

## Scientific research in the learning process for teaching: education, society and science

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### Abstract

The global pandemic situation has made it clear that the consumption of fake news, the predilection for articles to disseminate science rather than scientific research articles, and the legitimization of social networks as sources of information affect social development and maintain those involved vulnerable, as well as susceptible to misinformation. Thus, the need to train citizens with a research profile, interested in science and familiar with its discourses is imminent. In this paper, through documented research that includes social studies, pedagogical approaches and discursive analysis, it's intended to reflect on the relationship between the current situation of scientific discourse and education, as consequently, its impact on the development of the society. At the end, a working method is proposed for teacher training entities focused on interaction with scientific research texts.

**Keywords:** scientific research; science and development; education and development; pandemics.

## La investigación científica en el proceso de aprendizaje para la enseñanza: educación, sociedad y ciencia

### Resumen

La situación de pandemia mundial ha puesto en evidencia que el consumo de noticias falsas, la predilección por artículos de difusión de la ciencia antes que los artículos de investigación científica y la legitimación de las redes sociales como fuentes de información afectan el desarrollo social y mantienen a los involucrados vulnerables, tanto como susceptibles a la desinformación. Así, la necesidad de formar ciudadanos con perfil investigador, interesados por la ciencia y familiarizados con sus discursos resulta imperiosa. En el presente trabajo se pretende, mediante una investigación documentada que engloba estudios sociales, enfoques pedagógicos y análisis discursivos, reflexionar acerca de la relación entre la situación actual del discurso científico con la educación y, en consecuencia, su repercusión en el desarrollo de la sociedad. Al finalizar, se propone un método de trabajo para las entidades de formación docente focalizado en la interacción con textos de investigación científica.

**Palabras clave:** investigación; ciencia y desarrollo; educación y desarrollo; pandemia.

## A pesquisa científica no processo de aprendizagem para o ensino: educação, sociedade e ciência

### Resumo

A situação de pandemia global deixou claro o consumo de notícias falsas, preferindo artigos de divulgação científica, ao em vez de artigos de pesquisa científica e a legitimação das redes sociais como fontes de informação afetam o desenvolvimento

social e mantém os envolvidos vulneráveis, bem como suscetíveis a desinformação. Gerando assim, a necessidade de formar cidadãos com perfil de pesquisador, interessados em ciência e familiarizá-los com seus discursos é iminente. Neste artigo, por meio de pesquisas que incluem estudos sociais, abordagens pedagógicas e análise discursiva, pretende-se refletir sobre a relação entre a situação atual da ciência, discurso e educação, e conseqüentemente, seu impacto no desenvolvimento da sociedade. Ao final, é proposto uma metodologia de trabalho para entidades formadoras de professores voltados para interação com textos de pesquisa científica.

**Palavras-chave:** investigação; ciência e desenvolvimento; educação e desenvolvimento; pandemia

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## Background

Our society is facing a situation that tests not only the stability of our social structures, but also the competencies of the citizens who make it up. The growing popularity of fake news, the increased consumption of science dissemination articles (adapted and biased) rather than scientific research articles (detailed and methodically structured), and the legitimization of social networks as sources of information that surpass national and international scientific journals in local subscribers are considerably affecting social development, indisposing citizens in their search for a better quality of life and diminishing their expectation of overcoming the global pandemic situation.

Taking this into consideration and taking as references the research of González (2019) and Marmón (2014) that explain social problems related to scientific discourse, the growth and consumption of fake news, the lack of knowledge of information filters, as well as the study of Muñoz, Muñoz, García and Granado (2013) that relates the discourse of science with its application in the educational field, it was possible to identify management of information as a weakness in our society, whose improvement should be prioritized. In order to address it, Bakhtin's (1982) statement has been regarded as a premise. It states that we can only develop in those discursive genres with which we have learned to interact, and it is precisely this interaction that enables us to master them.

The studies by García (2008), Ciapuscio (2011), and Llácer & Ballesteros (2012) regarding the linguistic resources used in scientific discourse, contrasting the research article with the science dissemination article, will be taken as a basis to focus on the interaction with scientific research texts, as a sort of work suggestion for teacher training institutions.

