

SCIENTIFIC DISSEMINATION PRACTICES IN BASIC EDUCATION: REFLECTIONS ON A BRAZILIAN EXPERIENCE IN A PUBLIC TECHNICAL SCHOOL

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Abstract

This work assumes that it is a basic school commitment to contribute to scientific dissemination, scientific literacy, and the establishment of a culture of science in society, especially in Brazil, a country where scientific denialism is still very present. The purpose of this text is to reflect on the challenges and results of a practical experience with scientific dissemination at the Fundação Escola Técnica Liberato Salzano Vieira da Cunha, a public technical high school in Novo Hamburgo, Rio Grande do Sul, Brazil. Two actions carried out by a Portuguese language teacher at the institution are reported: the work with the discursive genre news for scientific dissemination in high school classes and the editorial of the journal Liberato Científica, the institution's journal for scientific dissemination.

Keywords: Scientific dissemination, Scientific literacy, Portuguese language, Basic education.

Introduction

This text results from researchers' reflections on the experience of scientific dissemination (SD) work in Brazilian public basic education. I have been a Portuguese language teacher in the city of Novo Hamburgo, state of Rio Grande do Sul, Brazil, for over twenty years. During this journey, I realized the need to discuss with students' themes such as the scientific dissemination, scientific literacy, and scientific culture. In our country, during the COVID-19 pandemic, we faced a reality of strong scientific denialism, misinformation, and infodemic, motivated by many factors including the attitude of the Federal Government at the time. However, these were not phenomena that emerged with the COVID-19 health crisis. (Castelfranchi, 2021; Massarani et al., 2020). According to Pasternak and Orsi (2021), the rejection of vaccines, for example, is as old as vaccination itself. There have also been movements of flat-earthers, creationists, and global warming deniers for a long time (Pasternak & Orsi, 2021).

Even before the pandemic, the survey "What Young Brazilians think about Science and Technology" (Massarani et al., 2019) brought results that caught my attention considering the range of Brazilians between 15 and 24 years old, precisely the age range of students I work with at the high school level. A total of 2206 young people living in all regions of Brazil were interviewed. According to these data, most young people showed a greater interest in science and technology than in sports and religion. These young people realize the importance of the topic, strongly support science, and believe that scientists are among the most reliable sources of information. They have, in general, a positive image of scientists and believe that investment in the area should be increased. However, most were unable to mention the name of a research institution (even some studying at universities), or a scientist, corroborating the data from the survey extended to other age groups.

Access to scientific and technological information was pointed out as low, and the means of access that stand out are Google, YouTube, Whatsapp, and Facebook, which — a factor also pointed out in the research — are means of disseminating misinformation. The interviewees also stated that they had difficulties in checking whether a piece of news about S&T is false. Basic information about science is also unknown to many, such as that antibiotics do not fight viruses (60% of respondents). Other issues of concern were the drop in visitation to science museums (only 6% had visited) and the expression of doubts about social and political controversies that permeate science, such as vaccination, climate change, and evolution. Furthermore, it is essential to highlight the stereotyped image that young people still have of scientists. Positive images stood out when characteristics such as creativity, organization, and ability to learn were pointed out. However, statements such as "they are weird", "they are not very attractive", "they do not have a happy marriage", "they have few friends" still appeared.

Data such as these indicate the need for basic education to contribute to discussions on science and society. This concern is supported by the Base Nacional Comum Curricular (BNCC) itself (Brasil, 2017). According to this guiding document, scientific literacy needs to be developed in primary school. Proposing the centrality of the text as a unit of work in the Portuguese language class, the BNCC guides the inclusion of genres belonging to certain fields of action, among which are listed the “field of study and research practices” and the “journalistic field-media”, in an intrinsic relationship with science and its dissemination.

