

Correlation between Facebook and Google Scholar in scientific journals impact

Correlación entre Facebook y Google Scholar en el impacto de revistas científicas

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How to reference this article / Standard reference.

Cueva Estrada, J., Sumba Nacipucha, N., Paredes Floril, P., Sánchez-Bayón, A., & Carbo Guerrero, K. (2023). Correlation between Facebook and Google Scholar in scientific journals impact. *Revista Latina de Comunicación Social*, 81, 297-314. <https://www.doi.org/10.4185/RLCS-2023-1897>

ABSTRACT

Introduction: Scientific journals (SJ) guarantee quality and contribute to the construction of knowledge through the publication and dissemination of research results. **Methodology:** The empirical study had

a mixed approach, non-experimental cross-sectional design, and descriptive and correlational scope. The social network chosen for the analysis was Facebook, the metric was the number of citations registered in the *GScholar* profile, and the population was 2054 SJ from Latin America registered in the 2.0 catalog of the Regional Information System online for Latindex Scientific Journals. The data was analyzed in SPSS 25 software, and Spearman's correlation coefficient test was performed. **Results:** There is a) a Low positive correlation between Facebook posts and citations obtained in *GScholar*, b) a Moderate positive correlation between the number of Facebook followers and the number of *GScholar* citations c) a Weak positive correlation between the number of followers of the SJ on Facebook and the number of citations obtained by the SJ in *GScholar*. **Discussion:** The limitation was to consider a single social network; it is suggested, for future research, to include other social networks and analyze the shared content. **Conclusions:** The use of social networks and marketing strategies by SJs is an activity that must be incorporated into daily actions considering that, in current times, a large part of the daily activities of people -scientists and researchers included- are developed through digital platforms and devices.

Keywords: Scientific journals; Facebook; *GScholar*; Citation; Indexation; Academic communication; Education economics

RESUMEN

Introducción: Las revistas científicas (RC) garantizan la calidad y contribuyen a la construcción del conocimiento a través de la publicación y difusión de los resultados de investigación. **Metodología:** El estudio empírico tuvo un enfoque mixto, diseño no experimental transversal, alcances descriptivo y correlacional. La red social elegida para el análisis fue Facebook, la métrica fue la cantidad de citas registradas en el perfil de Google Scholar (*GScholar*), la población fue de 2054 RC de Latinoamérica registradas en el catálogo 2.0 del Sistema Regional de Información en línea para Revistas Científicas Latindex. La data se analizó en el software SPSS 25, se realizó la prueba de coeficiente de correlación de Spearman. **Resultados:** Existe a) Correlación positiva baja entre las publicaciones en Facebook y citas obtenidas en *GScholar*, b) Correlación positiva moderada entre el número de seguidores de Facebook y el número de citas de *GScholar*, c) Correlación positiva débil entre el número de seguidores de la RC en Facebook y el número de citas obtenidas por la RC en *GScholar*. **Discusión:** La limitación fue considerar una sola red social, se sugiere para futuras investigaciones incluir otras redes sociales y analizar el contenido compartido. **Conclusiones:** El uso de las redes sociales y estrategias de marketing por parte de las RC es una actividad que debe ser incorporada al cotidiano accionar considerando que, en los tiempos actuales gran parte de las actividades diarias de las personas -científicos e investigadores incluidos- se desarrollan a través de plataformas y dispositivos digitales.

Palabras clave: Revistas científicas; Facebook; *GScholar*; Citación; Indexación; Comunicación académica; Economía de la educación.

Translation by **Paula González** (Universidad Católica Andrés Bello, Venezuela)

1. Introduction

Scientific journals (SJ) guarantee quality and contribute to the generation and promotion of knowledge through the publication and dissemination of validated research results (to improve the paradigms in force, García et al, 2021; Sánchez-Bayón, 2020). On the other hand, these spaces help to improve the positioning of higher education institutions (HEIs) in society, bringing significant benefits to the university brand (Overton-de Klerk and Sienaertm, 2016; Repiso, 2019). Additionally, it can be indicated that the publication of an article in an indexed journal by a professor is a way of validating their professional experience and research work (Van, 2001; Combes et al., 2008; Beck et al., 2019;

Pérez et al., 2019). This is understood from the branch of Economics of Education (Woodhall, 1985; Pineda, 2000).

