

The Strategic Integration of Instagram and YouTube in Scientific Dissemination - A Case Study of Manual do Mundo

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Abstract. This study investigates the strategic integration of Instagram and YouTube for science dissemination, specifically focusing on Manual do Mundo, a prominent science communicator in Brazil with more than 20 million followers on its digital networks. It seeks to expand the understanding of effective science communication in the digital age by highlighting the advantages of tailoring content to each platform's unique attributes. The research offers valuable insights into Manual do Mundo's audience engagement strategies. To assess the effectiveness of this integration, the study analysed three instances of Instagram and YouTube integration employed by Manual do Mundo, in particular two cases in which Instagram Reels and YouTube videos addressed the same scientific topic and one case where an Instagram post promoted a podcast exclusively available on Manual do Mundo's YouTube channel. This analysis also included relevant metrics and audience engagement. Ultimately, this strategic integration contributes significantly to advancing scientific literacy and enhancing accessibility in today's interconnected digital landscape.

Keywords. Scientific Dissemination, YouTube, Instagram, Social Media, Manual do Mundo.

1. Introduction

Equal access to scientific knowledge is essential for social inclusion and quality of life. Formal education often does not guarantee this, since most adults learn most of their science information after they leave formal schooling [1].

It is in this context that informal education enters the scene. Science dissemination, a form of informal education, is responsible for popularising science and technology, so that they are not restricted to the academic environment. Science dissemination can take place through the media, science museums, popularisation events and distance education [2]. It therefore benefits from today's context, where distance and online education is revolutionary in that it allows freedom for almost anyone to learn wherever they are physically, and not depending exclusively on formal education systems [3].

The new web 2.0 infrastructures provide quick access to information and make it easier for video creators to reach a wide audience [3]. Video-sharing platforms such as YouTube allow professionals or those interested in science to disseminate videos on

scientific topics, since users can upload, share and view videos. According to the platform itself, in 2023 YouTube is present in more than 100 countries and more than 500 hours of content are uploaded every minute. YouTube thus gives users access to current, innovative, and unconventional alternatives for teaching and learning [4].

From the point of view of science communication, the social network Instagram is also one of the biggest platforms for sharing audiovisual content. The app on this social network has more than 5 billion downloads in the Google app store as of September 2023, which indicates the platform's high potential for reaching different audiences and, consequently, disseminating science [5].

Given the constantly evolving scenario of audiovisual content consumption, it has become essential for science disseminators on YouTube and Instagram to have a presence on both social networks. This is due to the use of specific engagement strategies for each platform, with the aim of reaching as many people as possible.

The main question that this study seeks to address is: how does the strategic integration of these two

platforms, Instagram and YouTube, occur in science dissemination? Understanding how these platforms are used together to communicate science is essential for the evolution of science dissemination, considering the distinct nature of the two media. Instagram, with its emphasis on short visual content and quick interactions, contrasts with YouTube, which offers space for longer, more detailed videos.

It is essential to study the strategic integration of Instagram and YouTube in science popularisation, as this impacts social media outreach strategies and the popularisation and democratisation of science. Content creators need to optimise their approaches to meet new expectations of format and audience engagement. The study will use Manual do Mundo, a Brazilian science dissemination channel, as an example, to analyse how this integration is implemented and its impact on science dissemination. This will benefit not only content creators, but also researchers and institutions involved in promoting science and scientific literacy.

2. Historical overview of science dissemination

The history of scientific dissemination has been shaped by inventions that have transformed access to knowledge. The invention of the printing press by Johannes Gutenberg in the 15th century revolutionised the dissemination of ideas and information on a global scale [6]. The period of the scientific revolution in the 16th and 17th centuries brought new questions about physical nature, boosting the development of science, while the rise of the bourgeois class further stimulated this progress [7].

The practical results of scientific research became evident with the first industrial revolution in the 18th century and became even more so with the second industrial revolution at the end of the 19th century. This increased social awareness of the applications of scientific knowledge for material progress. The 20th century, marked by major wars, brought science even closer to society, making it accessible to citizens and not just academics, giving rise to the need to apply scientific knowledge in various areas [5].

