The influence of discipline, medium and target audience in multimodal recontextualisation practices: The case of popular science online videos

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Abstract

This study contributes to our knowledge about the rapidly evolving repertoire of genres that support Open Science communication practices online. The focus lies on popular science online videos (i.e., 10-minute videos that disseminate scientific content), which have been previously described as *scifotainment* or *edutainment* genres. Like other genres that disseminate science to lay audiences, they partake from a need to recontextualise information. To this aim they resort to a number of strategies that tailor the information to the assumed knowledge of the audience, build credibility and engage the audience (Pérez-Llantada, 2021). Given the multimodal nature of these videos, the recontextualisation processes involved in them imply the orchestration of complex multimodal ensembles. Our aim is to gain more insight into these ensembles and how they enact multimodal recontextualisation strategies (Luzón, 2019; Rowley-Jolivet & Carter-Thomas, 2019; Ruiz-Madrid & Valeiras-Jurado, 2023). In particular, we want to identify similarities and differences in the way multimodal recontextualisation is carried out in videos from different disciplines. With this, we want to contribute to a more accurate description of this emerging genre. To this aim, we adopt a Multimodal Discourse Analysis approach and use specialised annotation software for the comparative analysis of four selected examples. The analysis reveals both similarities and differences regarding the strategies used and their modal realisations. Our findings suggest that while most similarities are triggered by the online medium, the differences can be mainly attributed to the target audience, and to a lesser extent to the scientific discipline.

Keywords: Popular science, recontextualisation, Multimodal Discourse Analysis, target audience, disciplinary differences

Resumen

La influencia de la disciplina, el canal y la audiencia en prácticas de recontextualización multimodal: El caso de los videos online de divulgación científica

Este estudio contribuye a ampliar el conocimiento sobre la rápida evolución del repertorio de géneros que se utilizan en las prácticas comunicativas de ciencia abierta en línea. Se centra en los vídeos de divulgación científica en línea (es decir, vídeos de 10 minutos que difunden contenidos científicos), que han sido descritos como géneros de *scifotainment* o *edutainment*. Al igual que otros géneros que divulgan la ciencia entre el público no experto, estos géneros necesitan recontextualizar la información. Para ello recurren a una serie de estrategias que adaptan la información a los supuestos conocimientos de la audiencia, construyen credibilidad y atraen a la audiencia (Pérez-Llantada, 2021). Dada la naturaleza multimodal de estos vídeos, los procesos de recontextualización implican la orquestación de complejos constructos multimodales. Nuestro objetivo es profundizar en el conocimiento de estos constructos y en cómo ponen en práctica estrategias de recontextualización multimodal (Luzón, 2019; Rowley-Jolivet y Carter-Thomas, 2019; Ruiz-Madrid y Valeiras-Jurado, 2023). En particular, queremos identificar similitudes y diferencias en la forma en que se lleva a cabo la recontextualización multimodal en vídeos de diferentes disciplinas y contribuir, por tanto, a una descripción más precisa de este género emergente. Para ello, adoptamos un enfoque de Análisis Multimodal del Discurso y utilizamos un software de anotación especializado para el análisis comparativo de cuatro ejemplos seleccionados. El análisis revela tanto similitudes como diferencias en cuanto a las estrategias utilizadas y sus realizaciones modales. Nuestros resultados sugieren que, si bien la mayoría de las similitudes se deben al medio digital, las diferencias pueden atribuirse principalmente al público destinatario y, en menor medida, a la disciplina científica.

Palabras clave: Divulgación científica, recontextualización, Análisis Multimodal del Discurso, público destinatario, diferencias disciplinares

1. Introduction

As science transcends the boundaries of academia, knowledge dissemination expands beyond academic and cultural organisations (Scotto di Carlo, 2014, 2015), in a trend that can be described as science popularisation. Xia and Hafner (2021) define science popularisation as the process by which scientific knowledge is disseminated to the general public. Nowadays the

Internet is one of the privileged communication channels that facilitate this popularisation of science through the use of digital genres. Science popularisation through digital genres turns science communication into a transparent and accessible process and promotes collaboratively developed knowledge. According to Vicente-Saéz and Martínez-Fuentes (2018), these are defining characteristics of open science. Open science and digital genres, therefore, are tightly connected. In fact, the Organisation for Economic Co-operation and Development (OECD, 2015) defines open science as making "the primary outputs of publicly funded research results, publications and the research data publicly accessible in digital format with no or minimal restriction" (p. 7).

The focus of this paper lies on a digital genre that has recently gained increasing importance as a tool to communicate science to a broader audience: popular science online videos. Although they are a relatively recent phenomenon and their definition as a genre is still work in progress (Valeiras-Jurado & Bernad-Mechó, 2022; Ruiz-Madrid & Valeiras-Jurado, 2023), they have been found to share characteristics of what some scholars have called "scifotainment" or "edutainment" genres (Zhang & O'Halloran, 2013; Sancho Guinda, 2019; Pérez-Llantada, 2021). As a working definition, we can describe them as short videos available online and professionally produced, whose purpose is to disseminate validated scientific content to the general public.

An additional and very prominent characteristic of these videos is their use of a wide array of semiotic modes to convey content in a credible, accessible, and engaging way. In other words, these videos are intrinsically multimodal. This multimodal nature has been noted by authors such as Boy et al. (2020), who describe popular science online videos as:

> well-organized multimodal arrangements consisting of a variety of visual and verbal modes like stills, moving images, text, spoken language, sounds, animations, graphics, etc. which is a much more complex system of communication than text only (p. 4).

These authors offer a classification of scientific online videos according to their use of semiotic modes. One of their categories is *presentation films*, with the speaker talking directly to the camera and including modes such as background images, gestures, and facial expressions in addition to spoken language. Another one is *animation films*, which use artificial moving images

to illustrate a scientific issue. In addition, other categories combine features of these two.

Multimodality in popular science videos is also the focus of Valeiras-Jurado and Bernad-Mechó (2022). This study further explores a peculiarity of multimodality in these videos: the use of modes orchestrated by presenters as they speak to the camera (embodied modes), in combination with other modes added during montage (filmic modes). This is a possibility afforded by the online media which highlights the importance of co-authorship in this genre, since multimodal ensembles are collaboratively orchestrated by the presenter and the person in charge of montage (Xia & Hafner, 2021).

Popular science online videos are, therefore, equipped with interesting semiotic affordances, but still they need to overcome the barrier of the knowledge asymmetry between presenters and audience (Kastberg, 2011). As a consequence, scientific content needs to undergo a process of recontextualisation (Luzón & Pérez-Llantada, 2019). Furthermore, taking into account the multimodal nature of these videos, it is plausible to expect that this process of recontextualisation will imply a variety of semiotic modes. Our objective with this paper is to shed light into multimodal recontextualisation practices in popular science videos from different disciplines. More specifically, the main research question that guides our study is:

> Does multimodal recontextualisation in popular science videos vary significantly across disciplines and/or across videos within the same discipline?

In order to pave the way for the comparative analysis that will help us answer this question, the next section will explore multimodal recontextualisation practices in deeper detail.

2. Multimodal recontextualisation strategies

According to Bezemer and Kress (2008), recontextualisation involves a number of rhetorical principles, which include selecting content that is relevant for the audience, arranging this content in the way that best fits the audience, foregrounding significant elements, and redefining the author-audience relationship.

