Verbal and visual resources in graphical abstracts: Analyzing patterns of knowledge presentation in digital genres

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Abstract

Nowadays, open science communication is facilitated with the affordance of multimodal semiotic resources. Against this backdrop, graphical abstracts have emerged as a digitally mediated genre and have become an important means of knowledge communication in academic settings. While its interactive visual designs have been discussed in the literature, the rhetorical patterns of verbal and visual resources used in this genre warrant more empirical investigation. Therefore, based on a corpus of 90 graphical abstracts from journals in biology, chemistry and engineering, this study explores the organizational use of verbal and visual resources to mediate knowledge presentation. Five moves were identified in the textual components of the graphical abstract: reference to visuals, research background, report of results, interpretation of results, and implications or applications of the research. Furthermore, we examined what and how contents are visualized in the graphical abstracts. We found that the most visually displayed contents are the results and the overview of research, and that the duplication of pictures in the full article is a dominant source of the graphical abstracts. Additionally, the most commonly used layout patterns in the graphical abstracts are narratives or 'evolutions'.

Keywords: graphical abstracts, digital genres, verbal text, move analysis

Resumen

Recursos verbales y visuales en el resumen gráfico: Un análisis de los patrones de presentación del conocimiento en los géneros digitales

Hoy en día, los recursos semióticos multimodales han facilitado la comunicación de la ciencia abierta. En este contexto, los resúmenes gráficos han surgido como

un género digital que se ha convertido en un medio importante de comunicación del conocimiento en contextos académicos. Si bien sus diseños visuales interactivos se han discutido en la literatura, los patrones retóricos de los recursos verbales y visuales utilizados en este género merecen más estudios empíricos. Por lo tanto, basado en un corpus de 90 resúmenes gráficos de revistas académicas de biología, química e ingeniería, este estudio explora cómo se organizan los recursos verbales y visuales para presentar el conocimiento. En los componentes textuales del resumen gráfico se identificaron cinco movimientos: referencia a la imagen, antecedentes de la investigación, descripción de resultados, interpretación de resultados, e implicaciones o aplicaciones de la investigación. Además, examinamos qué contenidos se visualizan y cómo en los resúmenes gráficos y descubrimos que la mayoría presentan sus resultados y antecedentes de la investigación y que la duplicación de imágenes originales del artículo es frecuente. Además, los patrones de diseño más comunes incluyen patrones narrativos o 'evolutivos'.

Palabras clave: resumen gráfico, géneros digitales, texto verbal en resúmenes gráficos, análisis de movimientos retóricos

1. Introduction

Nowadays, web 2.0 technology facilitates scholarly communication and enables researchers to access, generate, and disseminate knowledge more quickly than before, thus contributing to the creation and progress of open science. Open science is concerned with "the transparent and accessible knowledge that is shared and developed through collaborative networks" (Vicente-Saez & Martinez-Fuentes, 2018, p. 434). It, therefore, promotes the wide accessibility of academic knowledge to scholars in the digital world.

Scientific communication has become increasingly reliant on visual presentations with the aid of digitalization (Bucher & Niemann, 2012), and knowledge exchange and dissemination are enhanced by multimodal resources. The increased multimodality in scientific knowledge production motivates the emergence of a range of digital genres, such as electronic posters and embedded videos, which "provide researchers an easier and efficient way to meet their need for making science accessible to a wider audience" (Fecher & Friesike, 2014, p. 34). Research has extended the scope of investigation from printed articles to digital genres in order to explore how these genres support open science communication practices. Pérez-Llantada (2021) presents a number of add-on genres that are used to

complement the conventional genre of journal articles in digital platforms, including highlights (Akbaş & Farnia, 2021), audioslides (Yang, 2017), and author summaries (Breeze, 2016). These digital genres facilitate the broad flow of scientific knowledge and overcome printing limitations and publication threshold constraints.

Among these digital genres, graphical abstracts have become an important means of knowledge communication in academic settings, especially since the release of the "Article of the Future" project by Elsevier, leading to "the average annual use of an article being doubled when compared with those without a visual abstract" (West et al., 2020, p. 2103). Graphical abstracts are introduced on the Elsevier website as follows:

> This is a single, concise, pictorial and visual summary of the main findings of the article. It could either be the concluding figure from the article or better still a figure that is specially designed for the purpose, which captures the content of the article for readers at a single glance[1].

One of the most effective ways of achieving this communicative purpose and "packing large amounts of data into small spaces" is "through the visuals", as Miller (1998, p. 30) argues. In graphical abstracts, therefore, the content of the article is typically packed into a visual image, so that readers can quickly browse the information that is visually represented. Furthermore, the information is presented in an enhanced way to reach both the members of the discourse community and diversified readers. Yoon and Chung (2017) observed a 350% increase of graphical abstracts in research articles within the social sciences from 2011 to 2015. Graphical abstracts are also found as an "attention-getting resource" (Luzón, 2023, p. 25) to express engagement in knowledge exchange on Twitter, presenting a useful "non-textual innovation" (Katsampoxaki-Hodgetts, 2022, p. 11) and "an innovative way which enables the authors to display the main points of their research" (Breeze, 2016, p. 51). Just as Pérez-Llantada (2013, p. 232) noted, graphical abstracts have "become [a] typified genre element", and Swales agrees that "maybe, if Elsevier gets its way, all 2035 abstracts will be graphical" (2014, p. 323).

