The Power of Algorithms in the Commodification of Social Media for Inclusive Education. Invisible or Invisibilised?

Laura Rayón-Rumayor, Carlos Barroso-Moreno, Elena Bañares-Marivela, Elena Pacetti

Note: This article can be read in Spanish on:
https://revista.profesionaldelainformacion.com/index.php/EPI/article/view/e330421

Recommended citation:

Rayón-Rumayor, **Laura**; **Barroso-Moreno, Carlos**; **Bañares-Marivela, Elena**; **Pacetti, Elena** (2024). "The Power of Algorithms in the Commodification of Social Media for Inclusive Education. Invisible or Invisibilised?". *Profesional de la información*, v. 33, n. 4, e330421.

https://doi.org/10.3145/epi.2024.0421

Manuscript received on March 26th 2024
Accepted on August 27th 2024

Laura Rayón-Rumayor ✉
https://orcid.org/ 0000-0003-0339-8221
Universidad Complutense de Madrid
Facultad de Educación - Centro de Formación del Profesorado
Rector Royo Villanova, 1
28040 Madrid, Spain
larayon@ucm.es

Carlos Barroso-Moreno
https://orcid.org/0000-0002-1609-2267
Universidad Complutense de Madrid
Facultad de Educación - Centro de Formación del Profesorado
Rector Royo Villanova, 1
28040 Madrid, Spain
carbarro@ucm.es

Elena Bañares-Marivela
https://orcid.org/0000-0002-9384-0193
Universidad Complutense de Madrid
Facultad de Educación - Centro de Formación del Profesorado
Rector Royo Villanova, 1
28040 Madrid, Spain
elebanar@ucm.es

Elena Pacetti
https://orcid.org/0000-0003-0204-2215
University of Bologna
Dept. of Educational Sciences "Giovanni Maria Bertin"
Via Filippo Re, 6
40126 Bologna, Italy
elena.pacetti@unibo.it

Abstract

Social networks are communication spaces mediated by complex and opaque structures of relationships and content. The result is an unequal participation of users in the access to and dissemination of content. The dual objective is to identify influential profiles and analyze strategies for disseminating educational content on social networks. The social listening technique and Power Business Intelligence analyse posts on Instagram, Twitter, and YouTube for inclusive education content, collecting 113,272 posts over one year. The results show the inequality in social networks, defined by the visibility of political and economic power groups that occupy a privileged position in disseminating content, to the detriment of certain publications associated with altruistic groups or individuals with vindictive content. The economic interests of algorithms, attractive visual content, a large mass of followers and coordinated dissemination campaigns monopolise the visibility of the network outside of socio-educational interests. This situation is partly facilitated by the algorithms of digital platforms, where the commodification of the network is evident through case studies. The value of the findings for building critical digital citizenship in the face of unequal behaviour and self-serving narratives is discussed.

Keywords

Social Network Analysis, Big Data, Business Intelligence, Citizenship; Identity, Instagram, Quantitative Research, Qualitative Research, Disability, Digital Inclusion, Commodification, Social Media, Algorithms.

1. Introduction

Social networks are communication spaces mediated by complex and opaque structures of relationships and content (**Escobar *et al.***, 2022; **Larsson; Moe**, 2014; **Yang *et al.***, 2023; **Zubcsek *et al.***, 2014). The consequences of this intermediation are twofold: first, there is an unequal participation of users to generate, share and foster interactions with potential audiences, according to their objectives and interests; second, a predominant position of profiles and content is created to the detriment of others (**Del-Fresno-García**, 2014; 2019). These peculiarities interfere in the dissemination of content and its influence; when, how and with whom information is accessed and interacted with are conditioned by different factors that are neither visible nor obvious to citizens.

One of these factors, which is of interest to the scientific community, is algorithms. The work carried out represents a space for critical reflection on the omnipresence of algorithmic intermediation and its structural power to define conditions on how information is distributed, presented, shared and consumed by citizens (**Lorenz *et al.***, 2022). In this line, the studies by **Barberá** (2015), **Barroso-Moreno *et al.*** (2023a), **Beer** (2017; 2018), **Bail** (2021), **Del-Fresno-García** (2019), among others, are relevant because they analyse the political polarisation imposed by algorithms, and their implications for public life and democracy.

A concern that has prompted several critical studies, such as **Dogruel *et al.*** (2022), **Gran *et al.*** (2021), **Hargittai *et al.*** (2020) and **Velkova and Kaun** (2021), whose results show the importance of understanding how algorithms operate for media and information literacy of citizens. Mitigating citizens' unequal access to infrastructure and content, and reducing possible disadvantages in the creation, distribution and social interaction in social networks, is even part of the international agenda of the Council of Europe in the field of Human Rights (**Schulz**, 2018). However, these same critical voices recognise the difficulty of its study, given the constant and dynamic updating of its operation and the lack of transparency about its use, information that is rarely made public and compromises the reliability of the information that can be obtained (**Yeung**, 2018; **Burrell; Fourcade**, 2021; **Lorenz *et al.***, 2022).

Another conditioning factor of relational and content structure is the role played by certain social agents that connect multiple groups in a social network and become relevant disseminators in the propagation of content. The works of **Isa and Himelboim** (2018), **Wang and Zhang** (2020), **Zhou *et al.*** (2022) show that certain social mediators foster content dissemination and accelerate its speed (they have many followers), as may be the case of celebrities, politicians, or corporations associated with brands that adopt marketing strategies to develop success rates in content dissemination, as evidenced by **Evans *et al.*** (2021). They are actors whose message dissemination, publication time, speed and size of message adoption generate a high impact of influence (**Yang *et al.***, 2023). **Barbera**'s (2015) well-known work gave rise to the well-known idea of "Birds of the Same Feather Tweet Together", which in turn has given rise to the important sociological construct of homophily applied to interactions on digital platforms (**Passe *et al.***, 2018). This conceptual element is fundamental to understanding the power of influence of certain actors. The basic principle of this concept is that users tend to foster relationships and form communicative links with profiles of similar views and interests. This defines a logic of interaction and content distribution with important consequences: majority groups and the users that make them up are more likely to interact with each other than users connected to minority groups, and the more connections, the greater the possibility of interaction and influence. Along the same lines, the review by **Al-Garadi *et al.*** (2018), aimed at analysing which procedures are the most relevant for identifying influential users in social networks, concludes that these users are connected to a greater number of users and maintain solid connections with them. However, they recognise that the capacity of influence could be conditioned by a large number of easily influenced users. However, they warn of the complexity of research aimed at identifying the most influential users, given the variety of data, models and procedures used, and the range of domains involved, which makes it difficult to select the most appropriate for analysing this object of research.