In 2011 I began a teaching career at the Fundação Escola Técnica Liberato Salzano Vieira da Cunha, a high school public technical school in Rio Grande do Sul with a tradition of teaching through research and scientific dissemination (Fernandes et al., 2017; Müller, 2018). In this space, I began to question myself more strongly about the need to work with reading and production of SD texts in the classroom. I intended to contribute so that the results and — perhaps more important than that — the path of these students’ research could also reach citizens who were not specialists in science.

Based on this concern, I came into contact with the work of the CCELD group — Communication in Science: Linguistic and Techno-discursive Studies, coordinated by Professor Maria Eduarda Giering, from the Graduate Program in Applied Linguistics at Unisinos University, Rio Grande do Sul, Brazil. After reading some papers and contacting the group’s researchers, I began to develop pedagogical proposals that included SD texts in Portuguese Language classes.

In 2020, the COVID-19 pandemic began, and with that, my concern about information clutter became even stronger. I then joined the CCELD group as a doctoral student, and studies in Applied Linguistics made it possible to qualify this work. The same year, I also assumed the position of editor of the Liberato Foundation’s SD journal, *Liberato Científica*, a publication that presents, to a wide audience, the work of young researchers in basic education who participate in the largest science fair in Latin America promoted by the International Exhibition of Science and Technology (*Mostratec*).

This text aims to socialize two actions that I carry out at school. Reflecting on the challenges and the fruits, practices that aim to contribute to the culture of science, scientific literacy and scientific dissemination in society, the work with reading and writing of texts belonging to the discursive genre news of scientific dissemination in the 1st years of high school and the editorship of *Liberato Científica* journal, the school’s scientific dissemination journal.

Starting points: some important concepts

SD is understood, in this text, as a recontextualization of scientific knowledge, with the aim of making science content accessible to a wide audience. It differs, therefore, from the dissemination of science, which is related to the process of communication with peers, in technical and formal language (Bueno, 1985; Zamboni, 2001). SD is not understood here as a

simplification or a translation of scientific discourse to a “lay” public. Therefore, it is part of a broader context of public education, bringing science closer to people's daily lives.

Scientific dissemination is an important step towards the promotion of scientific literacy and the culture of science in Brazil. Cunha (2017) and Santos (2007), when discussing the concept of scientific literacy, show that, just as it is not enough to know how to read and write and not use reading and writing socially, science is no different. It is not enough for citizens to just “read” information about science; they need to know how to use this information socially, to know how to debate the subject at least, base their decisions on this knowledge and even how to recognize the cultural value of science.

Vogt (2003) presents the concept of scientific culture, as he believes that the process that involves scientific development is cultural, whether from the point of view of its production and dissemination among peers, its circulation in teaching or, even, its circulation in society at large. The author presents a model of the development process of scientific culture represented in the form of a spiral:

For the author, in the first quadrant of the *production and dissemination of science*, scientists are the addressees and recipients of science; in the second, *the teaching of science and the training of scientists*, scientists and teachers provide information for students of all levels; in the third, from *teaching to science*, scientists, professors and museum directors provide information for students and a young audience; finally, in the fourth, the *scientific dissemination*, journalists and scientists provide information for society in general.

According to the author, the Elementary and High education systems would be in the second quadrant; science fairs, on the third; and science journals and newspapers, in the fourth. It is also interesting to highlight the role of feedback in this spiral, since all quadrants are interrelated. At a time when society is questioning scientific knowledge, it is possible to ask: in which quadrant is this spiral breaking?

The two experiences narrated here are based on the assumption that it is the primary school's role to provide opportunities for discussion on the subject and on the role of language in this task. According to Nunes (2019),

Science communication plays an important role, as it provides the general public with contact with scientific discoveries; it also enables democratic practice, as it highlights specialized approaches, in order to provoke possible discussions in the reader. This is how society is transformed: when science experiments and discoveries reach the non-specialized public, in an active and participative way. (p. 14).

