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# LOW VISIBILITY OF FEMALE YOUTUBERS ADDRESSING ENVIRONMENTAL MATTERS: A QUESTION OF DISCURSIVE STRATEGIES?

Cecilia Lartigue [1], Muriel Lefebvre [2], Aquiles Negrete [3]

[1] Posdoctoral Researcher, Center for Complexity Sciences, Universidad Nacional Autónoma de México (UNAM) México City, México
[2] The Institution is Université de Toulouse II Jean Jaures, and the Address is Toulouse, France
[3] Researcher, CEIICH, Universidad Nacional Autónoma de México (UNAM) México City, México

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**Corresponding Author**
Cecilia Lartigue,
cecilia.lartigue@gmail.com

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## ABSTRACT

Several studies have revealed that women are significantly under-represented in scientific research, as well as in science communication. Their lack of representation is noticeable in social media, including YouTube. In this study we tried to determine if low women visibility addressing environmental matters on YouTube is related to their discursive strategies vis-à-vis those of men. In particular, we tried to elucidate whether it is a result of women using less discursive elements related to gaining credibility, legitimacy and public attraction than their male counterparts. We also aimed to determine whether there was an indication of globalization in this difference or similarity of discursive strategies between men and women. Consequently, half of our sample of videos was produced by French youtubers, while the other half was produced by Mexican youtubers.

**Keywords:** Women's Underrepresentation, Environmental Communication, Science Communication, Discursive Strategies

## 1. INTRODUCTION

Since the 1970s, several studies in sociology and history of science have highlighted the low visibility of women in science. The so-called "Mathilda effect" underlines the lower recognition of women scientists compared to their male counterparts, both in their scientific careers and in the citation of their work (number of publications, references, citations, etc.) Merton and Zuckerman (1973).

Similarly, more recent studies have shown the low visibility and recognition of female figures in science popularization activities Amarasekara and Grant (2019), Chagnard et al. (2018), Perronnet (2021).

In this article, we will focus on the discourses of female personalities on a specific scientific subject: the environment. Today, environmental issues are present in both political and media discourse, including social networks. YouTube, in particular, is used to broadcast all kinds of science-related videos (entertainment, school videos and popularization). Female speakers appear less frequently than male speakers in this platform, which may be caused by its algorithms Amarasekara and Grant (2019).

Over 90% of the YouTube audience watches 20% of the most popular videos and these are mainly generated by users and not by professionals. Although no disparity has been seen between the presence of women and men in videos produced by professionals, a gender gap was detected in videos generated by users. Consequently, it can be affirmed that audiences are mainly watching science videos generated by men Welbourne and Grant (2015).

For this study our reasoning was as follows: The low popularity of videos produced by women on environmental issues could be due to the fact that they have different discursive strategies than men and that this may cause their videos to be less appealing to internet users. Therefore, we decided to first find out whether there is any disparity between men's and women's discursive strategies, in terms of the linguistic and non-linguistic elements that they use.

From a comparative perspective, our corpus is made up of French and Mexican videos. France and Mexico are two contrasting countries in geopolitical, economic, social and environmental terms. Mexico's per capita standard of living is significantly lower than France's United Nations Development Programme (2019). In addition, Mexico's environmental challenges today appear to be greater than those of France. This contrasting corpus allows us to speculate whether the differences or similarities between the discursive strategies of male and female youtubers are a global issue.

Our research question is as follows: is it possible to identify a gendered staging of science popularization discourse on YouTube? If confirmed, does this staging vary according to the geographical and cultural origins of the youtubers?

There are some studies that address the disparity between male and female content generators in terms of the perception of their videos. For example, Tsou et al. (2014) analysed TED talk video comments via YouTube and TED.com. Their study revealed that the comments about talks by female speakers were more personally directed, emotional and polarised than those concerning talks by male speakers. This was more evident on YouTube.

Brewer and Ley (2017) examined the impact of online STEM videos on science interest, self-concept in science, science anxiety, perceptions of scientists, and perceptions of gender bias in science among university students. Their results suggest that watching a YouTube video that directly addresses sexism in science produced more positive attitudes of participants about scientists and helped them to perceive greater gender bias in science versus the participants' attitudes motivated by videos that did not address sexistm in science.

Also, Amarasekara and Grant (2019) carried out a study to determine whether gender presence in STEM had an impact on YouTube channel's popularity; whether this presence influenced YouTube viewer responses and sentiments; and whether YouTube is a hostile environment for female science communicators to effectively

engage audiences. Their results show that gender does affect the reception of and interaction (responses and sentiments) with science YouTube videos. In other words, female science communicators on YouTube still face a hostile environment.

Nevertheless, to our knowledge there are no studies analyzing the discursive strategies of men and women on YouTube, particularly, addressing environmental problems. In other words, research has so far mostly focused on message reception than in message production. Therefore, we believe our exploratory study may contribute to this area of communication research.

It may be relevant to recall that speaker's "stage" their discourse. Staging" is a concept developed by Erving Goffman in 1956, according to which 'individuals or actors present and represent themselves in order to create an impression of themselves, with the purpose of influencing other participants in some way' Delas and Milly (2015).

## 2. THEORETICAL FRAMEWORK

To answer our research question, we drew on several theoretical frameworks: Studies on Gender Stereotypes, YouTube as a Socio-Technical Device, Discourse Analysis, and Discursive Strategies.

