



Scientific Literacy: Indispensable Tool in the Digital Age

Alfabetización Científica: Herramienta Indispensable en la Era Digital

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Abstract

When reflecting on the term literacy, individuals immediately imagine a subject without minimum literacy skills. This article was conceived to study the importance of generating knowledge in the 21st century. It arose from the antagonism that experts should only publish scientific publications. For the study's undertaking, a multidisciplinary approach was maintained, where different perspectives were incorporated and conceptions about Social Sciences, psychology, citizen, social and pedagogical participation. Qualitative research of the phenomenological-hermeneutic method was carried out. Ten (10) social actors of the International Workshop of Writing Scientific Articles were interviewed to structure, codify, and categorize the results. This epistemic journey allowed a theoretical approach focused on the literacy of social actors to generate knowledge through meaningful science education. Based on the social actors' voice, it was established the tearing of each editorial's bureaucratic chains because the experience is more accessible in the digital era. However, illiteracy has spread rapidly, incited by the old school groups, creating confusion in the events, and expanding their hegemony. Therefore, scientific literacy (SLC) is not only focused on the common factor of scientific activity of how, but also the strengthening of science through Higher Education Institutions, research groups, organizations, and educational enterprises.

Keywords: Legislation, constitution, law, violation of human rights, justice.

Resumen

Al reflexionar sobre el término alfabetización, los individuos de inmediato se imaginan a un sujeto sin competencias mínimas de lectoescritura. El presente artículo se concibió con el fin de llevar a cabo un estudio sobre la importancia de generar conocimiento en el siglo XXI. El cual, surgió del antagonismo, de que las publicaciones científicas solo deben ser publicadas por expertos. Para el emprendimiento del estudio, se sostuvo una aproximación multidisciplinaria, donde se incorporaron diferentes perspectivas, así como, concepciones sobre las Ciencias Sociales, psicología, participación ciudadana, social y pedagógica. Se realizó una investigación cualitativa de enfoque fenomenológico-hermenéutico, donde se entrevistaron a diez (10) actores sociales del Taller Internacional de Redacción de Artículos Científicos, para luego estructurar, codificar hasta categorizar los resultados. Este recorrido epistémico permitió un acercamiento teórico, centrado en la alfabetización de los actores sociales, en calidad de, generar conocimiento a través de educación científica significativa. Partiendo de la voz de los actores sociales, se estableció el desgarramiento de las cadenas burocráticas de cada editorial, debido a que el conocimiento es más accesible en la era digital. No obstante, el analfabetismo se ha propagado vertiginosamente, incitada por los grupos de la vieja escuela, creando confusión en el qué de los sucesos, para expandir su hegemonía. Por ende, alfabetización científica (AC) no solo está centrada en el factor común de la actividad científica del cómo, sino también en el fortalecimiento de la ciencia a través de las Instituciones de Educación Superior, grupos de investigación, organizaciones y empresas educativas.

Palabras clave: Siglo XXI, educación, científico, herramienta, alfabetización.



Introduction

Since the twentieth century, experts in the scientific field have been asking educational institutions for a more meaningful scientific literacy, which would allow students to justify the daily events present today. However, when reflecting on the term literacy, individuals immediately imagine a subject without minimal literacy skills, in other words, without verbal skills in the mother tongue or foreign languages. For the reasons stated above, the bases of scientific literacy (SFL) supported by the authors McConney, Oliver, Woods- McConney, Schibeci & Maor (2014) are consolidated because it remains prevailing and with new challenges in the digital era, which must be complied under a formative competence of the current city.

Therefore, the present article arises from the antagonism that experts should only publish scientific publications; in other words, paradoxically, the one who masters scientific writing skills is the one who can generate knowledge. In this sense, a multidisciplinary approach was held, where different perspectives are incorporated, as well as conceptions of social science, psychology, citizen participation, social, as well as pedagogical, resulting pertinent to raise a proposal where educational institutions promote the acquisition of scientific skills linked to evaluation and preservation of references in the digital era, as Olmedo-Estrada (2011) points out that it is increasingly evident that the (CA) "is indispensable for the citizen of the XXI century" (p.145).

CA as a curricular competence is committed to the advancement of literacy, acquisition of knowledge, mastery of a complex language, scientific epistemology capable of understanding the limits (Aguilar, 1999) to strengthen social and economic progress (Hurd, 1998), the efficient perception of scientific nature (Abd-el-Khalick, Bell & Lederman, 1998), active participation responsibly on the problems of the world (Martín-Díaz, 2001), likewise, the curricular transformation of the educational institutions that orient the scientific teaching towards social and personal aspects of the student (Furió, Vilches, Guisasola & Romo, 2001).