The way these principles are applied in practice has been the focus of recent academic research, and different taxonomies of recontextualisation strategies have been proposed. Valeiras-Jurado et al. (2018) found a number of multimodal persuasive strategies in a corpus of conference presentations and research dissemination talks which can contribute to recontextualisation. Among them we can mention anticipation and control of responses (i.e., predicting potential responses from the audience and prompting desirable ones), attention getting (i.e., raising and maintaining the interest of the audience), emphasis (i.e., highlighting parts of the message to make them more salient), evaluation (i.e., assessing something and implicitly inviting the listener to accept this assessment), processing aids (i.e. facilitating understanding of the message), projection of the context of interaction (i.e., presenting information as new vs. given; or agreed upon vs. open to discussion), and rapport (i.e., building a relationship of sympathy and mutual understanding with the audience). As the study brings to the fore, embodied modes such as gestures and head movements play a crucial role in the realisation of these strategies.

Along this line, Luzón (2019) explores recontextualisation strategies in online videos used by research groups to inform about their research. The author suggests four groups of strategies depending on their function: i) strategies to build credibility; ii) strategies to build persuasive arguments; iii) strategies to tailor information to the assumed knowledge of the audience; and iv) strategies to engage the audience. Adopting a multimodal perspective, the role of static and moving image, among others, is acknowledged.

In fact, it can be safely said that multimodal recontextualisation is paramount in all genres whose primary aim is to give visibility to ongoing research. This is the case of Three Minute Thesis presentations. Carter-Thomas and Rowley-Jolivet (2020) have investigated recontextualisation practices in these presentations. They note how presenters tailor information by selecting content, offering definitions, giving explanations in layman's language, paraphrasing, offering analogies and examples from everyday life and using scenarios (i.e., the audience is asked to imagine a particular situation). Presenters also engage the audience using catchy titles, visual impact (e.g., through striking images or the presenter's presence on stage), various personalisation devices (e.g., gestures, smiles, personal pronouns), questions, humour and "street cred" (i.e., a common framework based on shared cultural values rather than scientific know-how).

TED talks are also a genre that partakes from a need to recontextualise, and particularly to make specialised content engaging. Like the genres discussed above, they also resort to multiple semiotic modes to this aim, as pointed out by Xia and Hafner (2021). Their multimodal analysis of engagement strategies in TED talks revealed that engagement of online viewers is generally achieved by a combination of multiple semiotic resources, including, among others, visual aids, camera shot and gaze.

Focusing now on the genre that concerns this study, Ruiz-Madrid and Valeiras-Jurado (2023) and Valeiras-Jurado and Bernad-Mecho (2022) further explore the complexity of multimodal ensembles in PBS online science videos. Both studies reveal that these videos display a high number of modes and rich, seamlessly woven multimodal ensembles that realise a number of recontextualisation strategies. The former conclude that it is not possible to identify recurrent multimodal ensembles in these videos. However, some modal co-occurrences and some regularity in the sequencing of modes are identified in the realisation of recontextualisation strategies in their analysis. Valeiras-Jurado and Bernad-Mecho (2022) highlight the crucial role of filmic modes that are added to the ensemble during montage. They find that these videos are tailor-made for online audiences and exploit the possibilities of the online medium successfully and coherently to recontextualise content. In particular, these videos show a high density of filmic modes in the form of visual prompts, visual and sound effects, coherent types of shots and cuts. This line of research is followed up in Bernad-Mecho and Valeiras-Jurado (2023a, 2023b). These studies reveal that engagement in science dissemination genres differs considerably depending on whether it occurs within a life event (e.g., a TED talk) or in an online video (e.g., a YouTube science video). They also bring to the fore the different impact that filmic and embodied modes have on audience engagement.

As the taxonomies suggested in the abovementioned studies show, recontextualisation practices are multimodal and can be realised by means of different semiotic modes. Bezemer and Kress (2008) define multimodal recontextualisation as:

> moving meaning material from one context with its social organization of participants and its modal ensembles to another, with its different social organization and modal ensembles. Meaning material always has a semiotic realization, so recontextualization involves the re-presentation of the

> meaning materials in a manner apt for the new context in the light of the available modal resources (p. 184).

In the case of popular science videos, recontextualisation consists in moving scientific content to an online media in which new multimodal ensembles are available, in order to adapt to the audience's needs and expectations.

To our knowledge, little research so far has focused on disciplinary differences in science popularisation genres. Hyland and Zou (2021) compared stance in three-minute thesis presentations from different disciplines. They found that speakers from the hard and social sciences adopt different stance positions: while hard science students tend to take a stance by casting doubt or asserting certainty in the reliability of information, social scientists resort to a more visible personal presence and explicit affective commentary. These are clearly different ways of creating a receptive frame of mind and building credibility, and therefore, they are likely to have an impact in recontextualisation.

We want to contribute to this line of research by means of a comparative MDA analysis that is aimed at answering the aforementioned main research question:

> Does multimodal recontextualisation in popular science videos vary significantly across disciplines and/or across videos within the same discipline?

In order to answer this main research question, we split it into the following specific issues or subquestions:

a) What modes are used in each discipline and video?
b) What strategies are used in each discipline and video?
c) How are these strategies realised multimodally in each discipline and video?

3. Corpus and method

Multimodal ensembles refer to the orchestration of different modes to produce a specific meaning that is inferred from the interrelation among the specific modes involved. The communicator orchestrates multimodal ensembles, where each mode has a function (Kress, 2010) and "each mode

is partial in relation to the whole meaning" (Jewitt & Kress, 2003, p. 3). In order to explore the nature of the multimodal ensembles employed by speakers to recontextualise information in online science dissemination videos, we follow a multimodal analysis approach. A more detailed account of this methodology can be found in the Method and Instruments subsection below.

3.1. The corpus

Four science dissemination online videos available at YouTube were selected for the present study: i) *Why Megalodon (Definitely) Went Extinct*, ii) *Why Are We The Only Humans Left?*, iii) *Why the Muon g-2 Results Are So Exciting!* and iv) *What is the Magic Russian Diamond?*. Videos i) and ii) belong to the Anthropology field and videos iii) and iv) deal with Physics. All of them were hosted in the PBS multi-platform media (https://www.pbs.org/) at the time the analysis was carried out. PBS is a private, non-profit corporation, which defines itself as "a trusted window to the world" and "America's largest classroom" that offers programming for a wide range of ages, interests and genres about science, history, culture, great literature and public affairs.

The first video *Why Megalodon (Definitely) Went Extinct* has a duration of 11' 12" and it is the seventh episode of season 2 of the channel *Eons*. This channel offers episodes on the history of life on Earth from the so-called 'Age of Dinosaurs' to the end of the most recent Ice Age. This particular episode is narrated by palaeontologist and science communicator Kallie Moore. It discusses the fossil evidence and the effect the extinction of the Megalodon had on the ocean habitat and the current species. The second video *Why Are We the Only Humans Left?* (henceforth *OHL) is* 7' 31" and it is the 30th episode of season 4 of the channel *Be Smart* presented by Joe Hanson, a science writer, biologist and YouTube educator. This particular episode investigates human ancestry and explains why *Homo sapiens* are the only survivors on the human evolutionary tree offering a new view of the Neanderthals. The third video, *Why the Muon g-2 Results Are So Exciting* (henceforth *Muon*), is the longest of the videos selected with a length of 12' 35". It is the 13th episode of season 7 of the channel *Space Time*, which deals with space and Astrophysics. This channel is presented by Mathew O'Dowd, an astrophysicist who studies black hole Physics and received his Ph.D. from Columbia University. The chapter we analyse explains the results obtained by one of the most promising experiments in the world of Physics: Muon G-2. Finally, the fourth video, *What is the Magic Russian Diamond?* (henceforth

MRD) has a duration of 8' 27" and it is episode 10 of season 3 of the channel called *Physics girl*. This channel is presented by science communicator Dianna Cowern. It explores the field of physical sciences and presents experiments, demonstrations, and new discoveries. The episode analysed in the present paper describes the properties and applications of one of the most unusual diamonds in the world because of its properties and composition, that is, The Magic Russian Diamond.