## 3. GENDER STEREOTYPES

Stereotypes are defined as "beliefs about the characteristics, attributes, and behaviors of members of certain groups" Hilton and von Hippel (1996) A "gender stereotype" is an opinion or prejudice concerning the attributes or characteristics that women and men possess and the roles they should respectively play in society Damian-Gaillard et al.(2014).

According to some authors gender stereotypes are related to the issue in question. It is worth mentioning that according to Carli et al. (2016)women are thought of as having less agency (leader-like, analytical, competitive, and independent), and being more communal (kinder, warmer, and more understanding and helpful) and more passive than men. Similarly, Parker et al. (2017), a survey performed in the United States revealed the traits that society values most in men and women. For instance, honesty, ambition, and strength were the most valued attributes in men, while physical attractiveness, empathy, nurturing, and kindness were the traits that participants appreciated in women. It is therefore not surprising that women are perceived as more credible than men in subjects considered as *feminine* (e.g. education, healthcare, social security), men are perceived as more credible in subjects regarded as *masculine* (finance, energy, defense).

Nevertheless, in general, women are apparently perceived as less credible than men. In 2015 Strach et al. analyzed a sample of over four thousand ads sponsored by political candidates and political parties that aired during 2010 and 2012 U.S. House and U.S. Senate elections. They grouped them according to the speakers´gender. In addition, they collected surveys that asked for participant's ratings of the ads' credibility, and obtained an aggregate credibility score for every individual ad included in the sample. The study revealed that female speakers were perceived as less credible overall compared to their male counterparts, regardless of the specific subject they addressed.

## 4. GENDER STEREOTYPES IN SCIENCE AND SCIENCE COMMUNICATION

Gender stereotypes have been discussed in the scientific field for several decades. For example, according to Huge et al. (2013), male researchers are more likely to be portrayed as carrying masculine qualities: objective, assertive and organized, than their female counterparts. Aggravating this situation is the fact that even women have the perception that science is masculine, while arts is a feminine field. One implication of this is that in science women are treated differently from men and are held to different standards McKinnon and O'Connell (2020).

Two studies that highlighted the effects of gender stereotypes in science are worth noting. In 1999, Spencer et al. gave a series of tests to high-performance mathematics students at Stanford University. One group was given the test without providing additional information. The other group was told that the test results had previously shown differences between performances of men and women. Only in the second group, where gender stereotypes were evoked, women performed less well than men. A similar result was obtained in France, where a geometry test was given to high school students, in which it was pointed out that the intention of the test was to show the difference between the performance of men and women Huguet and Régner (2009).

Gender stereotypes also appear in science communication, in which women are traditionally less present than men Amarasekara and Grant (2019). This is also the case of social networks. Regardless of their popularity, female presences are scarce among the most popular channels, even rarer than in traditional media. This fact may have serious consequences, as young people might get the impression that women do not work in science.

According to Knobloch-Westerwick et al. (2013), because women have been historically underrepresented in scientific fields, people may be biased against them, which has had a detrimental impact on female science communicators´ ability to persuade. Also, they may be especially vulnerable to different types of harassment McKinnon and O'Connell (2020), due to the fact that stereotypes about women do not overlap with those about perceptions of what it means to be a scientist Carli et al. (2016).

McKinnon and O'Connell (2020) analyzed some of the implications of being a female science communicator. Their study revealed that prevailing perceptions of the stereotypes applied to women who speak publicly about their work are largely negative. They used workshops with over 300 participants, mainly science professionals, from very diverse cultural backgrounds. They were frequently described as 'bitchy', 'bossy', and 'emotional', even by women.

## 5. YOUTUBE: A "BROADCAST YOURSELF" PLATFORM WITH A PARTICULAR ALGORITHM

Nowadays, the media universe of young people is almost entirely digital. In this context, the emergence of Web 2.0 on the Internet in the early 2000s was a major event, as users could become an actor on the Web, either by directly posting a contribution, or by commenting on the contribution of other users Adenot (2016). In effect, they were able to choose the speakers of their choice themselves, beyond the offer proposed by the mass media Cocker and Cronin (2017).

Youtube, a Web 2.0 platform, was created in 2005 by Stephen Chen, Chad Hurley and Jawed Karim. It has become a public favorite. It is one of the most popular social networks, in terms of active users (the second most popular in 2022, according to Statista). The platform is a medium for sharing original amateur and professional videos around the world. It is an ideal medium for personal dissemination but also for education and communication Martins Flores and Muniz de Medeiros (2018).

In theory, a "platform" doesn't carry out an activity but rather facilitates it and does not exercise any form of mediation Gillespie (2010). Nevertheless, as a lucrative company, almost entirely financed by advertising, the interest of YouTube's partners is to match content, audiences and advertisers Philippe (2020). Reaching distinct audiences and capturing their attention becomes a paramount objective in order to develop traffic, to the detriment of the quality of video content Staii (2014). Therefore, the mobilization of specific algorithms leads video creators to produce attractive content, aimed at the segments of the population that interest them. With these algorithms, Youtube either promotes or excludes a significant proportion of videos Bishop (2018).

Moreover, according to Bishop (2018), YouTube causes a polarization between male and female listeners according to advertisers' demands. This is because the platform favors content produced by women that is closely related to consumption, such as fashion, beauty, and cooking. Consequently, through its algorithm, YouTube "guides" female content creators towards the production of videos recognized as feminine on a commercial level. These are rewarded with greater visibility, while videos that aren't as lucrative are rather overshadowed.