2.1 Science dissemination today

In the current scenario, characterised by Bush (1945) as an era of concern about the "information explosion", the production of scientific knowledge has had to be better organised due to the high interest in science and technology. A new area of knowledge emerged, responsible for organising and then disseminating science. This new discipline has been impacted by the new flows of information resulting from the rise of the internet, which has become a protagonist in the 21st century, increasing the visibility of science and its global audience, overcoming geographical and time barriers, including by making scientific journals available

online [6].

With the growth of the scientific community on the Internet, there has been an increase in the popularisation of content related to science and technology in the digital environment [6]. Contemporary science communication encompasses a variety of processes and is aimed at both experts and the lay public. In addition, it can have different objectives, including educational, civic and popular mobilisation. In this study, we will focus our analysis on educational outreach, the central purpose of which is to broaden the lay public's knowledge and understanding of the scientific process, stimulating scientific curiosity as a human attribute [7].

3. The role of YouTube and Instagram in science dissemination

In this context, the evolution of science dissemination in the digital age has benefited from video technology. From the early days of cinema, when silent film technology allowed for the depiction of real-world events, to today's YouTube landscape, videos play a crucial role in the dissemination of scientific knowledge. Just as silent films provided educators with a way to make teaching more concrete, realistic and visual, allowing students to see distant lands, visit dangerous places and witness natural phenomena while sitting in the classroom, online science videos also provide a dynamic representation that transcends the boundaries of textbooks and blackboards. This allows educators to bring the world to their students in a way that would not be possible otherwise [8].

YouTube is a video-sharing website where users can upload and share their own videos. With 2.6 billion users worldwide by 2022 and approximately 62% of global consumers using YouTube, the platform offers the possibility for content creators to upload videos that feature advanced visuals such as graphics, animations and practical demonstrations, making science more accessible and attractive.

The analysis of this platform is based on its impact on the internet, especially in education. YouTube's 2022 annual impact report revealed that more than 80.000 channels were producing content related to digital skills and school subjects by December of that year. In addition, 98% of users use YouTube to acquire information and knowledge, with 80% believing that the platform offers equal opportunities for learning and personal development. Educators also emphasise the importance of YouTube, with 84% of the teachers interviewed using the platform as a teaching tool. The survey revealed that 75% of teachers who use YouTube agree that it helps solve comprehension problems in education by providing access to quality information.

In addition, it is important to highlight that online science videos also promote the co-construction of knowledge by the audience, as indicated in comments on the videos. This aspect encourages the practice of discussing scientific topics based on evidence, even for those who are not experts in the field [9].

Today, audiovisual content consumption patterns are changing, according to a study by Zhejiang University in China, published in the journal *NeuroImage* in 2021. The study analysed the brain activity of 30 participants who watched videos personalised by algorithms from short video platforms, such as Instagram, and generic videos. The results showed that personalised videos activate areas of the brain related to the reward system, causing an immediate feeling of pleasure due to the release of dopamine. However, this constant stimulation of dopamine can create a vicious cycle, leading people to seek out more stimuli to get the same satisfaction, making it difficult to move away from short videos and focus on more complex activities. Additional studies indicate that the reasons for using short video platforms include seeking social self-affirmation, adhering to trends, developing an escapist addiction and seeking novelty, highlighting how these videos can create a cycle of engagement that is difficult to break. This research demonstrates the ability of short videos on social media platforms to stimulate the reward system in the brain, generating a rapid response of pleasure and satisfaction, which contributes to the growing popularity of these media [10].

Therefore, faced with a trend of looking for shorter videos, many creators of scientific content on YouTube have also started producing videos for platforms that allow short videos, such as Instagram, in order to reach as many people as possible and adapt to audiovisual consumption trends, while maintaining activities on YouTube.

From a content production point of view, Instagram is more simplified compared to YouTube. While YouTube requires a cover image for videos, Instagram simplifies this barrier to entry, allowing content creators to share short videos more immediately. In addition, the videos that are successful on YouTube are generally longer and more detailed, while Instagram videos stand out for their brevity and focus on capturing attention instantly.