The aim of the four videos is the dissemination of scientific content to a non-expert audience and mainly for pedagogical purposes. Therefore, these videos may resort to different semiotic resources and rhetorical strategies to recontextualise the scientific content and eventually achieve their communicative purpose.

The total size of the corpus is 39' 45", which does not allow for quantitatively based generalisations, but it is valid for qualitative analyses considering the duration of the videos analysed (i.e., no longer than 13'). It is also in line with similar previous multimodal studies (Luzón, 2019; Valeiras-Jurado & Ruiz-Madrid, 2019; Ruiz-Madrid, 2021; Valeiras-Jurado & Bernad-Mechó, 2022), which cannot afford to use larger corpora due to their minute level of data analysis and the lack of automating tools. Table 1 provides an overview of the corpus.

Video	Topic	Discipline	Speaker	Duration
Why Megalodon (Definitely) Went Extinct	Megalodon/Sharks	Anthropology	Male	11' 12''
Why Are We The Only Humans Left?	Prehistoric human beings	Anthropology	Female	7' 31''
Why the Muon g-2 Results Are So Exciting!	Particle Physics	Physics	Male	12' 35''
What is the Magic Russian Diamond?	Composition of diamonds	Physics	Female	8' 27''

Table 1. Description of the corpus.

As Table 1 shows, the shortest video was 7' 31" and the longest one was 12' 35". The corpus was varied in terms of disciplines: two videos from Anthropology and two from Physics. All of them were professionally edited and employed a wide variety of semiotic and filmic modes (Valeiras-Jurado & Bernad-Mechó, 2022).

3.2. Method and instruments

In this research an MDA (Multimodal Discourse Analysis) approach (Luzón, 2019; Ruiz-Madrid, 2021; Valeiras-Jurado & Bernad-Mechó, 2022) is adopted to analyse and gain further understanding on how recontextualisation is multimodally conveyed in online science videos. From this perspective, we focus on how the different semiotic modes are employed in these videos and more precisely in the multimodal ensembles resulting when recontextualising the information. As noted by Paltridge (2012), MDA results in too much data for a feasible analysis and therefore it is necessary to select specific modes to look into. Accordingly, we made a first selection of modes informed by previous studies (Querol-Julián, 2011; Valeiras-Jurado & Ruiz-Madrid, 2019; Valeiras-Jurado & Bernad-Mechó, 2022; Ruiz-Madrid & Valeiras-Jurado, 2023) which can be summarised as follows:

A. words (written and oral discourse), mainly those used as recontextualisation strategies (Valeiras-Jurado et al., 2018; Luzón, 2019; Carter-Thomas & Rowley-Jolivet, 2020)
B. four types of kinesics: gestures, head movement, facial expression (Kendon, 2004) and gaze and eye-contact (Argyle et al., 1981) as well as the way they interact with speech (Ladewig, 2013; Müller, 2013)
C. image, music, sound and visual effects (Valeiras-Jurado & Bernad-Mechó, 2022); when these modes are used together as a single multimodal ensemble, we consider it a different mode that we call *video* for the purposes of this study
D. disembodied modes such as graphs and equations, clothing, or artifacts (Ruiz-Madrid & Valeiras-Jurado, 2023)

The agreed list of modes, which was used as the basis for our coding library, is shown in Table 2:

Mode	Instances from the corpus
spoken words	i.e., what the presenter says
written words	i.e., text that appears on screen
gestures	i.e., movements of the hands and arms
head movements	e.g., tilt, shake, nod
face expression	e.g., frown, smile
eye contact	e.g., gazing at the camera or somewhere else
graphs and equations	e.g., a chart, Einstein's equation E = mc2
image	Including real (e.g., photographs of people, animals and objects) and cartoons or depictions
video	Including real and animated
music	It is frequently present at the beginning and end of the videos, and is also hearable quieter, as background, during the video
sound effects	e.g., an alarm, a typing sound
visual effects	e.g., movements in images and in the position of the presenter
clothing	i.e., the clothes worn by the presenter
artifacts	i.e., physical objects manipulated in the videos

Table 2. Modes used in the coding library.

The use of *video* as one of the modes requires some further explanation since the communicative events we are analysing are also videos in themselves. We consider *video* as a mode (or rather a collection of modes including other modes like image, sound and music) when it is pre-recorded and embedded in the episode (e.g., an interview with a scientist in *MRD*). It is a combination of semiotic resources that is added to the episode during montage, and, unlike gestures or face expression, not controlled by the presenter in the video. Together with music, sound effects and visual effects they are part of what Valeiras-Jurado and Bernad-Mechó (2022) call filmic modes. Likewise, the last two modes in Table 2 (i.e., *clothing* and *artifacts*) may not be so straightforward as a way of conveying meaning. We consider that clothes become a mode when they are worn intentionally. This is the case, for example, of a T-shirt shown in *Muon* displaying the names and logos of PBS studios and the name of the channel, or a lab coat used in *MRD* to "engage in scientist lecture mode" as Figure 3 shows in the section Modal realisations of strategies in each discipline and video. *Artifacts* are physical objects that are being manipulated. They also become a mode, especially when they are used to visually illustrate what the presenter is explaining. Figure 6 below

shows the use of gummies to visually represent the structure of a diamond in *MRD*.

Concerning the recontextualisation strategies, we again used a corpus-driven approach that was informed by previous studies (Valeiras-Jurado et al., 2018; Luzón, 2019; Rowley-Jolivet & Carter-Thomas, 2019). Accordingly, nineteen strategies suggested in these previous studies were considered and classified into three different groups according to their rhetorical aim, namely, i) strategies to tailor information, ii) strategies to engage the audience and iii) strategies to build credibility.

A computer-aided multimodal analysis of the four videos was conducted with the software MMAV (Multimodal Analysis Video) (O'Halloran et al., 2015). This multimodal annotation tool makes it possible to transcribe and annotate audio and video files and to organise transcriptions and annotations in different layers. For the multimodal analysis the layer structure shown in Figure 1 was used:

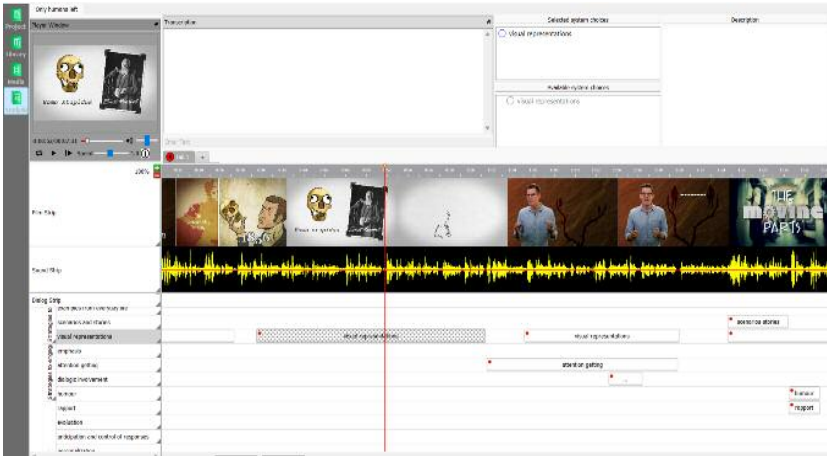


Figure 1. Screenshot of the analysis of 'Why are we the only humans left?' in MMAV.

