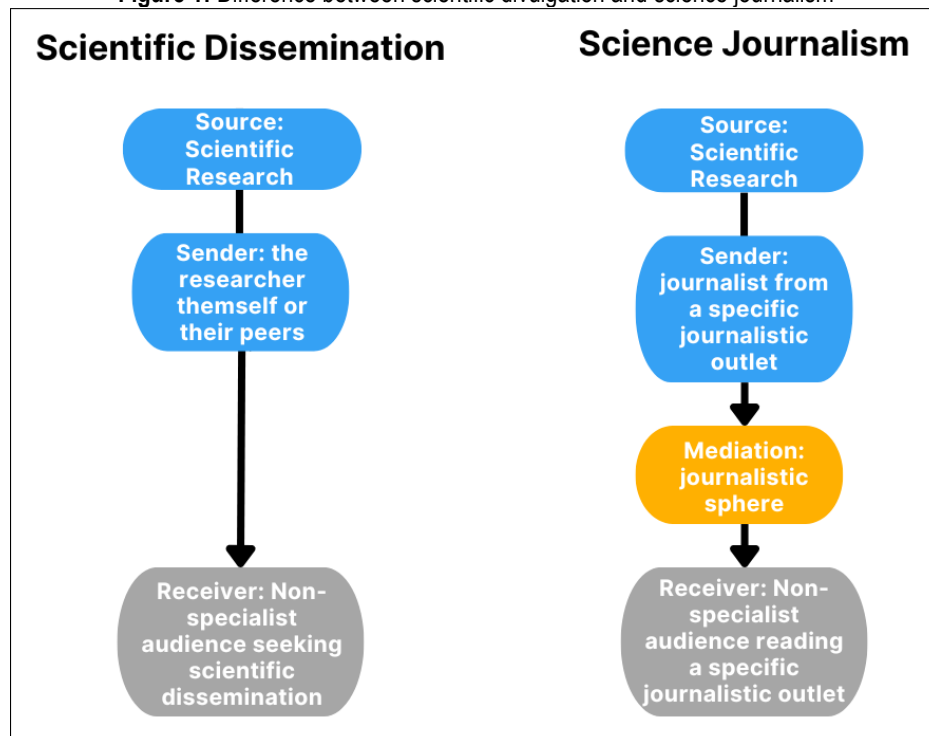
Source: prepared by the authors of the present study.

The *Colmeia Linguística* channel (Youtube[2] and Spotify[3]), Produced by researchers from LILA, with a focus on disseminating research in the field of Language Sciences, it is an example of what we refer to as SD. As an example of SJ, we mention the journalistic magazine *Galileu*,

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[2] https://www.youtube.com/@colmeialinguistica

[3] open.spotify.com/show/0d2jcQxcDev7j5ls1XIzMG?si=1e3fd7fdf53c4b45

which focuses on science-related topics in general and is available by subscription in digital format on its website or app *Globomais*[4].

It is important to highlight that SD and SJ are not textual/discursive genres themselves, however, as social practices shaped by language, they are always realized through one or more genres. Examples of genres associated with SD and/or SJ include: encyclopedia entries, reports, news articles, briefs, commentary pieces, popular science articles, and scripts for content repurposed into *podcast*[5], among others. Texts aimed at the popularization of science, traditionally, were published in print media, such as encyclopedias and newspapers. With the advancement of communication media, these texts began to be disseminated through electronic means, such as television and radio. These texts are considered part of the media space, as they are known and circulated through social communication sources or any medium of information divulgation (Leal, 2018).

With the advent of the internet, SD began to make use of digital communication media. As a result, new genres, platforms, and means of popularizing science emerged, such as blogs, podcasts, and YouTube channels. These divulgation platforms are generally motivated by research groups or projects (such as LILA). Therefore, in contemporary times, we can say that it is not only the elite who have access to scientific divulgation, as this practice is now present on the internet, which has, to some extent, democratized access for less privileged social classes.

Martins, Cassab, and Rocha (2011) understand both scientific activity and scientific knowledge as the result of historically situated social constructions, which influence and are influenced by other discourses. Thus, the communication of scientific ideas to a lay audience expands the possibility of their inclusion in discursive communities and "empowers" individuals to make personal or collective decisions (Martins; Cassab; Rocha, 2011).

For Grillo, Giering, and Motta-Roth (2016), in today's science popularization, the relationships between the knowledge produced by scientists and by society are understood and carried out through various ideological, cultural, and discursive perspectives.

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[4] http://bit.ly/Galileu_assine

[5] For more on this genre, see Braz and Cristovão (2023).

