Simplifying Science: A Multimodal Genre Analysis of Selected Egyptian Scientific Videos

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Abstract

Egyptian scientific videos are increasingly attracting the non-specialist audience, irrespective of age, gender, culture or education. Many Egyptian content creators are attempting to present a kind of simple Arabic scientific content that would appeal to diversified online viewers. This study aims to reach a multimodal genre analysis model that can explain how scientific content is simplified and popularized among the online audience using generic and multimodal resources in Egyptian scientific videos. The study adopts theoretical and analytical toolkits integrating the ESP framework of genre analysis (Swales, 1990) and multimodal analysis (Baldry & Thibault, 2006), utilizing the model devised by Xia (2021,2023), which she used to analyze TED Talks. The data comprises of episodes from E*LDdaheeh, Espitalia, Egychology* among others. The analysis reveals the association between moves and visuals employed to serve the same communicative purposes. The study suggests that Egyptian scientific videos have developed specific characteristics that make them a unique genre that appeals to a wide range of audiences.

Key words: Simplifying science, Egyptian scientific videos, multi-modality, genre analysis

الملخص

تزداد جاذبية الفيديوهات العلمية المصرية لدى الجمهور غير المتخصص، بغض النظر عن العمر، أو النوع، أو الثقافة، أو مستوى التعليم. يسعى العديد من صانعي المحتوى المصريين إلى تقديم محتوى علمي مبسط باللغة العربية يلقى قبولًا لدى جمهور الإنترنت المتنوع. تهدف هذه الدراسة إلى الوصول إلى نموذج لتحليل النوع النصي متعدد الوسائط يفسر كيفية تبسيط المحتوى العلمي وبالتالي شيوعه بين جمهور الإنترنت ، من خلال استخدام الموارد النوعية والوسائط المتعددة في الفيديوهات العلمية المصرية. تتبنى الدراسة أدوات نظرية وتحليلية تدمج بين إطار تحليل النوع النصي في اللغة الإنجليزية لأغراض محددة (Swales 1990)، وتحليل الوسائط المتعددة (Baldry & Thibault 2006) وتستفيد من النموذج الذي ابتكرته (Xia 2021،

2023)، والذي استخدمته في تحليل محادثات تيد. تتكون البيانات من حلقات من برامج مثل الدحيح، إسبيتاليا، وإيجيكولوجي وغيرها. يُظهر التحليل وجود ارتباط بين الحركات الخطابية والعناصر البصرية التي تُستخدم لتحقيق نفس الأغراض التواصلية. وتخلص الدراسة الي أن الفيديوهات العلمية المصرية قد طوّرت خصائص محددة تجعل منها نوعًا نصيًا فريدًا يستقطب جمهورًا واسعًا ومتنوعًا.

الكلمات المفتاحية:

تبسيط العلوم، الفيديوهات العلمية المصرية، الوسائط المتعددة، تحليل النوع النصي

1.Introduction

Scientific discourse has advanced into a range of genres, depending on the target audience, from the highly technical addressing the specialists in the field including technical seminars, scientific papers and literature reviews to popular genres broadcasted in the media (Hilgarter, 1990; Ye, 2021). Most of these genres have their rhetorical patterns that attempt to achieve their defined communicative purposes suited for specific discourse communities. On the other hand, "popular genres are targeted for diversified audiences with varying degrees of background knowledge, and writers need to resort to various structural and linguistic strategies in response to complex and dynamic contexts". (Ye, 2021, p. 2)

Egyptian scientific videos are increasingly attracting the non-specialist audience, irrespective of age, gender, culture or education. Many Egyptian content creators are attempting to present a kind of Arabic content that would appeal to their diversified online viewers. Digital technologies facilitate explaining and simplifying science to whoever is interested in science and knowledge in general. The Egyptian content creators strive to simplify and popularize science among the online audience, using all the available digital tools in their YouTube channels. This study aims to reach a multimodal genre analysis model that can explain how scientific content is simplified and popularized among the online audience, using generic and

multimodal resources in Egyptian scientific videos. The main aim is to explore the generic multimodal features of Egyptian scientific videos that make them a unique genre.

1.1. Scientific Digital Content

With the introduction of modern technology and the various digital platforms, competition is high among content creators to attract the viewer's attention, especially the non-specialist. Digital tools help creators present their complex scientific content in an engaging and accessible manner, using various media formats including images, videos, interactive visualizations, and audio recordings. This encouraged many researchers to investigate scientific genres addressed to non-specialists such as science blogposts (Luzón, 2013, 2019) crowdfunding proposals (Mehlenbacher, 2017) , open science notebooks (Rowley-Jolivet, Elizabeth and Carter-Thomas, Shirley, 2023) and TED Talks (Xia, 2023; Miranda & Moritz, 2021). From the perspective of genre analysis, many researchers have attempted to investigate scientific digital content in search for a pattern as in the scientific conference presentations (Carter-Thomas, Shirley and Rowley-Jolivet, Elizabeth, 2003), 3-minute thesis presentations (Hu & Liu 2018) among others. Due to the peculiar case of scientific content when presented digitally using all media available, the need emerged to analyze such captivating mode by incorporating all aspects of genre and multimodal features. For instance, Ye, 2021 attempted to create a multimodal genre analysis model to analyze 60- seconds science podcasts. However, "research into how verbal and visual resources are marshaled to explain scientific knowledge to the lay audience in an understandable manner remains limited." (Xia, 2023, p.71) To the researcher's knowledge, Egyptian scientific videos have not been tackled from this perspective.

2. Genre Analysis

As mentioned in the seminal article by Hyon (1996), the history of genre analysis research revolves around three traditions which are English for Specific Purposes (ESP), Systemic Functional Linguistics (SFL) and Rhetorical Genre Studies (RGS). They vary

in how each tradition views 'genre'. To clarify, the ESP genre tradition defines a genre as "a class of communicative events, the members of which share a certain set of communicative purposes" (Swales, 1990, p.58). SFL genre approach, which centers on the form and meaning of language, regards genre as "staged, goal-oriented, social processes" (Martin, J. R., Christie, F., & Rothery, J., 1987, p.59). The RGS tradition, which focuses on genres as social action in response to recurrent rhetorical situations, perceives genre as a "conventional category of discourse-based in large scale typification of rhetorical action" (Miller, 1984, p.163). The present study adopts the ESP approach which considers a genre as more than just a type of text but as a strategically constructed discourse addressed to target audiences for an event or a situation and share "a certain set of communicative purposes" (Swales, 1990; Martin, 2009). Accordingly, the authors would embrace certain moves and steps intentionally to achieve the intended purposes using similar rhetorical, stylistic, syntactic and lexical features.

2.1. Genre analysis and multimodality

However, with the initiation of technology in the digital age and the continuous rapid change in human nature and societies, the need emerged to incorporate other elements into the traditional genre analysis models, which eventually led to the rise of multimodal genre analysis. Typically, it refers to the genres that involve the integration of multiple communicative modes such as the videos analyzed in this study which spare no effort both verbal and visual to simplify the content for their spectators. Multimodal move analysis, used in the ESP and SFL genre approaches, sets out to analyze multimodal texts by identifying different moves and steps, considering various modes of communication whether linguistic or audiovisual such as images, gestures, sounds and layout. Jewitt et al. (2016) suggest that semiotic choices are generally governed by society and culture. Additionally, they state that "meaning is made with different semiotic resources, each offering distinct potentialities and limitations" (p. 3). This means that some modes of expression may be more suitable to some contexts and more efficient in achieving communicative purposes

than others. A useful genre analysis toolkit would be Move Analysis. Swales (2004) defines *a move* as "a discoursal or rhetorical unit that performs a coherent communicative function in written or spoken discourse" (p. 228). Furthermore, multimodality foregrounds semiotic resources, considering them of equal significance in conveying meaning to the audience (Kress, 2010; Jewitt et al., 2016). These underpinnings connect both theories of genre and multimodality since they both involve the relation between semiotic forms, functions, and social contexts (Swales, 1990; Kress, 2010; Jewitt et al., 2016).