This article will present a review of the situation of the current society and its relationship with the scientific discourse, as well as its presence (or absence thereof) in the school manuals and entrance exams to the state's higher education system. The last section will detail a work proposal aimed at teacher training students, appealing to the final recipient of this process: the citizen.

## Discussion

### Social Situation Related to Scientific Discourse

Peruvian society finds itself in a situation in which the management of adequate information is as important as it is decisive for survival. In the first half of 2020, digital channels became the sole source of information, and with that came the need to be able to adapt competently to this new interaction with scientific progress.

Fake news has become a significant obstacle when it comes to discerning information. According to González (2019), "during 2017, 122

websites devoted to publishing fake news were detected" (p. 33). Against them, pages such as "Fact Check" (from Google) and Maldito Bulo (from *maldita.es*) have been created to identify them and discard the sources. In spite of this, national media have been victims of deceit on more than one occasion, resulting in a large part of the population being affected. Moreover, because national representatives or state leaders legitimize platforms such as Twitter and Facebook by publishing communiqués, announcements, and opinions on them, fake news takes on the dimension of rumors and is distributed anonymously, making it increasingly difficult to erase its trail.

According to González (2019), "social media have introduced the concept of self-distribution, which implies that it is the users themselves who decide through which channels to initiate the dissemination of content" (p. 34).

Fake news usually imitate the science dissemination discourse and is propagated in unsupervised media (such as social networks), through descriptions with attached elements or links that lead to dubious or little known pages, but to which the most vulnerable population is mostly exposed. The preference for the dissemination article responds to the fact that the scientific research discourse is difficult to imitate due to the amount of intertext<sup>1</sup> (quotes, allusions, transpositions, etc.), in addition to the precise and objective language that does not appeal to the reader's sensibility, but to their rationality.

It can, therefore, be deduced that the command of scientific research discourse by the population could decrease the consumption of fake news and its propagation. Knowledge and mastery of reliable national and international sources for access to classified information is necessary at any time in history and is a competency that every citizen should acquire.

## The Scientific Research Discourse and Education

The classification and determination of discursive genres are still the product of inconclusive

studies; however, the certainty that we can develop only in those that, mostly unconsciously, we know and master through practice or interaction is irrefutable. Bakhtin (1982) explains that if a specific discursive genre is mastered, the enunciator will be able to interact with it more freely according to their enunciative intention. It follows, therefore, that the lack of interest in scientific texts or participation in debates of the same nature is due to an inability to master the genres corresponding to scientific discourse, and this difficulty stems from the little interaction one has had with the genre during our own education.

Proof of this is the almost monotonous presence of short, fragmented, or summarized texts in school textbooks (leaving aside the reading plan which, in its application, only includes the literary genre, despite the fact that the Ministry of Education (2006) suggests diversity in the selection of texts)<sup>2</sup>; the predilection for journalistic discourse and science dissemination articles in the entrance exam of the university with the greatest number and diversity of applicants (Universidad Nacional Mayor de San Marcos, UNMSM), which would also lead to rethink the desired profile of university students; and the production of research articles, which places Peruvian national universities in the 45th place in Latin America (Scimago Institutions Rankings, 2020).

Taking as an example the texts used to evaluate reading comprehension in the last five entrance exams of UNMSM and identifying its sources, we have prepared the following table (see Table 1).

As can be seen, out of 21 texts selected to evaluate the applicants in the areas of Engineering, Humanities, and Legal and Social Sciences, only 6 correspond to scientific research related to these areas.

Although the genres condensed in the "other" category of Table I correspond to different sources, such as national (*El Comercio*, *La República*) and international (*El País*) newspapers, blogs, news bulletins (*National Geographic*), and school textbooks (taken from the 2019-I process, due to the introduction of texts in English), the direct

<sup>1</sup> The term is taken from the interdiscursive studies by Adam (1999).

<sup>2</sup> This can be verified by checking the publisher's web pages such as Santillana (Loqueleo program) or *Black Cat* (Loqueleo program) (for the English reading plan).