Finally, a third factor that conditions the relational structure and distribution of content on digital platforms is the sentiment associated with shared messages. This is a line of study that is highly developed on Twitter. **Berger**; **Milkman's** (2012) study shows how emotion shapes virality. Positive content is more viral than unexciting negative content, such as sadness. However, they note that negative feelings that evoke arousal, such as anger or hatred, are significantly correlated with virality. The conclusion is that the intensity of the feeling to generate excitement is the element associated with virality, rather than the positivity or negativity of the content. Studies by **Chen *et al.*** (2020) on Twitter about natural disasters also show that positive messages spread more widely than negative ones, although negative tweets spread faster than positive ones at the onset of the disaster. This trend changes depending on the thematic content. **Qian *et al.*** (2022) study on sentiments associated with the financial market shows a different trend. Positive sentiments such as confidence prevailed worldwide (72%), as opposed to negative sentiments. The sentiments associated with the COVID-19 topic, analysed by **Shi *et al.*** (2023), show that negative and neutral sentiment is more frequent, as opposed to positive sentiment, accounting for only about 11% of the total samples.

The present research is no stranger to the complex issues, mixed results, and challenges of understanding how content and relational structure is generated in social networks. Nor is it oblivious to the need to contribute to the development

of knowledge that can respond to the important social and educational challenges that arise from the opacity of social networks. These challenges require multidisciplinary research teams to achieve cross-disciplinary analysis (**García-Marín; Serrano-Contreras**, 2023) in order to clarify which media and information literacy is relevant to reverse the digital divide in the use, access and social participation in digital platforms (**Law; Lee**, 2023; **Xu *et al.***, 2023). We consider social networks to be privileged spaces for citizens with altruistic interests to provide knowledge, inform about demands and lines of action, and participate in social issues within the framework of democratic citizenship (**Milošević-Đorđević; Žeželj**, 2017; **Braccini *et al.***, 2019; **Cruz Crespo; Cruz**, 2023). In this context, we are interested in social networks as communication and participation spaces for education, disability and inclusion purposes.

In view of these concerns, it is worth asking about the profiles of altruistic people: invisible or invisibilised? Answering this question requires determining the position of the most viral and influential profiles and publications and revealing how this position is defined for the intrinsic issues surrounding disability and inclusion in the field of education. This study can contribute to defining thematic lines so that teachers can build a critical digital citizenship.

The aforementioned concerns guide this study with two objectives in mind:

1. Identify who holds the most viral and influential profiles on Instagram, Twitter and Youtube for education, disability and/or inclusion related content.
2. Analyse which behavioural patterns and associated procedures are most effective in the distribution and dissemination of content.

2. Methods and Material

The mixed methodology is divided into the three phases described in Figure 1, which shows the multidisciplinary process, with the blue blocks corresponding to the educational domain and the red blocks to the IT domain.

The social listening technique monitors the social networks Instagram, Twitter and YouTube to capture the posts related to the keywords education, disability or inclusion, in Spanish and English. The reason for choosing these words is that, in a previous exploratory analysis, it was found that many users did not tag themselves with the word disability in the text of the post, but with the word inclusion.

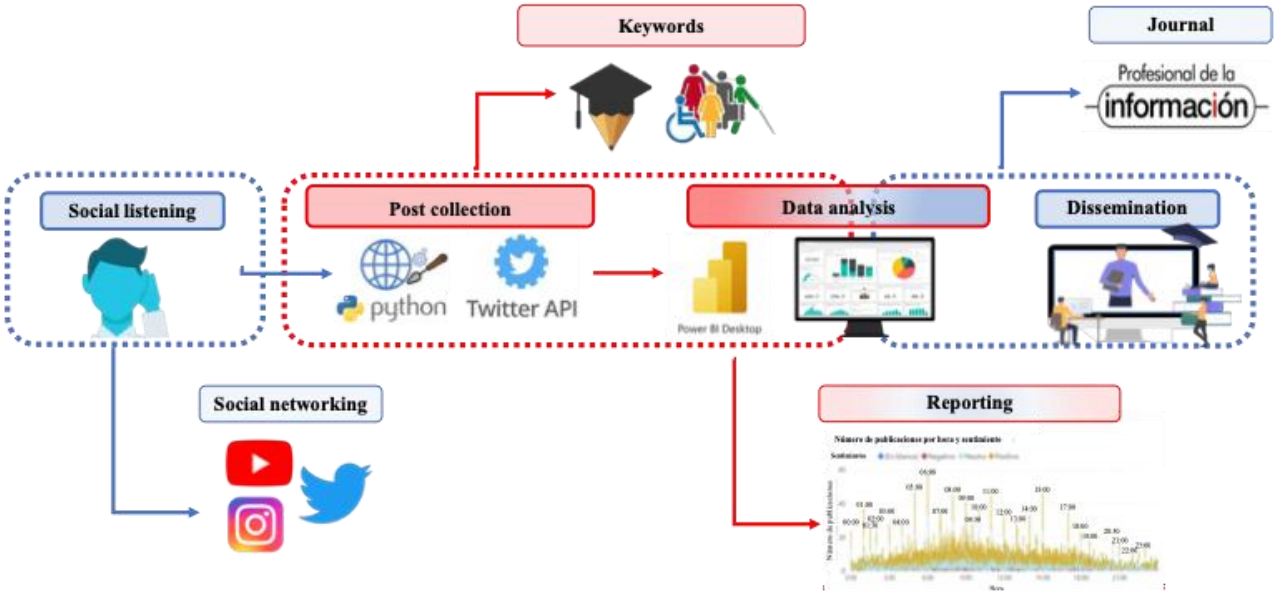

Figure 1: Research Flowchart.

The monitoring tool SocialNetworkTool, owned by the Detecese research group, uses the Twitter API and web scraping techniques for Instagram and YouTube (**Dogruel *et al.***, 2022; **Barroso-Moreno *et al.***, 2023b). The database consists of 113,267 posts collected over a full year, from 1 January 2022 to 31 December 2022. The study uses a mixed methodology. Quantitatively, the entire database is analysed using the Power Business Intelligence (BI) tool, which allows the generation of dynamic visualisations that help to extract value from the information from an educational perspective. Qualitatively, a manual analysis is made of the most viral and interesting publications on each social network. The computational analysis makes it possible to identify the patterns of influence groups in the creation of content, visualising and humanising the data obtained. Content analysis makes it possible to organise the themes associated with the publications of altruistic groups versus power groups. The methodology disseminates scientific knowledge among stakeholders through open data for free and responsible scientific dissemination. The possibility to consult the grouped data used in the research can be found at the following link: *https://bit.ly/46swR6e*

This type of monitoring has the limitation of not having publications prior to the software's operation. Although it would be technically possible to obtain such data through APIs, the economic costs associated with this option are unaffordable for research groups. This restriction limits the ability to perform full longitudinal analyses and could influence the interpretation of results, so the solution lies in keeping the software active for long periods of time and generating large databases.

In the second phase, variables and their automated categories are identified from the entire database, summarised in Table 1. They are made up of objective variables whose posting characteristics are common to both networks, such as: identifier, content, number of likes, profile name, followers, followed, date, time, views and geolocation. In addition, by applying algorithms, new variables are generated with added value to the previous ones: post title, sentiment, word frequency and hashtags. Sentiment analysis is a process within the broad branch of natural language processing (NLP), which classifies texts into positive, negative or neutral categories based on the words used (**Sarkar**, 2019). In our study, we have used the VADER (Valence Aware Dictionary and sEntiment Reasoner) library, included in the Python NLTK package, a lexicon and rule-based approach that has been trained on large volumes of data (**Elbagir; Yang**, 2019). In our case study it allows for a more accurate interpretation of sentiment, which is especially suitable for sentiment analysis in social networks because of its ability to capture contextual and emotive nuances in short texts. Hashtags are obtained by dividing the content by the # character, which is straightforward on Instagram as it is a property, but requires extraction on Twitter and TikTok.