3 Research Methodology: Systematic Literature Mapping

This research adopts a qualitative approach, is situated at the descriptive level (Gil, 2014), and employs the strategies of Systematic Literature Mapping (SLM), based on the studies by Dermeval, Coelho, and Bittencourt (2020) and Galvão and Ricarte (2019). For the discussion of the data, we are guided by the transdisciplinary perspective of Applied Linguistics, drawing on studies related to scientific divulgation and scientific literacies.

For this research, we consider it important to differentiate between Systematic Literature Mapping (SLM) and Systematic Literature Review (SLR). According to Dermeval, Coelho, and Bittencourt (2020), SLM focuses on the categorization of the research topic of interest and is used when there is limited evidence available in the literature on that topic and when there is no need for in-depth analysis of specific issues. In other words, according to the authors, SLM is conducted when a broader (less in-depth) overview of a given area is sought. For the authors, the differences between SLM and SLR are made clear in the formulation of the research question: in the former, the question is typically exploratory, while in the latter, it is usually causal. However, despite the authors' statement that the research question in SLR is usually causal, they also point out that they found many SLRs with exploratory research questions.

In SLR, it is essential that all procedures be structured in a way that ensures the quality of the sources: through the definition of a research equation, as well as inclusion and exclusion criteria, and all relevant standards (Ramos; Faria; Faria, 2014). In contrast, in SLM, even studies considered to be of "low quality" may be included in order to highlight research gaps (Dermeval; Coelho; Bittencourt, 2020).

As pointed out by Galvão and Ricarte (2019), SLR follows specific protocols and seeks to understand a large documentary corpus: it assesses what works and what does not work in a given context. SLM, in turn, requires less depth in data extraction (Dermeval; Coelho; Bittencourt, 2020).

As previously mentioned, this research is methodologically guided by the strategies of SLM, as we conducted a search for works on scientific divulgation based on a broader, exploratory research question and a less in-depth mapping.

As outlined by Dermeval, Coelho, and Bittencourt (2020, p. 20), the first step in conducting an SLM is the definition of a research protocol, which may be guided by the following

steps: I) research question(s); II) search and selection of studies; III) quality assessment; IV) data extraction; V) data synthesis and analysis; VI) review report.

Based on the research protocol proposed by the authors, the following section presents the systematization of the procedures carried out in the SLM undertaken in this study, in accordance with the requirements of this type of research.

4 Mapping of Research on Scientific Divulgation

As discussed in the methodological section, Movement I of the SLM involves defining guiding questions, which, in our research, are: 1) Does the study address scientific divulgation, science journalism, or another form of science popularization?; 2) Does it distinguish between these concepts?; 3) Is it linked to a Master's or a Doctoral program? Movements II (Search and selection of studies), III (Quality assessment), and IV (Data extraction) are described below. To initiate the research, it is necessary, as stated by Dermeval, Coelho and Bittencourt (2020), to select keywords that guide the mapping. Our SLM, conducted in the CAPES thesis and dissertation database on 04/24/2024, is primarily guided by the keyword "divulgação científica"[6] (in quotation marks), without applying any platform filters, since our objective is to map works whose central focus is scientific divulgation.

The subsequent steps taken in this research were: 1) an initial search without filters, using only the keyword "divulgação científica" in quotation marks; 2) selection of works from 2020 to 2024; 3) delimitation to theses and dissertations in the major area of knowledge of Linguistics, Language and Arts; 4) exclusion of professional master's theses and dissertations; 5) selection of works in which the keyword "divulgação científica" and similar terms/expressions appear only in the title. Each of these steps is described below.

In the first stage of the SLM, using the keyword "divulgação científica," we obtained 2,020 theses and dissertations. In the second stage, we selected only the most recent works, published between 2020 and 2024, and narrowed the results to 676 theses and dissertations, thereby excluding 1,344 texts. In the third stage, we selected only texts within the major area of knowledge of Linguistics, Language and Arts, which resulted in 29 publications, thus eliminating

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[6] English translation: scientific dissemination.

647 works that were not within the scope of this research. These 29 academic works are divided among Doctoral thesis (12), Master's dissertations (12), and Professional Master's dissertations (5).

In the fourth stage of the SLM, only the 24 Doctoral and Academic Master's publications were selected, thus excluding the 5 Professional Master's works. This exclusion is based on our understanding that research carried out in Professional Master's programs in the field of Language and Linguistics—our research focus—has its own nature, involving applied studies generally aimed at teacher education. While it is certainly important to understand the content of these five studies, due to the nature of our research, we chose to analyze them in a future study specifically focused on Professional Master's programs.