Thus, the strategic combination of YouTube and Instagram offers content creators the flexibility to meet changing expectations of format, engagement and informational depth in a constantly evolving media consumption landscape.

4. Methodology

The methodology used to conduct this research is based on a case study, an approach widely recognized in qualitative research, but which will also be quantitative in this research, since metrics such as views of Manual do Mundo science videos on Instagram and YouTube will be analysed.

The case study concentrates on a specific situation, in this case the "Manual do Mundo" channel, with a focus on three cases of multimedia alliance strategies. The research describes these science communication strategies in detail, covering the relevant themes, formats and visual resources analysed. In addition, it seeks to explain how the strategic integration of YouTube and Instagram can benefit science communication, investigating the motivations, challenges and impacts of the strategies adopted by content creators and their reception by the public. The research also seeks to identify metrics from the analysis of specific data, identifying patterns and trends related to integrated science communication on the YouTube and Instagram platforms [11]. It is also important to mention that all the metrics presented will refer to September 2023.

5. Case study of the Manual do Mundo

Manual do Mundo is one of the largest educational entertainment producers in Brazil, according to its creators. Bringing knowledge to the public since 2008, it has more than 2.500 videos and 20 million followers on its digital networks, having accumulated more than 4 billion views and more than 18 million subscribers on its YouTube channel alone [12] in data collected in September 2023. On Instagram [13], the Manual do Mundo profile has more than 2 million followers and more than 5,300 posts, ranging from photos to videos. An advocate of science for all, Manual do Mundo is always "testing, exploring and experimenting, because it believes that this is the most efficient and fun way to teach and learn science", as pointed out on Manual do Mundo's LinkedIn page [14].

For this case study, YouTube videos and Reels from Manual do Mundo will be analysed. YouTube videos are characterised by being mostly in horizontal format, namely equivalent to a 16:9 aspect ratio. In addition, the platform accepts video uploads in resolutions up to 8K (4320p). Also by default, a verified user of the platform can upload videos up to 12 hours long [15]. In contrast, Instagram Reels have a maximum length of 90 seconds or 15 minutes, depending on the video upload format, and can be created directly on the platform, while YouTube videos must be assembled and edited using separate editing software. In addition, Reels videos are vertically oriented [16].

5.1 Videos about solar energy

Two videos on the same general theme - solar

energy - were posted by Manual do Mundo on YouTube and Instagram just over a month apart. In the YouTube video, published in May 2023, entitled "TODA ENERGIA VEM do SOL!" (ALL ENERGY COMES from THE SUN!), with a duration of 7 minutes and 48 seconds, one of the founders of Manual do Mundo, Iberê Thenório, conducts a detailed tour of a solar energy complex located in the northeastern region of Brazil. The main objective of this video is to elucidate the concept that all forms of energy find their origin in the Sun. To achieve this, Iberê uses a series of science dissemination strategies. Firstly, it uses practical and accessible examples to illustrate the connection between solar energy and various forms of energy, such as wind, electrical, chemical and kinetic energy. The approach is enriched with audiovisual resources, including video inserts and images that contextualise each form of energy explained, as well as illustrations of the water cycle to visualise the relationship between the Sun and electrical energy. In addition, drone-captured images are used to provide an aerial perspective of the solar energy complex's facilities, enhancing understanding of the infrastructure. To make the process even easier to understand, Iberê uses a practical representation, using a Styrofoam ball to simulate an electron, in order to explain in a didactic way how solar panels convert solar energy into electricity. The video has 289.000 views, 30.000 likes and 908 comments.

On Instagram, Manual do Mundo's profile shared a Reels in July 2023, entitled "Quanto de ENERGIA tem na LUZ do SOL?" (How much ENERGY is there in the SUN'S LIGHT?), which was approximately 45 seconds long. In this video, Iberê Thenório addressed the subject of solar panels, drawing a parallel with the content presented in the YouTube video, which is almost 8 minutes long. In Reels, the emphasis was on the idea that one square metre of area exposed to the sun in a backyard receives around a thousand watts of solar energy, illustrated visually by comparing it to the consumption of everyday devices such as a microwave, ten vacuum cleaners or a hundred LED light bulbs. This strategy was essential for condensing complex information in an effective and captivating way, adapting to the short and dynamic format of the Instagram platform. In addition, Iberê clarified that solar panels have a conversion efficiency of approximately 20%, providing critical information about capturing solar energy. This Reels had more than 97.000 reproductions, around 4.600 likes and 32 comments. It can thus be seen that Manual do Mundo has adapted its science communication strategy on the same topic - in this case, solar energy - to suit the particularities of each platform, maintaining a commitment to science communication and demonstrating sensitivity to audience preferences and time and format limitations on both platforms.