The previous paragraph justifies the massive scientific production (SP) generated globally, which is directly linked to the number of SJs (Blanco and Graffe, 2000) sponsored mostly by universities or Higher Education Institutions (HEIs). That is why these forms of scientific dissemination seek to excel in digital media and social networks, increasingly saturated by competing journals, to get their scientific products read, shared, and cited by other researchers (Holsapple, 2009; Araújo, 2015).

Digitization has brought great socio-cultural changes (Sánchez-Bayón, 2021), and HEIs and their faculty and researchers have to adapt to such transformation (Sánchez-Bayón and Trincado, 2020 and 2021). Specifically, the emergence of social networks (SNs) eliminated the monopoly on the use of traditional media: now people consume and share content through these virtual communities. SNs have become information outlets; however, Masip et al. (2020) argue that these communities have also established themselves as a means of disseminating false or unvalidated content. Even in front of other communication channels. In this sense, it is contradictory to link SNs with other media that publish validated and formal knowledge, such as SJs. At this point, it is important to recognize what was stated by Pérez (2011), who emphasizes that a SJ is not of quality just because it has greater dissemination; however, it is a process that allows the publication to provide greater access and have better visibility, which contributes to the quality of the SJ. In this context, the study seeks to answer the question: how does the SN resource (especially Facebook and Google Scholar-*GScholar*) impact scientific-academic journals and what is its correlation in their metrics?

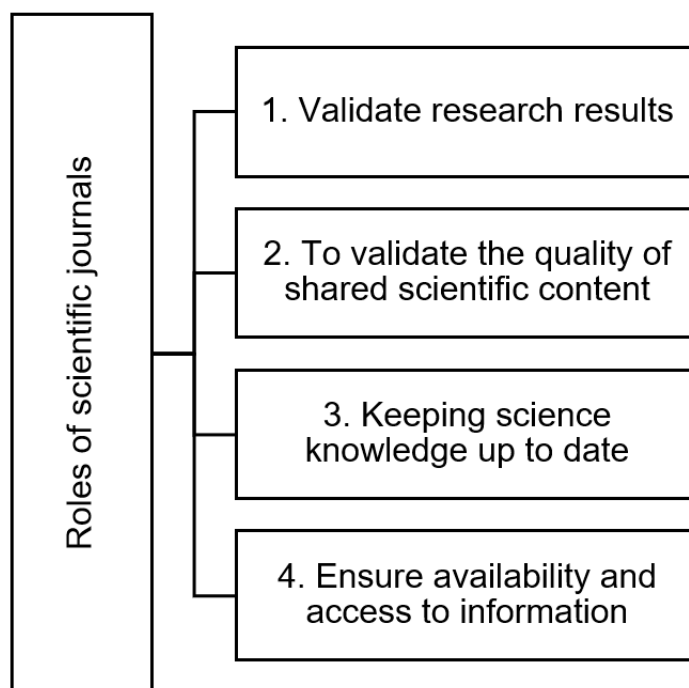
1.1. Scientific Journals

Cañedo (2003) argues that SJs are communication channels of the sciences (especially those studied here), in charge of validating, organizing, and publishing high-quality scientific content and knowledge, some of them only in print, others in digital format, and many of them in both formats (Aksnes et al., 2019). Fonseca-Mora and Aguaded (2014) add that the purpose pursued by a SJ is to provide society with updated knowledge of the sciences, for which the SJ publishes research results that contribute significantly and decisively to the areas of knowledge. It can be indicated that the process carried out by SJs begins with the reception of research results; this content must pass the peer review process (Palmatier et al., 2018), to be subsequently standardized, corrected, perfected, and formalized by the editors and scientific experts of the journal. After meeting the above characteristics, the content will be published and disseminated by the SJ (Bergquist et al., 2001; Ganga-Contreras et al., 2022). This system seeks to offer information to society for the generation of new and valid knowledge. Finally, Repiso (2019) observes SJs as virtual extensions that represent HEIs, so, to guarantee objectivity, it is convenient to try to reach communities external to them.