The classroom experience

Teaching through research is already adopted in many Brazilian basic education schools, a proposal that has gained support with the publication of the Base Nacional Comum Curricular (Brasil, 2017), which mentions the concept of “scientific literacy” and presents in the area of Languages and its Technologies the “field of study and research practices” as one of the priority fields of social action. In the BNCC (Brasil, 2017), the concept of scientific literacy appears directly in the area of Natural Sciences defined as

[...] the ability to understand and interpret the world (natural, social, and technological), but also to transform it based on the theoretical and procedural contributions of science. In other words, apprehending science is not the ultimate purpose of literacy, but the development of the ability to act in and on the world, which is important for the full exercise of citizenship. (p. 321).

In the Languages/Portuguese area, BNCC suggests a work with texts/discourses “that circulate both in the school sphere and in the academic and research spheres, as well as in scientific dissemination journalism” (Brasil, 2017, p. 480).

The Technical School Técnica Liberato Salzano Vieira da Cunha is a public institution linked to the Government of the State of Rio Grande do Sul. It began its activities in 1967, with the Technical Course in Chemistry. Currently, it has more than three thousand students enrolled. In addition to evening courses following high school, the course offers four-day courses integrated into this level of education: Chemistry, Electronics, Mechanics, and Electrotechnics. Such courses, aimed at students completing Elementary School, last for four years, plus 720 hours of Supervised Internship (Fundação Escola Técnica Liberato Salzano Vieira da Cunha, 2023).

Whether through the work proposals of the different disciplines that make up the curriculum of the technical courses, or through its internal and external science fairs, the school is a reference in the region when it comes to scientific method in basic education. Every year this school holds an international science fair- the International Exhibition of Science and Technology (Mostratec) that welcomes young researchers from basic education. Although the school is a high school, twelve years ago it expanded this fair, in a junior version, to also receive elementary school students from all over Brazil, and, more recently, even kindergarten students.

As a Course Conclusion Work, many of the Institution's students carry out research, configuring a scientific initiation work in High School. Therefore, with this proposal, the opportunity for this school to contribute not only to the dissemination but also to scientific dissemination is undeniable. SD's objective is not to make the target audience an expert on that subject, but rather to allow it to "better understand the phenomena of the world" in order to be able to "debate them when they present problems of a moral nature” (Charaudeau, 2016, p. 550).

Since joining the school, I started to watch students' presentations at Mostratec or even participate in evaluation boards of these works. I realized, however, a point to be discussed: many of these young scientists did not care about - or perhaps were unable to - recontextualize their language so that a reader who was not a specialist in the technical area - as was my case, a professor in the area of Languages - could understand. I then started to think about contributing to this challenge and, for some years now, I have been developing, with the 1st year classes of the Chemistry and Electronics courses, a pedagogical proposal with the discursive genre of news of scientific dissemination based on the choice of a research project presented at this school's science fair. This news produced by the students should have primary school children in the region as its target audience.

It is evident, here, that the practice is one of school journalism; in this case, produced by high school student-researchers with primary school interlocutors in mind. This proposal started from a conception of learning and language as interaction — interaction between teacher and student, between colleagues, between high school and elementary school students or early childhood education and the social environment. Such conception is based on the ideas of Bakhtin (2003) and therefore takes the concept of discursive genre as the basis for all didactic decisions.

The objective is to discuss the role of science and SD in a democratic society and the fact that students, as young scientists, will need to be concerned with the language used to interact with other scientists, as well as with the non-expert. I tried to emphasize the importance of the social practice in which they were inserted to produce the text that was the final product.

The work is the result of an experience that corroborates the thesis that scientific research carried out with the social commitment of Applied Linguistics, within the scope of graduate programs, can effectively reach the basic education classroom, bringing important results for the society. The pedagogical proposal described here is anchored in works by the CCELD group, such as Giering and Souza (2013), and Nunes (2019).