In the fifth and final stage, out of the 24 publications, 6 were excluded from the study because their titles did not contain the keyword "divulgação científica" or any of its variants, specifically: "divulgador(es) científico(s)"[7], "popularização da ciência"[8], and "jornalismo científico"[9]. At the end of this stage, we obtained 18 works, which are presented in Table 1, organized by year of publication and type (M – Master's, D – Doctorate). It is important to highlight that all 18 texts are related to the field of Linguistics. Although our initial objective was to focus on Applied Linguistics, our field of expertise, we decided not to filter the texts by subfield, since this classification is often tied to the name of the Graduate Program rather than the actual content of the research. Therefore, we opted to keep all 18 works mapped in the fifth stage.

Table 1: Studies selected in the final stage of the SLM

Year	Number of studies in the third stage	Academic degree
2020	4	1 M and 3 D[10]
2021	4	3 M and 1 D
2022	6	4 M and 2 D
2023	4	2 M and 2 D
Total	18	10 M and 8 D

Source: prepared by the authors of the present study.

As observed, although the number of Master's dissertations exceeds that of Doctoral thesis, we consider the distribution to be relatively balanced, given that there are more Master's

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[7] English translation: scientific disseminator(s).
[8] English translation: science popularization.
[9] English translation: science journalism.
[10] M: dissertação de Mestrado; D: tese de Doutorado.

programs than Doctoral programs in Brazil. This justifies a slightly higher number of theses compared to dissertations. Regarding the distribution of works by year of publication, there is also a certain balance: only in 2022 was there an increase in the number of publications compared to the average of four works published per year.

With these 18 mapped studies, we conclude our search and move on to Movements V and VI. However, although Dermeval, Coelho, and Bittencourt (2020) systematize the SLM in that order—Movement V (Data synthesis and analysis) followed by Movement VI (Review report)—in our study, we chose to reverse the authors' proposed sequence and present the Review report (of the mapping) prior to the Data synthesis and analysis.

5 Report of the mapped studies

Text 1, the Doctoral thesis "Multiplicidade semiótica: a construção de identidades e significados no jornalismo científico de três universidades públicas brasileiras durante a pandemia de covid-19"[11] (Barbosa, 2022), presents an analysis that demonstrates how different semiotic modes work together in the construction of meaning in this type of discourse, aiming to understand the multimodal identities present in SJ. The research focuses on a qualitative and comparative analysis of news articles related to the COVID-19 pandemic, published on the websites of three Brazilian public universities. This is the only mapped study that explicitly

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[11] English translation of the titles of the mapped studies: 1) Semiotic multiplicity: The construction of identities and meanings in the science journalism of three Brazilian public universities during the covid-19 pandemic; 2) Brazil in Antarctica: Scientific dissemination on climate change in online media; 3) Linguistic prejudice and scientific dissemination: proposal of a methodological path and action research experience with young disseminators from Rede Cuca (Fortaleza); 4) The discourses of scientific dissemination and self-help in the construction of persuasion; 5) The textual construction of opinion in scientific dissemination articles; 6) Scientific dissemination in the magazine Ciência Popular: themes related to the supernatural; 7) Pop Science: scientific dissemination on YouTube from the perspective of Sociosemiotics and the grammar of visual design; 8) The discursive genre scientific dissemination report: a proposal for teaching Portuguese language in an agricultural technical school; 9) The ethé in scientific dissemination media texts from the magazine Ciência Hoje das Crianças; 10) Marks of enunciation and meaning construction in scientific dissemination texts: a study on the magazine Ciência Hoje das Crianças; 11) Scientific dissemination as a discursive arena in Brazilian universities: (dis)encounters of voices in the discourse of professors-researchers; 12) Proposals for the simplification of term definitions for scientific dissemination: a contrastive study through corpora; 13) Scientific dissemination in the digital comics of the character Armandinho: the culture of participation and collective intelligence in Facebook comments; 14) The scientific dissemination writing of public school teachers in Fortaleza: reflections based on the teacher-author project; 15) Discursive ethos and extimacy: an analysis of the construction of the discursive image of scientific disseminators in the Twitter ecosystem; 16) The popularization of science as a semiotic strategy: a study of the manga 'Cells at Work!'; 17) Scientific literacy in the school context: a top-down look at the production of scientific dissemination articles in high school; Discursive cyberviolence present in technodiscursive amplification: troll-comments directed at the scientific disseminator Atila Iamarino in tweets about COVID-19.

addresses SJ, which is even mentioned in the title of the thesis. Furthermore, it distinguishes SJ from SD, following the same distinction proposed by Rojo (2008).

Text 2, "Brasil na Antártica: a divulgação científica sobre as mudanças climáticas na mídia online" (Carvalho, 2020), is a Master's dissertation that analyzes how scientific research conducted under the Brazilian Antarctic Program (Proantar) relates to climate change in online media, based on news articles. By analyzing content produced within the journalistic sphere, the research aligns with the theoretical framework SJ, although it does not make a clear distinction between SJ and SD, as suggested by the thesis's title.

