

Perception of open science among university professors in Cuba

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ABSTRACT

Objective. This study assessed the perceptions of university professors in Cuba regarding open science (OS).

Design/Methodology/Approach. A mixed-methods descriptive research design was employed, integrating quantitative methodologies and techniques for the collection and analysis of the cognitive and perceptual dimensions of the data. This approach was utilized to examine the behavior and modes of action of university professors in relation to OS. The study was conducted in three stages: (1) definition of the problem, (2) diagnosis among Cuban professors, and (3) analysis of the survey results.

Results/Discussion. The existence of a favorable situation in the implementation of OS highlighted the need for further development in some of its components. Conventional publishing practices persisted; nevertheless, there was a discernible inclination to persistently explore alternative avenues.

Conclusions. In the course of meticulously analyzing and designing actions to enhance the current landscape of OS in universities, certain patterns were identified. A discernible discrepancy emerges in the knowledge and skills exhibited by professors. Among the components of the phenomenon, open access is the competence that is most recognized by the surveyed community, and open evaluation or infrastructure is the least mastered. Conventional practices continue to influence the development of scientific and research processes. However, there is a dearth of knowledge concerning the regulatory aspects of OS.

Originality/Value. First assessment of OS in institutions under the Ministry of Higher Education of Cuba.

KEYWORDS: open science; diagnosis; survey; perception; university professors; Cuba.

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1. INTRODUCTION

THE CENTRAL American Higher Education Council (CSUCA, 2023) has indicated that the development of open science (OS) was enabled by the following declarations: the Declaration on Science and the Use of Scientific Knowledge (UNESCO, 1999); the Budapest Open Access Initiative of 2002, 2012, 2017, and 2022 (Budapest Open Access Initiative, 2002, 2012, 2017, 2022); the Bethesda Statement on Open Access Publishing (2003); the Berlin Declaration on Open Access to Knowledge in the Sciences and Humanities (2003); the San Francisco Declaration on Research Assessment (DORA, 2012); and the UNESCO General Conference (UNESCO, 2021). These initiatives culminated in the adoption of recommendations on OS, which advocate for the unrestricted accessibility of all publicly funded research, with the objective of fostering equitable access to scientific information. A number of authors have reflected on OS with the objective of promoting a more profound comprehension and representation of the phenomenon. According to CONACYT (2017), OS is defined as “the practice that aims to increase the accessibility of publicly funded scientific research for all citizens through the maximum dissemination of scientific, technological, and innovation knowledge” (p. 3). However, it should be noted that this should not be limited to promoting knowledge exchange among scientific communities; it should also promote the inclusion and participation of traditionally underrepresented or excluded groups (such as women, minorities, indigenous researchers, and researchers from less favored countries and languages with few resources). It also endeavors to mitigate disparities in access to scientific advancement, infrastructure, and competencies among nations and regions (UNESCO, 2021). The advantages of OS encompass enhanced transparency, the facilitation of participation and cooperation, the reusability and reproducibility of results, and the reinforcement of the reliability, inclusion, equity, and impartiality of research (FECYT, 2023).

These initiatives, declarations, and conceptualizations collectively signify a substantial shift toward a more open and collaborative research paradigm. This paradigm is aimed not only at

democratizing access to knowledge but also at maximizing the social impact of science. In this manner, they encourage a reevaluation of the manner in which these principles and postulates are situated within academic settings. However, there is still a lack of understanding of the fundamentals of OS in certain scientific ecosystems today, including its definition, application, and the importance of adopting its practices. Therefore, it is imperative to clarify its meaning, investigate existing experiences, and assess how its adoption can influence the better development of science and, consequently, society. This necessity for interpretation aligns with Siegel’s (2023) perspective, which asserts that perception is not solely determined by stimulus patterns. Rather, it is an active process of seeking the most suitable interpretation of the available data. In this sense, the cultural dimension is crucial, as frames of reference, values, and collective experiences profoundly influence the way science and its practices are understood.