Giering and Souza (2013) address the concept of scientific media dissemination, pointing out that it is located at the intersection of three discourses: the scientific, the didactic, and the media. For the authors, this discourse has a double purpose: to inform the reader (making-knowing) and, at the same time, to capture their interest (making-feeling). It is important to point out that in the pedagogical proposal to be discussed in this article, the discourse was not restricted to the didactic or the scientific, so that students could effectively assume the role of scientific disseminators as “journalists for a day”, creating texts that were disseminated in the media going beyond the walls of the school.

Since, in this didactic proposal, the selected interlocutor is the child and youth reader, the use of SD studies for children was relevant. For Giering and Souza (2013), an SD text aimed at children is intended for a reader who is in the process of intellectual formation and may not necessarily be interested in scientific topics. Among the strategies to achieve making-knowing and making-feeling, the authors appeal to the allocutive modality of interpellation (use of the pronoun “you”); use of verbs in the imperative mood, interrogative or exclamatory sentences and emotive evaluations of an object, being or action; references to themes and situations supposedly known to the reader; anticipation of possible questions or evaluations by the reader and calling attention to the fact that this young reader has learned something new.

Nunes' work (2019) is also dedicated to SD aimed at children. The researcher sought to identify linguistic-discursive and iconic elements of patemization in texts. Patemization is defined as “a strategy — which aims to capture and seduce the reader — used by the speaker, who mobilizes a set of discursive categories to organize an interaction through affection” (Nunes, 2019, p. 13). The work presents data that show that childhood is the phase in which science is most distant, hence the importance of discussion on the subject. Some of the pathetic strategies cited by the researcher, in addition to those already mentioned by Giering and Souza (2013), are the following: explosive opening of the text (beginning in the form of a question), interjections, words found in children's stories, situations that arouse disgust, humor, unusual facts, playfulness, relationship with the child's daily life, anthropomorphization of nature, use of the child's own language, among other strategies.

In the news of scientific media dissemination, there are, as well as in other news: title, subtitle (optional), lead (succinct information on the reported journalistic fact and the main circumstances in which it occurs), detailing, intertitle (optional), usually accompanied by some iconic element (illustration, photo, graphic, infographic, caption) – and, at the same time, the organization of the academic article – abstract, introduction, materials and methods, results, and discussion of results (Giering, 2013).

The text needs to address the final or partial results of a scientific activity relevant to the community. The answers to the six fundamental questions, popularly known as the “3Q+COP formula”, which must be answered in the text are related to this scientific novelty: who were the scientists, who discovered what, where, when, with what justification (why), with what methodology (how), but without the depth of a report.

The language needs to be simple, objective, and clear, seeking strategies to inform and, at the same time, capture the reader's attention. All scientific concepts must be explained. For this, it presents definitions, bets, comparisons, or analogies, being a different text from scientific articles produced for specialized scientific journals or from reports produced for science fairs, in which the author writes from scientist to scientist. The author needs to write for readers unfamiliar with the research topic or even with science. Another striking feature of the scientific dissemination news is the use of citations, a resource through which the journalist brings the

voice of the scientist responsible for the research or someone who is directly or indirectly linked to it (Giering, 2013).

According to the review of Nunes's ideas (2019), in the case of the young reader, the journalist can use pathetic strategies to achieve the double objective. It is a text, if written by the journalist, in third person. However, unlike non-scientific news, SD's text can use evaluative or qualifying expressions, according to the author's notes. It is a text published in journals, magazines, or blogs with popular access.

Every year, the pedagogical actions are designed specifically for the classes involved, considering their characteristics and the survey of prior knowledge carried out throughout the school year. However, the table below summarizes some actions that have been repeated over these years, since 2019:

Table 1. Some Stages of the Pedagogical Proposal

Steps prior to Mostratec
<p>1. Study of the genre's "chronicle" and "news", based on an articulation between chronicles from the book <i>Imaginário Cotidiano</i>, by Moacyr Scliar (2001), and news that originated the texts of that author.</p>
<p>2. SD news study for young people and adults and for children.</p> <p>Sub-steps:</p> <ul style="list-style-type: none"> • Reading scientific news published on scientific dissemination sites a few days before class. Exercises involving the text and the characteristics of the genre. Discussion about science in society, fake news, and the SD news. Explanation of the proposal to be developed. • Reading and discussion of children's SD news texts. Discussion on children's SD news, the characteristics of the news genre for children and the differences between the news and the article for children in the sphere of journalism in SD. Analysis of SD news texts for children selected by the teacher, published a few days before classes. • Task in groups: division of pathetic strategies listed by Nunes (2019) for presentation to colleagues, through examples found in the texts read. • Division of groups for interviews at the fair. • Discussion about the journalist's attitude and tips on how to be a "journalist for a day".
Heading to Mostratec (always in October)

Steps after Mostratec
<p>1. Text production</p> <ul style="list-style-type: none"> • Socialization, in the classroom, about the results found in interviews with elementary school scientists. Discussion about the language of popularization of science found (or not) in the works presented in the high school exhibition, also visited by the students. Evaluation of the validity of the task by the students. • Production and delivery of news. • Reading of the news by colleagues from other groups, with completion of the evaluation form and suggestions. • Reading, by the teacher, of the original texts and evaluation sheets with suggestions from colleagues. Return to students through tickets. No grade was assigned to this step. • Rewritten by the students. • New evaluation by the teacher and attribution of grade. Oral and written feedback from the teacher to students. <p>2. Referrals for publication.</p>

Note. Author’s table.

One of the last stages of the proposal was the revision of the texts. At that moment, each group should read the text of their colleagues and point out, if applicable, suggestions to improve the news, based on an evaluation form, reproduced below:

Table 2. Evaluation Form

ELEMENTS	CONTRIBUTIONS
1. Cover	
2. Title and subtitle	
3. Lide and news body	
a) 3Q+COP	
b) Use of science-specific vocabulary with explanations of these terms for a non-specialist audience	
4. Strategies for attracting the child's interest	
a) Explosive opening	

b) Use of interjections	
c) Evaluative and qualifying expressions (Ex. extremely important, amazing environment etc.)	
d) Words and expressions found in children's stories	
e) Situations that arouse disgust or embarrassment/disasters	
f) Humor	
g) Fantasies/characters they identify with	
h) Victories in adversity/good overcomes evil	
i) Unusual facts/fascinating discoveries/surprises	
j) Lucidity (playing with words, expressions, images)	
k) Aspects experienced by the child/events of the child's universe	
l) References to the interlocutor (use of the pronoun "you", imperative verbs)	

m) Use of interrogative sentences or exclamatory sentences	
n) Anticipations of possible questions or evaluations by the young reader	
o) Drawing attention to the fact that the young reader learned something new (Appreciation of scientific knowledge)	
p) Anthropomorphization of elements of nature	
q) Use of language close to the child's daily life/lexicon	
5. Photo (with the presence of all the members of the group) and caption	
6. Presentation/Formatting	
7. Grammar review	

Note. Author's table, based on Nunes (2019).