5.2 Videos of the OceanGate submersible implosion

In an example of integration between the Instagram and YouTube platforms, Manual do Mundo posted a video on YouTube on June 21, 2023, lasting 13 minutes and 11 seconds. Iberê Thenório covered the disappearance of OceanGate's Titan submarine on June 18, during an expedition to the North Atlantic Ocean in search of the wreck of the Titanic. The tragedy was confirmed by the US Coast Guard on June 22, following the discovery of wreckage and evidence of implosion in the Titan's cabin [17]. Manual do Mundo had made a name for itself in the online community due to its previous experience in building a submarine from scratch, which was documented in detail on its YouTube channel. In addition, the channel offered scientific explanations throughout this process, consolidating itself as a source of knowledge for viewers interested in the complexities involved in creating a submarine.

In the video entitled "SUBMARINO no TITANIC: por que É TÃO DIFÍCIL ACHAR?" (SUBMARINE on THE TITANIC: why is it SO HARD TO FIND?), Iberê, with the sea in the background, begins by explaining the general context of the disappearance of the submersible and then explains how the process of trying to locate and rescue it works, for example. He initially highlights the improvised nature of the video, as he felt the need to share information quickly with everyone who was asking questions. Because of this, Iberê intersperses inserts of videos filmed in the studio to enrich the moments when the improvisation of the initial video didn't cover enough detail. In these inserts, Iberê presents a series of possible technical faults that led to the disappearance, as well as figures, to allow viewers to understand important aspects, such as the weight and dimensions of the submersible, as well as the maximum depth it could reach. The science communicator uses an approach that includes comparisons with everyday life, making the information less abstract and more concrete, which makes it more accessible to the lay public.

In the ninth minute of the video, Iberê addresses another question asked by Manual do Mundo followers: if a submersible from a large company like OceanGate has disappeared, does that mean that the submarine made by Manual do Mundo, with considerably more limited resources, would also be subject to disappearing at sea? To answer this question, the presenter dedicates the remaining four minutes of the video to presenting 10 different points that differentiate the Manual do Mundo submarine from the OceanGate submersible. During this explanation of the differences, he shares information about the development process and technical aspects of the submarine he built, to prove that it was safe. This video has had more than 4 million views, 211.000 likes and more than 5.000 comments.

The Reels uploaded to Instagram on the same day is three and a half minutes long, is entitled "SUBMARINO no TITANIC: por que É TÃO DIFÍCIL

DE ACHAR?" (SUBMARINE on THE TITANIC: why is it SO HARD TO FIND?) and is taken from the final excerpt of the YouTube video. In other words, a new video was not created for Reels, but rather part of the detailed YouTube video was adapted for Instagram. The crucial difference between the videos on the two platforms is that, on Instagram, the scientific explanation was limited only to the aspects that make the Manual do Mundo submarine safe. This Reels had over 336.000 views, 33.000 likes and 378 comments.

The strategy adopted by Manual do Mundo in sharing this excerpt from its YouTube video in Reels format on Instagram demonstrates a clever approach that is integrated with the different content consumption preferences of its audience. This tactic not only amplifies the visibility of the topic, but also encourages the Instagram audience to seek out more detailed information in the full video on YouTube. By adapting the content for a shorter, more visual audience on Instagram, Manual do Mundo reaches a wider range of viewers interested in the topic. The strategy not only answers immediate questions, but also directs the audience to a more in-depth and technical exploration, making the most of the distinct characteristics of each platform.