Baldry and Thibault (2006) provide a multimodal transcription model for analyzing film texts as well as other moving images. He believes that "the meaning of the text is the result of the various ways in which elements from different cases of phenomena—words, actions, objects, visual images, sounds and so on—are related to each other as parts functioning in some larger whole". (p. 21) Moreover, Xia (2023) believes that "multimodality as an approach to understanding communication is considered compatible with genre analysis. Both strands of theories share the understanding that communication is achieved through the social use of language in context" (p. 72). One of the objectives of the current research is to validate Xia 2023 study in which she devised a multimodal genre analysis model to analyze science TED Talks. While analyzing the selected Egyptian scientific videos, the model is demonstrated and compared to the model used in the current study.

3. Research questions:

The study seeks answers to the following research questions.

1. How are the videos organized according to the genre analysis model?
2. What are the multimodal strategies employed in the selected videos to facilitate the realization of communicative purposes?
3. How is science simplified and popularized in the selected videos?

4. How does the multimodal genre analysis of Xia (2021, 2023) work for the analysis of Egyptian scientific content?

4. Data and methodology

The selected Egyptian scientific videos are not spontaneous presentations delivered to a live audience; they are manufactured products, prepared, most probably rehearsed, recorded, edited, and then dispersed to an online audience. While the selected content creators mainly concentrate on scientific topics; they occasionally deal with history, art, psychology, and social relationships. The channels' titles suggest scientific educational content. **الدحيح ElDaheeh** in Arabic means a studious person who is always in pursuit of knowledge and learning which involves studying for long hours, i.e. a nerd. Both **Espitalia الاسبتالية** (an Arabic word like hospital) and **Pharmastan فارماستان** suggest medical and pharmaceutical content. **Egychology ايجيكولوجي** has the suffix -ology which refers to a field of study. There is also the prefix Egy- referring to Egyptian YouTuber as well as Egyptian target audience. **ElmTube علم تيوب** explicitly includes the Arabic word "علم" (science) presented in the form of a YouTube video.

The data includes two scientific videos from each of the five channels: Al Daheeh, Espitalia, Pharmastan, Egychology, Elm tube which amounts to ten videos in total. The episodes are randomly selected from different seasons of each channel, spanning from their debut till 2023 (see Appendix A). It is noteworthy that the earlier videos are shorter in duration, whereas the later episodes are longer. Probably, most content creators can benefit from the increased watch time, which is a key factor in YouTube's algorithm besides better channel growth and more revenue from advertisements.

4.1. Procedure

The study adopts a qualitative analysis of the selected scientific videos. The selected videos are downloaded from the respective YouTube channels with scripts (when available and written/ transcribed when not). A pilot study is conducted aiming at finding a pattern of moves and steps. The pattern is compared to the move analysis model suggested by Swales (1990) and Xia (2021, 2023). The analysis is conducted on the sample videos to identify the

rhetorical structure and the communicative functions associated with it.

The selected videos are divided into shots for analysis according to the multimodal analysis of Baldry and Thibault (2006), with a special focus on Move 5, being the most influential move as explained below. To trace the most prevalent kind of visuals that appear in the selected videos, the study also employs the typology of visuals (Rowley- Jolivet, 2002).

5. Analysis and Results: Move Analysis

Following the models of Swales,1990, 2004; Xia, 2023, the following section presents an overview of the generic structure of Egyptian scientific digital content as depicted in the selected videos. The move structure is divided into three major sections, i.e. introductory, developmental and concluding moves comparable to the model proposed by Xia, (2021, 2023) as follows:

Table 1

Move Analysis comparison between Xia's TED talks (2021, 2023) and Egyptian Scientific videos

Introd	**Move analysis of TED Talks (Xia, 2023, p. 89,90)**	**Move analysis of Egyptian scientific videos**

	M1 Telling a lead-in story) [M2 Rationalizing the speech] (S2a Narrating the speaker's personal experience) (S2b Indicating research gaps) SSi Describing the existing paradigms/methods SSii Indicating the shortcomings SSiii Explaining the shortcomings [S2c Highlighting the importance of the issue] (M3 Introducing preliminary knowledge) **M4 Introducing the topic** (S4a Raising the research question(s)) (S4b Announcing the main arguments) (S4c Forecasting the speech)	M1 telling a lead-in story / A skit **M2 Greeting and /or an introductory phrase** **M3 introducing the topic** S 3 a Providing historical background S 3 b Raising the main question/ argument (M4 Highlighting the importance of the topic) S 4 a Providing evidence by quoting statistics (validating) S 4 b Highlighting the importance of this specific episode S 4 c Making acknowledgements

Developmental Moves	**M5 Developing the topic** S 5 a Raising a sub-question S 5 b Answering the sub question S 5 c Raising a sub-topic S 5 d Developing the sub-topic S 5 e Adding information to a (sub)question or (sub)topic S 5 f Describing solutions or methods S 5 g Stating the applications S 5 h Describing the researching process S 5 i Describing a personal story M6 Expanding the horizon] (S6a Stating future plans) (S6b Stating the implications)	**M5 Developing the topic** S 5 a Raising a sub-question S 5 b Answering a sub-question S 5 c Raising a sub-topic S 5 d Developing the sub-topic S 5 e Adding information to a sub-topic S 5 f Elaborating / explaining a sub-topic S 5 g Exemplification S 5 h Showing consequences or results S 5 i Defining a scientific term S 5 j Reporting a relevant scientific research /experiment S 5 k Validation (sources-dates- statistics) S 5 l Providing a solution to a problem S 5 m Proposing a hypothetical situation S 5 n Telling a story
Closing Moves	(M7 Summarizing the speech) (M8 Calling for actions) (M9 Making acknowledgements) **M10 Closing the speech**	**M 6 Concluding the video** S 6 a Summing up S 6 b Giving advice/ call for action S 6 c Eliciting response from the viewers **M 7 Closing the video**

5.1. Move analysis

The **bold** type moves in both models are obligatory since they appear in 100 % of the data. The underlined steps are the ones that are shared between the two models of TED Talks and Egyptian scientific videos. Xia's (2021, 2023) analysis of TED Talks structure revealed a model that revolves around ten moves (M) and their relevant component steps (S). Three of the ten moves are mandatory (i.e. they are adopted in all the TED Talks analyzed). The moves are *M4 Introducing the topic*, *M5 Developing the topic* and *M10 Closing the speech.* This basic three- move structure is similar to the model introduced by Chang and Huang (2015) involving "Topic introduction - Topic development – Closure" structure of TED talks. Similarly, the Egyptian scientific videos model revolves around seven moves, five of which are compulsory. These are M2 Greeting and /or an introductory phrase, M3 Introducing background knowledge, M5 Developing the topic, M6 Concluding the video and M 7 Greeting and /or a closing phrase.

The shared moves and steps between the two models suggest a similarity in the communicative purposes achieved in both genres: TED Talks and Egyptian scientific videos. For example, in introductory moves, they share M1 Telling a lead in story. Even though it is an optional move, it helps arouse the curiosity of their viewers, "disseminating scientific ideas among the lay audience… [and] engaging the audience at the very beginning of the popularization practice."(Xia 2021, p. 92). The following is an example from *Espitalia, Euthanasia* :

"نانسي كروزن بنت أمريكية اتصابت في حادثة عربية و اتوقف قلبها و تنفسها تماما لمدة 12 دقيقة.. و ده اللي سبب ان المخ تتلف فيه أجزاء و تدخل نانسي في غيبوبة.. بعدها فاقت و اتنقلت لحالة جديدة تماما..... فيها المريض بيتحول لحاجة اشبه بالنبات....و دي اسمها الحالة الخضرية الدائمة..Persistent Vegetative State "

"Nancy Cruzan was an American woman who was involved in a car accident. Her heart and breathing completely stopped for 12 minutes, which led to parts of her brain being damaged and put her into a coma. Later, she regained consciousness but transitioned into a completely new state—where a patient becomes something similar to a plant. This condition is called Persistent Vegetative State."