Previous research on graphical abstracts has been primarily concerned with visual resources and suggested the multimodal format in graphics (Yoon & Chung, 2017), design patterns (Hullman & Bach, 2018), and even visual metadiscourse (Sancho Guinda, 2016, 2021). However, the function of

textual and graphical elements in graphical abstracts and the way these different types of elements are co-deployed to achieve the communicative purpose has not received enough attention. In all, this study sets out to explore how text and visuals are organized to gain "a full understanding of the multimodal nature of genres" (Ruiz-Madrid & Valeiras-Jurado, 2020, p. 28). Specifically, this study aims to answer the following research questions:

(1) What is resemiotized in the visual image of graphical abstracts? And what compositional patterns are deployed in graphical abstracts?

(2) What are the distribution and function of moves in the verbal part of graphical abstracts?

(3) How are visual and verbal elements co-deployed?

(4) How do graphical abstracts relate to the full articles?

2. Graphical abstracts and visual presentation of research

Abstracts provide "a description of factual summary of the much longer report" (Bhatia, 1993, p. 78) and "the point at which readers decide whether to continue reading" (Hyland, 2004, p. 63), so they have attracted considerable attention from scholars. While abstracts are conventionally textual (Jiang & Hyland, 2017, 2023), graphical abstracts are more trendy and typically "speak more readily than the verbal abstract and reinforce its semantic meanings" (Pérez-Llantada, 2021, p. 80), offering "a visually appealing alternative to a text-only abstract" (Dharnidharka, 2023, p. 1).

Graphical abstracts are a multimodal digital genre composed of different multimodal resources that form a multimodal ensemble to represent meaning. Figure 1 shows a graphical abstract published in the Chemistry journal *Nano Today*. The text at the top and the image at the bottom are integrated into the whole graphical abstract. The visual image predominates, while the verbal text explains and enhances the visual content.

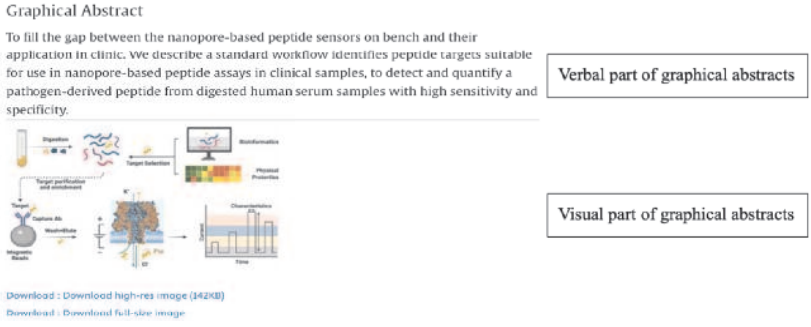


Figure 1. Example of graphical abstracts from the Nano Today in Chemistry[2]

Although there are no explicit requirements for what should be included in graphical abstracts, most authors typically provide both a visual image and written text on the electronic page (Yoon & Chung, 2017). By examining the interplay between textual and visual components, we can gain a deeper understanding of how the graphical abstracts convey their overall meaning (Lemke, 1998; Kress, 2010; Jewitt, 2013) and how writers achieve their communicative goals, rather than focusing solely on one semiotic resource.

In addition, graphical abstracts are not only searched by online result lists but can also be seen in academic blogs, Twitter, and academic homepages for promoting research to insiders and non-specialists, providing more convenient ways for people to access the study (Oska et al., 2020). Therefore, graphical abstracts increase the visibility of scientific publications on social media, which provides possibilities of giving more visibility and meeting the need of "making online research freely accessible to a broader population" in open science (Rhoten & Powell, 2007, p. 359).

Compared with the extensive literature on textual abstracts, the research on graphical abstracts is very limited to date and focuses on the visual composition of graphical abstracts. Yoon and Chung (2017) analyzed how graphical abstracts are adopted in the social science disciplines with a study based on 68 journals. They classified the use of visualization in terms of graphic type, content, and their relationship to the full article. They examined the content of graphical abstracts and showed that the results section is most often presented in the graphical abstracts in social sciences. Hullman and Bach (2018) sought to analyze the design patterns in terms of layout, depiction of time and text usage in graphical abstracts from a range of disciplines. Based on the design patterns summarized by Hullman and

Bach (2018), Hendges and Florek (2019) explored the promotional role of graphical abstracts by analyzing the layout and visual entities, originality, and the nature of the images.

Despite the abundance of previous research on the visualization of graphical abstracts, Sancho Guinda (2015) turned to the metadiscoursal resources used in graphical abstracts and focused on the way they support academic literacy education. In 2015 she conducted an interview with 23 teachers from four disciplines to collect their evaluations on graphical abstracts and found that they regarded clear moves, appeal, creativity and vectors as highly important, with color code and verbal text as unimportant. Sancho Guinda (2016) analyzed the graphical abstracts designed by engineering students to explore the encoding strategies students used in translating texts into visuals and raised pedagogical implications for ESP teaching in visual literacy/graphicacy. She summarized five visual metadiscourse categories in the graphical abstract (i.e., frames, vectors, typography, color, and trope icons) and further proposed a more comprehensive categorization of visual metadiscourse based on 16 graphical abstract examples provided on the website of *Elsevier*. The categories refer to Hyland's (2005) conception of metadiscourse and comprise visual interactive metadiscourse and visual interactional metadiscourse. The visual interactive metadiscourse relates to the visual composition strategy and items used in graphical abstracts, while the latter is concerned with how the compositional layout is used to express authorial stance and reader engagement in graphical abstracts. Sancho Guinda (2022) offered a more systematic taxonomy of stylization and made a case for the explicit visual literacy training of students and scholars.