As shown in Figure 1, the software is organised into three components: a set of media files, a set of categorical descriptions (i.e., systems) used in the annotation, and a set of annotation units (with time-stamped and spatial coordinates). The software provides access to plain text, images, sound, and videos, which cover to a major extent the ways multimodal phenomena can be digitally recorded. We imported the media file and designed a set of

annotation systems with the list of modes mentioned above. As the corpus-driven analysis of the different videos was carried out, this set of annotation systems was modified accordingly. The MMAV offers a 'state machine' tool that affords the visualisation of the annotation results as well as their quantification and the relationship among the created systems in a visual way (see Figure 2).

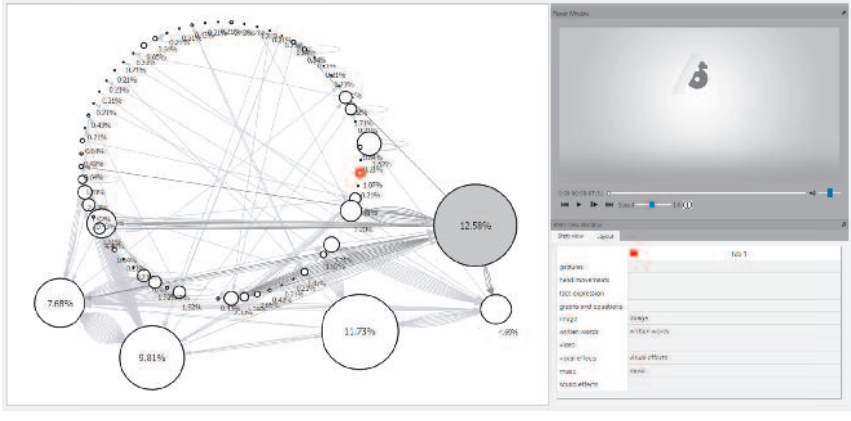


Figure 2. Screenshot of the visualisation of results of the use of modes in OHL provided by the state machine tool.

Figure 2 shows the quantitative results of the use of modes in the video *OHL*. This tool offers the possibility of calculating the percentages of the different combinations of modes coexisting in the video. This particular example shows that the combination of image+written words+visual effects+ music occurs 12.58% of the full length of the video. The videos were individually visualised and annotated by both researchers in order to ensure validity. Most disagreements concerned the annotation of the type of strategies. Consensus was reached by taking into account the communicative aim of the whole multimodal ensemble. In addition, it was acknowledged that modes can frequently have several functions at the same time and that the boundaries are never clear-cut.

4. Results and discussion

The analysis framework presented in the previous section yielded rich data concerning the modes and strategies that are used in each discipline and

video, as well as the frequency or intensity with which they are used. This provides a picture of the modal density in each video, which in turn facilitates the comparative analysis. The results are presented and discussed in subsequent sections following the order of the specific research questions, i.e., first modes, then strategies and finally modal realisations of strategies.

4.1. The semiotic modes employed in each discipline and video

One of the outcomes of our comparative analysis is that the four videos analysed use a wide array of modes, including embodied and filmic. Table 3 summarises the use of modes in each video.

	VIDEOS			
	Field of Physics		Field of Anthropology	
Modes	**MUON**	**MAGIC RUSSIAN DIAMOND**	**MEGALODON**	**ONLY HUMANS LEFT**
Written words	✓	✓	✓	✓
Spoken words	✓	✓	✓	✓
Gestures	✓	✓	✓	✓
Head movements	✓	✓	✓	✓
Face expression	✓	✓	✓	✓
Eye contact	✓	✓	✓	✓
Graphs and equations	✓	✓	✓	✓
Artifacts	X	✓	X	X
Image	✓	✓	✓	✓
Video	✓	✓	✓	✓
Music	✓	✓	✓	✓
Sound effects	✓	✓	✓	✓
Visual effects	✓	✓	✓	✓
Clothing	✓	✓	X	X

Table 3. Use of modes in each video.

As shown in Table 3, the two disciplines use almost all modes, with only two exceptions. One is clothing. This mode is used only in the two Physics videos. However, this does not seem to respond to a discipline trend, because the mode is used with very different purposes in each genre: in the

MRD video it is used for humoristic purposes, while in the Muon video it is used to refer to patrons and the channel network. The other exception is artifacts, which are only used in the MRD video. Again, rather than discipline, there seem to be other more determining factors to account for this difference. As it will be discussed in more detail in subsequent sections, the choice of artifacts as a mode seem to respond to the intended target audience of the video.

Table 4 shows the five most frequent combinations of modes, or modal ensembles in each discipline and video. Frequency is expressed as a percentage over the total duration of the video.

Field of Physics			
MUON	**%**	**MAGIC RUSSIAN DIAMOND**	**%**
Gestures + spoken words (presenter) + eye contact + clothing	16.45	Spoken words (other) + video	17.55
Gestures + spoken words (presenter) + eye contact + clothing + graphs equations	8.10	Spoken words (presenter) + visual effects+ artifacts	10.94
Image + visual effect + spoken words (presenter) + eye contact	5.91	Spoken words (presenter) + video	6.98
Video + spoken words (presenter)	5.14	Spoken words (presenter) + gestures + eye contact	6.98
Graph equations + visual effects + spoken words (presenter)	4.63	Spoken words (presenter) + artifacts	5.28
Field of Anthropology			
ONLY HUMANS LEFT	**%**	**MEGALODON**	**%**
Image + written words + visual effects + music	12.58	Spoken words (presenter) + Image	29.17
Gestures + eye contact + spoken words (presenter) + image + written words + music	11.73	Spoken words (presenter) + Image + visual effects	13.79
Gestures + eye contact + spoken words (presenter) + image + music	9.81	Spoken words (presenter) + eye contact + gestures	13.5
Gestures + eye contact+ spoken words (presenter) + image + visual effects + music	7.68	Spoken words (presenter) + eye contact + gestures + image	6.53
Gestures + eye contact + spoken words (presenter) + image + written words + visual effects + music	4.69	Spoken words (presenter) + Image + written words	5.37

Table 4. Five most frequent combinations of modes in each discipline and video.

Once more, no clear trends can be noted that can be attributed to discipline. In three of the four videos the most frequent ensemble includes the mode *spoken words*, indicating the importance of the voice in these videos (mostly the presenters, but occasionally also that of other contributors). The exception is OHL video, which uses a combination of *image, written words, visual effects* and *music* as the most frequent ensemble to introduce each section of the video, and to visually explain content. This is not always synchronous with spoken words, which reduces the amount of time a voice is heard.

Muon video is the only one that includes *gestures* and *eye contact* within its most frequent ensemble. The other three videos tend to rely more on *spoken words* as a voice over and *image or video*. This suggests that the figure of the presenter as a reputed scientist and YouTuber is more prominent in this video, and that a considerable part of its audience may feel attracted to this channel because they know and follow the presenter.

MRD video is the only one that includes the voices of other contributors (e.g., other scientists). We believe this is to compensate for a lack of explicit mention of scientific sources, which are definitely present in the other three videos. The video MRD, instead of mentioning other scientists or quoting them, brings these scientists as contributors in the video. As we will discuss in more detail in subsequent sections, this is a likely consequence of the intended target audience of this video.