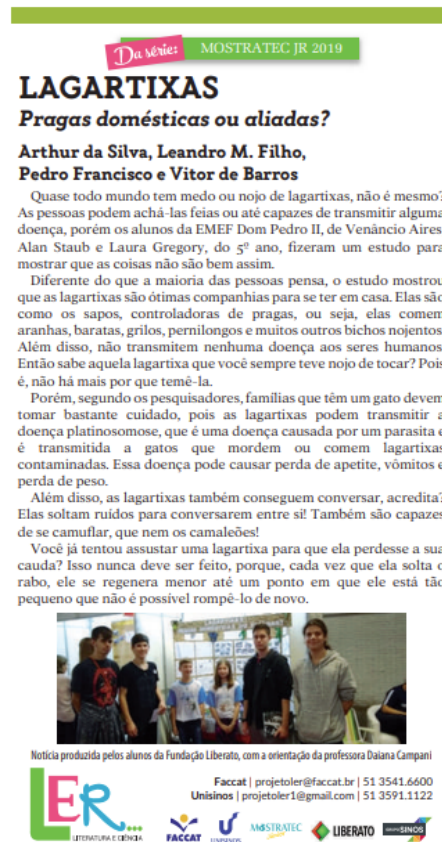
As a stage of publicizing the final product, some of the texts produced always go beyond the walls of the institution. Texts have already been published in the largest newspaper in the city, on the fair's social networks and in the school's journal *Expressão Digital*. Thus, the interlocutor of the text is not just the teacher of the Portuguese Language discipline, who proposed the work, but also children from Elementary School in the region, who will be able to get in touch with the scientific knowledge produced by young scientists and have ideas for their research work. In the same way, the authors of the surveys themselves can see their work become news produced by “journalists” from Technical High School. Elementary school teachers can also work with authentic texts especially aimed at their students. In addition, every community can have access to these texts. Some examples of publications follow.

Figure 1. Instagram Page of Mostratec Júnior



Note. Author's photograph available in: <https://www.instagram.com/p/CERvLe6pPM9/>. Accessed on: 10 Aug. 2023.

Figure 2. Jornal NH



Note. Photo Credit: Jornal NH (2019).

Figure 3. *Journal Expressão Digital*

Note. Photo Credit: screenshot of the author's computer, from the website <https://expressaodigital.liberato.com.br/?p=13946>. Accessed on: 10 Aug. 2023.

It is evident that not all texts meet all the requirements expected by the genre. In many cases, it is still possible to observe a mixture of communication language with scientific dissemination, following, for example, the norms of the Associação Brasileira de Normas Técnicas - ABNT, for academic articles. Another point to be rethought concerns the suggestions made by the groups in the colleagues' files, with corrections of supposed "errors", often grammatical, which did not exist. The teacher's role was to signal that the group should ignore that suggestion.

Despite the challenges of the proposal and the constant rethinking of practices, intrinsic to any pedagogical action, the objective of discussing the role of science and SD in a democratic society was achieved. This was an opportunity to initiate this discussion with these students, a debate that needs to be continually expanded in future proposals.

The editorial board of *Liberato Científica* journal

Liberato Científica journal, published since 2015, is one of the actions of the Liberato Foundation that reinforce the institution's commitment to scientific dissemination. It is only when the results of scientific research reach society as a whole and does not only circulate among specialists, but we can also effectively speak of a democratic society. It is the Institution's responsibility, in addition to stimulating research in its actions, to ensure that the results are socialized - and socialized not in a hierarchical way, but in a dialogic way. The Foundation believes that, when science establishes a dialogue with society as a whole, the population can make decisions based on this knowledge - and not on fake news or pseudo-arguments.

With this publication, the Liberato Foundation wants to help the community realize that the results of scientific research are at our side, in our daily lives. The researchers of the articles that make up the journal were all participants of the Mostratec or of the Junior Mostratec the year before publication and are faced with a great challenge: to elaborate a text that is not a scientific paper (an academic text, which is intended for specialists). They did need to prepare an article for scientific dissemination, that is, a text that is committed to the popularization of science. How to explain, for example, what a peptide is to someone who is not an expert in chemistry? How to discuss literacy with someone who is not a linguistic specialist?

For this purpose, these authors make use of language resources such as comparisons, analogies, interactions with the reader and even a certain dose of humor in some cases. They thus took on a dual role: making and disseminating science which is also a scientist's commitment.

Since 2020, I have been in charge of the publication's editorial. During the Mostratec, which always takes place in October, works are chosen that could be published in the following year, observing different areas of knowledge that receive the *Liberato Científica Award*. My role is to get in touch with these authors, explain the SD strategies to them, monitor the process of preparing the texts, forward them to the Scientific Committee and carry out the linguistic revision.