The YouTuber begins with a story about a girl who was injured in a car accident due to which she remained in a vegetative state for seven years. Her parents had to issue a court order to remove the feeding tube which eventually led to her death in 12 days.

To continue with the introductory moves, only Al Daheeh starts his videos in the later seasons with a skit (a short acting scene). In this skit *The Battery*, he is impersonating a TV show interviewer talking to the main hero of the episode which is "the battery". As much as this optional skit introduces the topic, it usually brings humor into the episode since the YouTuber plays all the roles in different costumes and says all the lines! (See Figure 1)

Figure 1

Al Daheeh, the Battery

M2 Greeting and /or an introductory phrase

This move is not present in Xia's 2021, 2023 model. All the selected videos start with a greeting and an opening statement that is repeated in each episode as follows:

- اعزائي المشاهدين السلام عليكم ورحمة الله و بركاته. اهلا بيكم في حلقة جديدة من برنامج الدحيح
- "Dear viewers, peace be upon you. Welcome to a new episode of *Al-Daheeh*."
- انا ايمان الامام ودي الاسبتالية
- "I am Iman ElEmam, and this is *Espitalia*."
- اهلا بيكم في حلقة جديدة من فارمستان
- "Welcome to a new episode of *Pharmestan*."

- Hello there (Egychology)
- السلام عليكم مشاهدينا الكرام وحلقة جديدة من علم تيوب
- "Peace be upon you, dear viewers, and welcome to a new episode of *Elm Tube*."

These introductory statements have become a signature, immediately recognized by regular viewers.

M3 introducing the topic

Another move in common between the two studies is *M3 introducing the topic.* They are represented in different optional steps. These steps may include *S3a, providing historical background* as follows*:*

فارمستان: السارين: السارين تم اكتشافه سنة 1938 في المانيا عن طريق اثنين من العلماء النازيين عشان يصنعوا اقوى مبيد حشري...

Pharmastan: Sarin: "SARIN was first discovered by two NAZI scientists in 1938 to invent a new powerful insecticide, but the resulted product wasn't only an insecticide (video auto translation)"

The historical background, especially when it appears early in the video, familiarizes the audience with the issue and its origin. The following example shows how step *S3 b Raising the main question or argument* would enthuse the audience to watch the episode in search of answers.

فارمستان: الاسبرين: فيا ترى ايه هي قصة الريفو و الاسبرين عموما؟ و ايه سر علاقة الحب اللي بينه و بين المصريين؟

*Pharmastan: Aspirin: "*I wonder what the story is behind Rivo and Aspirin in general? And what's the secret of the love affair between Rivo and Egyptians? (video auto translation)"

These questions foster the audience's involvement and engagement. By directly addressing the audience, a sense of proximity is created and hence making scientific concepts more accessible and relatable (Hyland, 2010).

M4 Highlighting the importance of the topic:

Some videos begin with the step, *S4a Providing evidence by quoting statistics (validating)* to grab the audience's attention to the

topic's importance and enhance credibility. In the following example, the YouTuber shocks the audience about the hidden dangers of handling money by reporting the research results with statistics on the number of bacteria and germs money can carry.

علم تيوب: الفلوس القذرة: **فلوسك هتموتك**. العملة اللي في **ايدك** دي عبارة عن قطن و كتان و دي سهل جدا البكتريا تنمو عليها. باحثون في جامعة اوهايو فحصوا مصدر الفلوس اللي جاية من السوبرماركت او ماكينات ATM ووجدوا ان **87%** منها ملوثة ببكتريا ضارة و اشهرهم Staphylococcus aureus البكتريا المسؤولة عن حب الشباب و امراض الصدر.

Elm Tube: Dirty Money: **Your** Money Might Kill **You!** The cash **you**'re holding is made of cotton and linen, which provide an easy surface for bacteria to grow. Researchers at Ohio University examined money sourced from supermarkets and ATM machines, discovering that **87%** of it was contaminated with harmful bacteria—one of the most common being *Staphylococcus aureus*, the bacteria responsible for acne and respiratory diseases.

Using numbers and percentages is characteristic of scientific language which typically resorts to evidence and validation to "illustrate the severity of some issues and to highlight the need to resolve unanswered questions" (Xia 2021, p.98).

Step S4 b indicates *the importance of a specific episode*. The value of this episode seems to emerge from the fact that it is upon the viewers' request, especially high school students who need these videos to simplify difficult scientific issues in their curricula as in the following example:

الدحيح: البطارية: **ركّز** في هذه الحلقة كويس أوي، كويس أوي، لأن "الدحّيح" هيعمل حاجة، **انت** دايمًا تطلبها منه، **اداهالك** مرّة في حلقة الـ"ترانزستور"، **وهيديهالك** تاني في هذه الحلقة .الطلبة تسمع وتركز معايا كويس أوي .**دا Chapter الـ Electrochemistry في الثانوية العامة، "الدحّيح" هيشرحه ببلاش.**

ElDaheeh: The battery: "**Pay close attention** to this episode—really close because *Al-Daheeh* is about to do something **you**'ve always asked for. He gave it to **you** once in the *Transistor* episode, and now **you**'re getting it again in this one. Students, listen up and focus! This is the **Electrochemistry** chapter from high school curriculum, and ***El-Daheeh* is explaining it for free."**

These videos are thought to be the reason behind the large number of followers of EL Daheeh. He also refers back to another

useful episode for students. This way his target audience, mostly young people, stays tuned, waiting impatiently for every new episode. At this stage, to effectively persuade the viewers, the YouTubers usually address them, using imperative structure as well as personal pronouns and adjective possessive pronouns (in underlined bold).

"فلوسك هتموتك" " انت دايما تطلبها منه ...و هيديهالك"

"Your Money Might Kill **You!"** **"….**something **you**'ve always asked for… and now **you**'re getting it…"

M 5 Developing the topic

This central obligatory move is a shared element between both types of data and can be executed via various steps, which are also common to both, as illustrated below.

To name a few, *S5a Raising a sub- question* and *S5 b Answering a sub-question* are related steps that usually appear together in the data and are usually recycled in the same video.

فارمستان: السارين: قبل جيمس ما رش كانو بيعرفوا إزاي [إن فيه تسمم] ؟ ..... كانوا بيعرفوا عشان بيترسب في الشعر والظوافر...

Pharmastan: Sarin: Before James Marsh, how did they know [there was poisoning?] They knew because it accumulated in hair and nails.

فارمستان: الاسبرين: طيب هو الاسبرين ده اكتشفوه ازاي؟ ..... الاسم العلمي هو Acetyl Salicylic Acid يعني هو حاجة مشتقة من حمض السالسيلك ....و ده اللي اكتشفوه زمان...

*Pharmastan: Aspirin: "*So how was aspirin discovered? Its scientific name is Acetyl Salicylic Acid, meaning it's derived from salicylic acid, which was discovered long ago..."

علم تيوب: سر السباب الدائم: عارف الشيخوخة بتحصل ازاي؟ ..... خلاياك الجميلة دي مع التقدم في العمر بتتوقف عن الانقسام و التجدد و بتشيخ...

ElmTube: The Secret of Eternal Youth: "Do you know how aging happens?... Your beautiful cells, as time passes, stop dividing and regenerating, and they start to age.."

The above examples show how the audience's attention is attracted by raising sub- questions to which they receive answers in detail during the episode. Detailed explanations and definitions are typical strategies used to provide the necessary information.

One more step to exemplify is *S5o Reporting a relevant scientific research /experiment*

فارمستان: الاسبرين: تم كتابه اول دراسة عن الصفصاف **سنه 1763** على يد رجل دين انجليزي اسمه **ادوارد ستون** الراجل ده لما كان بيستخدم مسحوق لحاء الصفصاف في علاج الحمى على **50 حاله** كان بيلاقي تحسن ملحوظ خاصه في الحالات اللي كان عندها حمى وارتفاع درجه حراره بعدها كتب رسالة **لرئيس الجمعية الملكية في بريطانيا** بيوثق فيها الكلام ده ومع مرور الوقت تم التعرف على صيغه حمض الساليسوليك وتم عزله و استخدامه بشكل نقي.