2. SOME BACKGROUND IN THE LITERATURE ON OPEN SCIENCE

The scientific literature has identified a number of OS practices in the field of higher education (Meneses-Placeres *et al.*, 2022). Of the consulted texts, some examine the phenomenon in its totality, while others explore specific components proposed by Silveira *et al.* (2023). For instance, the 2020-2021 OS Survey by the European University Association (EUA) appraised the degree to which OS has been integrated into the strategic priorities of institutions and its implementation in organizational practices. This analysis addressed both established fields (open access and research data) and emerging ones, including citizen science and open education (Moraes *et al.*, 2021). In the context of Spanish-speaking communities, notable studies have been conducted (Abadal *et al.*, 2023a, 2023b; Ollé *et al.*, 2023; Ortiz Uceta *et al.*, 2020). The work of Abadal *et al.* (2023a) analyzed the perception of OS and its elements (open access, open data, open review, and evaluation models) among agents in the research system (authors, journal editors, vice-rectors, directors of evaluation agencies, and library professionals). Conversely, Bardi *et al.* (2024) presented the current status of its

implementation in Italy, thanks to the analysis of established policies, scientific production, and services available and documented by publicly accessible information systems.

In addition, the study incorporated diagnoses from related medical disciplines to enhance its comprehensiveness. In the domain of neuroscience, the replicability and reproducibility of scientific findings are indispensable for the attainment of sustainable progress. In the context of empirical studies, the preregistration of hypotheses and methods, the sharing of primary data, and the adherence to standards such as the Brain Imaging Data Structure (BIDS) have been identified as effective strategies to ensure the advancement and the quality of research. Paret *et al.* (2022) examined the adoption of OS practices in neuroimaging and the challenges researchers encounter in utilizing them. Conversely, Ferguson *et al.* (2023), in collaboration with American researchers in the social sciences, conducted a comprehensive evaluation of attitudes, utilization, and perceived norms concerning OS practices. This evaluation was based on a sample of authors whose publications were featured in the 10 most frequently cited journals. Additionally, the study involved doctoral students from the 20 highest-ranked American departments across four distinct disciplines: economics, political science, psychology, and sociology. The findings indicate that the prevalence of such practices escalated from 49% in 2010 to 87% a decade later. In a similar vein, Liu and De Cat's (2021) research sought to address the following research questions: What are the attitudes of researchers in applied linguistics toward OS? To what extent do linguists engage in open practices, such as the dissemination of preprints and data? To what extent do these attitudes and practices vary depending on career stage? What are the perceived obstacles to OS? To what extent can these practices, attitudes, and barriers be predicted? The study revealed two key findings: (1) there is a general consensus among specialists in applied linguistics on the value and relevance of OS and (2) numerous obstacles and problems persist, requiring further resolution.

A multitude of international studies underscore the significance of OS in behavioral and psychological research, concomitantly highlighting the obstacles confronting its implementation. Eben *et al.* (2023) emphasize that,

despite progress in the adoption of practices such as preregistration and data sharing in the study of behavioral addictions, significant barriers persist, including a paucity of incentives and cultural resistance. The authors emphasize that the adoption of these OS practices is essential to improving transparency and reproducibility in the field (Eben *et al.*, 2023). In a similar vein, Graham *et al.* (2023) illustrate how the implementation of these principles can enhance the reliability of studies in political science, particularly in research on electoral behavior. This approach has been demonstrated to enhance the quality of findings and to reinforce the credibility of research by reducing publication bias (Graham *et al.*, 2023). Conversely, Matuk *et al.* (2023) explore the integration of OS in education, highlighting its potential to cultivate a culture of transparency from an early age. The authors of the study found that students who participated in the design and peer review of studies demonstrated a greater understanding of scientific principles and a greater appreciation for transparency in research. This pedagogical approach not only prepares future researchers but also fosters a critical and ethical mindset in scientific practice (Matuk *et al.*, 2023). In their statement from the Behavioral Medicine Research Council, Segerstrom *et al.* (2023) advocate for the widespread adoption of OS practices in health psychology and behavioral medicine. They argue that transparency and reproducibility are essential for advancing the understanding of behavioral factors that influence health. The extant literature on the subject underscores the benefits and challenges of OS, highlighting the need to overcome structural and cultural barriers to achieve robust and reliable research.