Table 1: Database Variables and Categories.

Variable Group	Variables	Types	Examples
Identifier	Identifier	Numeric	032974323492, 382056149214... The representative publications P01 P07, P13...
	Tag	Categorical	T Twitter I Instagram Y YouTube
	Profile name	Text	Asperger_y_mi_yo
Transactional data	Origin	URL	www.instagram.com/p/CeJOL94uRoG
Time	Day	Date	2022-12-03
	Time	Date	10:15
Content	Content	Text	Diversity is becoming more and more visible...
	Title	Text	What you see is what I am
	Hashtags	Text	#educacion #education #inclusión
	Retweets (twiitter) Comment (Instagram, YouTube)	Numeric	253, 2395,
Virality	Like	Numeric	24531, 2592…
	Views (video)	Numeric	3492, 139230…
	Following	Numeric	826, 453…
	Follower	Numeric	1352, 4,5 M…
	Feeling	Categorical	Positive, negative, neutral
Demographic	Estimated location of the person	Categorical	UK, USA

3. Results

The analysis of the data is approached from a macro perspective, with examples of publications to understand the information value extracted. The database consists of 113,267 publications, of which 58.19% correspond to Twitter (N=65,909), 39.89% to Instagram (N=45,179) and 1.92% to YouTube (N=2,179). Each social network has its own peculiarities; Twitter is the social network with the highest number of publications, but the highest virality by number of likes is concentrated on Instagram. On the other hand, YouTube has a low number of publications, but its messages are more visual than the previous two networks.

The results are presented in the form of multivariate graphs to make it easy to identify the behaviour of content on disability education. The figures displayed are accessible to the scientific community through Power BI, which allows them to replicate the same graphs and focus on the details of the publication with the interaction of the graphs.

3.1. The Influential Power of International Days

International Days aim to raise awareness of social problems in order to mobilise resources and reverse unresolved situations of injustice. Figure 2 shows the number of posts per day and sentiment grouped by social network. A visual analysis shows concentrations per day, due to the correspondence with international days. World Braille Day (WTD) is on 4 January, e.g. the Vicente Ferrer Foundation to promote literacy systems in schools [P01]. The Day of Education, on 24 January, features broadcasts by families or altruistic individuals who use images to highlight human rights [P02]. Down's Syndrome Day, 21 March, for example, brings together teachers to demand proposals for adapted inclusive education [P03], or the media to reflect on the impact of inclusion in society [P04]. The next relevant day is Autism Awareness Day, 2 April, when parents share stories of overcoming socialisation difficulties at school [P05], or non-profit organisations present their projects to raise awareness and ask for more collaboration [P06]. World Special Education Day, 9 August, is

a school holiday in most parts of the world, but its volume in the networks continues to stand out. Some examples are the NGOs that defend the role of teachers in their daily work [P07], or the Chaco Institute for Disability, which shows real situations of their actions to guarantee quality education for all students [P08]. A period not marked by international days but by the start of the academic year in various countries, between the end of August and the beginning of September, concentrates school demands for the new academic year, as can be seen from the publication on the demonstration against education cuts in Argentina [P09]. Another example is the activism in schools for people with disabilities without prejudice and discriminatory bias [P10]. Finally, the day with the highest volume corresponds to 3 December, the International Day of Persons with Disabilities, defined by a keyword used in the analysis. Some outstanding profiles correspond, for example, to a psycho-paediatrician, Zenaida Rodriguez, who highlights the different learning abilities of people [P11], or to a teacher, Martin Salvetti, who publishes a day of coexistence to promote an accessible world [P12]. All of this allows greater public awareness to be generated through visibility on social networks.

Interestingly, as can be seen in the graph, the weekly frequency pattern is defined by 5 days with high publication and 2 days with low publications. Weekdays are the days with the highest dissemination of content related to inclusive education or people with disability rights. If we look at the weekends, we observe a reduced frequency of publication. Although the reason for this pattern is unknown, if a public holiday is an international day, the frequency of publications is not affected.

The sentiments shown in Figure 2 are associated in green for positive, red for negative and blue for neutral or unclassified. At the bottom, the distribution is broken down by social network: Instagram has 51.07% positive (n=23,071) and 3.41% negative (n=1,542); Twitter has 21.36% positive (n=14,081) and 21.23% negative (n=13,994); and YouTube has 9.44% positive (n=205) and 3.13% negative (n=68). With these data, we can see that Instagram provides positive messages for dissemination and the greatest negative load is found on Twitter. The latter network has polarised messages in its content, with a percentage difference between the two sentiments of only 0.13%. If we order the first 100 publications by virality, polarised messages are the most viral with a predominance of positive messages (n=73).

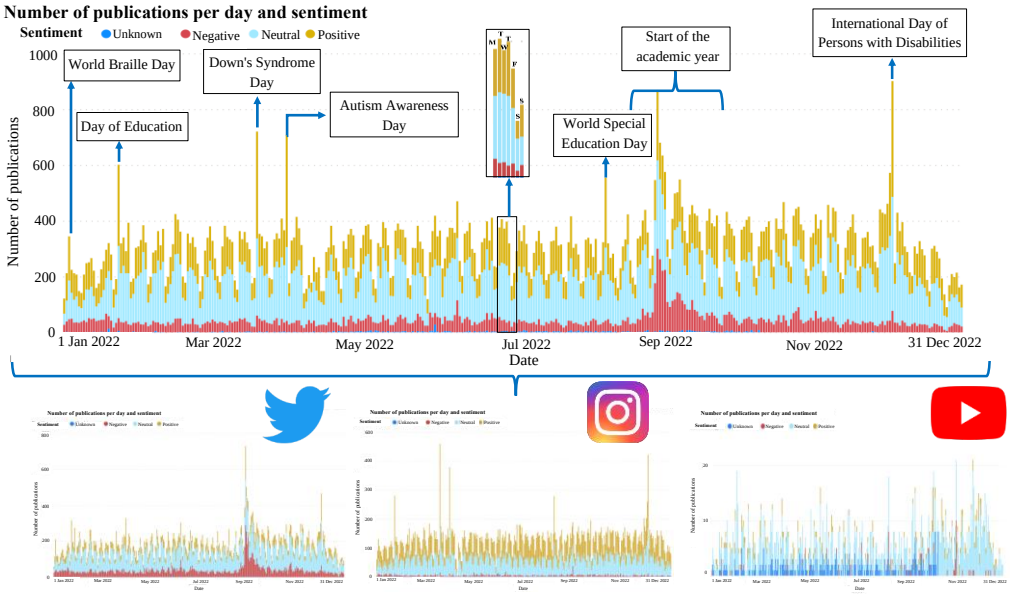

Figure 2: Timeline of Posts per Day and Sentiment Broken Down by Social Network.