4.2. The recontextualisation strategies employed in each discipline and video

As part of the analysis, we also compared the use of strategies in each discipline and video. Table 5 summarises the use of strategies:

	VIDEOS			
	Field of Physics		Field of Anthropology	
Strategies	**MUON**	**MAGIC RUSSIAN DIAMOND**	**MEGALODON**	**ONLY HUMANS LEFT**
Strategies to tailor the information to the assumed knowledge of the audience				
Selection of content	✓	✓	✓	✓
Paraphrases	✓	X	✓	X
Analogies	✓	✓	✓	X
Examples from everyday life	✓	X	X	✓
Scenarios, stories	✓	✓	✓	✓
Visual representations	✓	✓	✓	✓
Strategies to engage the audience				
Attention getting and retention	✓	✓	✓	✓
Dialogic involvement	✓	✓	X	✓
Humour	✓	✓	X	✓
Emphasis	✓	✓	✓	✓
Strategies to build credibility				
Rapport	✓	✓	✓	✓
Evaluation	✓	✓	X	✓
Control of responses	✓	X	✓	✓
Personalisation	X	✓	X	✓
Network	✓	✓	✓	✓
Patrons	✓	✓	✓	✓
Scientific sources	✓	X	✓	✓
Street credibility	X	✓	✓	✓
Cross-referencing	✓	✓	X	✓

Table 5. Use of strategies in each discipline and video.

The following strategies are present in the four videos:

- *Selection of content*, because it is a first step taken during the preparation of the video that makes the rest of the strategies possible, and therefore it is present overall.
- *Scenarios stories, and visual representations*, for their potential to tailor content to the assumed knowledge of the audience.

- *Attention getting, attention retention, and emphasis*, which most likely become a need as a consequence of the medium, since the audience can stop watching with just one click.
- *Rapport*, which is important to bridge the potential knowledge and interest gap between scientist and audience.
- *Mentions of a network* (the channel or the studio) and *patrons*, which is most likely due to the need to ensure funding.

As Table 5 shows, engagement strategies are used by most videos except *dialogic involvement* and *humour*, which are negligible in Megalodon. In fact, this video was proved to be perceived as less engaging in a study dealing with audience uptake of engagement in science dissemination videos (Bernad-Mecho & Valeiras-Jurado, 2023b).

OHL is the video that uses more strategies to build credibility and create a receptive frame of mind. This can be explained in several ways. One reason can be that the show has been online for a shorter time, so it is not so well-established. Another related reason may be that the audience is not so loyal yet. Finally, the presenter is probably not so popular as a YouTuber.

There is no clear correlation between videos of the same discipline and the strategies they use. Rather, the strategies seem to be determined by the online medium or the target audience. For example, all videos mention *patrons* because they need funding, which can be considered an influence of the medium. They also use engagement strategies because it is easy to stop watching, and they cannot monitor the audience as in a face-to-face event, which again can be considered an influence from the online medium. Finally, they all use strategies to tailor content because they need to adapt to their target audience.

Field of Physics			
MUON	**%**	**MAGIC RUSSIAN DIAMOND**	**%**
Networks + patrons	43.83	Visual representations	14.31
Networks + patrons + visual representations	11.68	Mentions of patrons and supporters	12.75
Visual representations	9.19	Scenarios-stories + visual representations	2.94
Mentions of scientific sources	5.91	Dialogic involvement	3.73
Networks + patrons + attention getting	3.81	Scenarios-stories	2.35

Field of Anthropology			
ONLY HUMANS LEFT	**%**	**MEGALODON**	**%**
Visual representations	43.14	Visual representations	61.60
Patrons	8.71	Analogies + visual representations	4.87
Visual representations + attention getting	6.10	Anticipation and control of responses + Visual representations	4.87
Mentions of patrons and supporters + personalisation	4.79	Mentions of scientific sources + visual representation	3.55
Visual representations + control of responses	4.58	Networks + patrons	2.66

Table 6. Five most frequent combinations of strategies in each discipline and video.

As shown in Table 6, generally speaking each video uses strategies with a frequency that varies greatly from one to another, regardless of their discipline. They also combine them in different ways. However, it can be noted that Anthropology (Megalodon/OHL) videos rely more heavily on *visual representations* than the Physics videos. We believe this can be explained as a trend of the discipline: since Anthropology involves the study of fossils, it is difficult to discuss this content without visually representing it.

In general, the strategies *visual representations* and *mentions of patrons* are the most frequent in the four videos, either on their own or in combination with other strategies. This suggests that in fact the four videos need to visually represent content to tailor the information to their audiences, to a greater or lesser extent. It also supports our previous claim that the online medium generates a need to ensure funding, hence the prominence of *patrons* in all videos.

4.3. Modal realisations of strategies in each discipline and video

When we turn to the modal realisations of strategies, we notice that the target audience again seems to have a strong influence. Depending on the audience, the same mode within the same discipline can be used for different strategies. One example that supports this claim is the use of the mode *clothing*. In MRD clothing is momentarily used to create a humorous moment, as the presenter disguises as a lab technician with a white robe and goggles. This would seem to fit a young audience that does not like to be "taught", but rather wants to be entertained. In Muon, on the other hand, the presenter wears a T-Shirt with the name of the channel (SpaceTime) and patrons (PBS) throughout the whole video. There are also frequent references to previous episodes. This would seem to be more appropriate for a more adult audience that regularly follows the channel and the series of episodes in it. Figure 3 illustrates this difference (all images extracted from the videos are reproduced here with permission from PBS Studios; the rest of the figures are the authors' own reproductions).

Figure 3. Use of clothing in Muon and MRD.

We find another example in the use of *video* as a mode. It is mainly used for the strategy *scientific sources* in Muon, but for *street credibility* in MRD. The former inserts a video within the episode to explain the results of an experiment carried out by a specific research group, giving them credit for this scientific breakthrough. The latter uses video to foster identification with the audience, and to build credibility based on shared values rather than on reliable scientific sources. These videos share the same discipline, but not the same audience, and that is why they use *video* with different purposes.

In fact, *references to scientific sources* are very different in each video and also in disciplines, also because of the target audience. Concerning the Physics

discipline, in Muon we find a serious and impersonal video referring to a research institute, to convince a more adult, critical audience. In MRD there are no mentions of scientific sources as such, but rather scientists are asked to contribute. This seems to appeal to an audience that is mainly interested in being entertained and is presumably not interested in scientific sources. As for Anthropology videos, in Megalodon there is a reference in spoken and written words to a specific researcher and her team. This is still serious in tone, but more personal, and shows credibility while still keeping rapport. In OHL we see a humorous reference to Darwin using cartoons. The main aim here is to keep the video engaging and retain the attention of a younger public. Figure 4 illustrates this difference.

Field of Physics	
MUONG	**MAGIC RUSSIAN DIAMOND**
	
(Presenter's voice) The Muon G -2 experiment at Fermilab hopes to push closer to this level of confidence.	*(Other's voice)* There is a Nitrogen vacancy centre and you can think of it as a little frozen atom

Field of Anthropology	
MEGADOLON	**ONLY HUMANS LEFT**
	
(Presenter's voice) But in 2016 a group of researchers led by Dr Catalina Pimiento decided to test that hypothesis.	*(Presenter's voice)* Until Charles Darwin published his theory of evolution

Figure 4. Mention of scientific sources in the four videos.

The strategy *visual representations*, which is revealed as one of the most frequent, also takes a variety of modes. In some cases some influence from the discipline can be spotted. For example, drawings and depictions are the most straightforward way to represent archaeological remains when a real picture is not available, and therefore they are frequent in Anthropology as shown in Figure 5 below:

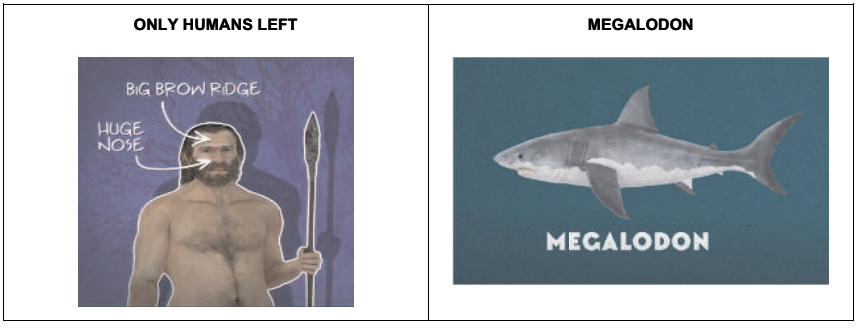


Figure 5. Visual representations in Anthropology videos.