Recently, Norris *et al.* (2024) proposed practical guidelines for implementing registered reports and data notes in health psychology and behavioral medicine. These guidelines highlight the potential of these practices to reduce publication bias and foster a culture of scientific integrity. The utilization of such tools has been demonstrated to foster enhanced transparency and productivity in research endeavors, thereby benefiting both the scientific community and clinical practice. In contrast, Wiradhany *et al.* (2025) offer a reflective perspective on the discrepancy between awareness and adoption

of OS practices, identifying the absence of incentives and institutional constraints as pivotal barriers to their implementation. These findings indicate that, while OS offers substantial advantages, including enhanced transparency and quality in research, the implementation of cultural and institutional modifications is imperative to surmount the prevailing structural impediments and ensure the attainment of extensive and effective adoption. In this regard, Cuban universities are endeavoring to implement OS practices; however, the academic community remains unaware of their implications. Consequently, the utilization of perception studies, which encompass the description, diagnosis, and understanding of audience behavior with respect to specific subjects, can facilitate a more profound comprehension of the phenomenon. It is therefore essential to recognize what individuals know about OS, what they expect from it, and what they believe the consequences for professors in higher education institutions might be. The objective of this study is to assess the perception of the OS process by professors from various Cuban universities.

3. METHODOLOGY

To achieve the objective of this study, a mixed-methods research design was developed. This design was descriptive in scope and nonexperimental in nature, and it was carried out in three stages. The initial stage entailed the selection and definition of the research topic, in addition to the delineation of the problem. A comprehensive literature review was conducted on the scientific literature related to OS, its components, and the main background information. In the subsequent stage, a survey was developed and administered with the objective of evaluating the status of OS in the participating institutions. To this end, a qualitative sample was defined, consisting of volunteer participants, with prior informed consent obtained from professors. The survey was structured around seven key actions, described below:

1. *Review of the components of OS to be measured in the Cuban context:* Open access, open data, open evaluation, open education, open infrastructure, citizen science, and OS policies. For this, the OS taxonomy was used as a basis (Silveira *et al.*, 2023).
2. *Definition of indicators:* Indicators designed to examine professors' attitudes and knowledge were identified based on a systematic review of the scientific literature (Borrego, 2022; Ferguson *et al.*, 2023; Liu & De Cat, 2021; Ollé *et al.*, 2023; Ortiz Uceta *et al.*, 2020; Paret *et al.*, 2022).
3. *Instrument development stage:* The questionnaire was developed using Google Forms, given its proven effectiveness in similar studies (Liu & De Cat, 2021). The dimensions of the instrument correspond to the components of OS (open access, open data, open evaluation, open education, OS policies, open infrastructures, and citizen science). The designated form was available for completion from June to September of 2024.¹
4. *Pilot test application:* An initial validation was carried out to obtain feedback on the quality and relevance of the questionnaire, from which the following opinions were gathered: "The introduction says that it takes a maximum of 10 minutes, but it usually takes around 15 minutes to answer"; "In the Open Education sections, there are questions that should allow more than one option to be selected"; "Typos were detected in several questions"; and "Explain what APC means in question 6."
5. *Post-pilot review:* The final questionnaire had a total of 33 questions, after incorporating the suggested adjustments, mainly the conversion of the answers to a multiple-choice format. Professors from several Cuban universities participated in the pilot, including the Universidad Central "Marta Abreu" de Las Villas (UCLV), the Universidad de Cienfuegos (UCF), the Universidad de Camagüey (UC), and the Universidad de Pinar del Río (UPR).
6. *Survey deployment and application:* The participating universities were essentially institutions directly involved in the Cuban sectoral research project. The distribution of participation was as follows: UCLV (54%), UC (16%), UCF (14%), other universities (13%), and UPR (3%). The result for UCLV can be explained by its status as the project leader.

¹ <https://forms.gle/ZG3V2Dn9EVUTxraw6>

7. Survey processing: 226 questionnaires were analyzed. CSV files generated by the Google Forms were used to quantify the results. Percentage calculations were performed on the total sample for the analysis of the findings.

In the third stage of the study, the survey results were analyzed, providing an overall assessment of the current state of OS among Cuban professors and their experiences with practices related to its components. The instrument obtained is a working tool for further exploring the perception of OS among university professors in Cuba.

4. RESULTS AND DISCUSSION

This section presents the primary findings obtained from the OS diagnosis, which are illustrated by the perceptions identified through the questionnaire. The results are described by OS components, according to the instrument's

sections. With regard to open access, the results indicated that 84% of professors have experience with this type of publication (Figure 1). However, responses were divided on the question of experience in depositing research results on open platforms (such as institutional, thematic, or preprint repositories), with 41% responding negatively and 59% positively. These figures suggest the persistence of a possible myth that contrasts publication with deposit, as the idea that the two are incompatible still prevails among participants. When asked about their reasons for publishing in open access (Figure 1), most professors agreed on several of the advantages of this modality: it increases the visibility of research (70%); it promotes transparency in the research process (82%); and scientific results are disseminated more quickly (64%). However, there was less consensus on compliance with institutional open access policies, with only 39% of respondents expressing agreement with this point.