Florek and Hendges (2023) examined the move structure of 100 graphical abstracts in medicine and chemistry and the role of the visual and verbal resources in the graphical abstracts. They found that written words are a crucial part of the realization of introductions and conclusions in both disciplines while visual resources play a key role in the methods and result moves. As Sancho Guinda notes in a series of studies (2015, 2016, 2019), textual organization of graphical abstracts raises important pedagogical implications, so it is useful to formulate workable guidelines to authors on how rhetorical moves are typically orchestrated. Therefore, we seek to explore the structuring of the rhetorical moves and multimodal components and discuss how the verbal and visual features are co-deployed in the communicative context. By analyzing what contents are visualized in

graphical abstracts and how visualization supports open science practice, this study raises pedagogical suggestions on how researchers can exploit the communicative resources in the composition of this digital genre.

3. Multimodal academic genres and rhetorical moves

As Lemke (1998) states, "science is not done, is not communicated, through verbal language alone. It cannot be. The 'concepts' of science are not solely verbal concepts, though they have verbal components. They are semiotic hybrids, simultaneously and essentially verbal, mathematical, visual-graphical, and actional-operational" (p. 87). The context of knowledge communication has changed from research articles to digital academic journals, in which the key findings and other important aspects of the research are presented in a concise visual way. This process of visualizing knowledge involves two relations between semiotic resources, which include "resemiotization, where semiotic choices are re-construed within and across multimodal phenomena", and "intersemiosis, where semiotic choices interact and combine" (Jewitt et al., 2016, p. 39).

Move analysis, introduced by Swales (1990), is a useful analytical approach to the rhetorical structuring of semiotic resources in academic genres (Liu et al., 2023). Visualized texts are typically segmented into a series of "moves" and each move refers to "a discoursal or rhetorical unit that performs a coherent communicative function in a written or spoken discourse" (Swales, 2004, p. 228). Investigating what moves are re-construed in graphical abstracts during the process of the resemiotization provides a way to understand the communication purposes they fulfill. Yoon and Chung (2017) identified the typical components (such as *background*, *method*, *results*, *overview*, and *others*) found in graphical abstracts within the social sciences. These coincide with components from the hard sciences (Sancho Guinda, 2016). This points to the value of move analysis in exploring how texts of a digital genre, such as graphical abstracts, are structured in a particular way and how the organizational discourse units are multimodally realized.

Move analysis is also effective in exploring intersemiosis relations because it shows the way writers combine those semiotic resources to organize multimodal genres. Since "multimodal research attends to the interplay between modes to look at the specific work of each mode and how each mode interacts with and contributes to the others in the multimodal

ensemble" (Jewitt, 2013, p. 255), it is essential to unpack the meaning expressed by each mode for effective communication. Therefore, move analysis has been done on academic digital genres such as video abstracts (Coccetta, 2021), video methods articles (Hafner, 2018) and Three-Minute Thesis presentations (Jiang & Qiu, 2022). These move analyses suggest the way that the generic structures of graphical abstracts can be examined to investigate the function of the verbal texts and the co-deployment between the moves in verbal text and visuals when realizing their communicative purposes.

Moreover, as Bateman (2008) pointed out, in multimodal genres "combinations of elements (...) signal meaningful relationships between elements that would not be available to those elements in isolation" (p. 143). The elements are combined into different kinds of patterns in the visual composition, such as the Given–New structure, Ideal-Real structure and Centre-Margin structure (Kress & van Leeuwen, 2006) and the layout layer of the Genre and Multimodality (GeM) Model (Bateman, 2008). In addition, Sancho Guinda (2015, 2021) classified graphical abstracts into four main types and suggested the compositional patterns that can be deployed, including (1) narratives or 'evolutions', (2) classificatory diagrams, (3) zoom-ins, (4) factual displays, and (5) mixed types. While the layout patterns suggest the interactivity writers establish with the reader, a better understanding of knowledge presentation in the digital genre can be gained by exploring the way verbal and visual elements are co-deployed to achieve their communicative purpose.

4. Research design

As mentioned above, the aim of this study is to explore how communicative purposes are realized by the combination of verbal and visual resources, so we focus on both the graphical and verbal presentation in graphical abstracts. Since graphical abstracts are characterized by stylistic diversity (Sancho Guinda, 2022; Florek & Hendges, 2023), we selected journals without a stipulated template of graphical abstracts. In addition, we specifically focused on high-impact journals to ensure the quality of the graphical abstracts under scrutiny.

Considering the common use of graphical abstracts in sciences (Sancho Guinda, 2016) and the comparison with earlier studies (e.g., Yoon & Chung,

2017; Hullman & Bach, 2018), we decided on three science disciplines (biology, chemistry and engineering). We selected two *Elsevier* journals in each discipline that had achieved the top ranking according to the 5-year impact factor published by *Web of Knowledge* in 2022. Thirty graphical abstracts published during the time span of 2020-2022 were taken from each of the six journals, and we randomly selected the first 15 abstracts by the alphabetical order of titles. The average length of the verbal text of graphical abstracts in our corpus amounts to 55 words, and the corpus totals 90 images and 4,938 words. Table 1 outlines the corpus across disciplinary journals.