In synthesis, (i) the high volumes of publications on international days affirm the visibility of social and educational demands, being invisible on digital platforms the rest of the year. (ii) Altruistic profiles, families, NGOs or associations lead social demands on these dates showing their real needs and projects. (iii) Publications with positive sentiments are the most viral, especially on Instagram, and Twitter is characterised by polarised messages due to social denunciation.

3.2. Shadow Influence Groups: Hierarchisation and Marketing Strategies

The business world uses social media as a communication channel to attract customers and spread the brand. Identifying their presence requires reverse marketing strategies to be applied on digital platforms. The study by **Evans *et al.*** (2021) indicates a time-based scheduling of posts to control advertising campaigns. An inspiring work to represent, in Figure 3, the number of posts per hour and to detect this marketing pattern. The results show a noticeable increase in the exact hours, when analysed globally there is no concentration at a certain time, but they confirm the technique. The exemplification moves to the publication of Microsoft (12:00 am) [Q13], the Senate of Argentina (3:00 pm) [Q14], the banking sector such as BBVA (3:00 am) [Q15] or traditional media such as The Hindu (8:00 pm) [Q16]. Moreover, these publications have a positive or neutral sentiment, avoiding negative discourse.

In the centre of Figure 6, a geolocation heat map is depicted according to the origin of the profile. A higher number of publications can be observed in developed areas such as the USA (16.91%), Spain (13.49%), Argentina (13.49%), the UK (11.60%), Mexico (9.51%), among others. The areas of Russia or China are practically non-existent due to the restrictions of these platforms, which is why they do not stand out in the heat map, although this does not indicate that there are no social demands in relation to inclusive education or disability. Other countries have very low percentages of publications in this regard, as they are countries that are fighting for basic education rights not for certain groups with disabilities, autism, Down syndrome, etc. Examples include Afghanistan (0.04%) with demands for girls to go to school [P19], in Indonesia (0.06%) for no discrimination in schools based on ethnicity or religion [P20], in Rwanda (0.10%) to demand the human right of access to education for children from poor families living in remote or neglected places [P21].

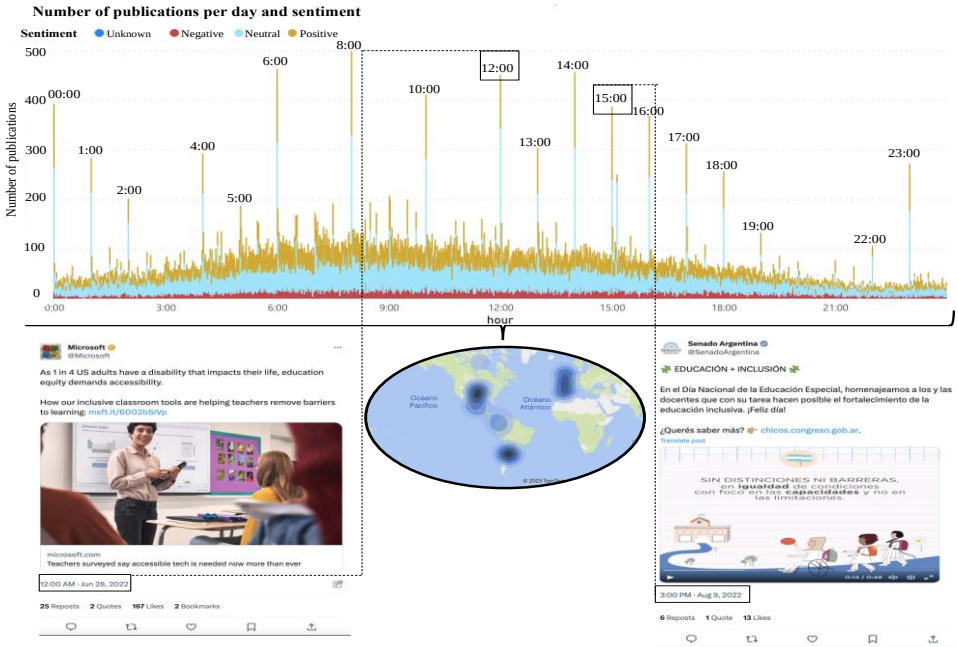

Figure 3: Timeline of Publications by Hour and Sentiment with Details of Geographical Location and Exemplification of Publications.

In summary, (iv) influential groups employ corporate marketing strategies to disseminate education-themed publications on inclusion or disability issues, marked by timetabling. (v) more economically developed countries generate a specific debate on particular groups, and less developed countries focus the debate on fundamental educational rights.

3.3. Groups of Influence and Virality: 'Playing Hide-and-Seek'

The need to understand unidentified patterns to detect who holds the most viral profiles (organisations, media, individuals or companies) requires establishing ratios by social networks and profiles according to the number of likes. Figure 4 (bottom) represents the ratio of likes per post in each social network, the most viral is YouTube with 202.3 likes/post, since it has few posts, but the outstanding ones have thousands of likes. Instagram has a ratio of 31.1 likes/post, although the ratio is lower than YouTube, it is the most viral network due to an accumulated number of likes of over 1.5 million. Twitter is the network with the highest number of posts, but its ratio drops to 3.73 likes/post. The data provided are ratios for the entire social network; if we analyse the 100 most viral posts on each of them, these account for 23.6% of the likes and only 0.1% of the posts. Therefore, there is a concentration of virality in just a few publications, showing that a few profiles have the most viral influence on the network.

Each social network has its own particularities that cause a high difference in ratios, so they are not directly comparable. To exemplify the situation without distorting the results, we focus on the ratios of Twitter profiles, depicted in Figure 4 below. The sphere of influence corresponds to profiles with a high accumulated mass of followers, and therefore, although their like ratio is low, they have a high impact on the network. The most prominent profile in terms of influence is Real Madrid, exemplified by its profile Real Madrid Club de Fútbol [P22] with 48.8 M followers and Real Madrid Basket with 790.2 K [P24], although the foundations have a smaller number of followers, their volume remains high, such as the Real Madrid Foundation [P23] with 398.7 K followers and the Real Madrid Foundation on YouTube [P25] with 26.5 K followers. The total number of likes is not high (+3,000 likes) but it accumulates more than 5 M views. The situation is similar for the newspaper El Espectador, whose main publications are [P26] [P27], with a total of 6 accumulated publications and an account with 6.7 M followers, the direct viewing impact is 40.2 M profiles.

In terms of virality, this corresponds to profiles with a high number of likes per follower, making them the most viral profiles on Twitter about education. The first position is occupied by the businessman and two-time Senator of Colombia, Gustavo Bolívar with 1.5 M followers and an accumulated number of likes of 27.2K [P28] and 11.2 K [P29].

Second place goes to singer and fashion entrepreneur Cher with 102.7K likes and a single post [P30], whose account has 3.9M followers.

Given the above results, where are the altruistic profiles? If we look at Figure 4 again, these profiles are found in areas of low influence, such as the Spanish Red Cross [P17] with 105K followers and only 286 likes on the publication of its annual report, where it reports that its social projects have reached more than 1.5M people. An NGO that has a great impact on Spanish society but is not echoed on the networks by users. Another example is UNICEF Zimbabwe [P18] with 83.1 K followers and only 14 likes in its educational inclusion campaign.