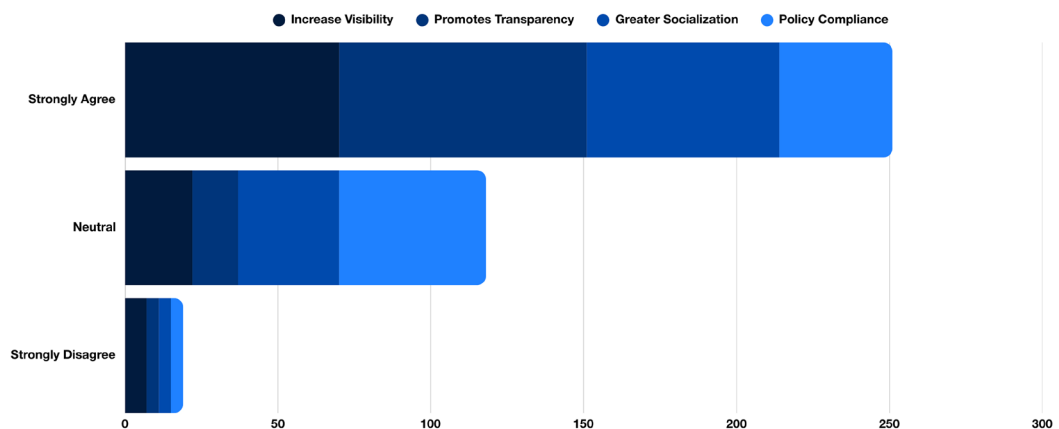


Figure 1. Reasons for publishing in open access.

Furthermore, 73% of participants indicated that they were unaware of whether their institution had any regulatory documents pertaining to open access publications. Additionally, 68% confirmed that they had not received any guidance or institutional support services to address this particular process. This underscores the imperative for university libraries to assume a more pronounced role in training and educational initiatives, in addition to offering technical assistance to educators. The identification of alternative methods to inform faculty members is imperative for enhancing capacity in this domain. With regard to open data, 59% of

respondents indicated that they had not shared or published their research data. However, a significant proportion of the participants, specifically 91%, demonstrated a readiness to share their research data with external researchers, primarily with the objective of enhancing the visibility of their research projects, as indicated by 64% of the respondents. With regard to access to research data, it is noteworthy that 28% of respondents advocate for the public to have access to it. This issue must be addressed deliberately, as it corresponds to the principles of OS. Furthermore, 64% of respondents reported a lack of awareness regarding the existence of

regulatory documents that govern or organize research data within their respective institutions. This has a direct impact on the knowledge that professors and researchers have regarding their responsibilities in terms of the protection and management of scientific data.

Table 1 presents the ranking of three priorities related to the implementation of open assessment in academia. This ranking allows for the identification of the areas of greatest interest and the gaps that exist in its adoption. When asked whether they were aware of open evaluation practices at their universities, 66% of respondents answered in the negative. However, when these practices were demonstrated, 98% of the participants recognized their institutional importance and their potential to enhance transparency and quality in research processes. Based on this, the professors surveyed established the following lines of action in order of priority.

Priority 1	Platforms for open evaluation: publishers, repositories, social networks, online curriculum creators
Priority 2	Open peer review in your university's journals
Priority 3	Open metrics (<i>altmetrics</i> , open publications)

Table 1. Priorities for open assessment practices.

The initial priority indicates that the surveyed professors are genuinely interested in leveraging digital tools and spaces that facilitate the transparent sharing and evaluation of knowledge. This underscores the pivotal role of publishers and repositories in ensuring the accessibility of scholarly publications. Conversely, academic social networks (e.g., *ResearchGate* or *Academia.edu*) and online academic profile creators (e.g., *ORCID* and *Google Scholar*) have been shown to enhance visibility and collaborative evaluation by functioning as alternative platforms that facilitate open evaluation. This phenomenon gives rise to significant challenges in the integration of scientific information systems and the transformation of conventional publishing processes. With regard to the second priority, it is evident that, while there is a discernible interest in enhancing transparency in peer review, its implementation remains limited. While the practice has the potential

to enhance quality, credibility, and constructive feedback, it poses substantial challenges in terms of research ethics and, most notably, the development of policies to promote these evaluation models. While the third priority is the least urgent, it signifies a degree of recognition regarding the necessity to incorporate metrics that extend beyond the conventional ones. This involves the use of indicators based on the use of information in digital environments, for example. This transition presents challenges related to the standardization of alternative metrics and resistance to adopting nontraditional indicators in scientific and academic evaluation.