*Pharmastan: Aspirin: "*The first study on willow bark was written in **1763** by an English clergyman named **Edward Stone**. When he used powdered willow bark to treat fever **in 50 patients**, he observed significant improvement, especially in cases with high fever and temperature. Later, he wrote a letter to the **President of the Royal Society in Britain**, documenting his findings. Over time, scientists identified the formula of **salicylic acid**, isolated it, and began using it in its pure form."

Reporting the process of scientific experiments may be employed to provide credible knowledge from authoritative sources. Notice the accurate reference to the date, the involved scientists and the research process in detail.

M 6 Concluding the video

Towards the end of the videos appear the concluding moves and steps which are almost identical between the two studies as exemplified below. *S6a summing up* corresponding to M7 summarizing the speech in (Xia 2021, 2023) are thought to help reinforce the main points the YouTuber wishes the audience to remember. It is usually preceded by expressions such as:

Egychology الفطر الأسود: **فخلاصة الموضوع ومنعا للإطالة،** الفطريات دي طول عمرها موجودة حوالينا ... فكل شوية تدخل ماتش شطرنج مع **جسمك. فجسمك** بيكون عنده الأدوات اللازمة للتغلب على الفطريات دي لكن في بعض الأحيان جهاز المناعة بيكون ضعيف زي التعافي من كورونا..

Egychology: Black Fungus: "**In short and without further ado**, fungi have always been around us… Every now and then, they engage in a **chess match** with your body. Your immune system usually has the tools to defeat them, but sometimes, it weakens—like during recovery from COVID-19—making it harder to fight off infections."

فارمستان: الاسبرين: **في النهاية** حابب أقول في النهاية لو **انت** مش بتعاني من اي امراض مزمنة او **حابب تحافظ** على صحة **قلبك** ممكن تعمل كده من غير ما **تاخد** أي ادويه خالص....

Pharmastan: Aspirin: "**In the end,** I'd like to say that if **you** don't suffer from any chronic diseases and **want to maintain your heart** healthy**, you** can do so **without taking any medication** at all…"

Most of the time step S6a is connected with *S6b Giving advice /calling for action* by efficiently engaging the audience. The advice given is the takeaway from the video on how to deal with problems raised in the episode encouraging the viewers to practically benefit from the knowledge they gained in their lives. This justifies the use of 2nd person possessive and personal pronouns "انت" "جسمك" " قلبك"

Some speakers call for action relevant to the serious issue discussed in the episode sometimes using the inclusive "we" as if it is a humanitarian action that involves us all.

الاسبتاليا: المضادات الحيوية: ضروري **كلنا نوعى** للخطر و **نتشارك** في الإجراءات التالية:.....

Espitalia: Antibiotics*:* "It's crucial that we **all stay aware** of the risks and **participate** in the following measures: …"

Egychology الفطر الأسود: المعركة ضد الوباء العالمي لسه مستمرة **فخلونا ناخد** احتياطنا لسلامتنا و سلامة أهلنا

*Egychology: Black Fungus: "*The fight against the global epidemic is still ongoing, **so let's take** precautions for our safety and the safety of our **loved ones**."

Some of the action calling is limited to the channel itself when the YouTuber asks the audience to like, share and subscribe to the channel or even to pick the topic of the next episode. This would guarantee the constant connection between the YouTuber and the viewers, guaranteeing them becoming avid supporters and followers and hence maintain the publicity and dissemination of science to the non- specialist.

علم تيوب ,الفلوس القذرة: **اكتبوا** لنا في التعليقات تحت ايه طريقة الدفع اللي بتستعملوها حاليا ..... و **متنسوش ال like و ال share**

ElmTube: Dirty Money: "**Write to us** in the comments below what payment method you currently use… And **don't forget** to like and share!

الدحيح, البطارية: **عايزك تختار** أصعب موضوع **عندك** في المنهج، و**تكتبه** في التعليقات، وأكتر موضوع هياخد "لايكات"، هفكر، يمكن أعمل عنه حلقة.

*ELDaheeh: The Battery: "***Pick** the hardest topic in **your syllabus** and **write it** in the comments. The topic that gets the most **likes**—I'll consider making an episode about it!"

M 7 Closing the video

All speakers of the selected videos employ *Move 7* to close the episodes with a quote that they repeat at the end of each of their videos and hence become memorable by the audience. Espitalia, for instance, extends wishes for health and recovery, achieving rapport with the audience and relating to the medical cases usually discussed in the episodes.

الاسبتالية: كل امنياتي بالشفا والقوة لكل محاربي الامراض في كل مكان.

"All my wishes for healing and strength to all warriors battling illness everywhere."

Egychology opts for emphasizing the rationale behind the channel; that's spreading knowledge and expertise via saying:

و كالعادة لازم **ننور** الضلمة

"As always, we must illuminate the darkness."

Similarly, Pharmastan ends with sharing wisdom about how humans could be more threatening to themselves than any other creature. This could be relevant to the topics discussed in the videos which mainly deal with drugs and medications – powerful substances that, if used unwisely, could be extremely hazardous or even lethal.

فارمستان: **خليك فاكر** دايما ان مفيش كائن في الدنيا ممكن يكون خطر على الإنسان غير الانسان نفسه. اشوفكم الحلقة الجاية.

***Pharmastan:* Always remember**, there's no creature in the world that can be more dangerous to humans than humans themselves. See you in the next episode!

6. Multimodal Analysis

Scientific discourse is characterized by being multi- semiotic, relying not only on linguistic tools but also non-linguistics ones, which Lemke, 1998 calls "semiotic hybrids". This may clarify why scientific content creators should be very careful in constructing the kind of visual material projected on the screen. In fact, it can make all the difference in explaining and simplifying their content. Analyzing the multimodal aspects of the selected videos helps identify the communicative, cognitive and rhetorical functions connected with the moves and steps achieved verbally and analyzed in the previous section. Synchronicity between verbal and non-verbal components is crucial for the viewers to be able to follow what is being projected on the screen (visual) and what is being heard (verbal).

6.1. Multimodal analysis: typology of visuals

Based on the framework proposed by Bertin (1973), Rowley-Jolivet (2002) analyzed the visual component in scientific conference papers and identified a four-part typology of visuals; Graphical (monosemic), Figurative (polysemic), Scriptural (text) and Numerical (mathematical).

Likewise, in her analysis of TED Talks, Xia (2021, 2023) detected five types of visuals used by TED speakers: Figurative I, Figurative II, Figurative III, Graphical and Scriptural (see Figure 2).

Figure 2

Figurative visuals refer to polysemic images that have multiple interpretations and hence may create ambiguity for viewers and generally require explanation from YouTubers. This type includes three sub-types: Figurative I (ordinary photos with no added photographic techniques) (Figure 3), Figurative II (photos with added photographic techniques like X-rays, MRI and ultrasound (which cannot be found in the selected videos). This sub-type employs photographic techniques to enhance the image, emphasizing a specific feature of the real object. The visual elements remain open to interpretation, allowing for diverse perspectives.

Figurative III includes drawings and caricatures representing a scientific phenomenon. (Figure 4).

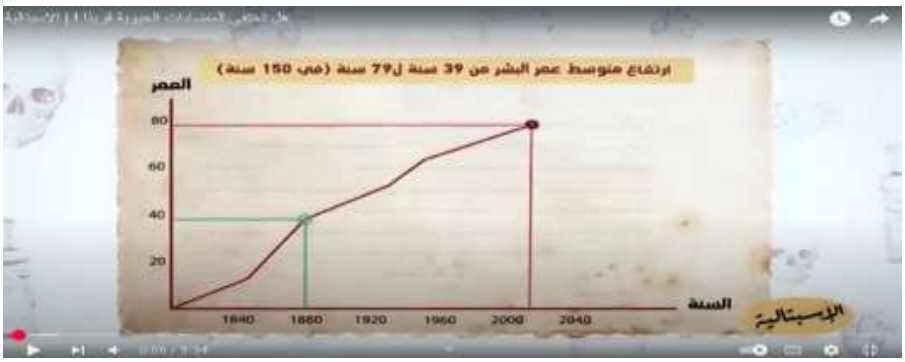
Figure 3
Figurative I
Espitalia: Antibiotics

Figure 4
Figurative III
El Daheeh: The battery

To elaborate, the photo in *Figure 3* shows an agricultural tractor at work. Without further explanation from the content creator, one can have multiple interpretations about the relevance of this photo to the issue of antibiotics. However, the accompanying voice over explains that it is related to humans' control over the land by cultivating it, using tractors, overlooking the fact that tiny creatures, like microbes, can be more powerful. To combat them, humans use antibiotics.