Discipline	Journal (issues per year)	Journal's requirement for the submission of GA (percentage of graphical abstracts in each journal)	Number of abstracts	Number of images	Number of words
Biology	*Redox Biology* (10 issues)	Mandatory (65%)	15	15	1,013
	Biomaterials (12 issues)	Optional (22%)	15	15	825
Chemistry	*Materials Today* (12 issues)	Mandatory (100%)	15	15	733
	Nano Today (6 issues)	Optional (100%)	15	15	793
Engineering	*Composites Part B* (20 issues)	Optional (53%)	15	15	752
	Composites Science and Technology (14 issues)	Optional (100%)	15	15	822

Table 1. Characteristics of the corpus of graphical abstracts

It is noteworthy that the biology and chemistry journals offer explicit author guidelines concerning the creation of graphical abstracts, which are readily available on their respective websites. Furthermore, the journals have expressly delineated within their journal policies whether the inclusion of a graphical abstract is optional or mandatory. To establish a reference point, the percentage of research articles featuring graphical abstracts in publications from the year 2022 was calculated and included in Table 1. Although within our corpus journal policies do not explicitly specify compositional patterns for graphical abstracts, requirements regarding image size and file types for submission are provided on the author guides at the journal websites.

Move analysis was conducted on the visual and textual components of graphical abstracts in order to explore the communicative purposes they fulfil and considering the visual-verbal interaction. We followed a top-down approach (Biber et al., 2007) and referred to Jiang and Hyland (2017) for the list of five moves of research abstracts. The annotation of rhetorical moves

and layout patterns was done by *MAXQDA* (2022). The two authors coded independently and achieved inter-coder reliability of 95% on layout patterns and 97% on moves. To ensure the reliability of the research, we consulted professors from each discipline to confirm our interpretation of the content of graphical abstracts.

5. Results and discussion

5.1. The contents of graphical abstracts

According to the submission requirement published on the journal *Materials Today's* homepage, "the graphical abstract should summarize the contents of the article in a concise, pictorial form designed to capture the attention of a wide readership online". Therefore, we investigated what contents are resemiotized in the visual elements of the graphical abstracts. Drawing on the content categories (*background, method, results, overview* and *others*) of graphical abstracts proposed by Yoon and Chung (2017), we closely read each graphical abstract, and found another communicative component, which discusses the application of the research in other contexts. The application is not included in "others" by Yoon and Chung (2017), which presents irrelevant visualizations or the overall themes or messages of the studies (p. 1377). Therefore, we replaced this non-specific category with "Application" in our study and coded the corpus with reference to the five components. Table 2 displays the distribution of each component in the corpus.

	Background	Methods	Results	Overview of research	Application
Percentage	9%	8%	43%	34%	7%

Table 2. The distribution of content components referred to in graphical abstracts

Unsurprisingly, the *results* component dominates graphical abstracts, concurring with the finding in Florek and Hendges (2023), which shows *results* is an obligatory move in chemistry and medicine. The *overview of research*, which functions to introduce the whole process of the research, accounts for as much as 34%. As seen in Figure 2, this component is typically used to simultaneously present methods and results and illustrates the workflow of the Immunoprecipitation nanopore (IP-NP). The graphical abstract provides visual details of how the experiment works, which is

difficult to describe textually. Hence, the overview of research by graphical illustration makes the entire process visually accessible to the reader.

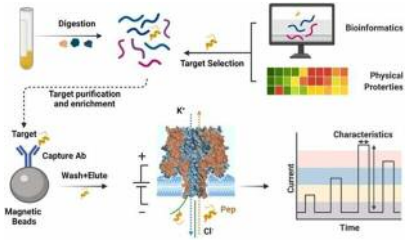


Figure 2. Example of the overview of research[2]

Each of the other three content components makes up less than 10% of the total. This composition of different types of content (i.e. methods and results) is arguably the most familiar, plausible, and persuasive manner in which graphical abstracts are constructed, as perceived by readers (Millar & Lim, 2022), so the presented research can be best accepted by the discourse community as adhering to the community's conventions (Coccetta, 2021). The distribution of content components indicates that this digital academic genre is primarily informational so that the reader can obtain the gist of the study.

Graphical abstracts are also displayed in an engaging way to attract the reader and promote the study to insider experts and interdisciplinary academics alike. The content is designed to be visually engaging and facilitate the communicative purpose of enhancing the representation and communication of numerical data (Pérez-Llantada, 2016; Reimann et al., 2022). It is also interesting to note the way the *application of the research* is discussed in graphical abstracts. One of the aims of this *application* is to promote the article to a diversified audience with different degrees of expertise, such as peer scientists, practitioners, commercial investors and students, so this multimodal recontextualization ensures a different way of understanding academic practices (Hyland, 2010, p. 117). By displaying the advantage and the applicability of the results, graphical abstracts can also achieve a persuasive effect on the reader, stimulate more visits and downloads of the full articles and improve the visibility of the presented research in the disciplinary field. As graphical abstracts can be disseminated in a more accessible way in digital contexts, it will be easy for the writer to achieve the goal of enhancing impact and visibility and facilitating

collaboration in this knowledge-intensive economic environment (Bartling & Friesike, 2014).

In the next section, we explore how the verbal elements perform their functions in the graphical abstract, and thus reveal the way "different modes offer different potentials for making meaning" (Kress, 2010, p. 79).