Text 3, "Preconceito linguístico e divulgação científica: proposta de percurso metodológico e experiência de pesquisa-ação com jovens comunicadores da Rede Cuca (Fortaleza)" (Vieira, 2020), is a Doctoral thesis aiming to disseminate discussions about linguistic prejudice among youth from the outskirts of Fortaleza, Ceará. The author's specific goal is to propose a methodological path for developing a scientific divulgation strategy and to carry out action research with young disseminators from Rede Cuca in Fortaleza. The action developed by the researcher consisted of four workshops with the following topics: 1) Language and identity; 2) Portuguese Language in school and in the media; 3) The voice of science; and 4) The response of the youth. The object of analysis in Text 3 is the action research itself. Since the workshops were proposed by an academic and therefore originated within the academic sphere, the research is classified as SD in this study.

Text 4, "Os discursos de divulgação científica e de autoajuda na construção da persuasão" (Catalano, 2020), a Doctoral thesis, aims to analyze SD texts produced by physicians with strong media visibility, seeking to identify, through discourse construction features, signs of adherence to ideological values the enunciators may be committed to. The author investigates discourses of science popularization and self-help in media texts by physicians who run digital channels focused on disseminating health science content. This thesis argues that the science popularization practiced by the investigated subjects incorporates elements of self-help, as it frequently includes advice and recommendations for a healthier lifestyle. Therefore, this study does not fit precisely into the theoretical frameworks of SD or SJ discussed in the present article; instead, it addresses a different practice related to science popularization, which we refer to as "Science mediatization of science by expert influencers." In this case, a professional from the scientific field, with high media visibility, not only disseminates content and discoveries from their area but also gives advice, recommendations, and lifestyle tips to their "followers."

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Text 5, the Doctoral thesis "A construção textual da opinião no artigo de divulgação científica" (Lima, 2022), focuses on the textual construction of opinion in "scientific divulgation" articles from the field of History, particularly those reconstructing the figure of the Marxist revolutionary and Argentine guerrilla fighter Che Guevara during the Cuban Revolution. The research investigates how opinions are textually constructed in articles published in journalistic magazines addressing historical topics. Since the production sphere is journalistic, Text 5 is classified as SJ, even though the term "scientific divulgation" appears in the title.

Text 6, "A divulgação científica na revista Ciência Popular: temáticas ligadas ao sobrenatural" (Matos, 2021), is a Master's dissertation that aims to examine *Ciência Popular* magazine with a focus on themes related to the supernatural. The study analyzes the general characteristics of the magazine and the relationship between visual elements and the transmission of the editorial discourse, considering that these visual aspects should not be viewed in isolation. Since the object of analysis is a magazine written by journalists, we classify this text as SJ. However, it does not distinguish between SD and SJ: despite including the term "scientific divulgation" in the title, its object of study stems from a journalistic sphere of production.

Text 7, the Master's dissertation "CIÊNCIA POP: Divulgação Científica no YouTube sob a perspectiva da Sociossemiótica e da Gramática do Design Visual" (Barbosa, 2022), seeks to understand the contemporary context of language and communication, particularly in the digital environment, where the predominance of visual elements is highlighted, resulting in a new form of "writing" in which the alphanumeric paradigm coexists with a more complex and hybrid format. The researcher focuses on YouTube videos centered on science popularization practices. By analyzing two Brazilian YouTube channels dedicated to scientific content divulgation (*Nunca Vi um Cientista*[12] e *Arqueologia pelo Mundo*[13]), the researcher aims to understand how meaning is constructed in these multimodal productions, particularly considering their interactional function. In this case, the objects analyzed are two YouTube channels focused on SD: researchers use these platforms to create content that helps non-experts understand scientific phenomena, apply them in everyday life, stay informed about scientific discoveries, among other things—in a simplified, informal, and relaxed manner.

Text 8, "O Gênero discursivo reportagem de divulgação científica: uma proposta de ensino de língua portuguesa em um colégio técnico agrícola" (Santos, 2020), is a Master's

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[12] https://www.youtube.com/channel/UCdKJlY5eAoSumIlcOcYxIGg
[13] https://www.youtube.com/channel/UCKR7fdwXSVNBJVXVVMyE3iA

dissertation that investigates reading practices in Portuguese language classes through the use of a genre related to the popularization of science. Although the title includes the term "scientific divulgation," the text actually addresses practices related to SJ.