Figure 4 demonstrates a drawing of the scientific experiment showing how the Volta battery was first invented. The snapshot depicts a stack of alternating zinc and silver disks, separated by fabric soaked in salty water, forming the first known battery capable of generating electricity. Without the accompanying description and explanation, the viewers may have trouble interpreting the drawing or may provide multiple readings.

Figure 5
Graphical
Espitalia: Antibiotics



Graphical visuals (Figure 5) are considered monosemic with only one specific meaning for each element such as bar/pie charts or tables. These images are intentionally structured, with each element carrying a distinct, predefined meaning. The components whether denoting numerical values, time, or temperature, are represented by a single variable, to eliminate ambiguity in understanding the final graphic. The chart represented in Figure 5 shows a horizontal axis, indicating the years of the study and the vertical axis, representing humans' age over these years. The graph shows that the average age is getting higher over the years, possibly due to the introduction of antibiotics. No other interpretation could be deduced.

Scriptural visuals usually involve writing or text that appears on screen to provide information either in Arabic or English, like infographics, sometimes fully occupying the frame or with the YouTuber in the background or on the side (Figure 6).

Figure 6
Scriptural

		
Egychology: Black fungus	Espitalia: Euthanasia	ElDaheeh: Immunotherapy

In her analysis of TED Talks, Xia (2021; 2023) found heavy reliance on visuals (specifically Figurative I and Graphical) mainly in Move 5, Developing the topic. In the present study, apart from the presence of the YouTuber either in the center or on one side of the frame, the most prevailing type of visuals in the selected videos is the scriptural (found in 100% of the videos). They are mainly in English and sometimes in Arabic. Usually, dates, percentages, names of scientists, medical cases or drugs are written in English. The YouTuber appeals to the viewers' multiple senses by verbalizing the script that concurrently appears on the screen. It is as if there is a teacher highlighting the intricate parts on the board to facilitate learning for students. Using such visual elements is designed to present complex information in a clear and engaging way.

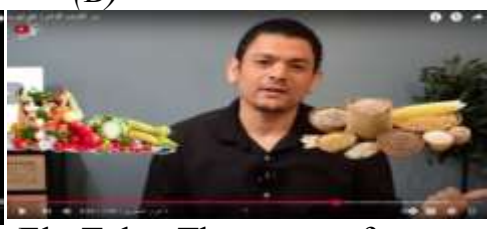
The second most salient type of visual is Figurative I (Figure 7), either with the YouTuber in the frame or with the visual filling the whole frame. These ordinary photos could be photos of ordinary people or scientists, medical conditions, food items, lab equipment, etc... "A possible explanation for this is that figurative visuals are more concrete and therefore accessible to the lay audience targeted" (Xia 2021, p.128). This may explain why they dominate the selected videos that aim to simplify science.

Figure 7

Figurative I (the second most salient type of visuals)

(A) *(B)*

Pharmastan : Sarin



ElmTube: The secret of eternal youth

The two Figurative I visuals in Figure 7 carry multiple meanings minimized into one meaning through the explanation concurrently provided by the content creator. In Figure 7 (*A)*, there is a photo of a child wearing an oxygen mask occupying the whole frame. The voice over cites one incident where Sarin was used by the Syrian government in 2017 to target civilians in Khan Shaykhun, mostly women and children. The combined effect of pity for children and fear of the dangers of Sarin is achieved by integrating both visual and verbal elements.

In Figure 7 (B), the YouTuber appears in a close shot in the center of the frame with photos of fruits and vegetables on one side and whole grains on the other side of the frame. The photos demonstrate the suitable diet for the healthy lifestyle led by centenarians which relates to the topic of the episode disclosing the secret of eternal youth. Therefore, relevance of the photo to the accompanying script reinforces the message effectively making the content clearer and more accessible by non-expert viewers.

In both types of data, the transcription of shots of videos shows heavy reliance on visuals in most of the moves with their respective steps. The shots may include either visuals only filling the frame or visuals with the YouTuber in the same frame, which also means that visuals are influential in simplifying any content that could be complicated for the non- specialists. It is like show and tell.

6.2. Multimodal analysis: moves and transcription

The current study adopts the multimodal transcription model of Baldry and Thibault (2006) which provides two modes of multimodal transcription: macro and micro. The first is macro-transcription which gives more of a general view of the meaning conveyed in the complete video, emphasizing its phases and sub-phases. In the present study, the videos are divided into phases representing the macrophases and pertaining to the move structure of the videos (see Appendix B). Baldry and Thibault define a phase as "a set of co-patterned semiotic selections that are co-deployed in a consistent way over a given stretch of text" (p. 47). A macrophase consists of multiple phases combined at high scale through some consistent connections. Hence, a move would be considered a unit similar to the macrophase comprising of connected phases, achieving the same communicative purpose. The study focuses on what is thought to be the most important move, i.e. *M5 developing the topic* since it occupies the largest part and could be realized through various steps that are sometimes repeated and/or recycled.

Appendix B illustrates how the whole episode of *Aspirin* from *Pharmastan* is organized into phases and subphases corresponding to the moves and steps identified in the move analysis of the selected videos (See Section 5.1). This is where the two models of analysis integrate.

The second mode is micro-transcription which provides a detailed analysis of the relevant semiotic resources combined. The shots, in each phase, are transcribed multi-modally, having in consideration the represented participants, the angle, height and size of the shots as well as gestures, speech and use of visuals.

Table 2 shows the analysis of the transition point (j) and phase (k) from the macrophase representing *M5 Developing the topic move*. The phase is split into shots, where a shot is "a filmed visual sequence in which there is no spatial displacement of the camera" (Baldry & Thibault, 2006, p.187). The table begins with a transition fading out into a yellow screen after which appears the YouTtuber, discussing what he believes to be 'the most important question in the video'. "The transition point may be characterized by a gradual merging of features from the two phases in question as one phase

decays or fades out and the other comes into being" (p. 185). Textually, transitions between phases help organize the composition of the parts of the video allowing the viewers to focus and prepare for the point that follows.

The transcription is summarized in a six- column table (See Table 2). Column 1 (C.1) shows the time (T.) (in seconds) of the visual frame while Column 2 (C.2) includes the frame itself. Column 3 (C.3) specifies visual information regarding the camera position (CP), distance (D), visual collocation (VC), visual salience (VS), colour (CO) and visual focus (VF). Column 4 (C.4) describes the gestures and movements of the represented participants in the shot. In Column 5 (C.5), speech, music and other sounds are transcribed. Column 6 (C.6) represents the metafunctional interpretation, connecting the components in the other columns together in terms of the metafunctions of interpersonal (INT), experiential (EXP), and textual (TXT).

The experiential metafunction is associated with the viewers' investigation of the represented participants, the processes, the world and the related circumstances. In the phase described as well as most of the selected videos, the YouTuber, usually in the center, is the only represented participant in the frame together with the other elements they choose to have in the background. In the analyzed video, on the left, there is a silver play button YouTube creator award and a light fixture on the right. To get this award, a YouTuber should have 100,000 subscribers on the channel. Possibly, the YouTuber wants to show how his channel is well recognized and encourage others to subscribe. Some other YouTubers may have a bookcase, a standing lamp, a desk or photo frames in the background. Textually, the phase is coherent via the unified presence of the Actor and the same setting as cohesive ties.