## 6. DISCOURSE AND DISCOURSE ANALYSIS

Discourse emerges from interactions between social groups Hardy et al. (2004). In addition to language, it reaches into the fields of ideology and strategy, and is forged by the relations between power and knowledge Sharp and Richardson (2001).

But what is the notion of "discourse"? It is "a path of meaning", which "depends on its conditions of production and on the speakers who produce and interpret it" Charaudeau (2009). In this study, we consider it as "statement in context", or more precisely, "any linguistic statement, oral or written, private or public, formal or informal, accompanied or not accompanied or not by images, photos or non-linguistic gestures, made at a given time and place, by identified persons. Jalenques-Vigouroux (2006).

Since the 1980s, discourse analysis has played a central role in Communication Sciences Simon (2017). It has become increasingly important due to the widespread interest in the role of discourse in the evolution of relations between individuals, their social structures, as well as on behaviors Farah (2013).

Discourse analysis is not a homogenous field of research. It is the name given to a diversity of approaches to studying texts that have emerged from different disciplines and a diverse set of research traditions. Consequently, very different theoretical-methodological frameworks are referred to as "discourse analysis" Gill (2000).

Our work agrees with the viewpoint of other authors regarding several aspects of discourse analysis: the recognition that our worldview is culturally and historically influenced, and that our knowledge is constructed through social processes Gill (2000), the perception of discourse analysis as not prescriptive, i.e. a

field of research that does not dictate rules or recommendations on the types of texts, statements or formulas that should be produced; and discipline that does not evaluate the effects of the discourse on the audience receiving the message Krieg-Planque (2012). Finally, we agree with Dominique Maingueneau (2012) that the aim of discourse analysis is to apprehend discourse as an articulation of texts and social locations.

## 7. DISCURSIVE STRATEGIES

It is worth remembering that discourse does not exclusively comprise written text, but also non-language elements. According to Booth (2004), in Hawhee (2006), the individual would seek an effect on his interlocutor even when he smiles, or even when he/she insults someone. As a result, words and gestures, both facial and bodily, are part of the discourse Hawhee (2006). When talking about videos, specifically, in particular, music, location, set and post-production visual and sound effects constitute discourse.

By discursive strategy, we mean "the use of linguistic and non-linguistic elements on the part of the enunciator to produce a certain reaction in the interlocutor" Charaudeau and Maingueneau (2002). Complementing this definition, Charaudeau (2007) points out that, for the communication act to take place, it is essential to implicitly establish a "communication contract", i.e. to lay down the rules identified and respected by the participants. As part of these rules, three communication imperatives, which we also name objectives of discursive strategies must be met: legitimacy, credibility and audience capture.

## 8. COMMUNICATION IMPERATIVES OR OBJECTIVES OF DISCURSIVE STRATEGIES

Legitimacy concerns the purpose of speech, which is why it will be considered worthy of being heard or not Charaudeau (2007). According to Weber in Cocker and Cronin (2017), one form of legitimacy is charismatic, particularly appropriate for analyzing our corpus. It is the result of the charm or strength of an individual personality, from which a kind of emotional community emerges, whose cohesion is linked to the affection towards the speaker.

Credibility has to do with the speaker's "sincerity" towards the addressee. It's partly a matter of ethos, of the image the speaker constructs of himself. His identity is thus established in the areas of "telling the truth" (being sincere) and "telling it like it is" (he speaks of seriousness and honesty in his assertions, declarations and explanations) Charaudeau (2007).Credibility concerns the extent to which speakers are perceived as possessing expertise on the subject in question and as being trustworthy to give their opinion Halder et al. (2021).

Finally, audience capture is linked to the principles of seduction, empathy and emotion. Resources for meeting this imperative can include the appearance of stars, the type of angle used, the appeal of suspense in storylines, etc. Coulomb-Gully (2002). In the case of YouTube, speakers use various elements, both linguistic and non-linguistic, such as humor, still or animated images, fictional characters, background music, etc., in order to create an emotional experience.

## 9. METHODOLOGY

### Corpus Construction

In order to conform our corpus, our first challenge was to identify the main environmental problems. For this purpose, we consulted the websites of recognized international institutions, such as the United Nations Environment Programme, the Worldwide Fund for Nature, and the International Union for Conservation of Nature. They reported the following problems as being the most important: climate change, pollution, biodiversity loss, deforestation, overpopulation, soil erosion, invasive species and ocean dead zones.

## 10. DEFINITIONS OF ENVIRONMENTAL PROBLEMS

For purposes of clarity, the following are the definitions of the main environmental problems currently faced worldwide:

- Climate change: long-term changes in temperatures and weather patterns. They can be natural (caused by the activity of the sun or by volcanic eruptions), but in the past two centuries human activities have been their main driver, primarily due to the burning of fossil fuels United Nations. (2024).
- Pollution: "the presence of substances and/or heat in environmental media (air, water, land) whose nature, location, or quantity produces undesirable environmental effects United Nations Office for Disaster Risk Reduction. (2024).
- Biodiversity loss: "reduction of any aspect of biological diversity (i.e., diversity at the genetic, species and ecosystem levels) in a particular area through death (including extinction), destruction or manual removal; it can refer to many scales, from global extinctions to population extinctions, resulting in decreased total diversity at the same scale" United Nations Office for Disaster Risk Reduction. (2024).
- Overpopulation: "the state of the population when there are more people than can live on the earth in comfort, happiness, and health and still leave the world a fit place for future generations" Population Reference Bureau. (1988).
- Soil erosion: The loss of topsoil to wind, rain, and other forces. It is a natural process but can be intensified by human activity Natural Resources Defense Council. (2024).
- Invasive species: They are species that are non-native to a particular ecosystem and whose introduction causes or potentially causes economic or environmental harm or harm to human health National Invasive Species Information Center. (2024).