SJs have been influenced and driven by the increased use and positioning of information and communication technologies (ICTs), making them the main channel for the dissemination and exchange of knowledge among teachers, researchers, and scientists, uniting and validating knowledge globally (Bokser, 2019; Ganga-Contreras, 2022). In this sense, Gungula et al. (2020) argue that scientific publications in digital format are the most powerful channels for sharing research results in the form of scientific articles. Such publication should be of open access, a relevant feature considering the presence of the current knowledge era (Iglesias and Martín 2020; Cabrera and Saraiva 2022). SJs can even connect the academic sphere with the professional sphere (Tur-Viñes et al, 2018).

Figure 1 shows the different roles of SJs in society, for which they must transform the postulated content into a publicly accessible file.

Figure 1. *Roles of scientific journals.*



Source: Own elaboration (based on Vessuri, 1995; Fernández, 2004).

Regarding the support provided by SJs to HEIs as their letter of introduction, it is important to review the concept of the university brand. Repiso (2019) argues that the university brand is formed from external elements such as: the image of other institutions allied to the university and the image of the country where it develops its activities, also, and mainly, from the HEI's own elements such as its activities and actions, its students, its teachers, its authorities, and even its founders, Therefore, SJs are an element that supports the university brand. Boix et al. (2019) observe SJ as a form of communication and consequently a way to show a dimension of the university, which contributes to the construction of the brand, i.e. the image of quality that it projects to the world. For this, the HEI must support the management of the SJ to subsequently associate its brand with the name of the SJ.

The Regional Online Information System for Scientific Journals, Latindex, shows on its website that in its 2.0 catalog, there are 2054 scientific publications registered in Latin America, with Argentina, Mexico, Brazil, Ecuador, and Peru being the countries with the largest number of SJs (Latindex, 2022). Figures that show the importance of research activity in the region, the number of SJs in this part of the world can be attributed to the impact that technology has had on scientific publications, which have migrated from ink to bits, sharing their content, now online, allowing them to have a greater global reach (León et al., 2020). This is a very interesting situation for the positioning and management of the university brand.

Finally, it should be noted that SJs strive to achieve a greater number of article submissions from authors at the global level, and also seek to have their shared publications cited and read by the scientific/academic community, a situation that is not easy if we consider the numbers mentioned in the previous

paragraph. It is in these new challenges where the management of social networks could help SJs to improve their visibility globally, through the dissemination of strategic content aligned to the interests of readers, to arouse interest in examining such information; all this is in line with the guidelines of a marketing aspect that has gained momentum since the establishment of new information channels, content marketing (Pachucho-Hernández et al., 2021).

1.2. Social networks in scientific journals

The university, since its inception, has as its leitmotiv the construction and transmission of knowledge to society, which is why several authors (López-Pérez and Olvera-Lobo, 2016; Vivas et al., 2018; Ganga-Contreras et al., 2022) point out that the imperative of universalizing knowledge requires universities to use various mechanisms for that knowledge to be disseminated to societies.

Parejo et al. (2017) and Kato-Vidal and Hernández-Mendoza (2022) argue that universities are obliged to use the new digital context and its various tools to achieve their mission of disseminating scientific knowledge, thus taking advantage of non-formal virtual spaces as a means for scientific dissemination. This has led to a series of studies by various authors, which analyze the importance of the use of social networks by universities for the dissemination of information and dissemination of scientific research (Meredith et al., 2011; Brito et al., 2012; Guzmán and Del Moral, 2014).

Herrero-Gutiérrez et al. (2011) indicate that social networks are conceived as the structure for creating and sharing diverse content, focused on management at personal and professional scales, besides being consolidated as new ways to maintain, establish, and cultivate social relationships, as well as the rapid dissemination of information (Chan et al., 2020). For this reason, scientific journals, the majority of which are part of universities, have also embarked on the use of social networks to extend their scientific dissemination processes and at the same time form and consolidate virtual societies of researchers and people, in general, interested in the focus and topics of the journal.

Facebook, LinkedIn, Instagram, and Twitter are now among the social networks used by SJs as part of their communication strategies for the dissemination of knowledge. This is in line with Guerra et al. (2021) who state that the digital transformation that organizations must manage in the context of an increasingly digitally immersed society encompasses, among other things, the establishment of direct and interactive communication channels with their users, which evidently can also be exploited by SJs.