As for the interpersonal metafunction, the camera position is usually stationary with horizontal direct perspective in the selected videos, emphasizing proximity with viewers. "If, finally, the picture is at eye level, then the point of view is one of equality and there is no power difference involved" (Kress & van Leeuwen, 2006, p.140). To show closeness to their viewers, most YouTubers in the selected videos appear in CS = *Close shot* (head and

shoulders) or MCS = *Medium close shot* (human figure cut off at waist). The represented participant's gaze (in this case the YouTubers) is generally engaged, addressed towards the audience. "[P]articipants who look directly at the viewer simulate an interactive relation with the viewer" (Baldry &Thibault, 2006, p. 201). According to Kress and van Leeuwen (2006), it is a demand; "the participant's gaze (and the gesture, if present) demands something from the viewer, demands that the viewer enter into some kind of imaginary relation with him or her" (p. 118).

All semiotic affordances in the frame integrate to achieve the intended communicative purpose, including hand gestures. For instance, to realize *Step 5a Raising a sub-question*, the YouTuber addresses the audience, using an interrogative structure accompanied by raising his hands forming the O shape to show the importance of the question and attract the audience attention to follow for answers (shot 1). *Step 5b answering a sub- question* is realized via language (Soundtrack C.5) and hand gestures counting the causes of blood clots, while the scriptural visuals appear simultaneously on the screen (shots 7, 8 & 9). This is repeated and recycled not only on this channel but also in most of the selected videos in the present study. Thus, on the textual, interpersonal and experiential levels, the YouTubers in the selected videos make full use of the available multimodal resources to create an intimate relationship with the audience that enables them to disseminate scientific knowledge.

Table 2

Analysis of transition point (j) and phase (k) according to Baldry and Thibault (2006)

T.	Visual Frame	Visual Image	Kinesic Action	Sound track	Meta-functional Interpreta-tion
C. 1	C. 2	C. 3	C. 4	C. 5	C. 6

Transition		< yellow screen			**TXT:** organize the division between phases
1 **6:12**		CP: stationary HP: direct D: MCS VC: in studio, silver play button YouTube creator award on the left, a light fixture on the right VS: YouTuber alone CO: naturalistic VF: close; directed at audience	The YouTuber raises both hands with the OK hand gesture, with all fingers curved to form an O shape.	[☺♂] وصلنا بقى لأهم سؤال في الحلقة We have reached the most importa nt question in the episode.	**EXP:** Actor (YouTuber addressing viewers) **INT:** YouTuber identifies with viewers in demand image in the shots. **TXT:** The YouTuber's presence and voice with the same background and setting as cohesive ties.
2 **6: 19**		↓	The YouTuber uses his left hand to refer to one of the two reasons people use Aspirin for.	[☺♂] هل كل اللي سنهم اكبر من 40 سنه لازم ياخدوا اسبرين دايما عشان يحموا نفسهم من الجلطات	As in shot 1

				والنوبات القلبيه؟ Do all people over the age of 40 have to take aspirin regularly to protect themselves from clots and heart attacks?	
3 6: 24			The YouTuber closes both hands as if shaking them together while stating the famous saying	[☺♂] كان في جمله مشهوره بتتقال زمان ان اي حد بعد سن الاربعين لازم ياخذ اسبرين. There was a famous saying in the past that anyone over the age of forty	As in shot 1

				must take aspirin.	
4 **6: 26**		↓	The YouTuber closes both hands and extends them, pointing to the audience as he answers the question.	وفي الواقع الكلام ده مش صح In fact, this is not correct.	As in shot 1
5 **6: 27**		CP: stationary HP: direct D: MCS VC: in studio, silver play button YouTube creator award on the left, a light fixture on the right VS: YouTuber alone CO: naturalistic VF: close; extended off screen upward	↓	[☺♂] او ما بقاش صح Or… it's no longer correct.	As in shot 1
6 **6: 28**		CP: stationary HP: direct D: MCS	The YouTuber extends the left hand as	[☺♂] لأن النوبات والجلطات	As in shot 1

		VC: in studio, silver play button YouTube creator award on the left, a light fixture on the right VS: YouTuber alone CO: naturalistic VF: close; directed at audience	he clarifies the main point.	اسبابها كتيره جدا وعوامل الخطر بتاعتها مش هيقدر يوقفها الاسبرين لوحده. Because heart attacks and clots have many causes, and their risk factors cannot be stopped by aspirin alone.	As in shot 1
7 **6: 36**		CP: stationary HP: direct D: MCS VC: in studio, silver play button YouTube creator award on the left, a light fixture on the right VS: YouTuber alone, script	The YouTuber uses his left hand to count the number of causes behind blood clots on his right hand	يعني مثلا من اشهر الاسباب السمنة وزياده معدل الكوليسترو ل في الجسم I mean, for example, one of the most	

		on the right side CO: naturalistic VF: close; extended off screen upward		common causes is obesity and an increased cholesterol level in the body.	
8 **6: 37**		↓	The YouTuber raises the left hand with the OK hand gesture, with all fingers curved to form an O shape.	[☺♂] تحديدا الكوليسترول الضار او ال دي ال Specifically, I refer to bad cholesterol or LDL.	As in shot 1
9 **6: 42**		↓	The YouTuber uses his right hand to show the four causes behind blood clots	[☺♂] عندنا كمان امراض زي السكر والضغط وعندنا كمان التدخين We also have diseases like diabetes and high blood pressure, besides	As in shot 1

				smoking .	
10 **6: 43**		CP: stationary HP: direct D: MCS VC: in studio, silver play button YouTube creator award on the left, a light fixture on the right VS: YouTuber alone CO: naturalistic VF: close; directed at audience	The YouTuber raises both hands to face the audience with a rounded shape to indicate the unity between causes behind blood clots.	[☺♂] العوامل دي بقى كلها لما بتتجمع او حتى من غير ما تتجمع فالاسبرين ساعتها لوحده مش هيقدر ينقذك All these factors, whether they combine or not, aspirin alone won't be able to save you at that point.	As in shot 1
11 **6: 52**			The YouTuber extends both hands on both sides facing downwards to show lack of	[☺♂] ما هو مش طبيعي برده يا جماعه ان الواحد يبقى لي النهار مقض وحلويات مفخد قاعد	As in shot 1

			movement or activity.	ومش بيلعب رياضة ولا حتى بيتمشي It's not normal, guys, for someone to spend the whole day eating sweets, sitting around, lounging, and not exercising or even walking.	As in shot 1
12 6: 55		↓	The YouTuber raises his right hand waving in indifference to show people's attitude.	[☺♂] ونقول في الاخر مش مهم انا كده كده باخد اسبرين عشان الجلطات. And in the end, we say it doesn't matter, I	

				take aspirin anyway for clots.	

7. Linguistic and stylistic features:

Simplifying science to non-specialists requires the use of clear, accessible language and an appropriate style, making complex concepts easier for understanding. The titles chosen by the content creators for their channels and episodes (see Section 4 & Appendix A) are one of the strategies they utilize to attract their audience. YouTubers are inclined to use simple everyday language that is closer and easier to lay viewers. "They therefore tend to avoid jargon and offer an immediate gloss" (Hyland 2010, p.10). Clarifications, exemplifications and definitions are recurrently added, especially that shared knowledge cannot be constantly assumed.

Code -switching to English is mainly used when referring to scientific terminology, elements, drugs or names of foreign scientists, etc. This is usually accompanied by a photo of the scientist or the mentioned element or an English scriptural visual of the scientific data (see Section 5.1). This strategy is also thought to maintain credibility by mentioning the source of the information they report.

YouTubers in the selected videos adopt a predominantly engaging and conversational style. Hyland, 2010 states that engagement is important to attain proximity to audience by recognizing their presence "pulling them along with their argument, focusing their attention, acknowledging their uncertainties, including them as discourse participants, and guiding them to interpretations" (p.16). They frequently use second person pronouns and the inclusive 'we' (See Section 4.1). Moreover, they prefer colloquial Arabic over classical, a key feature of conversationalization according to Fairclough (1992). "Conversationalization includes colloquial vocabulary; phonic, prosodic, and paralinguistic features of colloquial language " (p. 247).