Text 9, "Os ethé nos textos midiáticos de divulgação científica da revista *Ciência Hoje das Crianças*" (Cayser, 2021), is a Doctoral thesis that takes as its object of study media texts aimed at disseminating science to children. The main goal of the research is to examine how the speaker presents different discursive identities in the text in order to meet both scientific standards and the specific characteristics of a child audience, aiming to attract and maintain their reading interest. The author selected three texts from the magazine *Ciência Hoje das Crianças*, published by Instituto *Ciência Hoje*, as the objects of analysis. Thus, although the thesis includes the keyword "divulgação científica" in its title, the sphere of production of the texts analyzed is journalistic—therefore, it operates from the perspective of what we understand as SJ. This text also does not differentiate between the concepts of SC and SJ.

Text 10, the Master's dissertation "Marcas da enunciação e construção de sentidos em textos de divulgação científica: um estudo sobre a revista *Ciência Hoje das Crianças*" (Oliveira, 2021), adopts an enunciative approach to analyze texts that communicate scientific content to children, with the overall goal of investigating the characteristics of orality present in these texts, which function as tools to create a sense of closeness between interlocutors. The specific objectives include exploring the concepts of enunciation and utterance, discussing enunciative mechanisms—particularly focusing on the category of person—and demonstrating that orality and writing should not be seen as opposites, but rather as part of a continuum. Like in Text 9, this dissertation focuses on *Ciência Hoje das Crianças*, a magazine that belongs to the journalistic sphere. Therefore, we classify this work as part of SJ, even though the title includes the keyword "divulgação científica"; in other words, the author does not distinguish between the concepts of SD and SJ.

The Doctoral thesis (Text 11) "A divulgação científica como arena discursiva nas universidades brasileiras: (des)encontro de vozes nos dizeres de professores-pesquisadores" (Fetter, 2022) is guided by the following research question: How is scientific divulgation conceived by professors-researchers at Brazilian universities? Grounded in the theoretical framework of the Bakhtin Circle, the aim of the study is to investigate conceptions of scientific divulgation—generally viewed as the science popularization—in the discourse of professors-researchers from Brazilian universities, with the intention of contributing to the improvement of

this practice in the country. For data collection, the study used the Google Scholar tool and selected 34 scientific articles authored by professors-researchers affiliated with stricto sensu graduate programs, published between 2016 and 2018 and indexed with the keyword "divulgação científica". This research does not aim to distinguish between SC and SJ, as we have conceptualized in this study, but instead works with a broader notion of outreach of cience. Text 11, as we can see, does not address the actual practice of science popularization—the focus of this SLM—since its corpus of analysis is not composed of SC/SJ texts per se, but rather of academic articles indexed with the keyword "scientific divulgation." Therefore, we opted to exclude it from the final categorization of results in this SLM.

Text 12, "Propostas de simplificação de definições de termos para a divulgação científica: um estudo contrastivo por meio de *corpora*" (Santos, 2023), is a Doctoral thesis. According to the author, the lexicon provides a variety of linguistic options for speakers, allowing everyone to communicate, understand, and be understood in different contexts. The objective of the research is to present definition models that may assist experts, journalists, and laypeople in simplifying the definition of terms used in texts aimed at disseminating scientific knowledge. The author compiled four types of corpora, based on texts from the field of health sciences: (1) a specialized corpus, with texts written by experts for other experts (scientific articles); (2) a specialized scientific divulgation corpus, consisting of texts written by experts for laypeople (what we understand as "scientific divulgation"); (3) a journalistic science popularization corpus, made up of texts written by journalists for lay audiences (what we understand as "science journalism"); and (4) a science content divulgation corpus, composed of texts and video captions from YouTube produced by laypeople for other laypeople. As we can see, this dissertation adopts a broad conceptual approach to scientific divulgation. The first group of analyzed texts does not fall under the practice of science popularization, as it consists of scientific articles published in academic journals – texts that publicize science for a peer audience. Regarding the other groups: the second is aligned with "scientific divulgation," and the third with "science journalism," although this theoretical distinction is not discussed in the thesis. A key contribution of this study is the introduction of a new category of science popularization: texts produced by laypeople for lay audiences. In this study, these texts refer to science-related content in video format, produced by YouTubers who are considered non-experts – they are not academics, researchers, or trained science journalists, but nonetheless disseminate scientific content in some form. For this new category, we are using the term "science mediatization by lay influencers". This category is

similar to the one observed in text 4, with the difference being that in that research, science mediatization is carried out by expert influencers—professionals from a scientific field (in that case, health sciences) who gain visibility on social media and acquire an "authoritative voice" to give advice related to science. In the case of text 12, the influencers are non-experts. Thus, text 12 deals with three categories: SD, SJ and science mediatization by lay influencers.