On the other hand, it is also necessary to point out the positioning of scientific social networks among researchers, among them we can count GScholar, ResearchGate, Academia.edu, Mendeley, My Science Work, and MethodSpace, among others (Kong et al., 2019). In this regard, Maestro et al. (2010) point out that, in these types of social networks, scientists get in touch with other researchers to share opinions, generate debate, and even become co-participants in other scientists' research.

Therefore, it can be concluded that social networks allow, among other uses, the sharing of research, of both completed work and work in progress; the sharing of resources used in research: links, references, digital books, and documents; the possibility of obtaining funding for research projects; the creation of networks of researchers and academics with areas of research in common; and to make visible and contribute to the acknowledgment of the researcher's experience.

According to this reality in which the digital is present in many of the aspects in which society develops, Oller et al. (2012) point out that the presence of academic journals on the Internet and social networks is related to strategies of visibility, networking, and dissemination. This coincides with Ojeda et al. (2022) who indicate that universities, and by extension SJs, can take advantage of social

networks to improve their scientific dissemination processes, and thus encourage interest in science by the community in general. However, adequate management of SNs is not always present. Martínez-Guerrero (2018) recommends that there should be a greater and better commitment to the management of SNs by the entire editorial team of the journal, always seeking to publish quality content.

1.3. Retos Journal Case

An interesting case study to analyze is that of the journal Retos, indexed in Scopus since April 2022, sponsored by the Universidad Politécnica Salesiana of Ecuador and specialized in administrative and economic sciences. The articles received by the journal must pass a demanding process of editing and peer review, after which the articles are published in print and different electronic formats. Its indexing in different international databases and repositories, as well as its management in SN linked to sharing scientific content, has allowed the publication to be known in Ecuador and beyond its borders, which has led to an increase in the reception of articles. In this sense, some interesting metrics can be seen in Table 1.

Table 1. *Retos journal metrics.*

Number	Articles received	Rejection rate	Acceptance rate
19 (2020)	35	71,43%	28,57%
20 (2020)	36	72,22%	27,78%
21 (2021)	61	83,61%	16,39%
22 (2021)	78	87,18%	12,82%
23 (2022)	104	90,38%	9,62%
24 (2022)	130 ↑	92.31% ↑	7.69% ↓

Source: Own elaboration (based on data from the Retos website).

These statistics allow us to observe the correct management and editorial process of the journal. In this sense, it is important to emphasize that Retos has the support of the Universidad Politécnica Salesiana, an institution that assumes all the costs inherent to the review process, editing, publication, and dissemination of knowledge.

In November 2019, Retos changed its editorial team, which is committed to maintaining the quality of the articles published. On the other hand, it is important to note that the new editorial team also promoted in a much more active and constant way the presence of Retos in social networks, maintaining an average of 5 posts published per week, which per year translates into 260 published posts, a situation that has been maintained since 2019. This constant proceeding has paid off as shown in Table 1 where, in the first publication of the new editorial team, it received a total of 35 submissions, while for its last issue published in October 2022, it received 130 ↑ articles, improving its metrics in acceptance and rejection rates. See Table 1.

Retos adhered to social networks since 2017 on LinkedIn, Facebook, Twitter, and Instagram, and since 2019 on YouTube. From these channels, the journal seeks to approach and socialize research results to the different virtual communities and especially to the scientific and academic communities, involving

in the world of scientific research the actors directly related to it and even the younger generations who undoubtedly spend time in these virtual environments. It can be mentioned that among the strategies applied by Retos in SN are:

- Periodically share content about the articles published by the journal.
- Publish content congratulating the authors of the research for the number of citations obtained.
- Create videos with information about published articles and their authors.
- Show news and publications related to Administrative and Economic sciences.
- Share information about events held by Retos, as well as events in which the journal's editorial team participates.

Additionally, it can be added that within the management carried out in virtual environments, the community manager of the journal sends personalized congratulatory emails to authors who have achieved citations through articles published in Retos, making the journal even better known.

A separate point to expose within all this management is the development of infographics for each of the articles that have been published since 2020 under the management of the new editorial team. This strategy has allowed Retos to become much better known since this graphic element that summarizes the content of the article is shared with the authors of the research, who use it as a resource in their classes and proudly share it on their social networks, maximizing the visibility of the publication.