**Table 1**

*Classification of Selected Texts for the Last Five UNMSM Admission Processes According to their Sources*

Admission process	Genres		Total texts
	Scientific research article	Others	
2020-I			
2019-II	1		
2019-I	1		5
2018-II			
2018-I	0		
Total			

**Table 2**

*Classification of Sources of Scientific Research Articles According to their Indexation*

Source	Indexed	Not indexed	Note
Contexts	X		
Science, Technology, and Sustainability		X	With publications cited in indexed journals
Ideelee		X	With publications cited in indexed journals
Media and Education Magazine	X		
Form and Function	X		
Alterities	X		

relationship of their content with the different specialties grouped in each area is highlighted.

From the scientific research articles, sources that can be classified as indexed and non-indexed are recognized (see Table 2).

In addition, many of them have been adapted in length and for the sake of condensing information that corresponds to the time devoted to each text in the entrance test.

It should be noted that indexing is a tool that facilitates the search for a diverse public, professionals, or students, but it should not be taken as a factor to dismiss national journals that do not have this distinction since this does not diminish the quality of the researcher's work (bear in mind that many non-indexed journals have publications in journals that are indexed).

Currently, there are studies that have

demonstrated the importance of science discourses for the acquisition of competencies and the development of communicative skills. In Muñoz et al. (2013), the contributions of scientific texts are described based on the characteristics that stress their role in the academic activity.

They reflect the intellectual activity of man, as well as the progress of science and technology. Its essential characteristics are impersonality, objectivity, and accuracy. Generally, the scientific text is constructed not only with a language, but also includes other systems of communication such as: specific metalanguage of the science in question, graphs, formulas, etc. The communicative function acts here in its informative form. (p. 792)

To this contribution it should be added that a scientific text can stimulate the search and review of sources in order to address the different aspects of a problem, contrast the criteria of different authors, reach their own conclusions that reflect their judgment, and conceive projects in whose application the participation of a guiding, facilitating and critical professor will be essential.

A scientific research article, unlike a science dissemination article, stimulates the reader to form their own judgment, due to the impartiality with which it is presented. It exposes, describes, and argues, making active use of the interdiscourse that will keep the student in a dynamic where the language appears as complete, functional, and totally alive. Also, it allows recognizing and replicating the use of logical connectors and discursive markers that facilitate the organization of ideas in any field of research, and constantly interacts with reality, whether to explain current events, to present them, or to expect future changes through meticulously established analyses.

Seen from another perspective, becoming familiar with the discourses of science stimulates the development of skills to interact in society by making use of the different levels of language; creates active citizens with criteria and autonomy; and encourages participation in the national and international scientific community, which strengthens institutions and organizations engaged in research, whose results benefit the population by giving them prestige and relevance worldwide, a situation that will allow combating the linguistic minorization experienced by Spanish-speaking communities, among others (Arnoux, 2014).

### **Proposal for the Application of Scientific Discourse in the Pedagogical Field**

As a human being who dabbles in the art of speaking, the evolutionary development of scientific discourse to which people unrelated to its discursive genres will be subjected will require the full commitment of its mediators; therefore, every student preparing for a teaching career must learn to adapt scientific research articles to articles for the dissemination of science. This will enable the aspiring teacher to master reference

material, as well as to become familiar with the various sources. It is important to remember that this process will not consist of minimizing the research dissertation; on the contrary, it will consist of adapting it in order to focus its content according to the pedagogical purpose (which in turn depends on the needs of the context) and then show it as the pinnacle of the work, the apex of the research.

Taking as a reference the division by periods with which the Ministry of Education groups the educational levels, a proposal would be to work on the articles of science dissemination and its scientific references up to period VI and the articles of scientific research in period VII, which encompasses the last academic levels (4th and 5th year of secondary school). However, this proposal suggests that the exposure and mastery of both discourses be proposed in the Schools of Education since any innovation made in teacher training has a rapid and effective multiplier effect on the performance of the educational system.

In this regard, as mentioned above, discursive genres are learned through interaction with the genre itself as with the acquisition of a mother tongue, even if one is not fully aware of it; therefore, providing future mediators and, subsequently, future scientists with this knowledge will only be achieved by exposing them to it, making them familiar with the scientific discourse (passive stage) and encouraging their participation through studies or projects for application in the classroom (active stage). To this end, the passive participation stage is the first link in the researcher training chain. At this stage, the preparation of a syllabus that includes review of scientific journal articles, participation in symposia, and the scheduling of debates on current topics by specialties are not only appropriate, but also necessary.