Open education, however, presents a different picture. In a pilot study, 70% of respondents reported familiarity with open educational practices, with the most prevalent activity being the use of online learning platforms. The advent of the Coronavirus 2019 (COVID-19) pandemic has been identified as a seminal moment in this process. The creation of open content has been identified as a priority area for university support services, particularly libraries and educational technology departments, which are tasked with prioritizing their actions in Cuban universities. While the predominant challenge identified pertains to technological infrastructure issues (82%), it is encouraging that 80% of participants recognize the significance of open licenses in the creation of educational resources. However, the study reveals limited mastery of OS tools among professors: A survey of researchers reveals that 56% have not used open source repositories in their research, 67% have not used open service providers, only 40% admit to having experience with open collaborative work platforms, and only 30% recognize the existence of interoperability protocols or guidelines between platforms. Furthermore, the participants reported a lack of awareness regarding institutional policies that support OS processes. In the domain of citizen science, the prevailing perceptions among respondents regarding the dissemination of scientific outcomes indicate that the predominant methods include the publication of articles and active engagement in events (64%), reflecting a conventional model of science communication that remains significantly distanced from the approaches advocated by the OS movement. These results indicate a substantial discrepancy

between contemporary practices and the standards promoted by the OS movement, which advocates for alternatives such as preprints, open data, and institutional repositories.

5. CONCLUSIONS

The OS paradigm is predicated on the principles of transparency and the facilitation of active participation by a diverse array of actors in the scientific process. The model's components collectively promote innovation and collective progress through an inclusive and participatory research approach. This study identified patterns in OS practices among a sample of Cuban professors and assessed their perceptions regarding their assimilation and knowledge of the subject. These results serve as a foundational starting point for the design of actions aimed at enhancing the implementation of national and institutional policies. A discernible discrepancy in the levels of knowledge and skills exhibited by the OS components among the different professors is evident. The surveyed community demonstrated a high degree of expertise in the domain of open access, while the components of open evaluation and infrastructure were less well understood and utilized. Despite the advancement of OS on a global scale, a conventional research approach persists among educators, characterized by a culture oriented toward formal publication rather than open access to scientific results. This approach imposes limitations on both the visibility and the social impact of the knowledge generated.

A number of critical gaps were identified, including but not limited to: limited public dissemination of research data, low participation in communities of practice, and a lack of awareness regarding tools related to open evaluation and collaborative work. These limitations have the effect of diminishing the potential of open education and methodological innovation in academia. Professors' limited knowledge of the regulatory frameworks governing OS, as well as the underutilization of university library services, are cause for concern. This discrepancy underscores the necessity to fortify training and institutional coordination strategies, thereby fostering more transparent and cooperative practices. With regard to the analysis of digital infrastructure and OS evaluation,

these aspects form the basis for implementing advanced scientific evaluation models, such as open peer review or other transparent evaluation initiatives. Despite the theoretical appeal of open review, its implementation remains in its infancy. Cultural barriers, including a strong adherence to traditional anonymity and a reluctance to address potential conflicts of interest, appear to be contributing to the delayed adoption of blockchain technology. While *altmetrics* and open access are acknowledged, they have yet to be fully integrated into academic evaluation systems. The successful integration of these technologies necessitates not only a considerable time investment but also the implementation of regulatory changes that formally recognize their value within the framework of institutional scientific policies.

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Conflict of interest

The authors declare that there is no conflict of interest.

Contribution statement

Conceptualization, resources, software: Grizly Meneses Placeres.

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Acquisition of funds: Grizly Meneses Placeres, Denis Buedo Hidalgo.


Methodology: Grizly Meneses Placeres, María Josefa Peralta González, Sadia Vancauwenbergh.

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Research, writing – original draft, writing – revision and editing: Grizly Meneses Placeres, María Josefa Peralta González, Denis Buedo Hidalgo, Sadia Vancauwenbergh.

Statement of data consent

The data generated during this research have been included in the results of this study. 

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