All this management has given way to Retos increasing the number of followers in its virtual communities. This increase in visibility has also allowed Retos to increase its citations in GScholar starting with 356 in 2019, 576 in 2020; 1022 in 2021, and until December 2022, it is approaching 1100 citations. Considering the case of the journal Retos, but trying to find inferable statistical results that support the above, the research mainly seeks to determine whether the use of social networks in scientific journals positively affects their metrics.

2. Objectives

To determine the correlation between social networks (Facebook and GScholar) and their impact on scientific journal metrics.

3. Methodology

To meet the research objective, an empirical, non-experimental, cross-sectional, descriptive, and correlational study was designed. The study was developed under a mixed approach to determine the possible relationship between the use of social networks and SJ metrics. The social network chosen for the analysis was Facebook, given that, in an exploratory study, it was observed that it is the social network where most SJs have a profile. On the other hand, the selected SJ metric was the number of citations registered in the GScholar profile for 2021, considering that in the region it is one of the most important reference indexes for the research community.

The study population were the 2054 SJs of Latin America registered in the 2.0 catalog of the Regional Online Information System for Scientific Journals Latindex. To carry out a comprehensive analysis of the situation of SJs in this region of the world, a census of this entire population was carried out. Using scientific observation, the Facebook accounts of SJs will be analyzed, and the number of publications on this social network during 2021 will be obtained, as well as the total number of followers. Similarly, the number of citations in the same year will be obtained from the SJ's GScholar profile, as well as

the total number of citations registered in this indexing. For this purpose, it will be verified that the SJ website has direct links to both Facebook and GScholar.

Once the particular case of the journal RETOS was analyzed, where growth has been evidenced in terms of publications in social networks and citations to articles published in the journal; and to seek statistical evidence to affirm that there is a positive effect of strategies in social networks (publications on Facebook) on the SJ's metric (number of citations in GScholar), a correlation-type conclusive statistical study was carried out between both variables, proposing the following hypothesis structure. Data analysis was performed in SPSS version 25 statistical software.

H1. There is a correlation between the number of publications on Facebook and the number of citations obtained by SJ in 2021.

H2: There is a correlation between the number of publications on Facebook and the number of followers in the SJ profile on that social network.

H3: There is a correlation between the number of followers on the SJ's Facebook profile and the total number of citations obtained on GScholar.

4. Results

Once the census of all the SJs in Latin America registered in the Latindex 2.0 catalog was carried out, data were obtained that provided a glimpse of the situation of SJs in the region in terms of whether they had direct links to Facebook and GScholar on their websites (see Table 2).

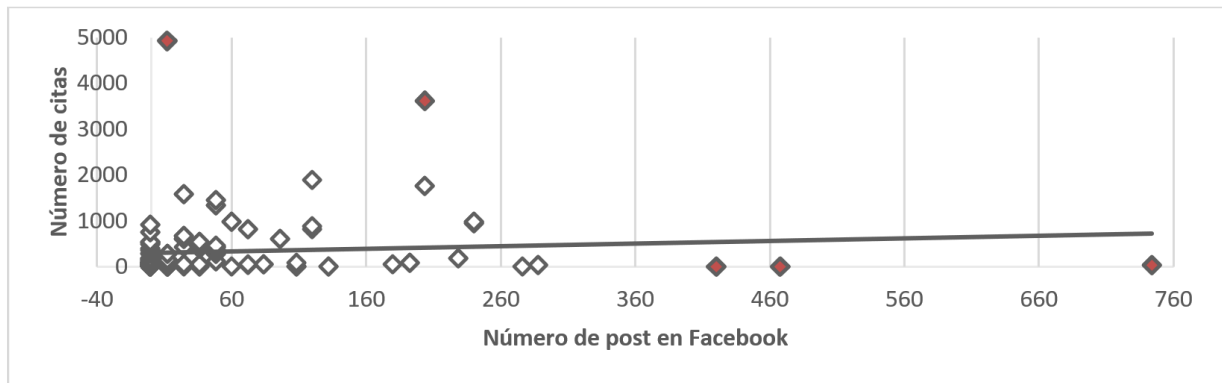
Table 2. *SJ websites with direct links to Facebook and Google Scholar.*

	Yes	No	Total
Facebook	732	1322	2054
	36%	64%	100%
Google Scholar	451	1603	2054
	22%	78%	100%

Source: Own elaboration (based on data from the websites of the SJs analyzed).