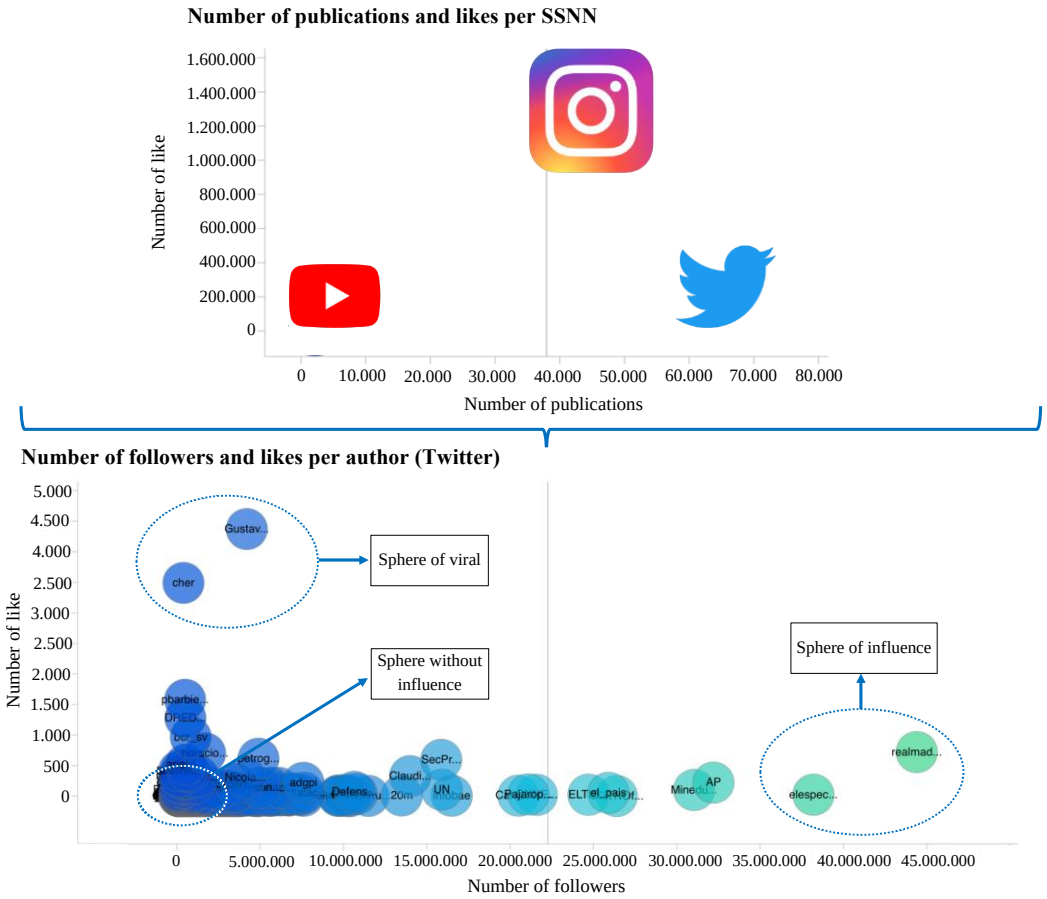

Figure 4: Like Ratio between Publications per Social Network (top) and Like Ratio between Followers per Author on Twitter (bottom).

Therefore, we can say that (vi) the spheres of virality and influence are occupied by companies, institutions or people outside the educational sphere (groups of influence), overshadowing altruistic dissemination.

3.4. The Commercialisation of Social Issues

Economic and political groups of influence monopolise users' attention and push altruistic profiles into the background. How does this power of influence, invisible to users, come about? To answer this question, we continue our investigation with a different perspective than concentration by profiles, because if they use different accounts, this will not be reflected in the ratios. This is why we created Figure 5, which is a chronogram of the number of likes and allows us to evaluate the concentration per day of the three social networks analysed. A first analysis shows clusters that do not correspond to international days, although the clusters of virality and influence detected on Twitter and Instagram are observed, in favour of the latter network. However, as pointed out above, we must take into account the characteristics of each social network and the different procedures for expressing the adoption of content by users. This is the case for likes on Instagram and retweets on Twitter, which is why a direct quantitative comparison is not possible.

The like analysis on 25 January is dominated by the profile Saber.detodo (McDonald's) [P34] at 11:34 with 13.2 K likes, the profile Asombroso.dato (McDonald's) [P35] at 11:39 with 34.3 K likes and the profile Dato.increible (McDonald's) [P36] at 11:44 with 4.6 K likes. All three posts have the same content and refer to the McDonald's brand for the employability of people with disabilities. The NLP classifies them as having a negative sentiment because of the use of words such as: stereotype, obstacles, unfortunately, stunted intellectual development, dangers or wrong. Although the publication actually sends a message of overcoming.

Looking at the pattern of distribution, we observe the same post on different accounts, but by the same person, within a

period of 10 minutes. Linked to the marketing strategy perspective (**Evans *et al.***, 2021) is the use of coordinated campaigns between different actors to increase impact. This situation could be a coincidence, but the same pattern is repeated on 11 November with a Rubik's Cube for the blind on the same accounts Saber.detodo [P31] at 8:48 with 12.2 K likes, the profile Asombroso.dato [P32] at 8:52 with 6.4 K likes and the profile Dato.increible (Rubik) [P33] at 8:50 with 4.6 K likes.

If this pattern is linked to the profile identified in Figure 4, these co-ordinated marketing techniques are also used by Real Madrid Club de Fútbol [P22] at 10:06, Real Madrid Basket [P24] at 10:31 and Fundación Real Madrid [P23] at 11:55.

The attractive visual content of the publications, the large number of followers of the profiles and the recommendations of the algorithms of the digital platforms result in a "glass algorithm" that places the publications recommended to users in the first place, without actually displaying the altruistic individuals. This leads to a feedback loop of visible influencers and the invisibility of profiles of social interest because they have few followers, no marketing teams to edit videos and images, or do not pay privileged positioning fees on the network.

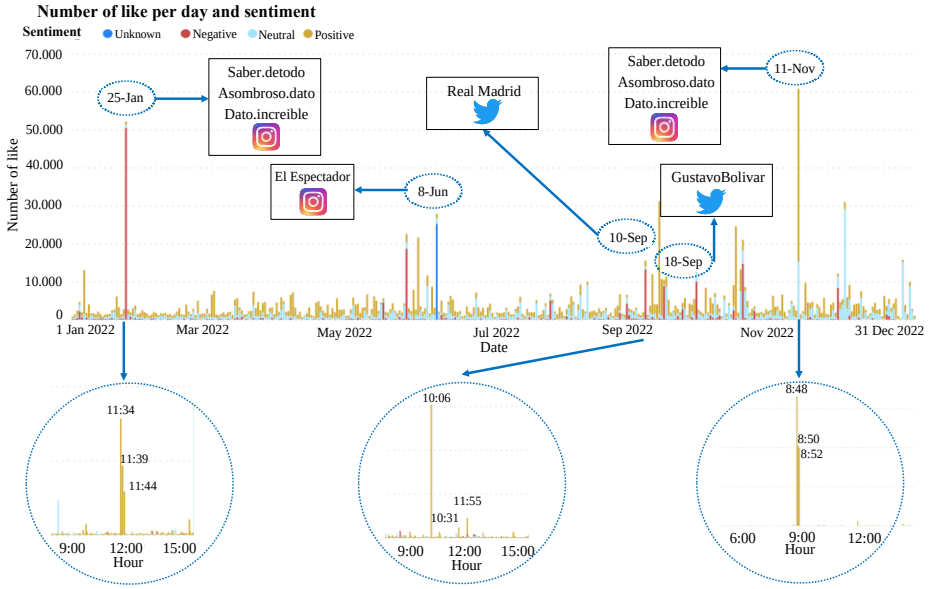

Figure 5: Timeline of the Number of Likes Associated with Sentiment, Highlighting the Times of the Most Viral Posts.