From February to April 2023, we carried out the YouTube video search. When youtubers upload their videos, they must complete the video's metadata: title, description and tags ("tags" in English) Affluences (2019). Therefore, we typed in the keywords that, from our point of view, are related to the identified environmental problems.

To ensure the fullest possible sample, as Table 1 shows, in our search we included general words as keywords, such as "environment" and "ecology", even if the topics addressed in the videos were more specific.

**Table 1**

| Problem | Keyword | Problem | Key word |
|---|---|---|---|
| General | Ecology | Loss of biodiversity | Species disappearance |
| | Environmental issues | | Species extinction |
| | Ecological crisis | | Biodiversity |
| | Environment | | Extinction danger |
| | Environmental problems | Invasive species | Invasive species |
| | Environmental crisis | | Exotic species |
| | Nature | Overpopulation | Overpopulation |
| Pollution | Pollution | | Populatio growth |
| | Pollutants | | Demographic explosion |
| | Air | Déforestation | Deforestation |
| | Water | | Forests |
| | Soil | Dead zones | Dead zones |
| | Wastes | | Ocean problems |
| | Garbage | | Marine problems |
| Global warming | Global warming | | Ocean pollution |
| | Global change | | |
| | Greenhouse gases | | Marine pollution |
| | Greenhouse emissions | | |
| | | Erosion | Soil |
| Water scarcity | Water scarcity | | Soil loss |
| | Water crisis | | Erosion |
| | Drought | | |

**Table 1** Keywords, and the Environmental Problems They are Related to, that Were Used to Build the Sample of Female and Male Mexican and French Youtubers that Address Environmental Problems

A selection criterion used to build the corpus was that the video channel should belong to individuals and not to institutions or organizations, whether public or private. This is in line with our desire to identify certain characteristics of the speakers, such as their age, gender, and origin.

## 11. ANALYTICAL FRAMEWORK

In this thesis, we consider audiovisual text as a discourse and as a constant practice of signification. Videos, like films, are particular types of text of text in which several codes (sound, visual, literary) interact Toti (2012).We therefore speak of "syncretic" texts in which several languages are involved: verbal, visual, musical, gestural, which is in line with the postulate of multi-channelling, which requires not to select a priori verbal or non-verbal aspects, but to consider them as a whole Cosnier and Vaysse (1997).

Since the linguistic and non-linguistic elements of audiovisual text may be too numerous to be analyzed, we thought it appropriate to identify a few of them, which we believe are decisive in differentiating speakers' discourse strategies.

However, we must always bear in mind that, even if we break down the elements of the audiovisual text. From the moment that culture takes hold of the iconic text as it does of any other text, it receives the imprint of discourse. Consequently, the semiology of the image will not take place outside a general semiology" Toti (2012).

Table 2 shows the linguistic and audiovisual elements that were analyzed in this study, adapted from Lartigue (2022), as well as the objective of the discursive strategy they are related to.

**Table 2**

**Table 2 Linguistic and Audiovisual Elements Analyzed in a Sample of Mexican and French YouTube Videos Addressing Environmental Problems**

| Discursive Element | Objective of Discursive Strategy |
|---|---|
| Colloquial/vulgar/English words | Legitimacy |
| Frequent mention of self | |
| Dominant personal style | |
| Dominant present tense | |
| Use of comparisons/equivalences/question-answer/definitions/examples | |
| Explanatory texts and images on screen | |
| Speaker frequently addresses interlocutors | |
| Speaker on stage | |
| Dressed casually/formally | |
| Close-up or extreme close-up | |
| Expressive/inexpressive face | |
| Intimate or non-intimate shooting location | |
| Use of credits/slogan/logo | |
| Use of figures (percentages, proportions, etc.) | Credibility |
| Mention of opinion of experts or prestigious organizations | |
| Dominant impersonal style | |
| Dressed formally or as a scientist | |
| Insertion of graphs | |
| Insertion of satellite images | |
| Inexpressive face | |
| Scientist´s elements in shooting location | |
| Use of humour | Audience capture |
| Speech rate | |
| Scene length | |
| Use of evaluative adjectives | |
| Frequent jump cuts | |
| Change of shooting location | |
| Attractive shooting location | |
| Frequent body movements of speaker | |
| Creation of different characters | |
| Insertion of extracts of films/animations | |
| Use of music | |

For purposes of clarity, we present below the definition we gave to each of these discursive elements: bothe the linguistic and audiovisual or non-linguistic elements.

## 12. DEFINITION OF LINGUISTIC ELEMENTS INCLUDED IN THE ANALYSIS

- Colloquial/vulgar/English words: Low versus moderate or high number of colloquial, vulgar or English words included in the youtuber's speech.

It must be remembered that the videos were in Spanish or French and that English words have become popular especially among young people.