5.3 Manual do Mundo podcast with Drauzio Varella

Manual do Mundo, through its Instagram presence, shared a post promoting one of the episodes of its podcast entitled "Na Trilha dos Gigantes" (On the Trail of Giants), which featured Drauzio Varella, a widely known figure in the field of medicine and science communication. Drauzio Varella is recognized for his vast experience as a doctor, writer and science communicator, and is one of the most renowned personalities in science and health communication in Brazil. In the September 21, 2023 Instagram post, Manual do Mundo featured photos of the podcast's host, Iberê Thenório, together with Drauzio, captured during and after the interview. In the caption, the post shared brief curiosities about Drauzio, exposing aspects of his personal and professional career. The post received over 3,000 likes and 69 comments, including some such as "Going to watch it now!" and "I thought Drauzio Varella's episode was going to be the last. I'm glad it's out, it was what I was waiting for", showing that this post reached people interested in watching the podcast on YouTube.

The full interview with Drauzio Varella is available on Manual do Mundo's YouTube channel and lasts 1 hour and 12 minutes. In this podcast, Drauzio and Iberê talk about topics such as the doctor's career since his youth and his time as a physics teacher. The episode also covers his work raising awareness of AIDS in the 1980s and his experiences in Carandiru, a detention house in Brazil, as a volunteer doctor. The podcast, which is a media

medium that emerges from the publication of audio files on the Internet and offers an engaging approach to the presentation of information and knowledge [18], had more than 53.000 views, 6.000 likes and 330 comments.

Manual do Mundo adopted an integration strategy between Instagram and YouTube when sharing its promotional post for the podcast "Na Trilha dos Gigantes" with Drauzio Varella. It's important to point out that Manual do Mundo didn't include a direct link to the full YouTube video in the Instagram post, but instead created a thought-provoking call-to-action that sparked viewers' interest. By sharing photos of Iberê Thenório and Drauzio Varella during and after the interview, as well as brief trivia about Drauzio, the Instagram post provided a thought-provoking insight into the conversation. The strategy here was to captivate Instagram viewers by offering an intriguing sample of the content available on the podcast, indirectly encouraging them to seek out the full episode on YouTube. This approach allows Manual do Mundo to reach both its target audience on Instagram and those who prefer YouTube, taking advantage of the distinct characteristics of each platform.

6. Discussion

In today's scenario, where the dissemination of scientific knowledge plays a key role in social inclusion and quality of life, formal education is not always able to meet basic science education needs. In this context, science communication plays a crucial role in making science and technology accessible to a wider audience through different means, such as social media.

The strategic integration of social media platforms, such as Instagram and YouTube, into science popularisation proves essential to meet the changing expectations of format, engagement and informational depth in an ever-evolving media consumption landscape. This case study focused on analysing Manual do Mundo, an influential Brazilian science dissemination channel, to understand how this integration is implemented and its impact on science dissemination.

It was observed that Manual do Mundo adopted a smart strategy by sharing content on both platforms. On YouTube, it went deeper into explaining scientific topics, taking advantage of the platform's long and detailed format. On Instagram, on the other hand, it adapted its content to meet the preference for short, fast-viewing videos. This not only increased the visibility of the topics, but also directed the Instagram audience to explore more detailed information on YouTube.

In addition, Manual do Mundo has demonstrated the ability to create attractive and informative educational content on both platforms, presenting different approaches to meet the needs of its diverse

audience. This strategy not only benefits content creators, but also researchers and institutions involved in promoting science and scientific literacy.

In the context of science dissemination, Instagram and YouTube present themselves as powerful tools that cater to different content consumption preferences. Instagram offers a visual and concise approach, ideal for attracting a wide audience, while YouTube allows for a more in-depth and detailed exploration of scientific topics.

Ultimately, this study highlights the importance of the strategic integration of social media platforms in science communication. Understanding how these platforms are used together to communicate science is essential for meeting the needs of the public and for the evolution of science communication in an increasingly digital and diverse world. The ability to adapt science communication strategies to the specific characteristics of each platform is key to reaching a wider audience and promoting the democratisation of scientific knowledge. By continuing to explore and improve these strategies, science content creators and educational institutions can make a significant contribution to promoting science and scientific literacy in contemporary society.

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