In short, (vii) there is a commodification of social networks, a situation that is evident in previous economic literature but not as well described in social issues. Furthermore, (viii) the economic interests of algorithms, attractive visual content, a large mass of followers and coordinated dissemination campaigns monopolise the visibility of the network in favour of influential groups outside of socio-educational interests.

4. Discussion and Conclusions

The results obtained reveal a panorama in which there is little room for optimism. The results reveal how the opacity of certain claim-making publications associated with altruistic groups or individuals is generated in the face of the influential position of political and economic power groups with rhetorical narratives. This raises important questions and challenges for an inclusive digital society. We will discuss the findings in relation to the multifactorial nature of relational and content structure, in dialogue with the perspective of critical digital education.

It is manifest that large companies (McDonald's, Real Madrid, El Espectador, among others) distribute messages about inclusion and disability outside their business sphere, with a virality of content and a sphere of influence defined by millions of followers and views. It is worth asking what may be the motivation behind the adoption of this type of strategy for education, disability and inclusion content by these social actors, whose interests are clearly linked to a brand or business model (**Evans *et al.***, 2021). Evidence that is not necessarily negative a priori, as its distribution has an extraordinary reach to people all over the world. However, it is how they position themselves as influential agents, along the lines proposed by **Isa and Himelboim** (2018), **Wang and Zhang** (2020) and **Zhou *et al.*** (2022), that poses a challenge for the impact on public opinion and equal participation in digital platforms. Undoubtedly, profiles with the largest number of followers are guaranteed a viral dissemination of content. However, coordinated and orchestrated campaigns through marketing strategies multiply content communication and dissemination, depending on the results obtained.

It is important to highlight the role of these procedures for other social actors who participate in the networks with a well-defined objective. In our study, this objective is the social and educational integration of people with disabilities. The lack of awareness of how some stakeholders (eg. teachers, disabled persons, families and NGOs) are structurally marginalised and put at a distinct disadvantage in terms of altruistic participation in the rest of the year. When **Law and Lee** (2023) propose digital citizenship education, they emphasise preparing new generations for digitally mediated participation and

engagement for personal and social well-being. Awareness of how these exclusions are generated seems reasonable as part of the new literacy about the structure of social networks. It should be noted that the identification of the patterns of influence we have observed is possible thanks to complex computational procedures and is therefore not intuitive for citizens.

Another interesting question related to the diffusion and virality of corporate actor profiles is the one raised by **Al-Garadi *et al.*** (2018), which can be subtly nuanced by the results obtained. If the influence power of certain actors can be explained by the fact that their followers are easily influenced, it is worth considering, in light of the results obtained, that brands and their associated emotional and prestigious legacies (for example, Real Madrid, McDonald's, Cher...) can act a priori as symbolic elements that activate influence power in social networks (**Barberá**, 2015).

The resulting structural inequality is also significant because, surprisingly, this trend is reversed on international days. The findings confirm that commitment to social advocacy for education, disability and inclusion is advantageously positioned in networks on international days. This is when profiles that are overshadowed during the rest of the year are not subordinated to the interests of algorithms and coordinated marketing campaigns, as we discussed earlier. Is there a rational awareness of algorithms on these days? As **Milošević-Đorđević and Žeželj** (2017) argue, online and real life activism are not independent constructs, but the two are combined in a new so-called 'hybrid activism', where both feed into each other. The question is obvious. Would it be interesting to explore further whether offline awareness of the needs and demands of disabled people has the power to reverse the positioning and influence of corporate groups on social media for the rest of the year? It seems plausible that increasing citizens' offline civic activism would improve conscious participation on social media and could be a critical element in increasing the visibility of advocacy content not only on international days.

Another explanatory hypothesis for this paradoxical behaviour is put forward by **Cruz Crespo and Cruz** (2023) when they point to the value of hashtag activism as a form of online advocacy "where users raise awareness about a specific cause by posting on social networks under a common tagged word or phrase". An effective way to organise information and increase the chances of an issue attracting the attention of other users, the gateway to content virality. According to the findings obtained in this study, the name of the international day (A.M. for Autism, A.M. for Down Syndrome...) would act as the slogan of hashtag activism, with the power to revert structural inequality in social networks by bringing together collective actions of actors with social and humanist interests. A line of work that could be explored in the Curriculum for critical digital citizenship (**Law; Lee**, 2023).

This exceptionality evidenced by the international days is also relevant because it supports the work of **Dogruel *et al.*** (2022), **Gran *et al.*** (2021), **Hargittai *et al.*** (2020), **Velkova and Kaun** (2021). These authors argue that citizens need to know how algorithmic intermediation operates and develop skills to navigate, create and disseminate content, skills that are not only technical, but also social. This is obviously not to underestimate the power of algorithms in consolidating the patterns of virality and influence identified in this study. The works of **Burrell and Fourcade** (2021), **Lorenz *et al.*** (2022) and **Yeung** (2018) show that to think otherwise would be naïve. However, it is possible to offer alternatives for digital literacy aimed at developing the conscious complicity of users, as understood by **Gran *et al.*** (2021) and **Hargittai *et al.*** (2020). This would be about educating users to understand that they actively participate and are involved in shaping the access and distribution of information, even if it is hidden. **Gran *et al.*** (2021) put it clearly, "continuously evolving 'smart' structures that rely on user input to grow, suggest that users are 'complicit' and actively participate in shaping the information environment". Awareness of this paradox, therefore, would enable informed decisions about how to navigate digital platforms with greater autonomy, and thus partially reverse the disadvantage and inequality vis-à-vis influential groups.

If we look at the sentiments associated with the most viral altruistic posts, these correlate with positive sentiments, and Instagram is the network that stands out in the accumulated highest virality, as does YouTube, and in line with studies by **Berger and Milkman** (2012) and **Chen *et al.*** (2020). The visual nature of Instagram orients users to emphasise positive and aesthetically pleasing content due to the visual component. This would suggest **Evans *et al.*** (2021), the value of multimodality (text, image or video) to capture users' attention, which would also explain the virality of this social network for the topic at hand. However, the significant virality of Twitter with polarised sentiments echoes the clarification made by **Berger and Milkman** (2012), the intensity of the sentiment and the excitement it arouses, regardless of whether the sentiment is positive or negative, would be the element associated with virality in this social network.