On the other hand, the target audience also has a noticeable influence. For example, in Muon *visual representations* frequently take the form of equations or abstract figures, because the video is addressed to an adult audience that is supposed to understand them. MRD, on the other hand, uses gummies (an artifact) to represent the structure of a diamond, because a younger public will probably have trouble understanding an equation or a formula (see Figure 6).

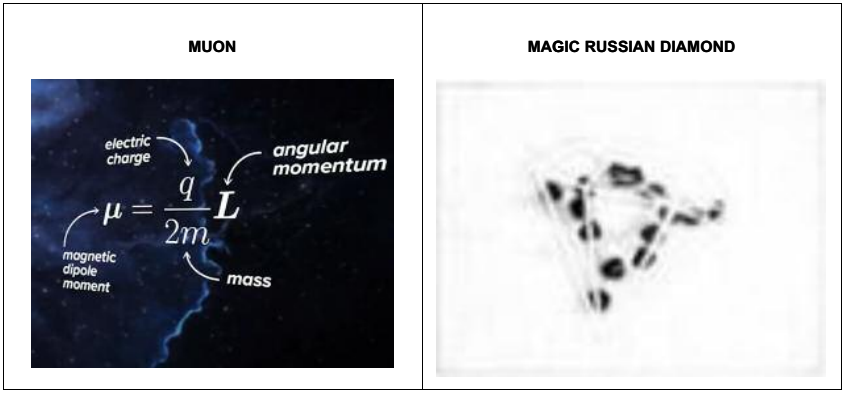


Figure 6. Different Visual representations in Physics videos.

As part of our analysis, we selected the most frequent strategy in all videos (i.e., *visual representations*) and looked at the most frequent multimodal ensembles realising it.

Figure 7 below represents how the strategy *visual representation* is typically enacted in the video Megalodon. To the left, a depiction of a giant shark is foregrounded. In the background a smaller maritime animal is shown so as to provide a relative impression of the shark's size. Simultaneously, we hear the presenter's voice discussing Megalodon's date of extinction. To the right, we find the same modal ensemble, but with the addition of *visual effects* so as to provide an impression of movement: Megalodon approaching its prey. This visually represents what the speaker conveys through her voice: the shark evolved to become huge in order to hunt large preys.

MEGADOLON	
Visual representation 1	**Visual representation 2**
	
Presenter's voice: *Until 2.6 million years ago, when it went extinct.*	Presenter's voice: *Well, Megalodon's massive size was linked to the size of its prey.*

Figure 7. Most frequent ensemble for visual representation in Megalodon.

In the case of OHL, the most frequent realisation of the strategy *visual representation* is through a complex ensemble including *music*, *image*, *visual effects*, *written words* and *spoken words*. This is the modal configuration that is shown to the left of the picture in Figure 8 below. As we hear the speaker's voice explaining the differences between Neanderthals and Homo Sapiens, we see a depiction of both, and the differences are progressively highlighted with arrows and written text. Throughout the excerpt, background music is also heard. A variant of this ensemble is shown to the right. In this case, the images and visual effects are in the background, and the presenter is foregrounded. This includes *gestures* and *eye contact* in the ensemble.

ONLY HUMANS LEFT	
Visual representation 1	**Visual representation 2**
	
Presenter's voice: *There were some differences: the big brow ridge, huge nose…*	Presenter's voice: *Lots of scientists thought Neanderthals fitted the bill.*

Figure 8. Most frequent ensemble for visual representation in OHL.

Moving on to MRD, this video is characterised by a quite unique use of physical objects, or artifacts, to visually represent content. Figure 9 shows how gummies of different colours are used to represent the molecular structure of a diamond and how diamonds tend to contain impurities. The gummies are used simultaneously with *written text* and *visual effects* as we hear the *presenter's voice*. A hand is also occasionally seen manipulating these objects at high speed.

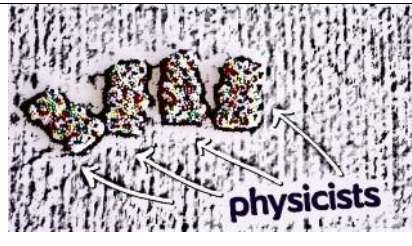
MAGIC RUSSIAN DIAMOND	
Visual representation 1	**Visual representation 2**
	
Presenter's voice: *Physicists were looking through scientific journals…*	Presenter's voice: *…searching for a diamond with very specific properties*

Figure 9. Most frequent ensemble for visual representation in MRD.

Finally, in the Muon video, *visual representations* most frequently take the form of images animated through visual effects, while we hear the presenter's voice. This is the ensemble shown in Figure 10. Although it is an ensemble similar to the one found in Megalodon, it is notable that the images are very

different from the ones used in Anthropology videos: while the images used in Anthropology are depictions aimed at reproducing the assumed appearance of extinct species, the images in Muon are abstract representations, in this particular case of particles in electromagnetic interaction.

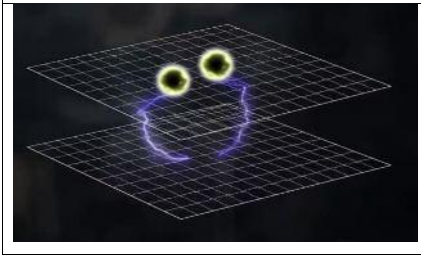
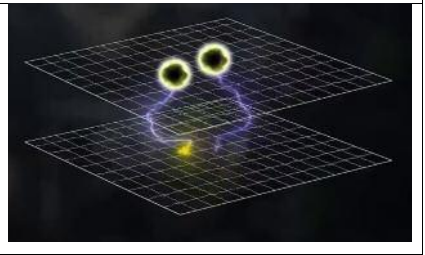
MUON	
Visual representation 1	**Visual representation 2**
	
Presenter's voice: *Electromagnetic interaction results from charged particles…*	Presenter's voice: *…communicating by exchanging virtual photons.*

Figure 10. Most frequent ensemble for visual representation in Muon.

In addition to the most frequent realisations of multimodal strategies, we have found some singularities that, although probably not statistically significant, are worth mentioning because of what they can reveal about science popularisation.

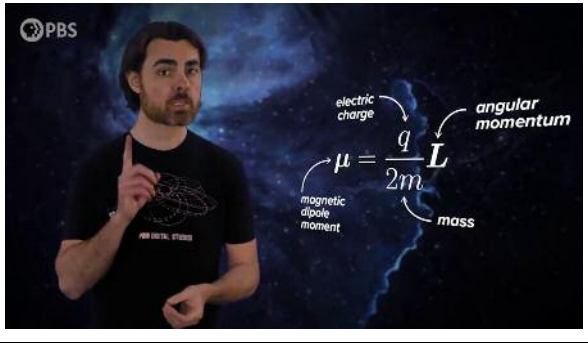
The video OHL (Anthropology) is the only one in which the presenter occasionally interacts with images and visual effects. Figure 11 shows an example of this trend.

Figure 11. Interaction with images in OHL.

In this excerpt, the presenter is arguing that the size of the brain does not determine species' superiority, otherwise blue whales would be the most intelligent animals on earth. In the background, two silhouettes of human brains with their respective size can be seen. As this background image shrinks, a god-like image of two whales appears and we can hear the sound of a whale. Interestingly, the presenter seems to look at the silhouette and whale to his left while he wonders "they're not, right?"