Llácer and Ballesteros (2012) detail the differences between the language of scientific research articles and the language of science dissemination, a difference that can be used as a structural reference for both discourses and as a way to achieve one based on the other (see Table 3).

This adaptation will capture the attention of education students and will facilitate the assimilation of their work as a commitment to constant discovery and learning. In addition, they

**Table 3**

*Differences between the Structural and Linguistic Resources of the Science Dissemination Article and the Scientific Research Article.*

<b>Scientific research articles</b>	<b>Science dissemination articles</b>
It has a fixed and mandatory structure <ul style="list-style-type: none"> <li>• Introduction</li> <li>• Materials and methods</li> <li>• Results</li> <li>• Conclusion</li> </ul>	It presents a summary that reflects the most important points of the research.
Long titles with accuracy and precision of the subject matter to be covered.	Titles that are understandable to the average reader, aiming to attract attention and lead them to an interesting topic.
They present line or bar graphs and tables.	They show figures, graphic, and schemes in order to summarize and visually outline the information.
Regulations that reproduce the research process (approach, experimentation, and conclusion).	It contains journalistic and didactic components, adapts terminology, uses metalinguistic resources (such as italics, quotation marks, parentheses), and follows a sequence known as "simple linear progression" (from theme to theme).
Impersonalized language.	The discloser is the protagonist and narrates chronologically (plot, crux, and possible outcome).

will acquire skills to transmit to their students and follow the chain of active researcher training.

Ciapuscio (2011), who devoted an article to the study of scientific discourse, mentioned that "metaphor constitutes a mechanism of conceptualization of great importance in the field of creation and communication of science" (p. 91). This statement provides us with a resource for the adaptation of scientific discourse for pedagogical dissemination purposes, since metaphor as such constitutes an effective communicative resource for explanation and allows the construction of appropriate interpretations by different types of audiences. Because it evokes domains close to everyday experience, it is effective in opening new modes and paths of thought.

Another crucial mechanism for the elaboration of an article for scientific dissemination is the intensive and highlighted citations (García, 2008). Inside the final article, they will facilitate intertextual communication and thus familiarization with their references, in addition to providing academic support to the author. The use of bibliographic sources during the training period (passive stage) will be mandatory for all those involved, as well as knowledge of the

rules for authors described in the web portals of scientific journals. Each proposed dissemination article should, in turn, have the scientific research article(s) taken as an attached reference so as not to lose sight of the final objective: to train active researchers.

It should be clarified that the use of the diffusion article would only be effective for the proposed purposes as long as it is applied in the first levels of their formal education (for Regular Basic Education, RBE). The mentioned adaptations could be extended up to the first grade of level VII, and for university education, it would be part of the general courses (Cycles II and III)<sup>3</sup>. Once the aforementioned limits have been reached, work shall be done with scientific research articles previously selected according to the area of interest or the topic to be developed based on the established projects (suggested by the professor or proposed by the student) pre-set at the beginning of the course.

<sup>3</sup> Translation from one genre to another requires the acquisition of specific linguistic skills. It is, therefore, necessary to reinforce the mastery of syntactic, semantic, and pragmatic functions in Cycle I.

## Conclusions

Fake news, the lack of diversity of discursive genres in school textbooks, and the popularity of science dissemination articles rather than scientific research articles have kept the population susceptible during critical periods of history, in which the knowledge of information sources and the mastery of information mark significant differences.

Becoming familiar with the discourses of science, especially the research article, will be fruitful and, in the long run, advantageous for the development of any society, as it will provide its citizens with the tools to fight against false, biased news and biased discourses to which they are currently vulnerable.

Recognizing the characteristics of the various genres proposed by science makes it possible to take advantage of their benefits and make them useful for pedagogical activity, which is why it is not a resource that should be overlooked.

Studies of scientific texts have shown how productive they are at different levels of language skill development, and the best way to disseminate their results is through their application in the classrooms of teaching students, who will be in charge of producing the results in RBE.

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