5.2. The rhetorical moves in the verbal part of graphical abstracts

Drawing on the types of moves in research abstracts proposed by Jiang and Hyland (2017), we conducted a move analysis on the verbal texts of graphical abstracts to see the communicative strategies the researcher deployed in each rhetorical move, which also reveals how verbal and visual modes are co-deployed in the graphical abstracts. We closely read each text and annotated the moves. After recursive modifications and discussions, we renamed and reconceptualized the move types in order to minimize the potential overlaps between the components. Through this process, we identified five moves, including *Reference to the visual, Research background, Report of the results, Interpretation of the results*, and *Implications or applications of the research*.

Moves	Number of occurrences			Total
	Biology	Chemistry	Engineering	
Move1 Reference to the visual	6 (20%)	1 (3.3%)	1 (3.3%)	8 (8.9%)
Move2 Research background	3 (10%)	3 (10%)	1 (3.3%)	7 (7.8%)
Move3 Report of the results	14 (46.7%)	5 (16.7%)	8 (26.7%)	27 (30%)
Move4 Interpretation of the results	23 (76.7%)	27 (90%)	26 (86.7%)	76 (84.4%)
Move5 Implications or applications of the research	15 (50%)	17 (56.7%)	19 (63.3%)	51 (56.7%)

Table 3. Rhetorical moves in the verbal text of graphical abstracts (frequency and percentage)

Table 3 presents the five moves identified in the verbal part of the graphical abstracts. Move 4 is the most common across the three disciplines, accounting for 76.7%, 90%, and 86.7% in biology, chemistry, and engineering, respectively. Move 5 is the second most frequent in the corpus, which is used in over half of the chemistry and engineering samples. Move 5 appears in the text more frequently than in the visual images, which may suggest that it will take more time to modify the image or create a new one than add the attached text. Move 1, Move 2, and Move 3 are less frequent across the three disciplines.

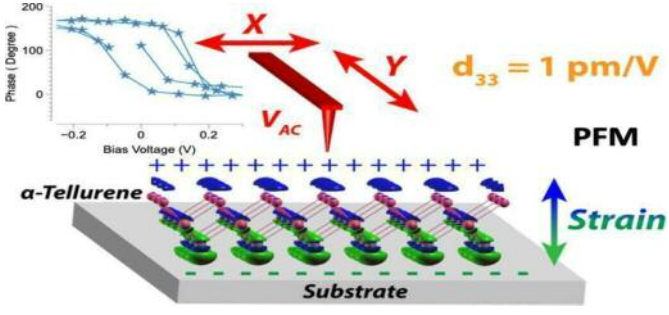
Move 1: Reference to the visual. It explains the visual and makes a connection between the verbal and visual elements. For example, "the above graphical abstract represents a summary of the data presented in this work". By referring to the visual, the writer indicates the function of the graphical abstract in summarizing the research. The replication from the manuscript is accepted according to the journal policy in our corpus. Therefore, some sentences in this move are also the same as the title of figure legends in the manuscript since the picture of graphical abstracts is replicated from the full articles as shown in example (1), which "summarized information of the visuals" (Liu et al., 2023, p. 92).

(1) **[Move 1]** A schematic diagram of artemether confers neuroprotection on cerebral ischemic injury. **[Move 3]** Artemether stimulated ERK1/2 phosphorylation in PC12 cells, primary cultured cortical neurons and MCAO mouse model, which results in activation of CREB/Bcl-2 pathway and inhibition of apoptosis pathway. **[Move 5]** All these findings indicate the potential application of artemether in the prevention and treatment of ischemic stroke. (Biology)[5]

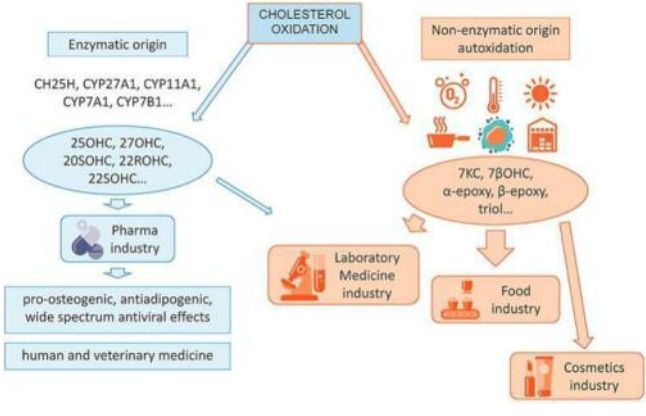
Move 2: Research background. It presents the research background, research questions, or clarifies the full name of concepts in the form of abbreviations in the visual part of graphical abstracts. This move is used to contextualize research, raise research questions, and show the importance of the research. By complementing the background information of this research, this move lays the foundation for the understanding of the research and the visual part of the graphical abstracts. In example (2), Move 2 shows that the field of Monoelemental two-dimensional (2D) materials is well established and that their research on this important topic deserves attention from the researchers in the field. Another key step provided for the readers is concept explanation, as shown in example (3). Those terms are the ones deserving attention from experienced readers in the community of practice. Therefore, the verbal texts serve to specify what the abbreviation refers to. This move is infrequent in the graphical abstract in our corpus.