The figures below show some of these articles:

Figure 4. Journal *Liberato Científica*

HEVS: TECNOLOGIA NA PRESSÃO ARTERIAL
 UMA ABORDAGEM PARA TRAZER DINAMISMO À SAÚDE NO BRASIL
 HEVS – Hypertension Estimation Visual System

Marcos Augusto Flôres e Vladimir Simões da Luz Júnior
 Curso Técnico de Eletrônica, Fundação Liberato, Novo Hamburgo – RS, Brasil
 Orientador: Marco César Sauer

6 | Liberato Científica, 2022



Nós poderíamos dizer que o impulso inicial para a criação do projeto foi a paixão pela ciência, a sede pelo conhecimento ou a promoção de uma mudança significativa no mundo. Entretanto, a inspiração revela-se mais simples: inovar. Seria injusto não mencionar também o anseio de participar das feiras.

Começamos nossa jornada ainda em 2019, na Feicit – Feira Interna de Ciência e Tecnologia, da Fundação Liberato. Na ocasião, queríamos otimizar os cruzamentos da cidade construindo semáforos inteligentes. Essa proposta não seguiu como esperávamos; contudo, serviu de fagulha para a criação do projeto sobre o qual estamos escrevendo. Em 2020, durante a pandemia, avaliamos que projetos na área da saúde seriam um grande foco para as próximas feiras. Soluções para evitar catástrofes na saúde foram questões que a sociedade atentou. A partir disso, começamos nossas conversas com nosso professor orientador, Marco Sauer, a quem é devida uma importante parte desse trabalho.

Depois de nos chocarmos com os dados da mortalidade das doenças cardiovasculares – a média de mortes de um ano “normal” supera em 7 vezes a média obituária da covid-19 em maio de 2020, no Brasil, conforme dados da BBC News – decidimos levar nossos esforços para essa área, a cardíaca. Ai vem um ponto que consideramos importante ressaltar: a criação de ideias também deve ser estratégica. É um erro comum esperarmos o tempo passar para “ter uma ideia”. Isso não acontece. Imagine a seguinte situação: Alberto Santos Dumont, no começo do século XX, era um homem comum, com uma vida normal. Tinha seus interesses, é claro, mas não era um ávido alimentador de suas paixões. Entretanto, em uma regular terça-feira de sol, Santos Dumont, ao se olhar no espelho, “teve uma ideia” e disse a si mesmo: “Criei um aeroplano unido a um balão 14 para reduzir o peso efetivo facilitando a decolagem, instalei um motor náutico Antoinette de 50 cavalos-vapor, emvernizarei a seda das asas, retirarei a roda traseira, cortarei a estrutura portadora da hélice e voarei no 14-isi!” Isso é completamente inimaginável! Somente o assíduo contato com o conhecimento e o alicio na ciência farão as ideias surgirem. As ideias são construídas, não tidas.

Note. Source: Liberato Científica Journal (2022).

Figure 5. Journal *Liberato Científica*

MENOS ERVAS DANINHAS E MENOS IMPACTOS AO MEIO AMBIENTE

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 Orientadora: Schirlene Viviane Rossa

AMBIENTE

Entenda por que o estudo comparativo aponta o ácido acético como um promissor substituto para agrotóxicos comerciais em culturas de tomate-cereja.

26 | Liberato Científica, 2022

MENOS ERVAS DANINHAS E MENOS IMPACTOS AO MEIO AMBIENTE

Que os agrotóxicos acarretam diversos riscos tanto para a saúde dos seres humanos como para o meio ambiente não é novidade. Segundo relatório da ONU de 2017, anualmente morrem cerca de 200 mil pessoas de envenenamento agudo por pesticidas no mundo. No Brasil, um fato agravante é a utilização de agrotóxicos em quantidades acima das recomendadas com baixa fiscalização. Foi pensando nisso que começamos a pesquisar mais sobre o tema para entender suas causas e consequências e aprender a como lidar com elas.