Examples: “top”, "deal", "cool", "green"

- Mention of self: Either speakers avoid using the first-person singular, through the words “I", "my", "mine", "me" or they use them moderately or frequently.
- Speech rate: Number of speakers that exceed the speech rate pointed out by Rist (1999) as the highest among traditional media speakers: This author showed that institutional speakers speak at 85 to 120 words per minute, news experts at 175 to 200 words per minute, and news presenters at 200 words per minute.
- Use of figures. Either speakers avoid using figures (percentages, absolute numbers, proportions) or they use them moderately or frequently. Examples of figures: “80% of deforestation is used to expand agricultural land”, “It takes 20kg of bous to dry 1kg of tobacco”.
- Dominant personal style/impersonal style. The speakers explain the environmental problem in question by using expressions like “I believe that.”, “I think that…”, instead of using the impersonal expressions like “It is believed”, “The phenomenon is as follows…”.
- Dominant verb tense. Either youtubers mainly use the present tense throughout the video, or they indiscriminately mix different verb tenses or use mainly the past tense.
- Use of comparisons, equivalences (e.g. “400 ppm, i.e. 0.04%”), examples (e.g. “You know, that's the one you can see when you put on night vision goggles”), question-answers (e.g.“What makes a given gas a greenhouse gas? As we saw earlier, for there to be a greenhouse effect, far-infrared radiation has to be absorbed by the atmosphere.”).
- Mention of opinion of experts or prestigious organizations. The speaker mentions or not the names of authors recognized in the professional and academic world, or by national or international institutions. Examples: “Back to those famous biologists, including a very famous couple: Paul and Anne Ehrlich”, “The FAO estimates that 65% of the world's fisheries are unmanaged and 35% are overexploited.”
- Frequency of addressing their audience. Either speaker talk regularly to their audience by using the pronoun “you” (e.g. “Maybe you think that…”, “It’s like when you…”. “The only thing you need to do”) or they only address it at the beginning and at the end of the video.
- Use of evaluative adjectives. Youtubers avoid evaluative adjectives or they have a moderate or frequent use of evaluative adjectives (for instance, “disgusting”, “ridiculous”, “great”) that show their attitude toward the environmental problem they are addressing.

## 13. DEFINITIONS OF AUDIOVISUAL ELEMENTS INCLUDED IN THE ANALYSIS

- Presence or absence of explanatory texts and images on screen. In the post-production stage, words, short phrases or images (photos or

illustrations) are inserted to reinforce the message or explain complicated concepts.

- Speaker on stage/ voice-over. We see the youtuber on the screen instead of just listening to the video voiceover
- Dressed casually/formally. Speakers wear casual attire (e.g. women: top, jeans; men: sweatshirt, jeans) or they are dressed formally (women: pullover, dress; men: suit, tie, pullover)
- Close-up or extreme close-up versus medium shots. There is a predominance of closed shots or, on the contrary, the tendency is towards open shots.
- Expressive/inexpressive face. The speaker makes very expressive gestures or, on the contrary, maintains a phlegmatic gesture
- Intimate or non-intimate shooting location. The shooting location is not recognizable or it looks like an impersonal room, such as an office. Alternatively, we can distinguish an intimate space like the youtuber's bedroom.
- Scene duration. Frequency of videos with a time average (in seconds) between two shots of less than 10 seconds.
- Use of credits/slogan/logo. In the post-production stage, the logo or the slogan of the youtube channel and the credits, in which the youtuber's name appears, are inserted. This allows us to identify the channel or the speaker. Alternatively, none of these elements appear on the video.
- Insertion of graphs. In the post-production stage, graphs that normally look as coming from a scientific article, are or are not inserted.
- Insertion of satellite images. In the post-production stage, satellite images are or are not inserted.
- Scientist´s elements in shooting location. As part of the decoration of the shooting location, we see elements that make us think that the speaker is a scientist or knows a lot about science, for example, scientific posters, books, satellite images, atlases.
- Frequent or infrequent use of jump cuts. Jump cuts on the speaker are direct transition from one shot on the speaker to the next shot, similarly on the speaker, without any optical effect, such as a change of shot.
- One or several shooting locations. Either the speaker gives all his/her speech in the same shooting location or he/she changes from one place to another.
- Attractive or dull shooting location. Either we can tell that the youtuber made an effort to make the recording site attractive or it lacks elements that are appealing.
- Body movements of speaker. Either the speaker remains relatively immobile in space or you notice that he or she moves frequently from one place to another; stands and sits; or approaches and moves away from the camera.
- Creation of different characters. It may be that the youtuber always behaves as the same or, on the contrary, that he/she disguises himself/herself as other characters or voices different characters.

- Insertion of extracts of films/animations. Some youtubers insert excerpts from movies or cartoons, especially American ones, while others only play their own recordings.
- Use of loud music. Some videos are accompanied by music at a fairly high volume, while others have no or very subtle music.

## 14. CLASSIFICATION OF ELEMENTS ACCORDING TO OBJECTIVES OF DISCURSIVE STRATEGIES OR COMMUNICATION IMPERATIVES

The aforementioned elements were classified in terms of the three objectives of discursive strategies or communication imperatives. For instance, features that could make the concepts easier to understand, such as illustrations, texts, Q&A, and examples, were considered as being related to "legitimacy," given that if the message is understood by internet users, we believe that it is more likely that they will find the videos worth watching. Similarly, we consider that the speakers´ characteristics and their familiar use of words would contribute to this discursive element. Also, we included the dominant use of the present tense as a sign of legitimacy, given that it maintains a strong link with the speaker's actuality Deseilligny (2008).

On the other hand, some features related to credibility were the use of figures, such as percentages and frequencies, or the fact of mentioning the opinions of experts or organizations. Additionally, we included the use of impersonal language as a sign of credibility, i.e., the avoidance of personal pronouns and of referencing the author or the audience directly.