This peculiar use of images turns them into almost physical objects and brings them closer to the way artifacts are manipulated in the video MRD (Physics). In comparison, the other videos use images either occupying the full screen, or as background, while the presenter is shown at the foreground. The way the presenter in OHL interacts with *images* and *visual effects* reveals two relevant aspects. On the one hand, it shows that a well coordinated co-authorship between the presenter and the editor of the video that adds these images after recording is required, and on the other hand, it puts forward the importance of the filmic modes in this specific science dissemination genre.

Finally, the analysis has also brought to the fore a case of a strikingly similar ensemble in two videos from different disciplines: Muon (Physics) and Megalodon (Anthropology). In both excerpts there is an identical use of strategies and a very minor variation in their modal realisations. Figure 12 represents this ensemble in Muon.



(Presenter's voice) *Yes this will be on the test and it is also important for the next thing I'm going to say*

Figure 12. Rich combination of strategies in Muon.

In this extract we find a rich combination of recontextualisation strategies. On the one hand, there is dialogic involvement in the way the speaker

directly addresses the audience and makes a warning gesture with a finger pointing upwards together with some subtle nods of his head. On the other hand, the speaker seems to be anticipating that the equation to calculate the magnetic diapole moment is not likely to be very straightforward or exciting, so written text helps clarify what each element in the equation stands for, and he also explains why this equation is relevant. The reference to a fictional test is humorous and helps build rapport, while it also appeals to shared common ground between himself and the audience. For this reason, it can be considered a way to appeal to street credibility. Figure 13 shows a very comparable excerpt in Megalodon.

(Presenter's voice) *Yes, don't let Hollywood convince you otherwise, I know you're smarter than that.*

Figure 13. Rich combination of strategies in Megalodon.

In this case the presenter is discussing Megalodon's date of extinction. Once more, we find dialogic involvement in the direct address to the audience, and the outward-inward gesture with her right arm with a slightly extended finger that seems to point at the audience. She is also anticipating some surprise and disbelief at the shark's extinction, and the way she solves these doubts is humorous: despite the claims made in Hollywood fiction films, the shark is definitely extinct. Her smiling face expression is consistent with this humorous tone. In referring to a popular Hollywood film she is also drawing on street credibility and trying to find common ground with the audience. Immediately before this scene, a full screen image of the shark was shown, which gives way to a dark background where shapes of fossils can be perceived, with the presenter at the foreground (see Figure 13). This is consistent with the idea of extinction.

If we compare both examples, we note that the only differences lie in the use of head movements (nod) in Muon vs face expression (smile) in Megalodon. This can probably be attributed to personal traits since it is a tendency for both presenters throughout their respective videos. The other difference is the use of graphs and text in Muon vs an image that gives way to plain background in Megalodon. This difference in visual representation is clearly in line with the discussion offered above (see Figures 12 and 13).

5. Conclusions

In this paper we have undertaken a multimodal analysis of recontextualisation strategies in four science dissemination videos from two different disciplines: Physics and Anthropology. Concerning multimodal recontextualisation, the analysis has revealed that the four videos analysed use a wide array of modes, including embodied and filmic to convey recontextualisation strategies. The differences in multimodal recontextualisation found across videos seem to be triggered by either the target audience or the online medium rather than the discipline.

Concerning RQ1, our results show that both disciplines use almost all modes, except for clothes and artifacts, which are only used in the discipline of Physics (see Table 2). However, this does not seem to respond to a discipline trend, since even in the same disciplines these modes are used with different purposes in order to respond to the intended target audience of the video (e.g., *clothes* are used for humoristic purposes in MRD and for mentioning patrons in the case of Muon, being both videos of the same discipline). Artifacts, on the other hand, can only be found in MRD, and they are used with the clear intention of visually representing content in a clear way for a young audience. The analysis has not revealed recurrent multimodal ensembles in each discipline. However, the results show that the mode *spoken words* is part of the most frequent multimodal ensembles regardless of the discipline. This indicates the importance of the voice in these videos, occasionally as a voice over, and frequently in combination with image or video.

As for RQ2, our analysis shows that there are a number of strategies that are present in the four videos: i) selection of content; ii) scenarios and stories, and visual representations; iii) attention getting, attention retention, and emphasis; iv) rapport and v) mentions of a network (the channel or the studio) and patrons. These recontextualisation strategies are employed to

tailor the information to the assumed knowledge of the target audience, engage the audience and build credibility regardless of the discipline. As shown in Table 5, each video uses the strategies to a different extent and in different combinations, regardless of their discipline. In general, the strategies *visual representations* and *mentions of patrons* are the most frequent in the four videos, either on their own or in combination with other strategies. This suggests that the strategy *visual representation* is particularly efficient to tailor the information to the assumed knowledge of the audience. It also supports our previous claim that the online medium generates a need to ensure funding, hence the prominence of *patrons* in all videos. The analysis has revealed a significant difference in the use of strategies that could be attributed to discipline: Anthropology (Megalodon/OHL) videos rely more heavily on *visual representations* than the Physics videos. We believe this can be explained as a trend of the discipline: the easiest way to discuss fossils is to visually represent them through photographs or depictions.

Regarding RQ3, when we turn to the modal realisations of strategies in each discipline, we notice that the target audience again seems to have a strong influence. Depending on the audience, the same mode within the same discipline can be used for different strategies. Some examples that support this claim is the use of the modes *clothing* or *video*. As mentioned earlier, in MRD *clothing* is used to create a humorous moment to engage a young audience, while in Muon, this mode is employed to build credibility among a more adult audience. In the case of *video*, it is mainly used for the strategy *scientific sources* in Muon, but for *street credibility* in MRD. It can be clearly seen that, although these two videos share the same discipline, they do not share the same audience and therefore the way they multimodally convey the recontextualisation strategies is different. For instance, *references to scientific sources* are very different in each video because of the same reason: their target audience. The strategy *visual representations* is especially varied in its modal realisation, and this is due to influence from both discipline and target audience. For example, drawings and depictions of extinct animals and species are predominant in Anthropology videos, while animated abstract images and equations are used in Muon to represent abstract physical concepts such as electromagnetic interaction to an adult audience. On the other hand, artifacts are employed in MRD to convey physical concepts (in this case the composition of a diamond) to a younger audience.

Finally, the analysis has also brought to the fore some singularities that, although probably not statistically significant, are worth mentioning because

they can pave the way for further research in the field. On the one hand, the video OHL (Anthropology) is the only one in which the presenter occasionally interacts with images and visual effects, making the most of the editing affordances inherent to the medium. Finally, a strikingly similar ensemble was identified in two videos from different disciplines: Muon (Physics) and Megalodon (Anthropology). In both excerpts there is an identical use of strategies and a very minor variation in their modal realisations.

The multimodal analysis of the corpus selected has helped us to look into how variables such as discipline, medium and target audience shape the multimodal recontextualisation practices of popular science online videos in two particular disciplines: Physics and Anthropology, contributing in this way to our knowledge of science dissemination, digital genres and multimodality. The results obtained show that except for some discipline-related particularities in the way content is multimodally recontextualised in the videos analysed, it seems that the influence of the medium prevails to the possible disciplinary traits. This leads to further reflection on the definition of this digital genre that seems to be determined by the affordances of the medium and an online audience. This genre requires complex multimodal ensembles that effectively convey the content transmitted and eventually engage the audience. Therefore, a seamless combination of modes attending to the medium and target audience is paramount to the success of science dissemination genres.

The study presented in this paper is limited in scope, since the corpus includes four videos from two disciplines. Further research with larger corpora would help to identify genre traits, and to further explore the multimodal nature of this emergent genre and to expand our understanding of the multimodal recontextualisation practices inherent to it.