(2) **[Move 2]** Monoelemental two-dimensional (2D) materials has attracted significant attention due to their exciting electro-mechanical properties and extreme thinness. **[Move 4]** Here we report the existence of piezoelectricity in atomically thin monoelemental α-Tellurium films. Theoretical and experimental exploration demonstrate the existence of

through thickness piezoelectricity due to the Born effective charges, similar to traditional perovskite piezoelectric structures. (Chemistry)[6]



(3) **[Move 2]** CYP27A1: cholesterol 27-hydroxylase; CYP7A1: cholesterol 7-alpha-hydroxylase; CYP7B1: noxysterol 7-alpha-hydroxylase; CYP11A1: cholesterol side-chain cleavage enzyme; 25OHC: 25-hydroxycholesterol; 27OHC:27-hydroxycholesterol; 20SOHC: 20 (S)-hydroxycholesterol; 22ROHC:22(R)-hydroxycholesterol; 22SOHC:22(S)-hydroxycholesterol; 7 KC:7-ketocholesterol; 7βOHC:7β-hydroxycholesterol; α-epoxy:5α,6α-epoxide; β-epoxy:5β,6β-epoxide; triol:cholestan-3β,5α,6β-triol. (biology)[7]



Move 3: Report of the results. It describes the data or procedures of the experiments shown in the graphics. This move shows the details of the research process and reports specific data in the visual pictures of graphical

abstracts, instead of generalizing the data as seen in example (1). The move can help readers understand data which may be confusing if they are only listed in the graphical abstract. In terms of the relation between the verbal and the visual, this move plays the role of highlighting the most important data that the researcher wants to show to the reader.

Move 4: Interpretation of the results. This is a conventional move in the verbal text of the graphical abstract, which summarizes and interprets the main findings. Unlike Move 3 (*report of results)*, this move makes a generalization and draws a conclusion based on the data obtained from the experiment in the study, as shown in example (2). The phrase *the result indicate/demonstrate/verify/show* is used to generalize the results. By adding the interpretation, the author intends to guide the reader to the result to be valued by the target audience.

Move 5: Implications and/or applications of the work. This move discusses the advantages of the research or how to apply the results of research in solving the problem in real life, with a persuasive function. The value of the research is concluded within one or two sentences so that researchers are able to "create an identity as both disciplinary servant and creative originator" (Hyland, 2001, p. 223).

According to the annotation of moves in our corpus, we found that only seven graphical abstracts show the application of the research in both the verbal and the visual part. As we have reported in Section 5.1, only 7% of the graphical abstracts have shown the application in the visual part, while Move 5 (*implication and/or applications of the work*) in the verbal text accounts for 56.7%. Therefore, the higher frequency of this move shows that writers are trying to present a positive evaluation of their research by complementing the persuasive verbal texts, as shown in example (1). By verbally adding the applications of research to the visual part, writers seem to be in a better position to strengthen the promotion of their work with a minimum effort. They can reduce the modification of the visual image by duplicating the original picture from the manuscript without any change, which will be discussed in the next section.

Furthermore, we also found that Moves 4 and 5 frequently occur together, accounting for 46.7% of the total, so a rhetorical chain is formulated to generalize the main findings and suggest their applications to the readers, which may attract the reader to read the whole article. All in all, the verbal texts and the visuals combined contribute to meaning-making, serving the

same communicative purpose of promoting research. According to the rhetorical moves in our corpus, we found that the text plays an important role in summarizing the content of visuals or claiming their values, reinforcing the function of providing information and promoting the research. Compared with traditional abstracts, the advantage of the digital genre is that it makes the research accessible to readers with broader interests and, most importantly, allows researchers to grasp the main idea by combining the dominant visual and complementary verbal resources.

5.3. The sources of graphical abstracts

As regards the sources of graphical abstracts, *Elsevier* suggests that "it could either be the concluding figure from the article or better still a figure that is specially designed for the purpose". The purpose of this section is to investigate the preference of writers to relate graphical abstracts to the accompanied full articles when creating this digital genre.

Yoon and Chung (2017) argued for four types of relationships between graphical abstracts and the full articles: *new*, *integrated*, *modified* and *duplicated*. However, according to the images in our corpus, we made modifications to the categories as follows. First, *new* means that the image is newly created for this part; second, an *integrated* graphical abstract incorporates one or more new created images and existing visualizations in the full article; third, *modified* graphical abstracts combine several images from different parts in the full article or slightly modify the original picture copied from it; finally, a *duplicated* graphical abstract is a wholly original picture copied from the full article without any modification. Table 4 presents the proportion of the *new*, *integrated*, *modified* and *duplicated* relations to the full article in the graphical abstracts.

Relation to the full article	Biology	Chemistry	Engineering	Total
New	14 (46.7%)	3 (10%)	1 (3.3%)	18 (20%)
Integrated	0	0	5 (16.7%)	5 (5.6%)
Modified	5 (16.7%)	9 (40%)	16 (53.3%)	30 (33.3%)
Duplicated	11 (36.7%)	18 (60%)	8 (26.7%)	37 (41.1%)

Table 4. Relation of graphical abstracts to the accompanied full articles

Duplicated graphical abstracts are a dominant source among the three disciplines, accounting for 41.1% of the total, and the modified and new

ones accounted for a similar distribution with 20% and 33.3%. The least used are integrated images, which are present only in engineering (5.6%), but absent in biology and chemistry. This statistic of frequently duplicated pictures in graphical abstracts in hard sciences aligns with what Hullman and Bach (2018) found in their study of social sciences. It showed that copying or compiling some important original images is a frequent strategy scholars use to quickly form a graphical abstract to display the important aspect of the articles.