Text 13, "A divulgação científica nas tiras digitais do personagem Armandinho: a cultura da participação e a inteligência coletiva nos comentários do Facebook" (Rosa, 2021), is a master's dissertation that seeks to understand the process of collective knowledge formation within the participatory culture of Facebook comments, especially in the context of digital comics featuring the character Armandinho. The author analyzed the main comments found in ten strips of the character Armandinho, created by Alexandre Beck, based on comments constructed through multimodal resources using both verbal and non-verbal language. The author of the Armandinho comics is an illustrator who publishes them both in newspapers and on his Facebook page. We understand that comics, like other genres focused on entertainment, can, even if tangentially, popularize scientific content—precisely as demonstrated in this research. In this case, we created the category "science popularization through multimodal texts in genres from the entertainment sphere."

Text 14, "A escrita de divulgação científica de professores da rede municipal de ensino de Fortaleza: reflexões a partir do Projeto Professor Autor" (Santos, 2022), is a master's dissertation that analyzes the identity of the "teacher-author" among Basic Education teachers from the municipal school network of Fortaleza, who write experience reports on teaching and learning during their participation in the "Professor Author Project: making history... exchanging stickers." The concept of scientific divulgation in the research is based on the "structure of the text," which is expected to match scientific writing, as we can see in the following excerpt: "the experience report [...] can be considered scientific divulgation discourse, as long as its materiality aligns with the structure typical of works that circulate in the scientific sphere, with emphasis on theoretical references, description of the practice, analysis, and reflections" (Santos, 2022, p. 45). That is, Text 14 does not address the discursive practice of science popularization, even though it includes the keyword "divulgação científica" in the title. Therefore, it will not be included in the categorization made in this SLM.

According to the author of the master's dissertation (Text 15) "Ethos discursivo e extimidade: uma análise da construção da imagem discursiva de divulgadores científicos no

ecossistema Twitter" (Redel, 2023), in 2020, due to the pandemic, many people began engaging with social media, especially Twitter, in search of information about Covid-19, which highlighted the importance of science. In this context, the author argues that scientific divulgation methods had to be revised and adjusted to fit this new reality. One significant change, according to the dissertation, was the growing number of scientists using their personal social media accounts to disseminate science. Based on this issue, the research aimed to analyze how science disseminators in the field of Health construct their image on Twitter. The object of analysis in this study is similar to that in Text 4, as it also deals with science disseminators who are experts in a given field (in this case, Health Sciences) and who operate on social media – digital platforms – functioning as influencers. The goal of these media channels goes beyond simply disseminating science to a lay audience; the "voice of authority" acquired by these researcher-influencers to speak about scientific content gives them media visibility as individuals. In other words, what is being promoted is not only science but also the scientist. Therefore, Text 15 is categorized as "mediatization of science by expert influencers."

According to the author of the master's dissertation (Text 16) "A popularização da ciência como estratégia semiótica: um estudo do mangá 'Cells at Work!'" (Batista, 2023), manga, although primarily aimed at entertaining readers, can also serve as a means of science popularization, as long as it includes elements that align with the practices oriented toward that goal. The researcher thus aims to test this hypothesis through the study and analysis of "Cells at Work!" (Hataraku Saibou), a shonen-style manga by Akane Shimizu, released in 2015 in Japan and translated into English in 2016. Just like in Text 13, the object of this research is categorized as "science popularization through multimodal texts in genres from the entertainment sphere". We understand that comics, like other multimodal genres focused on entertainment, can contribute to the popularization of scientific content.

The master's dissertation (Text 17) "Letramento científico no contexto escolar: um olhar descendente para a produção do artigo de divulgação científica no Ensino Médio" (Sousa, 2022) analyzes the process by which high school students from a full-time public school in the state of Paraíba appropriate scientific writing practices through the production of the scientific divulgation article genre. With the idea of creating a digital magazine to circulate the articles produced by the students, *Revista do Biu*, a biannual digital school journal, was launched. Although the dissertation uses the term scientific divulgation in the title, it addresses the didactic production of

a journalistic magazine, and for this reason, we classify the study within the scope of science journalism.

According to the author of Text 18, "A Ciberviolência discursiva presente na ampliação tecnodiscursiva: comentários-troll dirigidos ao divulgador científico Atila Iamarino em tuítes sobre a Covid-19" (Nunes, 2023), a Doctoral thesis, during the COVID-19 pandemic there were efforts not only by scientists searching for vaccines but also by scientific disseminators working to disseminate science to a lay audience. According to the author, biologist and microbiologist Atila Iamarino was among the leading scientific disseminators who gained prominence during this period. However, his appearance on the Roda Viva program in March 2020 triggered numerous instances of verbal violence against him by individuals who denied science. In this context, the purpose of the thesis was to identify and examine the technodiscursive markers of cyberviolence present in troll-comments directed at Iamarino's posts about COVID-19 on Twitter. These troll-comments were aimed at a expert scientific disseminator—a scientist in the academic fields of biology and microbiology. In this case, the object of the study, like in Texts 4 and 15, is categorized as "mediatization of science by expert influencers."