The purpose of this research stems from the need to promote scientific literacy from Higher Education Institutions, research groups, organizations, and educational companies because, according to Sternberg & Lubart (1997), creativity and innovation are underestimated by the community and institutions that exist within society. Seen as follows, it is unavoidable to reflect on what Laugksch (2000) stated that scientific knowledge is used to participate in decision-making about the world. From this, the following questions can be raised: Who can generate scientific knowledge? How can scientific literacy be promoted? What are the contributions of CA in the construction of knowledge in the 21st century? How does CA contribute to quality scientific production?

Methodology

For the study of the different authors and experts in scientific writings, the present research was based on the qualitative paradigm, under the phenomenological approach that allowed the author to follow the hermeneutic paths through her events in the understanding of the investigated subject. According to the author Husserl (1998), the phenomenological research approach aims to reveal the nature of the objects, attributes, and authenticity of the phenomena from the lived experience.

In this regard, the authors Aguirre & Jaramillo (2012) argue that phenomenology is a philosophical method emphasizing phenomena (Heidegger, 2006). In other words, in a sense, meaning and subjectivity formation the world (Bolio, 2012), exhibits in every human experience moment (Rizo-Patrón, 2015). Therefore, it became necessary to understand the author's voices as a combined dynamic, an organized and systemic totality, employed under the qualitative-structural methodology as pointed out by Martínez (1996). Considering that, phenomenology and teaching are constituted from the transference of culture with the world, from the experience of understanding and talking about reality (San Martín, 1986, p. 9).

Hermeneutics offered congruences to establish expertise that admits the

organizational context approach, to understand the authors' actions in it. This research had a context of development in the technological-educational platform Docentes 2.0, which assembles favorable approach conditions for the study. New concepts were established from the social interaction and active collaboration utilizing the in-depth interview technique, directed to ten (10) social actors belonging to the International Workshop on Writing Scientific Articles for Indexed Journals. The interpretation process was carried out by structuring, coding, and categorizing the content.

In the present research, the author did not aim to verify a hypothesis but to reveal the underlying from the voice of the social authors; the exegesis derived in this study sought to understand, structure, systematize and codify the testimonies based on the emerging categories identified for each unit of meanings. For these purposes, the following meaning units emerged: (1) scientific writing, (2) curriculum, (3) research methodology, and (4) informational culture. From these emerged the emergent subcategories: Lexical competencies, communication, expertise, professional preparation, meaningful knowledge, writing strategies, research results, methods, scientific knowledge, content creation, writing skill, didactic resources, for a total of twelve (12) emergent categories.

This methodology fulfilled the purpose of the research in terms of knowing how the authors of scientific production think and act from their writing practices, constituted based on shared critical reflection, to be considered the object of scientific transformation, through the pragmatism of the scientific lexicon that implies the resolution of practical problems of scientific writing, among them: articles, theses, essays and reflective documents of dynamic rationality, from the individual subjectivities of the author by the knowledge society, which, leads to value the empirical knowledge that authors build for the advancement of science.

Results

The hermeneutic report was designed

from a double approach, the scientific-academic approach on the units of meanings and emerging categories arising from the interaction with the social actors, which allowed to reveal some substantial findings on the object of study.

Table 1
Relationship of the Unit of Meanings and Emerging Categories

Units of meaning	Emerging Categories	Coding	Chromatization
Scientific Writing	Lexical Competencies	ECCL	Dark Blue
	Communication	ECC	Purple
	Experience	ECE	Grass green
Curriculum	Professional Preparation	CPP	Light purple
	Meaningful Knowledge	CCS	Dark red
	Writing Strategies	CER	Orange
Research Methodology	Research Results	MIRI	Fuchsia
	Methods	MMI	Yellow
	Scientific Knowledge	MICC	Light gray
Information Culture	Content Creation	CICC	Red
	Writing Skills	CIHE	Olive green
	Didactic Resources	CIRD	Light Blue

Note. The systematic approach of the categorical relationships allowed for interpretation from the voice of the actors under study, own elaboration (2020).

This research made it possible to evaluate the importance of generating knowledge in the 21st century. Consequently, it was determined that it is positive to teach literacy for the construction of quality scientific content, now of carrying out changes according to the reality and strategies of scientific writing in the population under study. From this orderly approach, the following interpretation was provided:

From the above conceptual structure "Lexical Competences", it can be deduced that it implies integrating, conserving, and preserving the significant intellectual production. The author Alfonso-Sánchez (2001) sustains that "the manuscripts and each of their editions reveal the numerous corrections that the works undergo before going, definitively, to the printing press" (p.1).