The SJs with links to both GScholar and Facebook totaled 201. This number of SJs became the analysis population for the correlational study between the number of citations in GScholar during 2021 (dependent variable) and the publications on Facebook during the same year (independent variable). Figure 2 shows the dispersion diagram between the study variables.

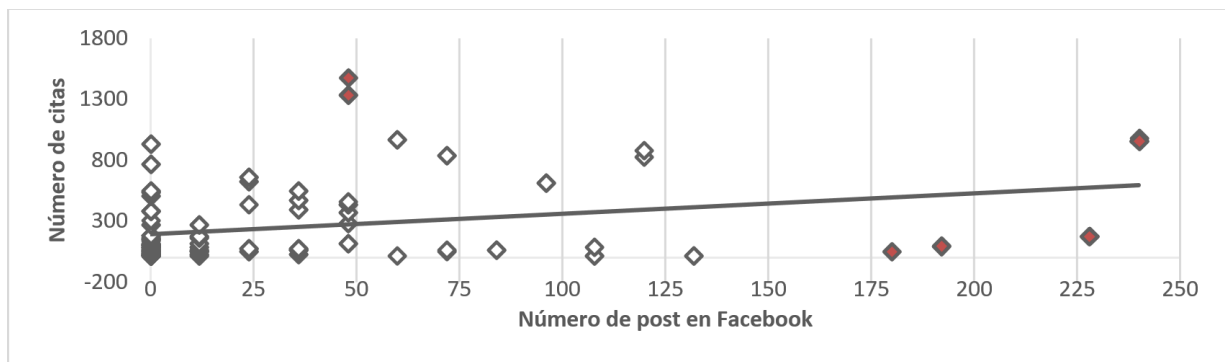
Figure 2. Dispersion diagram for the variables, considering a population of 201 SJs.



Source: Own elaboration

Once the data from the 201 SJs had been collected and observed, the authors considered performing a 5% cut of the extreme data (lower and upper) to eliminate the outliers presented. Once this cut was performed, a total of 161 SJs were obtained. The dispersion diagram for this case can be seen in Figure 3.

Figure 3. Dispersion diagram for the variables, considering a population of 161 SJs.



Source: Own elaboration

To statistically validate the visual assessment, a correlation test was applied. First, the Kolmogorov-Smirnov normality test was performed on the variables, the results can be seen in Table 3.

Table 3. Results of Kolmogorov-Smirnov normality test.

	Null hypothesis	Test	Sig.	Decision
1	The distribution of the number of citations in Google Scholar	Kolmogorov-Smirnov test for one sample	<.001	Reject null hypothesis
2	Distribution of the number of posts on Facebook	Kolmogorov-Smirnov test for one sample	<.001	Reject null hypothesis

Source: Own elaboration.

Table 3 shows that the variables proposed in the study do not have a normal distribution ($p < 0.05$), so the Spearman correlation coefficient nonparametric test was applied.

Table 4. Results of Spearman's correlation coefficient test for the variables Facebook publications and citations obtained in Google Scholar in 2021.

		FACEBOOK_POST	GOOGLE SCHOLAR CITATIONS 2021
Spearman's Rho	FACEBOOK_POST	Correlation coefficient	1,000
		Sig. (bilateral)	,219**
		N	161
	GOOGLE SCHOLAR CITATIONS	Correlation coefficient	1,000
		Sig. (bilateral)	0,005
		N	161

** . Correlation is significant at the 0.01 level (bilateral).

Source: Own elaboration.

The results presented in Table 4 show a bilateral p-value of significance (0.005), which allows the acceptance of H1, that there is a correlation between the number of posts published on Facebook and GScholar citations in a scientific journal. However, Spearman's rho coefficient (0.219) indicates, according to Bisquerra (2009), the existence of a low positive correlation between the variables. The coefficient of determination (r^2) is 0.04, which shows that a very low percentage of the variability of the data is explained by the association between the two variables.