It is important to continue investigating structural inequality in the networks, and the factors associated with it. It is not enough to identify the unequal behaviour and self-interested narratives of influential groups in the networks. It would be interesting to combine quantitative methodologies with methodologies that allow access to the meanings and motivations of users when they create, share and adopt content. **Del-Fresno-García** (2014) proposes qualitative approaches using network ethnography, which, based on the results obtained in this study, could provide answers to certain questions that we have raised in the discussion of the results, and for which we do not have an answer. This would help to identify possible lines of action for information literacy in social networks. Otherwise, the construction of a critical digital citizenship will be compromised to the benefit of a use of social networks under a propagandistic and mercantile logic.

5. Funding

Action financed by the *Community of Madrid* through the *Multiannual Agreement with the Complutense University of Madrid* in its *Programme of Excellence for University Teachers*, within the framework of the *V PRICIT* (*Regional Plan for Scientific Research and Technological Innovation*), Spain.

References

Al-Garadi, Mohammed Ali; Varathan, Kasturi Dewi; Ravana, Sri Devi; Ahmed, Ejaz; Mujtaba, Ghulam; Khan, Muhammad Usman Shahid; Khan, Samee U. (2018). "Analysis of Online Social Network Connections for Identification of Influential Users: Survey and Open Research Issues". *ACM Computing Surveys (CSUR),* v. 51, n. 1, pp. 1-37. *https://doi.org/10.1145/3155897*

Bail, Chris. (2021). *Breaking the Social Media Prism: How to Make Our Platforms Less Polarizing*. Princeton University Press. *https://doi.org/10.1515/9780691216508*

Barberá, Pablo. (2015). "Birds of the Same Feather Tweet Together: Bayesian Ideal Point Estimation Using Twitter Data". *Political Analysis,* v. 23, n. 1, pp. 76-91. *https://doi.org/10.1093/pan/mpu011*

Barroso-Moreno, Carlos; Rayón-Rumayor, Laura; Bañares-Marivela, Elena; Hernández-Ortega, José. (2023a). "Polarization, virality and contrary sentiments for LGTB content on Instagram, TikTok, and Twitter". *Profesional de la información,* v. 32, n. 2, pp. e320211. *https://doi.org/10.3145/epi.2023.mar.11*

Barroso-Moreno, Carlos; Rayon-Rumayor, Laura; García-Vera, Antonio Bautista. (2023b). "Big Data and Business Intelligence on Twitter and Instagram for Digital Inclusion". *Comunicar: Revista Científica de Comunicación y Educación,* v. 31, n. 74, pp. 49-60. *https://doi.org/10.3916/C74-2023-04*

Beer, David. (2017). "The Social Power of Algorithms". *Information, Communication & Society,* v. 20, n. 1, pp. 1-13. *https://doi.org/10.1080/1369118X.2016.1216147*

Beer, David. (2018). *The Social Power of Algorithms*. Routledge. *https://doi.org/10.4324/9781351200677*

Berger, Jonah; Milkman, Katherine L. (2012). "What Makes Online Content Viral?". *Journal of Marketing Research,* v. 49, n. 2, pp. 192-205. *https://doi.org/10.1509/jmr.10.0353*

Braccini, Alessio Maria; Sæbø, Øystein; Federici, Tommaso. (2019). "From the blogosphere into the parliament: The role of digital technologies in organizing social movements". *Information and Organization,* v. 29, n. 3, pp. 100250. *https://doi.org/10.1016/j.infoandorg.2019.04.002*

Burrell, Jenna; Fourcade, Marion. (2021). "The Society of Algorithms". *Annual Review of Sociology,* v. 47, n. 47, pp. 213-237. *https://doi.org/10.1146/annurev-soc-090820-020800*

Chen, Sijing; Mao, Jin; Li, Gang; Ma, Chao; Cao, Yujie. (2020). "Uncovering sentiment and retweet patterns of disaster-related tweets from a spatiotemporal perspective – A case study of Hurricane Harvey". *Telematics and Informatics,* v. 47, pp. 101326. *https://doi.org/10.1016/j.tele.2019.101326*

Cruz Crespo, Yanitza Angely; Cruz, Shannon M. (2023). "The role of social media activism in offline conservation attitudes and behaviors". *Computers in Human Behavior,* v. 147, pp. 107858. *https://doi.org/10.1016/j.chb.2023.107858*

Del-Fresno-García, Miguel. (2014). "Haciendo visible lo invisible: visualización de la estructura de las relaciones en red en Twitter por medio del análisis de redes sociales". *Profesional de la Información,* v. 23, n. 3, pp. 246-252. *https://doi.org/10.3145/epi.2014.may.04*

Del-Fresno-García, Miguel. (2019). "Desórdenes informativos: sobreexpuestos e infrainformados en la era de la posverdad". *Profesional de la información,* v. 28, n. 3, pp. e280302. *https://doi.org/10.3145/epi.2019.may.02*

Dogruel, Leyla; Masur, Philipp; Joeckel, Sven. (2022). "Development and Validation of an Algorithm Literacy Scale for Internet Users". *Communication Methods and Measures,* v. 16, n. 2, pp. 115-133. *https://doi.org/10.1080/19312458.2021.1968361*

Elbagir, Shihab; Yang, Jing. (2019). "Twitter Sentiment Analysis Using Natural Language Toolkit and VADER Sentiment." In: *Proceedings of the International MultiConference of Engineers and Computer Scientists 2019.* IMECS. *https://www.iaeng.org/publication/IMECS2019/IMECS2019_pp12-16.pdf*

Escobar, Modesto; Gil Moreno, Elena; Calvo López, Cristina. (2022). "Análisis de la dinámica, la estructura y el contenido de los mensajes de Twitter: violencia sexual en# Cuéntalo". *Empiria: Revista de metodología de ciencias sociales,* v. 53, pp. 89-119. *https://doi.org/10.empiria.53.2022.32614*

Evans, Dave; Bratton, Susan; McKee, Jake. (2021). *Social Media Marketing*. AG Printing & Publishing.

García-Marín, Javier; Serrano-Contreras, Ignacio-Jesús. (2023). "(Un) founded fear towards the algorithm: YouTube recommendations and polarisation". *Comunicar,* v. 31, n. 74, pp. 61-70. *https://doi.org/10.3916/C74-2023-05*

Gran, Anne-Britt; Booth, Peter; Bucher, Taina. (2021). "To be or not to be algorithm aware: a question of a new digital divide?". *Information, Communication & Society,* v. 24, n. 12, pp. 1779-1796. *https://doi.org/10.1080/1369118X.2020.1736124*

Hargittai, Eszter; Gruber, Jonathan; Djukaric, Teodora; Fuchs, Jaelle; Brombach, Lisa. (2020). "Black box measures? How to study people's algorithm skills". *Information, Communication & Society,* v. 23, n. 5, pp. 764-775. *https://doi.org/10.1080/1369118X.2020.1713846*

Isa, Daud; Himelboim, Itai. (2018). "A Social Networks Approach to Online Social Movement: Social Mediators and Mediated Content in #FreeAJStaff Twitter Network". *Social Media + Society,* v. 4, n. 1, pp. 2056305118760807. *https://doi.org/10.1177/2056305118760807*