Finally, in order to capture the users' attention, speakers use different resources, such as humorous elements, as well as frequent jump cuts. The latter, in our opinion, contribute to making the videos more dynamic.

It is important to mention that most of the aforementioned linguistic and audiovisual elements were used in the study by Lartigue (2022) to try to determine whether French and Mexican youtubers (men and women) addressing environmental problems use different discursive strategies. Significant differences were indeed found regarding two of the three objectives of discursive strategies (legitimacy and attention capture) and also in relation to the following specific elements: use of familiar words, dominant personal style/impersonal style, speaker on stage/ voice-over, close-up or extreme close-up versus medium shots, mention of self, use of humor, character creation, frequency of addressing their audience, speech rate, body movements, use of comparisons, examples, questions and answers, and equivalences.

The fact that the French speakers in our sample had a greater need for credibility, legitimacy and capturing the audience's attention than the Mexican speakers could be explained by greater competition among French speakers than among Mexican speakers, as the former are more numerous than the latter in producing, on a daily basis, videos on topics related to science, technology, environmental or social issues.

## 15. RESULTS

### Description of corpus

As previously mentioned, we chose to approach the theme of the environment by considering youtubers from two distinct countries, France and Mexico, with

different cultures, different standards of living and dissimilar relationships to nature and the environment.

Almost all the youtubers considered are in the 18 to 35 age brackets. They often appear on screen in a relaxed manner. For example, the speaker of the *Partager c'est sympa* channel, or the female speaker of *Marie Go Wilde*, wear a t-shirt, jeans and a cap. In general, female speakers seem to avoid very gendered outfits. Last but not least, most of the youtubers under consideration present themselves as amateurs, both of science and of video-making.

Almost all Mexican youtubers live in the country's biggest cities (Mexico City, Guadalajara, Monterrey and Puebla), whereas French youtubers live in large (Paris, Lyon, Toulouse) and medium-sized (Reims, Amiens) cities, and even in more rural areas. Beyond these few specificities, the profiles of the youtubers considered turn out to be very similar.

## 16. DESCRIPTION OF VIDEOS

One of the first results of this study was that it was not possible to find videos on all the problems identified by international organizations. In addition, there was an overrepresentation of some issues in particular. The most recurrent subjects in our sample were pollution, climate change and biodiversity loss. Pollution was more prevalent among female youtubers Table 3 and biodiversity loss was more prevalent among male youtubers Table 4.

**Table 3**

**Table 3 Main Characteristics of Sample of Videos Uploaded by Mexican and French Female Youtubers Addressing Environmental Problems.**

| Origin of youtuber | YouTube channel | Name of video | Environmental problem | Length | Number of views (March, 2023) | Link |
|---|---|---|---|---|---|---|
| Mexican | Rocío Carreón | Pollution | Pollution | 3´44´´ | 700 k | https://www.youtube.com/watch?v=3XVx9URQprw |
| | Selene Guajardo | Throw away your unused garbage | Pollution | 6´4´´ | 24 k | https://www.youtube.com/watch?v=XFQpxdErISs |
| | Sustentófila | Invisible water | Water scarcity | 3´50´´ | 18k | https://www.youtube.com/watch?v=DsLBpMjigH4 |
| | Ciencia detrás de | Plastic eaters | Pollution | 6´57´´ | 9.5k | https://www.youtube.com/watch?v=KbDiNjjurZM&t=143s |
| | Lumara la bióloga | Erosion | Soil loss | 5´00´ | 5 k | https://www.youtube.com/watch?v=pSXUXELycdM |
| | Hablemos con Gis | Four ecological projects | Climate change | 5´27´´ | 5 k | https://www.youtube.com/watch?v=FnZ-IeZQ9yA |
| | Ojos de bióloga | Devilfish | Biodiversity loss | 5´22´´ | 1k | https://www.youtube.com/watch?v=bfM9Pv9nK3w |
| | Pregúntale al biólogo | Why turtles do not survive? | Biodiversity loss | 6´37´´ | 1 k | https://www.youtube.com/watch?v=lYOSDHHVGwo |
| French | Scilabus | Why aren´t cucumbers sold bare? | Pollution | 14´0´´ | 656k | https://www.youtube.com/watch?v=o619ERbHrcI |
| | Science de comptoir | The solution to save the weather | Climate change | 19´35´´ | 230k | https://www.youtube.com/watch?v=Y4yeTTOTfO8 |
| | Vert chez vous | Eating as ecologically | Pollution | 19´30´´ | 71k | https://www.youtube.com/watch?v=PFYziMs2C1o |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | friendly as possible | | | | |
| | Florence Porcel | 1000 billion to save the weather | Climate change | 15′48′′ | 34k | https://www.youtube.com/watch?v=_oYRGqEUzms&t=8s |
| | Ophélie-Ta mere nature | A world without bees ? | Biodiversity loss | 16′01′′ | 12k | https://www.youtube.com/watch?v=F75U5Nj3bac |
| | Girl go green | Karaocop | Pollution | 4′15′′ | 11k | https://www.youtube.com/watch?v=Z3uFpW7KL7c |
| | Mary Wild | I would like to see coral reefs but it al goes wrong. | Climate change | 11′32′′ | 10k | https://www.youtube.com/watch?v=Fdd5zj8-ggk&t=405s |
| | La boite a curiosités | The massacre of pilot whales | Biodiversity loss | 3′13′′ | 4k | https://www.youtube.com/watch?v=unskKtOm0L8 |