O resultado dessa investigação nos levou a pensar na utilização de algum substituto menos prejudicial a algum agrotóxico usado comercialmente no Brasil. Contudo, o tema ainda estava muito amplo, precisávamos focar melhor em alguma cultura afetada por um agrotóxico que fosse danoso ao meio ambiente e à saúde. Voltamos então a aprofundar nosso estudo e a conversar com especialistas da área e definimos como cultura estudada o tomateiro, não só pelo tomate ser um produto muito consumido mundialmente como também por absorver bem agrotóxicos utilizados em suas plantações.

O tomate-cereja foi a variação escolhida por sua plantação ter menor porte e possuir um ciclo de vida mais curto, o que facilitou o desenvolvimento do projeto dentro do ano de 2021. Já quanto ao agrotóxico a ser estudado, acabamos optando por trabalhar com o metribuzin, por ser o herbicida mais utilizado na cultura de tomate-cereja mundialmente, ser tóxico a células do fígado de fetos animais, ter efeitos sobre enzimas do fígado, modificar o sistema hormonal e poder acarretar fitotoxicidade (capacidade de causar danos na parte aérea da planta).

Logo de início, pensamos que seria muito interessante estudar como fazer essa substituição com algo que já fosse usado na cultura do tomateiro, um tipo de “remédio caseiro” contra as ervas daninhas. Foi pensando nisso e sabendo que o vinagre, ou ácido acético, é comumente utilizado como um herbicida caseiro, que decidimos testar como diferentes concentrações do ácido agiriam frente a plantas invasoras mais comuns na cultura de tomate-cereja e, ainda, comparar sua eficácia e seus danos frente ao metribuzin.

Ao nos aprofundarmos mais no referencial teórico, encontramos artigos explicando que o ácido acético atua como um herbicida de contato, isto é, ele ataca e mata as plantas por meio da destruição das membranas da célula, causando, assim, a rápida dessecação de tecidos vegetais. Além disso, o ácido ainda se torna biodegradável quando liberado na água ou no solo, uma vez que é rapidamente degradado por microorganismos.

Tendo as bases bem definidas, montamos nossa metodologia do projeto, feita a partir do preparo de soluções com diferentes concentrações de ácido acético, 6%, 12%, 18% e 24% em volume. Realizamos o estudo com foco em dois casos diferentes.

O primeiro caso foi o estudo do ácido como herbicida de contato, plantio, ou seja, a aplicação de herbicida antes de inserir as mudas de tomate no solo de cultivo. Em oito vasos, semamos ervas daninhas das espécies dinheirinho (*Pilea Microphylla*), quebra-pedra (*Phyllanthus tenellus*) e picão-preto (*Bidens pilosa*), que foram escolhidas por serem as que mais afetam as plantações de

Note. Source: Liberato Científica Journal (2022).

This process is not always without challenges. Perhaps the biggest one is precisely that the authors and the school community understand the differences between the dissemination of science (between peers) and scientific dissemination (to a wide non-specialized public). Sometimes, I still receive texts with language that is very much geared towards other scientists, without the perception that that vocabulary, which is quite common in the area of authors, is completely unknown by the non-specialist. Likewise, it is sometimes difficult for authors to popularize their research without “childishizing” the language or making it informal. Thus, a constant process of writing and rewriting by the authors, evaluation, and reassessment by the editorial committee, is necessary. I notice however that each year a new publication is launched, and more and more texts from the following years are more suited to the expected genre.

Final considerations

With the report of these two actions, I reinforce the social commitment to Applied Linguistics, the area in which I am carrying out my research. I believe that actions taken in high school can contribute to changing the scenario of denialism, misinformation, and infodemic that have always existed but have been accentuated during the pandemic, especially in Brazil. Studying scientific dissemination texts, starting from the theoretical-methodological support of research by linguists can be an important step towards the establishment of a culture of science in our country. I also emphasize the importance of the partnership between university and basic school, since it was based on research by the CCELD group so that the work could be carried out and qualified.

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