6 Data synthesis and analysis

Firstly, we highlight that, out of the 18 works analyzed, 14 contain the keyword "divulgação científica" in the title, and 4 include other similar terms (or terms that fall within the scope of this research): science journalism (1), science popularization (1), and scientific disseminator (2). Of the 18 works, 2 were excluded during the research description stage for not addressing science popularization in the way it is conceptualized in our study. Text 11 analyzes scientific articles published in academic journals; therefore, the notion of scientific divulgation in that study does not align with the social practice of disseminating science to a non-expert audience, which is the focus of this SLM. Text 14, in turn, considers teachers' experience reports as scientific divulgation, based on their similarity to the structure of scientific texts, which led us to exclude it from the categorization resulting from the analysis of the 18 mapped theses/dissertations, presented in Table 2, which synthesizes the answers to questions 1 and 2 of our SLM.

Table 2: Categorization of Science Popularization Developed in the SLM

Categories	Number of studies	Percentage
SD	03 (texts 3, 7 and **12**)	17%
SJ	02 (texts 1 and **12**)	11%
SJ (without differentiating it from SD)	07 (texts 2, 5, 6, 8, 9, 10 and 17)	39%
Science mediatization by lay influencers	01 (text **12**)	05%
Science mediatization by expert influencers	03 (texts 4, 15 and 18)	17%
Science popularization through multimodal texts in genres from the entertainment sphere	02 (texts 13 and 16)	11%
TOTAL	**18**	**100%**

Fonte: prepared by the authors of the present study.

We highlight that of the 16 studies that served as the basis for the categorization of science popularization texts (2 were excluded for falling outside the scope of the research), 1 addressed 3 distinct categories (Text 12), which is why the total number of approaches amounts to 18, as shown in Table 2. This table also makes it possible to see that the SLM expanded the categories of science popularization, which were initially considered only as SD (scientific divulgation) and SJ (science journalism).

Table 2 shows that 50% of the mapped studies focus on SJ, whether explicitly defined (11%) or addressed without distinguishing it from SD (39%). This leads us to consider that science popularization has been more prominently carried out through the journalistic sphere, since this is the communication field most often selected to guide studies dealing with this discursive practice. The SLM also highlights another issue: the lack of academic divulgation of the theoretical concept of SJ. In other words, even when a study engages with practices, texts, and genres that Rojo (2008) classifies as SJ, it is still guided by a broader concept, conceiving science popularization as a homogeneous discursive practice. Text 1 is an exception, as it explicitly states in the title that it addresses the divulgation of scientific content through the lens of journalism: the dissertation "Semiotic multiplicity: the construction of identities and meanings in the science journalism of three Brazilian public universities during the Covid pandemic" (Barbosa, 2022 – our emphasis). Text 12, in turn, offers a categorization of what it considers science popularization, by proposing distinct groups for the texts analyzed, including one that refers to SD (experts producing for non-experts) and another to SJ (journalists producing for non-experts). That is, in this case, there is an explicit distinction between these practices.

The results of the SLM show, as can be seen in Table 2, that only three studies work with the concept of SD as defined in this research: academics and scientists who disseminate research findings and/or scientific content to a non-expert audience. An example of this category is Text 7, the master's dissertation "Pop Science: scientific divulgation on YouTube from the perspective of sociosemiotics and visual design grammar" (Barbosa, 2022). In this study, the author analyzes videos from two YouTube channels focused on SD practices (Nunca vi um cientista and Arqueologia pelo mundo). These channels illustrate how young researchers are engaging with the general public and making scientific phenomena more accessible, including by relating them to everyday practices. The issue is that these channels typically focus on "established" areas of science – mainly the biological and health sciences – thereby reinforcing the common-sense representation of what science is.

The difference between the SD category (Texts 3, 7, and 12 – 17%) and "mediatization of science by expert influencers" (Texts 4, 15, and 18 – 17%) lies in the fact that the latter includes SD practices carried out by digital influencers on social media platforms, such as Twitter and Instagram. In these cases, the influencer role outweighs that of the scientist/researcher/academic. The author of Text 4, for instance, considers the discourse of the medical influencers studied to be "self-help," since these digital figures rely on their scientific background to offer advice and tips for healthy living. They are a type of "media celebrity of science," due to their high visibility on social media, as evidenced by their large follower count. It is worth noting that all three works categorized under this label analyze content from the health sciences field, two of which are related to the Covid-19 pandemic period.