The address terms used equally build a connection and intimacy with the viewers, such as:

Guys يا جماعة Man, يا عم

my dear يا عزيزي ,Dear (beautiful) viewer (الجميل) عزيزي المشاهد

The former two address terms use colloquial and informal language to help build rapport with their viewers. The latter two suggest a warm, personal, polite yet rather formal address to the audience of a broadcast context. With the insertion of the word "beautiful" , the address turns into flattering and even humorous, adding to the engagement between the YouTuber and viewers.

The content creators anticipate the viewers' "expectations and responses to participate in what amounts to a virtual dialogue with them" (Hyland, 2009, p.111). They even imagine a dialogue with the audience where they predict the questions arising based on the issues discussed as in:

Someone comes and asks me...	-ييجي حد يسألني
Of course, the question that's going to come to your mind is…	-طبعا السؤال اللي هييجي في بالك هو…
I hear you, the one saying that…	-سامعك يا اللي بتقول ان…

During such imaginary dialogue, they would assign address terms for themselves as well. Ahmad El Ghandour in ElDaheeh would be addressed as أبو حميد (Abu-hemeid) which is a popular Egyptian nickname for Ahmad. Similarly, Dr. Ahmad Ibrahim in ElmTube, being an Upper Egyptian (Saidi), would be addressed as أبو خالو (Abu-khalo) which is a familiar address term in the Saidi culture. All these nicknames could be used to show closeness.

It appears as if the speakers are engaged in a conversation with the audience that is mostly light and sometimes humorous as in El Daheeh. The following example is from The Battery episode which simplifies electrochemistry for secondary school students.

Let's take an example:	خلّينا ناخد مثال..
"**Abu- Hemeid**, is this going to be on the exam?"	**(أبو حميد)**، ده هييجي في الامتحان؟
No, my dear, do I look like *Al-Gomhuria* newspaper? Focus!"	لا، يا **عزيزي**، هو أنا جريدة "الجمهورية"؟ ركز!

It illustrates a playful hypothetical dialogue between the YouTuber and the viewers where he suggests providing an example to clarify a scientific point. He imagines the students asking whether this example would appear in their exam. The YouTuber replies with a touch of sarcasm that he is not "*Al-Gomhuria* newspaper" which is known for publishing model exam questions for secondary school students.

Generally, the language used helps get closer to the audience, building rapport and serving the communicative purpose of simplifying and popularizing science. The young people watching feel they are having a class with their private tutor who is familiar with the way they think and interact. He predicts their questions and answers them in advance.

8. Limitations and further research

The data for this study were randomly selected from five YouTube channels that present scientific content alongside other topics. However, only videos focusing on scientific issues were randomly selected for analysis. However, an alternative criterion could have involved selecting data based on the number of views or reviews. Incorporating such factors might have enhanced the validity of the selection process by reflecting public opinion. Nevertheless, this approach could also introduce bias towards more popular content, possibly disregarding less viewed but scientifically valuable material.

Al Daheeh YouTube channel stands out as a unique channel due to distinctive features. ElDaheeh is believed to be the most popular Arabic channel, presenting this kind of content, with more than two million subscribers. The channel benefits from a comprehensive dedicated production team behind the camera,

responsible for writing the script, verifying sources, filming, editing the episodes, providing guidance and sponsorship (Zawaya_ly, 2024, WAM, 2024). In addition to the charismatic character of the content creator, Ahmad El Ghandour, these advantages significantly come in favor of EL Daheeh over the other channels. Moreover, it is the only channel that begins its episodes with a light skit that becomes a signature awaited by its viewers. Section 5.1. deals with this peculiar feature as part of the discussion of M1 (the first of the introductory moves) in the move analysis. Nonetheless, it was not given due attention since it is only present in El Daheeh and not any of the other channels that comprise the data of the present research.

Therefore, further research could tackle El Daheeh channel in detail analyzing its peculiar features whether visual or verbal. Pedagogically, those involved in designing teaching materials or educational programs could benefit from the techniques used in these scientific videos to make their productions more like interactive edutainment especially for young learners. Additionally, foreign YouTube science channels broadcasting similar content such as Veritasium Vsauce, scishow, etc could be an area of research especially if compared to the Egyptian channels.

Moreover, just as argumentation and topoi have been used in Arab socio-religious didactic TV shows for persuasion and raising public awareness (Mounir et al., 2025), they can also be explored in Egyptian scientific YouTube videos to showcase their persuasive and communicative functions.

Finally, the selected videos are primarily from YouTube channels hosted by male YouTubers, except for Eman El Emam. This highlights a potential area for further research: exploring gender differences between male and female content creators. By collecting a broader range of videos produced by female YouTubers, it would be possible to investigate whether and how

gender impacts content creation styles, themes, or audience engagement.

9. Conclusion

The current study adopts a multimodal genre analysis of Egyptian scientific videos with the aim of depicting how science is simplified and popularized among the non-specialists, using the same model used by Xia 2021, 2023 to scrutinize TED Talk videos. To achieve their communicative purpose, the YouTubers make full use of the available verbal and non-verbal resources. The analysis proves the Egyptian scientific videos to be a distinctive genre with a specific move structure that revolves around seven moves and their corresponding steps all of which serve unified communicative purposes. Some of the moves are obligatory; others are optional and recurrently used by the YouTubers in the selected videos. The analysis demonstrates that the most important move is *M5 Developing the topic* where the different steps employ multiple strategies to clarify the complex scientific areas. Nonetheless, the introductory and the concluding moves both include steps that help engage and get closer to the viewers. Such strategy adds to the connection between YouTubers and their audience.

Furthermore, the multimodal analysis demonstrates how employing visual resources can facilitate the simplification and dissemination of scientific content. With regard to the types of visuals, the prevalence of mainly scriptural and figurative I visuals reflects the strategic use of these visuals to achieve the main purposes of making science more accessible by non- experts. As for the multimodal transcription, the results demonstrate the effective exploitation of visual, kiensic and linguistic elements to simplify the intricate scientific content. Moreover, the macrophases in the videos are divided into phases and subphases corresponding to the pattern of moves and steps, collaborating the two tools into a unified model for analysis as used by Xia (20221, 2023).

On comparing the two types of data and the two models for analysis in the present study and those utilized by Xia (2021, 2023), it appears that they both share similar communicative purposes, as

well as many of the techniques used to achieve them. Xia's 2021, 2023 model proves to be useful and fitting for the Egyptian scientific content, with some modifications to suit the selected data. Finally, the integration between the models of genre analysis and Baldry and Thibault's multimodal transcription model (2006) together with the typology of visuals (Rowley- Jolivet, 2002) has yielded a unique model that can be used to analyze not only scientific but also other genres.

References

Baldry, A. & Thibault, P.J. (2006). *Multimodal transcription and text analysis: a multimodal toolkit and coursebook.* London: Equinox.

Bertin, J. (1973). *Sémiologie graphique* (2nd ed.). Paris: Gauthier-Villars press.

Carter-Thomas, Shirley and Rowley-Jolivet, Elizabeth. (2003). Analysing the scientific conference presentation (CP), A methodological overview of a multimodal genre. *ASp, 39-40*, 1-18. https://doi.org/10.4000/asp.1295

Chang, Y. & Huang, H. (2015). Exploring TED talks as a pedagogical resource for oral presentations: A corpus-based move analysis. *English Teaching & Learning,, 39*(4), 29-62. doi:10.6330/ETL.2015.39.4.02

Fairclough, N. (1992). Discursive practices of consumerism. *Selected papers on theoretical and applied linguistics, 6*, 237- 261. doi:doi.org/10.26262/istal.v6i0.7119

Guangwei, Hu and Yanhua, Liu. (2018). Three minute thesis presentations as an academic genre: A cross-disciplinary study. *Journal of English for Academic Purposes, 35*, 16-30. doi:https://doi.org/10.1016/j.jeap.2018.06.004

Hilgarter, S. (1990). The dominant view of popularization: Conceptual problems and political uses. *Social Studies of Science, 20*(3), 519-539.