**Table 4**

**Table 4 Main Characteristics of Sample of Videos Uploaded by Mexican and French Female Youtubers Addressing Environmental Problems.**

| Origin of youtuber | YouTube channel | Name of video | Environmental problem | Length | Number of views (March, 2023) | Link |
|---|---|---|---|---|---|---|
| Mexican | Dankev | The Earth is Dying | Climate change/Pollution | 8′46′′ | 5 M | https://www.youtube.com/watch?v=JQYXJfMlD30&t=56s |
| | Curiosamente | Is Climate Change Real | Climate change | 7′12′′ | 1.2M | https://www.youtube.com/watch?v=weIBPwFuYwA |
| | Arturo Islas | The Video that the Damned Government Doesn't Want You to Watch | Biodiversity loss | 6′08′′ | 1.2M | https://www.youtube.com/watch?v=FT37PEu6lEA&t=103s |
| | Profe Dhito | Mexican Biodiversity | Biodivesity loss | 4′12′′ | 76k | https://www.youtube.com/watch?v=FT37PEu6lEA&t=103s |
| | Arnoldo Montano | Are Humans a Pest? | Climate change | 12′0′′ | 63k | https://www.youtube.com/watch?v=22_Q6-RQEYM&t=640s |
| | Crónicas de Chivizcoyo | Invasive Species | Biodiversity loss | | | |
| | Elin g niero | Advantages and Disadvantages of Eolic Energy | Biodiversity loss | 10′54′′ | 5k | https://www.youtube.com/watch?v=ohfEfirfiYY&list=PLYsyPwvZ4P3msfyzlCSF3kDUOkSNDRR81&index=2 |
| | Cielos despejados | Fracking and Biodiversity | Biodiversity loss | 5′24′′ | 2k | https://www.youtube.com/watch?v=43ajJNOy_1k&t=150s |

| | | | | | | |
|---|---|---|---|---|---|---|
| French | Science étonnante | Must We Believe in Climate Change | Climate change | 17´12´´ | 1.2M | https://www.youtube.com/watch?v=R6eywXdssMw&t=926s |
| | Le Tatou | Don't Eat Tomatoes in Winter | Pollution | 8´13´´ | 1M | https://www.youtube.com/watch?v=0rc4CFLOBCA |
| | Maxbird | Tearing Paper Causes Deforestation in the Amazone | Deforestation | 7´22´´ | 1M | https://www.youtube.com/watch?v=Gtumgyddbb8&t=61s |
| | Poisson féconde | 3 Amazing Things of Our Pollution | Pollution | 12´47´´ | 750k | https://www.youtube.com/watch?v=XtTn5EYz-ks&t=688s |
| | Dr Nozman | In the Middle of Coral Reefs in Tahiti | Climate change/ Biodiversity loss | 10´45 | 529k | https://www.youtube.com/watch?v=XGTwmhHf9Ng&t=169s |
| | Nicolas Meyrieux | Water | Water scarcity | 6´46´´ | 233k | https://www.youtube.com/watch?v=adQpvQkM5A4&t=72s |
| | Partager c´est sympa | 5 Things to Change your City | Climate change | 5´11´´ | 49k | https://www.youtube.com/watch?v=D6iGtsJ5QA0&t=183s |
| | Le reveilleur | Fish and Overfishing | Biodiversity loss | 17´12´´ | 24k | https://www.youtube.com/watch?v=PQ7aQI7x7ng |

There was a notorious diversity of video lengths: from 3-minute videos to some close to 20 minutes. However, two thirds of them are less than 10 minutes long. Also, the duration was similar between the videos of both sexes: 9´18´´ (women) and 9´33´´(men).

In terms of number of views, more than a third of the videos uploaded by men had over one million views, while none of the women's videos reached that number; 60% of the male videos had over 200 000, and only 25% of the female videos.

Table 5, Table 6, and Table 7 show the comparison between the videos of female and male youtubers with respect to the frequencies of the different elements. For each discursive strategy or communication imperative (legitimacy, credibility, attention-getting), a chi-square test was used to analyze whether they were equal. None of them showed significant differences: Legitimacy: $X2(12, N = 32) = 3.6$, $p = .05$; Credibility: $X2(7, N = 32) = 6.4$, $p = 0.05$; Attention capture: $X2(7, N = 32) = 7.3$, $p = .05$.

**Table 5**

**Table 5 Frequence of Discursive Elements Related to Legitimacy in the Sample of Female and Male Youtubers Addressing Environmental Problems (N=32)**

| | Discursive elements | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Youtuber's sex | Use of familiar words | Frequent mention of self | Use of grammatical persons | Prevalence of present tense | Use of equivalences, exemples | Insertion of explanatory images or texts | Frequently addresses the audience | Visible speaker |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Women | 3 | 6 | 10 | 14 | 12 | 12 | 7 | 15 |
| Men | 5 | 5 | 11 | 10 | 16 | 11 | 5 | 12 |

**Table 6**

**Table 6 Frequence of Discursive Elements Related to Credibility in the Sample of Female and Male Youtubers Addressing Environmental Problems (N=32)**

| | Discursive elements | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Youtuber's sex | Frequent use of figures | Mention of experts or organizations | Impersonal style of speech | Formally dressed | Insertion of graphs | Insertion of satellite images | Neutral gesture of yotuber | "Expert´s" decorative elements |
| Women | 5 | 7 | 9 | 4 | 4 | 1 | 6 | 4 |
| men | 10 | 10 | 6 | 2 | 8 | 6 | 10 | 7 |