Text 12, in turn, introduces a new concept of science popularization, which its author calls a "lay SD corpus" (Santos, 2023). The texts that comprise this corpus refer to videos produced by YouTubers who are neither experts/academics in a given scientific field nor journalists, but rather digital disseminators of non-expert scientific content. This is a phenomenon that certainly requires further investigation, especially so that it can be more accurately distinguished from other practices—such as the one categorized in this SLM as "Science mediatization by expert influencers"[14].

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[14] Motivated by the results of this SLM, the first author of this paper submitted a Master's research project aimed at further investigating the phenomenon of science popularization on social media, which was approved by the Graduate Program in Language Studies (PPGEL) at the State University of Londrina (UEL).

Another "finding" of this SLM is the category "Science popularization through multimodal texts in genres from the entertainment sphere" (Texts 13 and 16 – 11%). This is a form of science popularization that makes use of multimodal entertainment genres to, in some way, disseminate scientific content. The two mapped texts analyze comic genres—specifically, the Armandinho comic strips and Japanese manga. Even though our research mapped only two texts in this category (out of a total of 16), we consider it significant, as it represents a phenomenon that is traditionally not associated with science popularization practices. Therefore, as with the previous category, it requires further in-depth investigation.

Conclusions

As we conclude this study, we return to the initial questions proposed for this SLM. The first is simple to answer, as it concerns the academic level of the studies – Master's or Doctoral. As shown in Table 1, of the 18 works mapped, 10 are at the Master's level and 8 at the Doctoral level. This indicates that the topic of science popularization attracts both Master's and PhD students from Graduate Programs in the field of Linguistics. The higher number of Master's studies is coherent, considering that there are more Master's programs than Doctoral ones. For this SLM, we chose not to include Professional Master's research, as we understand that it has a specific nature and therefore deserves a distinct SLM.

About the specificity of the science popularization practice, we initially highlighted SD and JC as possible categories in the research questions. However, our SLM identified, in the analyzed studies, in addition to these two categories (explicitly or not), three other types of practices aimed at disseminating science to non-expert audiences: the science mediatization by lay influencers, the Science mediatization by expert influencers, and the Popularization of science through multimodal texts in genres from the entertainment sphere. This overall picture demonstrates how broad the concept of scientific divulgation/popularization is and how diverse this practice is from a discursive perspective. It certainly deserves further research from various theoretical and methodological viewpoints.

Our SLM made it clear how JC, even within the scope of academic research, has a stronger presence than SD: science popularization seems to be much more associated with the journalistic sphere than with the academic one. In this sense, beyond research itself, it is necessary for scientists to more actively assume the role of scientific disseminators. Nowadays,

with the rise and expansion of digital media, the divulgation of scientific content to lay audiences can be done quickly and at low cost (compared to print media). Through video channels and podcasts, websites, blogs, and social media pages, researchers/scientists have the opportunity to connect directly with the general public – non-experts in their field – disseminating scientific information and even receiving feedback on the content produced through comments and private messages. Beyond the 'Science mediatization by expert influencers,' researchers – from any field, not only the traditionally recognized sciences—can take advantage of digital platforms to demonstrate the importance of scientific research for the consolidation and advancement of human knowledge, helping to understand phenomena in various fields and applying them toward the development of society as a whole.

As we have already pointed out throughout this study, in the popular imagination, scientific research is often seen as existing only within the boundaries of traditionally recognized scientific fields, such as the exact, biological, or health sciences. This leads people to believe, for example, that Linguistics is not a science. Although this was not the focus of our SLM, it was possible to observe that even research developed within Linguistics/Language Studies programs does not address practices related to the divulgation of linguistic science. Therefore, a suggestion for future research is an SLM focused on studies that analyze discursive phenomena aimed at the popularization of language-related content.

In conclusion, although the didactization of SD practices was not the focus of our SLM, we would like to highlight the importance of educational projects that value SD and the potential for such projects to be investigated through scientific research. In this regard, we emphasize an ongoing doctoral research project that involves undergraduate students from a Language and Literature program in outreach activities with high school students, working together to produce podcast scripts (Braz; Cristovão, 2023) based on research carried out in the fields of Linguistics and Language Studies. The work "Learning through Praxis," written by Cardoso et al. (https://sites.google.com/view/selac-lila/ii-selac/anais?authuser=0), illustrates the work developed in a Junior Scientific Initiation project through this partnership between the LILA project and high school students. We believe that incorporating SD into Basic Education, among other possibilities, has significant potential in the fight against misinformation and fake news.

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