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References

Argyle, M., Ingham, R., Alkema, F., & McCallin, M. (1981). The different functions of gaze. In A. Kendon (Ed.), *Non- verbal Communication, Interaction and Gesture* (pp. 221–237). Mouton.

Bernad-Mecho, E., & Valeiras-Jurado, J. (2023a). Multimodal engagement strategies in science dissemination: A case study of TEDX talks and YouTube science videos. *Discourse Studies*, 0(0). https://doi.org/10.1177/14614456231161755

Bernad-Mecho, E., & Valeiras-Jurado, J. (2023b). Engaging the audience in online Youtube dissemination videos: A look at the uptake of multimodal engaging strategies. *ESP Today,* 11(2), 198–427. https://doi.org/10.18485/esptoday.2023.11.2.6

Bezemer, J. A., & Kress, G. (2008). Writing in multimodal texts: a social semiotic account of designs for learning. *Written Communication,* 25(2), 166–195. https://doi.org/10.1177/0741088307313177

Boy, B., Bucher, H.-J., & Christ, K. (2020). Audiovisual science communication on TV and YouTube. How recipients understand and evaluate science videos. *Frontiers in Communication, 5*, 1-18. https://doi.org/10.3389/fcomm.2020.608620

Carter-Thomas, S., & Rowley-Jolivet E. (2020). Three minute thesis presentations: Recontextualisation strategies in doctoral research. *Journal of English for Academic Purposes,* 48, 1–14. https://doi.org/10.1016/j.jeap.2020.100897

Hyland, K., & Zou, H. (2021). Pithy Persuasion: Engagement in 3 Minute Thesis Presentations. *Applied Linguistics*, 43(1), 21–44. https://doi.org/10.1093/applin/amab017

Jewitt, C., & Kress, G. (Eds.) (2003). *Multimodal Literacy*. Peter Lang.

Kastberg, P. (2011). Knowledge Asymmetries: Beyond 'to have and have not'. *Fachsprache: Internationale Zeitschrift für Fachsprachenfors chung -didaktik und Terminologie*, 33 (3-4), 137–151.

Kendon, A. (2004). *Gesture: Visible Action as Utterance*. Cambridge University Press.

Kress, G. (2010). *Multimodality: A Social Semiotic Approach to Contemporary Communication* (2nd ed.). Taylor & Francis.

Ladewig, S. H. (2013). Creating multimodal utterances: the linear integration of gestures into speech. In C. Muller, A. Cienki, E. Fricke, S. Ladewig, D. McNeill, & S. Teßendorf (Eds.), *Body-Language-Communication: An International Handbook on Multi-modality in Human Interaction* (vol I, pp. 1662–1677). De Gruyter Mouton.

Luzón, M. J. (2019). Bridging the gap between experts and publics: the role of multimodality in disseminating research in online videos. *Ibérica*, *Journal of the European Association of Languages for Specific Purposes,* 37, 167–192. https://revistaiberica.org/index.php/iberica/article/view/114

Luzón, M. J., & Pérez-Llantada, C. (2019). Connecting traditional and new genres: Trends and emerging themes. In M. J. Luzón, & C. Pérez-Llantada (Eds.). *Science communication on the Internet: Old genres meet new genres.* (pp. 1–18). John Benjamins. https://doi.org/10.1075/pbns.308.01luz

Müller, C. (2013). Gesture as a medium of expression: the linguistic potential of gestures. In C. Muller, A. Cienki, E. Fricke, S. Ladewig, D. McNeill, & S. Teßendorf (Eds.), *Body-Language-Communication: An International Handbook on Multi-modality in Human Interaction* (vol I, pp. 202–217). De Gruyter Mouton.

OECD. (2015). Making Open Science a Reality. *OECD Science, Technology and Industry Policy Papers,* 25. OECD Publishing. https://doi.org/10.1787/5jrs2f963zs1-en

O'Halloran, K. L., Tan, S., & Marissa, K. L. E. (2015). Multimodal analysis for critical thinking. *Learning, Media and Technology,* 42, 147–170. https://doi.org/10.1080/17439884.2016.1101003

Paltridge, B. (2012). *Discourse Analysis* (2nd Ed). Bloomsbury.

Pérez-Llantada, C. (2021). Genres and languages in science communication: the multiple dimensions of the science-policy interface. *Language & Communication*, 78, 65–76. https://doi.org/10.1016/j.langcom.2021.02.004

Querol-Julián, M. (2011). *Evaluation in Discussion Sessions of Conference Paper Presentations: A Multimodal Approach*. LAP Lambert Academic Publishing GmbH & Co. K.G.

Rowley-Jolivet, E., & Carter-Thomas, S. (2019). Scholarly soundbites. Audiovisual innovations in digital science and their implications for genre evolution. In M. J. Luzón, & C. Pérez-Llantada (Eds.), *Science Communication on the Internet: Old genres meet new genres* (pp. 81–106). John Benjamins.

Ruiz-Madrid, M. N. (2021). A multimodal discourse approach to Research Pitches. *Journal of English for Academic Purposes,* 52, 1–15. https://doi.org/10.1016/j.jeap.2021.101003

Ruiz-Madrid, N., & Valeiras-Jurado, J. (2023). Reconceptualisation of genre(s) in scholarly and scientific digital practices: a look at multimodal online genres for the dissemination of science. In R. Plo-Alastrue, & I. Corona (Eds). *Digital Scientific Communication: Identity and Visibility in Research Dissemination*. Palgrave.

Sancho Guinda, C. (Ed.). (2019). *Engagement in Professional Genres*. John Benjamins.

Scotto di Carlo, G. (2014). The role of proximity in online popularizations: The case of TED Talks. *Discourse Studies*, 16(5), 591–606. https://doi.org/10.1177/1461445614538565

Scotto di Carlo, G. (2015). Stance in TED talks: Strategic use of subjective adjectives in online popularisation. *Ibérica, Journal of the European Association of Languages for Specific Purposes, 29*, 201–221. https://revistaiberica.org/index.php/iberica/article/view/255

Valeiras-Jurado, J., Ruiz-Madrid, N., & Jacobs, G. (2018). Revisiting persuasion in oral academic and professional genres: Towards a methodological framework for Multimodal Discourse Analysis of research dissemination talks. *Ibérica, Journal of the European Association of Languages for Specific Purposes,* 35, 93–118. https://revistaiberica.org/index.php/iberica/article/view/136

Valeiras Jurado, J, & Ruiz-Madrid, N. (2019). Multimodal Enactment of Characters in conference presentations. *Discourse Studies*. SAGE. 21-5, 561–583. https://doi.org/10.1177/1461445619846703

Valeiras-Jurado, J., & Bernad-Mechó, E. (2022). Modal density and coherence in science dissemination: Orchestrating multimodal ensembles in online TED talks and youtube science videos. *Journal of English for Academic Purposes,* 58, 101118. https://doi.org/10.1016/j.jeap.2022.101118

Vicente-Sáez, R., & Martínez-Fuentes, C. (2018). Open science now: A systematic literature review for an integrated definition. *Journal of Business Research,* 88, 428–436. https://doi.org/10.1016/j.jbusres.2017.12.043

Xia, S. A., & Hafner, C. A. (2021). Engaging the online audience in the digital era: A multimodal analysis of engagement strategies in TED talk videos *Ibérica, Journal of the European Association of Languages for Specific Purposes s,* 42, 33–58. https://doi.org/10.17398/2340-2784.42.33

Zhang, Y., & O'Halloran, K. L. (2013). From popularization to marketization: The hypermodal nucleus in institutional science news. In E. Djonov, & S. Zhao (Eds.), *Critical multimodal studies of popular discourse* (pp. 172–190). Routledge.

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