Table 2

Category: Scientific Writing

Matrix I: Analysis and Interpretation of Results

Unit of Meanings	Emerging Categories	Author's Interpretation
Writing Scientific	Competences Lexical	When interpreting the feelings expressed by all the social actors, according to what was found in their discourses on Lexical Competences, it was possible to understand that there is consensus in affirming, according to what was stated by A1, A3, A5, A7, A9 and A10, that the generation of scientific knowledge requires literacy to enrich their experience when writing with quality, because this affects to a greater or lesser degree in the formation of quality content in the digital era. On the other hand, it was possible to affirm that behind any daily educational practice there is always an answer to "why" and "what for" it is taught. In academia, most teachers, researchers, and facilitators do not have experience in writing scientific articles, in other words, they do not have lexical competence in scientific writing. Therefore, the world itself becomes a propitious setting for redefining the pedagogical experience by developing the ability to observe, reflect, devise strategies, and solve practical problems. In short, thinking about experience creates the conditions necessary to improve the scientific field.

Note. Lexical competence is the knowledge and ability to use the vocabulary of a language, own elaboration (2020).

Therefore, educational institutions, organizations and companies dedicated to the generation of quality content should not forget the importance of the research process, originality, methodology, as well as adequate structure, so that their publication and dissemination comply with the three essential principles: rigor, transparency, as well as brevity.

Table 3

Category: Curriculum

Matrix II: Analysis and Interpretation of Results

Unit of Meanings	Emerging Categories	Author's Interpretation
Curriculum	Writing	In their discourse A1, A2, A3, A4 and A8, it can be perceived that writing is important for

Strategies

authors when developing their scientific writings. Education is the one who empowers man in this search, reinforces the scheme or order of action on which he must base, improve, and improve himself. At present, there is an increase in literature on the approach of how to improve scientific writing, based on motivation, own experience of writing, exchange of opinions or experiences with other experts. The society of the 21st century demands a permanent renewal of the universities, since the scientific and technological scope demands clarity, precision, brevity, as well as how, when and for what purpose to write. This involves a linguistic action that inserts the social place, addressee, enunciator, and purpose. It is important to know the levels of scientific communication, although differences converge, in the same way as cultural experiences; for this reason, knowing the communicative competences, textual competence, international standards and policies will help the transformation of significant quality scientific knowledge. However, this implies a reorganization to improve the above, where a different way of creating science is contributed to its community, in whose center is the appropriation process of the student-author. In summary, scientific writing is a skill that is achieved and perfected if language proficiency, focus, revision, precision, clarity, brevity, and formality are associated.

Note. Scientific writing strategies provide a degree of precision and clarity of the manuscript, own elaboration (2020).

From the conceptual constitution "Writing Strategies", it was evidenced the existence of a series of difficulties faced by authors when writing a scientific article, among them: information density, syntactic complexity, distribution of information (Jerz, 2000), discursive genre, strategies (Remerger, 2000), logic, inconsistencies related to the discipline or audience, plagiarism, grammatical weaknesses,

vocabulary (Feldman, Anderson & Mangurian, 2001) and writing the introduction, frame of reference (Lerner & Ogren-Balkama, 2007). Therefore, prior knowledge is necessary in writing to adequately express the information.

Table 4
Category: Information Culture

Matrix III: Analysis and Interpretation of Results

Unit of Meanings	Emerging Categories	Author's Interpretation
Information Literacy	Writing Skills	The author interpreted what was stated by A1, A2, A3, A4, A6, A8, A9 and A10; the desire to obtain competences, strategies, and meaningful continuing education on how to write scientific articles. In the first place, the actors wish to be taught as a transformative component to understand, interpret, argue, propose, and generate knowledge in the corresponding area of knowledge. Secondly, they seek skills to know the stages (prewriting, writing, and rewriting), text production (creativity and reworking), academic skills (data interpretation, linking information and synthesizing skills) and cognitive skills (planning, rereading, revising, selection and form). Finally, strategies to improve writing in terms of grammatical structures (syntactic, semantic, pragmatic, stylistic, schematic, and mutual connection). Thus, the construction of a text involves stages to optimize the communication discourse. The practice of literacy is linked to the academic environment, which involves reading, taking notes, and rereading to produce writings with reliable rhetorical discourse. In summary, the ability to write implies a close link between the organization of ideas and the statement of information, so that each letter, word, phrase, or sentence is spliced to build a thematic coherence to be disclosed.

Note. The writing skill involves an arduous process, which is determined by the person's writing skills, own elaboration (2020).