Subsequently, Spearman's correlation coefficient was obtained between the number of Facebook posts made in 2021 and the total number of followers in the SJ's profile on this social network; the results can be seen in Table 5.

Table 5. Results of the Spearman correlation coefficient test for the variables publications and the number of followers in the Facebook social network.

		FACEBOOK_POST	FACEBOOK_FOLLOWERS
Spearman's Rho	FACEBOOK_POST	Correlation coefficient	1,000
		Sig. (bilateral)	,483**
		N	201
	FACEBOOK_FOLLOWERS	Correlation coefficient	,483**
		Sig. (bilateral)	0,000
		N	201

** . Correlation is significant at the 0.01 level (bilateral).

Source: Own elaboration.

The p-value (0.000) allows the acceptance of H2, indicating the existence of a correlation between the number of posts published on the Facebook social network profile and the number of followers of the SJ on this social network. The Spearman's rho coefficient obtained (0.483) indicates the presence of a moderate positive correlation between the two variables. Lastly, Spearman's correlation coefficient was calculated between the number of followers on the Facebook social network and the total number of citations obtained in GScholar by the SJ, the results of which can be seen in Table 6.

Table 6. Results of Spearman's correlation coefficient test for the variables publications and the total number of citations obtained in GScholar.

		FACEBOOK_FOLLOWERS	TOTAL_GS_CITATIONS
Spearman's Rho	FACEBOOK_FOLLOWERS	Correlation coefficient	1,000
		Sig. (bilateral)	,341**
		N	201
	TOTAL_GS_CITATIONS	Correlation coefficient	,341**
		Sig. (bilateral)	0,000
		N	201

** . Correlation is significant at the 0.01 level (bilateral).

Source: Own elaboration.

In this final analysis, a p-value (0.000) was obtained that allows us to accept H3, the existence of a correlation between the number of followers of the SJ on the Facebook social network and the total number of citations obtained by SJ in GScholar. The Spearman's rho coefficient obtained (0.341) indicates the presence of a weak positive correlation between both variables.

5. Discussion and Conclusions

The use of social networks and marketing strategies by SJs is an activity that should be incorporated into the daily actions of SJs considering that, in current times, a large part of the daily activities of people -including scientists and researchers- are developed through digital platforms and devices. In this regard, Statista (2022) mentions that the average penetration rate of social networks in Latin America is 78.22%. This coincides with Facebook being the social network most chosen by SJs in Latin America to publish content related to their research topics and axes, encourage the reading of published articles, and invite researchers to apply for research papers; however, only 36% of all SJs in the region have a direct link to this social network from their websites. This allows us to elucidate that there is a high percentage of SJs that are not managing this social network to try to establish a direct two-way communication channel with their scientific-research community.

On the other hand, it can also be noted that only 22% of SJs in Latin America have a profile on GScholar which, according to Miguel and Herrero (2010), allows them to improve the visibility of published research, considering that this data source has recently positioned itself as a means of disseminating scientific and academic literature among researchers and educators in the region.

In this study, low correlations were found between the number of publications on Facebook and the number of citations in GScholar in 2021 ($\rho=0.219$), as well as between the number of Facebook followers of SJs and the total number of citations in GScholar ($\rho=0.341$). These coefficients are not detrimental to the use of this social network by SJs but point to the presence of other factors that, associated with this, can have an impact on the increase of citations in Google Scholar for a SJ, such as the creation of infographics and short videos with information related to the published articles, as well as the sending of personalized emails to authors and researchers related to the journal's topics, among other actions that make SJ's scientific publications visible and, in turn, increase the citations of these articles.

On the other hand, a moderate positive correlation was found between the number of posts published on the social network Facebook and the number of followers of the SJ on this social network, which implies that increasing the number of publications by SJ in its Facebook profile increases the number of followers in this social network. These publications should have a constant frequency and can be of a variety of topics such as: ideas or summary of the articles published in the last issue of the journal, call for papers, infographics designed for each article, news and/or current research aligned with the thematic axes of the SJ, among others.

In short, the SN resource and its positive impact on the metrics of scientific-academic journals help to improve their positioning and their work of disseminating validated knowledge. In this sense, the work developed by Academic Communication and Economics of Education is helping, providing new theoretical and methodological contributions, which are increasingly present in the journals studied.

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