While it is difficult to identify a categorical reason, we can hardly ignore the influence of journal policies on the relational use of graphical abstracts to the accompanied full articles. For example, the journal *Nano Today* in our corpus has explicit instructions for the sources of graphical abstracts, requiring that "the graphical abstract can either be the concluding figure from the article or a figure that is specially designed for the purpose". Therefore, both the newly designed and duplicated graphical abstracts are encouraged in this journal, while most researchers in our corpus are inclined to combine the existing pictures or duplicate from the manuscripts. The frequent use of duplicated pictures may help researchers save time and effort in creating another image since "some informants in the interview evaluated graphical abstracts negatively as useless or time-consuming practices" (Sancho Guinda, 2015, p. 82).

In addition, using the original image from the article is beneficial to researchers who seek to increase the visibility of their study, because graphical abstracts are shown to have to do with more views, engagements, and retweets on Twitter (Oska et al., 2020). Similar studies and original articles can be retrieved through images in image-based databases, making it easier for the research articles to be identified and downloaded, thus enhancing the visibility and dissemination of the authors' research (Sitek & Bertelmann, 2014). From the readers' perspective, they can obtain more details of the original text, which is also an advantage of the digital genre compared to traditional textual abstracts.

Although the sources of graphical abstracts are not explicitly required in the authors' guidelines on the journal websites in our corpus, the newly designed and integrated ones account for about 30% of the total. The use of new and duplicated pictures in biology is almost evenly distributed and accounts for the highest rate of newly created graphical abstracts, almost half of the total. As the editors in the *Journal of Applied Animal Behaviour Science* suggest,

researchers should conduct self-evaluation before the submission of the graphical abstract and ensure colleagues would give the paper a chance of further reading after only seeing the graphical abstract (Pongrácz & Camerlink, 2023). The journals *Materials Today* and *Redox Biology* also recommend that "authors must provide images that represent the work described in the article". This may lead the researcher to design a new qualified image in order to meet the journal's expectations and present concise and informative visuals to facilitate scientific communication with other experts.

Another interesting finding in the newly designed graphical abstracts refers to the use of cartoonish faces. The expression of emotion in graphical abstracts is found in Sancho Guinda (2019, 2022), which was also supported by Luzón (2023), who regarded graphical abstracts as an interactive resource. We found that cartoonish faces and cartoon figures are used in newly designed or modified graphical abstracts as a visual engagement strategy to make them attractive and intriguing. Cartoonish faces, angry faces, smiling faces, and crying faces are often used to show the results or represent the comparison of the results under different conditions. The presence of emotions in graphical abstracts appears to be closely intertwined with the extra-academic role of scholars in non-academic domains such as journalist, advertiser, designer or entertainer (Sancho Guinda, 2019).

For example, the fight between the two cartoonish faces in Figure 3 is more engaging and accessible than the verbal expression "the vanadyl nanocomplex, which simultaneously serves as a photothermal agent (PTA) and an immunogenic cell death (ICD) inducer to enhance the anti-tumor immunity of PTT" that is presented in the full article. Therefore, those cartoonish faces are employed in this digital genre to create a humorous wink to fellow experts and contribute to the promotion of the research to a wide grouping of interested readers.

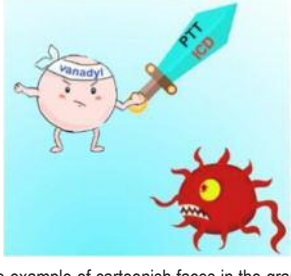


Figure 3. The example of cartoonish faces in the graphical abstract[6]

5.4. The layout patterns of graphical abstracts

The various types of visualization of the data, such as diagrams, tables and pictures, are composed to organize a multimodal document in different layout patterns that make the argument convincing (Miller, 1998). In terms of graphical abstracts, "layout describes the organization of graphical elements in the 2D space of the graphical abstract" (Hullman & Bach, 2018, p. 5), contributing to the comprehension of the content of the graphical abstracts. Sancho Guinda (2015, 2021) classified graphical abstracts into four main pure types that give us an idea of what kind of compositional patterns can be deployed: (1) Narratives or 'evolutions', (2) Classificatory diagrams, (3) Zoom-ins, and (4) Factual displays and mixed types. We adopted this categorization to show how the compositional patterns are designed in the graphical abstracts in our corpus.

Table 5 shows the distribution of the layout patterns. The *narratives or 'evolutions'* is the most frequent pattern in the corpus. As defined by Sancho Guinda (2021, p. 91), "*narratives or 'evolutions'* show with the aid of vectors or the mere collocation of items, the progression of some phenomenon, a change of state or condition, or some sequential or linear development often following the narrative sequence (I)MR(D)". The *narratives or 'evolutions'* pattern deploys the visual cues as an effective way to inform readers of the sequential logic of research and structural organization in static graphics. Visual cues, which are predominantly arrows in different sizes, colors, and shapes, tend to be mainly used to designate a clear reading path and represent the sequences of different steps in experiments. Sancho Guinda (2016) found that students used arrows to spell out major steps and guide readers from frame to frame while signaling an intended reading path in the graphical abstracts they designed. This "linear structure does not encourage as many re-viewings" (Djonov & Zhao, 2014, p. 189), thus assisting readers in comprehending a large amount of information in a short span of time. Most of the newly designed (78%) graphical abstracts in our corpus employ this pattern to help the reader grasp the main idea with vectors.