Larsson, Anders Olof; Moe, Hallvard. (2014). "Triumph of the Underdogs? Comparing Twitter Use by Political Actors During Two Norwegian Election Campaigns". *Sage Open,* v. 4, n. 4, pp. 2158244014559015. *https://doi.org/10.1177/2158244014559015*

Law, Nancy; Lee, Wing On. (2023). "Curriculum and digital citizenship." In: *International Encyclopedia of Education (Fourth Edition).* Tierney, Robert J.; Rizvi, Fazal; Ercikan, Kadriye (Eds.), pp. 414-423. Elsevier. *https://doi.org/10.1016/B978-0-12-818630-5.03077-3*

Lorenz, Lukas; van Erp, Judith; Meijer, Albert. (2022). "Machine-learning Algorithms in Regulatory Practice: Nine Organisational Challenges for Regulatory Agencies". *Technology and Regulation,* v. 2022, pp. 1-11. *https://doi.org/10.26116/techreg.2022.001*

Milošević-Đorđević, Jasna S.; Žeželj, Iris L. (2017). "Civic activism online: Making young people dormant or more active in real life?". *Computers in Human Behavior,* v. 70, pp. 113-118. *https://doi.org/10.1016/j.chb.2016.12.070*

Passe, Jeff; Drake, Corey; Mayger, Linda. (2018). "Homophily, echo chambers, & selective exposure in social networks: What should civic educators do?". *The Journal of Social Studies Research,* v. 42, n. 3, pp. 261-271. *https://doi.org/10.1016/j.jssr.2017.08.001*

Qian, Cheng; Mathur, Nitya; Zakaria, Nor Hidayati; Arora, Rameshwar; Gupta, Vedika; Ali, Mazlan. (2022). "Understanding public opinions on social media for financial sentiment analysis using AI-based techniques". *Information Processing & Management,* v. 59, n. 6, pp. 103098. *https://doi.org/10.1016/j.ipm.2022.103098*

Sarkar, Dipanjan. (2019). *Text Analytics with Python: A Practitioner's Guide to Natural Language Processing*. Apress Berkeley, CA. *https://doi.org/10.1007/978-1-4842-4354-1*

Schulz, Wolfgang. (2018). *Algorithms and Human Rights*. Council of Europe.

Shi, Wei; Zhang, Jing; He, Shaoyi. (2023). "Understanding Public Opinions on Chinese Short Video Platform by Multimodal Sentiment Analysis Using Deep Learning-based Techniques". *Kybernetes*. *https://doi.org/10.1108/K-04-2023-0723*

Velkova, Julia; Kaun, Anne. (2021). "Algorithmic resistance: media practices and the politics of repair". *Information, Communication & Society,* v. 24, n. 4, pp. 523-540. *https://doi.org/10.1080/1369118X.2019.1657162*

Wang, Li; Zhang, Qingpu. (2020). "Identifying the optimal initial adopters and adoption paths of the internet-based intangible network goods". *Kybernetes,* v. 49, n. 3, pp. 681-706. *https://doi.org/10.1108/K-10-2018-0566*

Xu, Shun; Liu, Meixin; Ma, Dan. (2023). "Exploring Secondary Vocational Students' Digital Citizenship from the Perspective of Their Social Media Competence". *Computers in the Schools,* v. 40, n. 2, pp. 152-172. *https://doi.org/10.1080/07380569.2022.2157230*

Yang, Zhi; Yang, Cai; Lu, Chongyu; Wang, Feng; Zhou, Wei. (2023). "Diffusion between groups: the influence of social brokers on content adoption in social networks". *European Journal of Marketing,* v. 57, n. 4, pp. 1039-1067. *https://doi.org/10.1108/EJM-11-2020-0811*

Yeung, Karen. (2018). "'Hypernudge': Big Data as a Mode of Regulation by Design." In: *The Social Power of Algorithms.* Beer, David (Ed.), pp. 118-136. Routledge. *https://doi.org/10.4324/9781351200677-8*

Zhou, Fang; Su, Chang; Xu, Shuqi; Lü, Linyuan. (2022). "Influence Fast or Later: Two Types of Influencers in Social Networks". *Chinese Physics B,* v. 31, n. 6, pp. 068901. *https://doi.org/10.1088/1674-1056/ac4484*

Zubcsek, Peter Pal; Chowdhury, Imran; Katona, Zsolt. (2014). "Information Communities: The Network Structure of Communication". *Social Networks,* v. 38, pp. 50-62. *https://doi.org/10.1016/j.socnet.2014.02.001*

Annex

Table Annex: Word in the Text and Publications.

ID	Word in the Text	Link	ID	Word in the Text	Link	ID	Word in the Text	Link
P01	Braille World Day	https://bit.ly/3qP23xw	P13	Microsoft (12:00 a.m)	https://bit.ly/44F9WmO	P25	Real Madrid Foundation (Youtube)	https://bit.ly/44V73iH
P02	Education World Day	https://bit.ly/45xh9a0	P14	Senate of Argentina	https://bit.ly/3Z7LTfm	P26	El Espectador (I)	https://bit.ly/481M1kn
P03	Autism World Day	https://bit.ly/3P34Yuh	P15	BBVA Mexico	https://bit.ly/44GPvWx	P27	El Espectador (II)	https://bit.ly/44A2Lwq
P04	Autism Dissemination	https://bit.ly/45QtAgP	P16	The Hindu	https://bit.ly/44E27hj	P28	Gustavo Bolívar (I)	https://bit.ly/3Ytgx2j
P05	Autism Wolrd Day (Father)	https://bit.ly/3Z4rvvE	P17	Spanish Red Cross	https://bit.ly/3PnPyCv	P29	Gustavo Bolívar (II)	https://bit.ly/3R8GyST
P06	Autism World Day (Association)	https://bit.ly/45yavQQ	P18	UNICEF	https://bit.ly/45YFlSx	P30	Cher	https://bit.ly/45S8XRs
P07	Special Education World Day (Ngo)	https://bit.ly/3L6oYLn	P19	Afghanistan	https://bit.ly/3sCCAb3	P31	Saber.detodo (Rubik)	https://bit.ly/3OZNVcB
P08	Special Education World Day (Institute)	https://bit.ly/3OYqqRj	P20	Indonesia	https://bit.ly/3sIr0ek	P32	Dato.increible (Rubik)	https://bit.ly/3qWezer
P09	Beginning academic year (School)	https://bit.ly/3OZeKO5	P21	Rwanda	https://bit.ly/3OXY8q9	P33	Dato.increible (Rubik)	https://bit.ly/45Wprb0
P10	Academic year (Demonstration)	https://bit.ly/3PlEEwR	P22	Real Madrid Fc	https://bit.ly/3EnVZiz	P34	Saber.detodo (Mcdonald's)	https://bit.ly/3PnHIJ3
P11	Disability World Day	https://bit.ly/44BGPAI	P23	Real Madrid Foundation	https://bit.ly/3P4z2G8	P35	Asombro.dato (Mcdonald's)	https://bit.ly/3L7hRm4
P12	Disability World Day (Conference)	https://bit.ly/3OZCSAo	P24	Real Madrid Basket	https://bit.ly/3R6pihg	P36	Dato.increible (Mcdonald's	https://bit.ly/3P46JHD