**Table 7**

**Table 7 Frequence of Discursive Elements Related to Attention Capture in the Sample of Female and Male Youtubers Addressing Environmental Problems (N=32)**

| | Discursive strategy | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Youtuber's sex | Use of humor | Use of evaluative adjectives | Use of jump cuts | Change of shooting location | Speaker moves continuously | Creation of characters | Insertion of film extracts | Use of loud music |
| Women | 12 | 2 | 6 | 5 | 3 | 6 | 13 | 4 |
| Female | 7 | 6 | 7 | 10 | 5 | 2 | 13 | 8 |

However, it should be noted that there are some evident differences in the frequencies of particular discursive elements. For example, in terms of credibility, men use figures (percentages, proportions, etc.) more than women. This is the case of the French youtuber of the channel *Nicolas Meyrieux* who said the following: "72% of our blue planet is water (…) Freshwater represents only 2.8% of this water, and as 2.1% remains trapped in ice and permanent snow, we're left with only 0.7%...".

Male youtubers also insert satellite images, and graphs more than women. For instance, the video about climate change by the Mexican channel *Curiosamente*, presented a graph showing the increase of hurricane intensity in the past few decades.

In relation to attention capture, they use a higher number of shooting locations, their videos present loud music more often than women's videos, and their speech includes more evaluative adjectives than their female counterparts do. Examples of these adjectives are "disgusting", "absurd", "important", "shocking", and "surprising".

In contrast, female youtubers make greater use of humor than men. They do so, for example, by inserting funny illustrations, using comic local expressions, or by making funny faces. They also create characters more frequently than men. For instance, French youtuber of the channel Scillabus talks about a cucumber as if it was a person saying "He doesn´t need a moisturizing cream. His skin dries on its own and in a few days poor Querentin will become really old."

## 17. DISCUSSION

For this study we incorporated a method that had been used to distinguish discursive strategies between French and Mexican youtubers (Lartigue 2022). On that occasion, the difference was striking since it was found that French youtubers used more frequently than Mexican youtubers two of the three objectives of discursive strategies analyzed, as well as an important number of the specific discursive elements included in our study. This leads us to think that a smaller number of differences between discursive elements used by men and women found in the current study is not due to deficiencies in the method. Instead, it may be due to the fact that the differences are indeed not significant, with the exception of a few mentioned above.

So how can we explain the lack of visibility of women youtubers compared to men? In our opinion, it is due to gender stereotype, i.e., to the prejudices concerning their attributes and the roles they should play in society. In the case of our sample of YouTube videos this would mean not being perceived by the YouTube audience either as credible environmental scientists or as credible speakers. In the future, it would be convenient to test this hypothesis, specifically regarding the credibility of female and male environmental communicators, in general, and in YouTube, in particular.

This is an exploratory study with a relatively small sample size. In this respect, it is possible that other YouTube videos address environmental issues in an "incidental" or tangential way, so their creators might not have used the keywords we looked for in our search. Such videos would have therefore been left out of our sample. Nevertheless, we believe that this does not invalidate our method, since our object is environmental discourse, which attempts to contribute to the preservation, protection or regeneration of the environment. In other words, we assume that speakers intend to produce this kind of content, and that this is reflected in the words used in titles, video descriptions and tags.

In addition, the relatively small sample size may have been caused by YouTube's algorithm that promotes certain videos and excludes others. It is possible that we did not access all of the videos of male and female content creators who intentionally address environmental issues in YouTube.

Our study includes French and Mexican videos exclusively. It would be interesting, for example, to carry out an analysis similar to ours, but with corpuses of other nationalities other than French and Mexican. This would contribute to determine whether female youtubers' low visibility in other parts of the world is related to them having different discursive strategies than their male counterparts or if it may obey with women being perceived as less credible.

This study is one of the first to compare female and male environmental discourse on YouTube. It would be interesting to extend this analysis to other social networks, such as to Facebook, Instagram, TikTok, etc., which have different audiences as well as other production features.

Finally, it might also be interesting to perform the same analysis in a couple of years given the large amount of videos uploaded to YouTube daily. The results of both studies could then be compared.

## 18. CONCLUSION

This study contributes to revealing how gender patterns in environmental communication are influenced by stereotypes, broader social structures, as well as by YouTube's characteristics.

While both male and female youtubers address environmental issues with similar discursive strategies—deploying legitimacy, credibility, and attention-getting devices—it is possible to distinguish gender differences in terms of their stylistic forms. These strategies are often underrecognized as markers of credibility, as previous research has shown that women in scientific and public communication tend to be perceived as less credible (Strach et al., 2015; Carli et al., 2016).

YouTube has been described as a democratizing medium. However, our results show that not all voices are equally visible, as this platform actively shapes and reinforces the audience's interests, privileging content creators that conform to commercially beneficial gender norms. Consequently, female communicators may face both the pressure to conform to algorithmically favored styles while simultaneously contending with biases questioning their credibility.

In summary, the way in which scientific authority is constructed on YouTube is not only a question of discursive strategies but also of gender expectations. If we want to promote a kind of science communication which is more inclusive and equitable, it is of particular interest to understand how these dynamics occur.

## CONFLICT OF INTERESTS

None.

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