In this conceptual structure, unit of meanings "Information Culture" was considered necessary a scientific literacy that strengthens writing skills in a meaningful way. An education

based on the construction of scientific documents with reasoning skills, which characterize the cognitive approach. According to the author (Gonzalez, 1993) "mechanical type skills, orthographic type skills, production skills, linguistic skills and organizational skills" (p.39). These skills are legible handwriting, proper writing, spelling, ideas, linguistic components, logical, sequential, and organizational coherence.

Figure 1
Categories of analysis



Note. Integration of the eight (4) units of meanings generated by the semantic network of the nineteen (12) emerging categories, own elaboration (2020).

Thus, we can end with an illustration Figure 1, which corresponds to the integration of the table (4) units of meanings that generated the semantic network of the twelve (12) emerging categories, corresponding to the discourse of the interviews conducted on the importance of generating knowledge in the XXI century.

Discussion

Even when scientific articles are published at present, many of them are rejected for not presenting quality writing, therefore this has become a key factor for the dissemination of scientific knowledge, which, according to the author Furio et al. (2000), is a long process of direct collaboration between teachers and experts in science didactics. Paradoxically, most of the research related to scientific production is carried out by university students, with a marked weakness in the lexicon; this approach has not been sufficiently investigated in terms of the role that educational institutions, organizations, and companies should play in strengthening the writing of original scientific articles and their link with the origin to propose possible solutions.

What the authors suggest could be derived on the one hand from the bureaucratic chains of

each publishing house to the knowledge that is more accessible or by the vertiginous propagation of illiteracy incited by the anachronistic groups of the old school, those who have created confusion in what of the events, to expand their hegemony. Since the great majority of Spanish-speaking countries, the art of writing scientific articles is considered part of the subject of research methodology, although it is not approached as an autonomous unit where the differences between writing an article and a thesis are shown. The author Cassany (1993) points out that "there are no magic concoctions or even instant recipes for writing" (p. 237), which shows that writing involves the author's attitude and work style.

In the findings, the interpretation, comprehension, and construction of new conceptual links are evidenced. According to Moya (2003) "there are several techniques to activate prior knowledge, such as anticipation activities, anticipation guides, semantic maps, discussion, etc." (p. 34). (p. 34), for this reason it is essential to teach literacy to achieve quality knowledge production. Another result that calls for attention in this study is the writing skill, where greater difficulty was evidenced in expressing intricate ideas in a simple way, demonstrating in the second review that the social authors were able to determine their own weaknesses, in terms of: lexical competences, communication, experience, professional preparation, significant knowledge, writing strategies, research results, methods, scientific knowledge, content creation, writing skills and didactic resources.

It is pertinent to emphasize that the present research is timely and novel because it is oriented towards determining the main causes of writing scientific articles by a group of authors. At present, several researches have been carried out regarding the relevance in scientific production, but these have been presented as a general and not specific study on the difficulties of writing that oppose the increase of quality. Faced with the ways of accessing an informational culture, the associations of the cultural sector should reflect on what their role will be to establish a more cultured, engaged, and interactive digital society (Celaya, 2011).

One of the restrictions of this publication is subject to the period of data collection, which was extended from April to August 2020, due to the problems caused by the global pandemic, so that the articles received late were not observed. For the correct interpretation of the results, a significant inclination is sustained; the difficulties encountered are restricted by the units of meanings to be assessed in the instrument applied, in the same way that the review time was not the same for all social actors.

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Conclusion

The research carried out allows us to deduce that every scientific literacy proposal proposes an explicit statement of its purposes because these are a necessary condition to provide meaning to the scientific writing process. These purposes are born from the curriculum theory and from the beliefs that sustain the subject. In addition, the principles, values, and norms are placed before them to provide the institution with its own style "as a dynamic of a personal development that each subject makes by his own means, each one forms himself with the help of mediations that only make formation possible" (Ferry, 1997, p.13). Therefore, scientific literacy (SLA) is not only focused on the common factor of the scientific activity of how, but also on scientific empowerment through Higher Education Institutions, groups, organizations, and educational enterprises.

The purpose of educating in scientific writing is urgent, it is necessary to appropriate a neat lexicon that transcends editorially through clear, authentic, and original arguments, which captivate not only to be read, but also to encourage those who still do not write, to nurture aspects to strengthen the writing. As the author Foucault (1970) points out, "scientific discourse can define the axioms it needs, the elements it

uses, the propositional structures that are legitimate for it and the transformations it accepts" (p. 314). Therefore, a proposed education for literacy admits contributing to an education for citizenship, since any reform includes as a central unit teachers and students for scientific purposes, a debate that has almost always been subtracted from it too many times.

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