Hyland, K. (2009). Corpus informed discourse analysis: The case of academic engagement. In M. a. Charles, *Academic Writing: At the Interface of Corpus and Discourse.* (pp. 110-128). London: Continuum.

Hyland, K. (2010). Constructing proximity: Relating to readers in popular and professional science. *Journal of English for Academic Purposes, 9*(2), 116-127. doi:doi:10.1016/j.jeap.2010.02.003

Hyon, S. (1996). Genre in Three Traditions: Implications for ESL. *TESOL quarterly, 30*(4), 693-722. doi:https://doi.org/10.2307/3587930

Jewitt, C., Bezemer, J., O'Halloran, K.L. (2016). *Introducing Multimodality.* Routledge.

Kress, G. (2010). *Multimodality A social semiotic approach to contemporary communication.* Routledge.

Kress, G., & van Leeuwen, T. (2006). *Reading Images: The Grammar of Visual Design* (2nd ed. ed.). London: Routledge.

Lemke, J. (1998). Multiplying meaning: visual and verbal semiotic in scientific text. In J. M. Veel, *Reading science* (pp. 87- 113). London: Routledge.

Luzón, M. (2013). (Public communication of science in blogs: Recontextualizing scientific discourse for a diversified audience. *Written Communication, , 30* (4), 428 – 457. doi:https://doi.org/10.1177/0741088313493610

Luzón, M. (2019). Bridging the gap between experts and publics: the role of multimodality in disseminating research in online videos. *Journal of the European Association of Languages for Specific Purposes, 37*, 167-192.

Martin, J. R., Christie, F., & Rothery, J. (1987). Social process in education: A reply to Sawyer and Watson <and others>. In I. Reid (Ed.), *The place of genre in learning* (pp. 58-82). Geelong: Australia Deakin University.

Mehlenbacher, A. (2017). Crowdfunding Science: Exigencies and Strategies in an Emerging Genre of Science Communication. *Technical Communication Quarterly.* doi:26. 10.1080/10572252.2017.1287361.

Miller, C. (1984). Genre as social action. *Quarterly Journal of Speech, 70*(2), 151-167.

Miranda, J., & Moritz, M. (2021). TED Talks: A Genre Analysis. *Revistsa X, 16*(6), 1552–1573. doi:https://doi.org/10.5380/rvx.v16i6.82070

Mounir, N., Attia, M.F. & Farag, S.F. (2025). Exploring Classification and Functions of Topoi as Rhetorical Features in Arab Didactic Socio-Religious TV Shows. *International Journal of Arabic-English Studies*. doi:https://doi.org/10.33806/ijaes632

Rowley- Jolivet, E. (2002). Visual discoure in scientific confernce papers A genre based study. *ESP, 21*(1), 19-40. doi:doi.org/10.1016/S0889-4906(00)00024-7

Rowley-Jolivet, Elizabeth and Carter-Thomas, Shirley. (2023). "Research goes digital: A challenge for genre analysis?". *ASp, 84* , 15-40. doi: https://doi.org/10.4000/asp.8423

Swales, J. (1990). *Genre Analysis: English in academic and research settings.* Cambridge: Cambridge University Press.

Swales, J. (2004). *Research genres: Explorations and applications.* New York: Cambridge University Press.

WAM. (2024, January 10). *WAM*. (E. N. WAM, Producer) Retrieved from https://www.wam.ae/article/b12xvyy

Xia, S. (2021). *Popularizing Science in the Digital Era: A Multimodal Genre Analysis of TED Talk Videos* . Hong Kong: Doctoral dissertation.

Xia, S. (2023). Explaining science to the non-specialist online audience: A multimodal genre analysis on TED Talks Videos. *English for Specific Purposes, 70*, 70 -85. doi:https://doi.org/10.1016/j.esp.2022.11.007

Ye, Y. (2021). From abstracts to "60-second science" podcasts: Reformulation of. *Journal of English for Academic Purposes, 53*, 2-13. doi:https://doi.org/10.1016/j.jeap.2021.101025

zawaya_ly. (2024, 12 20). انا بحب اتفرج على الدحيح. tiktok. Retrieved from https://www.tiktok.com/@zawaya_ly/video/7450429846645165318?lang=ar

Appendix A:

Data selected

YouTube channel	YouTuber	Episode title	Date	Duration (minutes)
Al Dahee h	Ahmad ElGhandour	العلاج المناعي Immunotherapy	9 Mar. 2019	11:52

		The البطارية Battery	20 Jun. 2023	29:09
Espitalia الاسبتالية	Eman El Emam	القتل الرحيم- حق المريض في الموت Euthanasia- Patients' right to die!	29 Jun. 2016	8:55
		المضادات الحيوية Antibiotics	19 Nov. 2021	9:34
Pharmasta فارمستان	Ali Ammar	استخدام مادة السارين Use of Sarin	17 Sep. 2017	3:44
		Aspirin الاسبرين	5 Jun. 2023	12:18
Egychology ايجيكولوجي	Ahmad Samir	ليه مبنعرفش نركز و احنا بنذاكر؟ Why can't we concentrate while studying?	30 Dec. 2015	1:49
		الفطر الأسود Black Fungus	2 Jun. 2021	8:28
Elm tube علم تيوب	Dr. Ahmad Ibrahim	Dirty الفلوس القذرة money- Amazon Go	5 Apr. 2018	4:00
		سر الشباب الدائم The secrets of eternal youth	8 Jun. 2023	7:05

Appendix B:

Summary of the move structure and macrophases and phases in *Pharmastan, Aspirin*

Move structure	Macro-phases	Phases	Description of phases
M2 Introducing the topic	Lead-in-story	a.	The episode starts with an anecdote about a recurrent situation at an Egyptian pharmacy where you may be asked to take the change in the form of a strip of Aspirin or Rivo.
	Highlighting the importance of the topic	b.	What is it with Aspirin that Egyptians love it and deal with it as a remedy to every disease? It is believed to cure many symptoms.
M 5 Developing the topic	Raising a sub-question and answering a sub-question	c.	How was it discovered? Its scientific name, history and origin are fully explained.
	Providing a solution to a problem	d.	Scientists discovered that the salicylic acid in tis raw form tastes really bad at first and had to add other substances to make it taste better and hence Aspirin is invented.
	Adding information to a sub-topic	e.	In Egypt, we have two concentrations of Aspirin and Rivo.

	Raising a sub-question and answering a sub-question	f.	How does Aspirin work both as pain killer and anti-coagulant? The first usage is historically related.
	Raising a sub-question and answering a sub-question	g.	How does Aspirin work on pain? A scientist named John Van discovered the mechanism and the YouTuber explained it in detail.
	Transition point	h.	The YouTuber expects that a question would pop into the viewers' minds.
	Raising a sub-question and answering a sub-question	i.	Why does a low concentration doze of Aspirin cause fluidity, while a high concentration does not?" The answer has to do with how it works in the human body.
	Transition point	j.	Here comes the most important question in the episode.
	Raising a sub-question and answering a sub-question	k.	Should all people over 40 take Aspirin as a protection of coagula? Not true and it is fully clarified.

	Raising a sub-question and answering a sub-question	l.	Some people believe that one tablet would not hurt. However, it proves to hurt and may lead to fluidity and sometimes bleeding.
	Raising a sub- topic and developing the sub-topic	m.	Taking Aspirin when unneeded may be hazardous for one's health and not preventive unless it is prescribed.
	Transition point	n.	Before discussing the side effects, the YouTuber stops to clarify an important point about Aspirin and Reye's syndrome,
	Adding information to a sub-topic	o.	The types of Aspirin that Egyptians give to their children, because the package tells it is for kids, may be harmful.
	Raising a sub- topic and developing the sub-topic	p.	Side effects of Aspirin are mentioned and scientifically clarified.
M 7 Concluding the video	Giving advice	q.	The YouTuber advises the audience to lead a healthy life by practicing sports and keeping a balanced diet and be grateful for God's blessings.

	Greeting or closing phrase	r.	Always remember that no creature in the world can be a danger to humans more than humans themselves."