	GA typology	New	Integrated	Modified	Duplicated
Pure types	Narratives or 'evolutions'	9	1	6	24
	Classificatory diagrams	2		1	
	Zoom-ins	1			1
	Factual displays	1		5	1
	TOTAL	**13**	**1**	**12**	**26**
Mixed types	Narrative + classification	3		3	
	Narrative + zoom-ins	2	2	3	8
	Narrative + data displays			2	
	Zoom-ins + data displays		2	5	1
	Narrative + classification + data displays				1
	Narrative + classification + zoom-ins				1
	Narrative + data display + zoom-ins			5	
	TOTAL	**5**	**4**	**18**	**11**

Table 5. The distribution of compositional patterns in different sources of graphical abstracts in this study's corpus

Factual display may "include graphs, tables, equations and chemical reactions and even wordmaps" as noted by Sancho Guinda (2021, p. 92). Writers therefore were inclined to use the narrative and factual display patterns when modifying the graphical abstract in our corpus. Figure 4 shows an example of the modified graphical abstract, which is composed of diagrams that are copied from the manuscripts and are used to present the results of the research. This pattern is a useful strategy to form a graphical abstract that meets the criteria of representing the research in the journal policy.

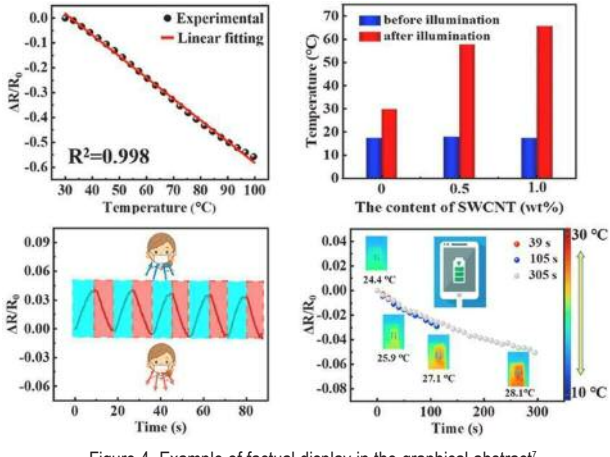


Figure 4. Example of factual display in the graphical abstract[7]

The *Zoom-ins* pattern tends to combine with the narrative pattern and form a mixed type. Zoom-ins highlight details, often with a stylized lens icon departing from a certain point in a system or structure (Sancho Guinda, 2021). Therefore, showing part of how the whole research is conducted, in this study the zoom-ins patterns were often embedded in the narrative pattern, making the picture informational by providing more details.

The journal policies in our corpus encourage the choices of compositional patterns compared with medicine journals which often provide specific templates for authors, such as the three-panel template advised by the journal *Kidney International*. This gives much leeway to authors to present their research logically and coherently by using pure types or mixed types, and also helps to present the information they want to highlight. Although the journal policy impacts on the design of graphical abstracts, effective knowledge communication can best be achieved by displaying the information following the conventions within the academic cultures and engaging with peers in an appropriate manner.

6. Conclusion

This study analyzed 90 graphical abstracts, which is an important and previously under-investigated genre used by researchers to facilitate scientific communication. The aim of the research is twofold: firstly, it aims to explore what content has been displayed in graphical abstracts and how these graphical abstracts are created and designed. Secondly, it aims to explore the function of verbal texts and the relationship between visual and verbal elements. The findings of the study deepen our understanding of how the genre works to stimulate discussions and collaborations (Millar & Lim, 2022).

We have shown that *background of the study, research methods, details of results, overview of research,* and *application of the research* are typically resemiotized in the visual images of graphical abstracts. Therefore, the visuals provide a snapshot of the research, arousing specialists' attention and persuading the readers to examine the full article in depth (Ostergren, 2013). This research contributes to the analysis of digital academic genres and adds to the researcher's current body of knowledge on what is visualized in one static image and the supplement function the verbal texts played.

In terms of the creation of graphical abstracts, we explored the relationship between the graphical abstracts and the image in the manuscript, and the

layout pattern in the visuals. Concerning the graphical abstract's goal of presenting "a visual that clearly represents the work" in the definition by Elsevier, the authors may create a visual with four strategies: *designing a new picture, integrating existing pictures from the research article, modifying existing pictures, or duplicating them*. The duplication of pictures in the full article is the predominant strategy in graphical abstracts.

When researchers create a new graphical abstract, they prefer to use the *narratives or 'evolutions'* pattern to direct the viewers' attention by the vectors and show the sequential logic of the research. This provides insights into raising academics' awareness of their visual literacy, as in today's academic communication, the communication of scientific knowledge is increasingly dependent on visuals, but scientists are scarcely trained for this specific visual literacy (Desnoyers, 2011). No matter what the digital genre may be, such as graphical abstracts or academic blogs, it is essential for researchers to develop a visual literacy to communicate scientific knowledge effectively.

Findings also suggest that multimodal semiotic resources such as cartoonish faces are added in newly designed graphical abstracts, as an attention-getting resource. Considering that the graphical abstracts respond to the need to attract more reading of the full article and facilitate communication with multidisciplinary researchers, the emotional appeal marks a new path for knowledge creation in digital academic journals.

By exploring the function of verbal texts and their relationship with visual elements, we identified five moves in the verbal texts of graphical abstracts, which are used to supplement the visual images. The verbal and visual complementation helps to avoid only repeating the image from the full article. It was also seen that the visibility strategy was employed to articulate authorial contribution through the rhetorical move of emphasizing the value of the research in the texts and visual graphics. The combination of visual and accompanying texts in this genre shows the hybrid nature of the genre, which will be helpful for researchers to promote their study by "orchestrating a complex multimodal ensemble of different semiotic systems" (Bucher & Niemann, 2012, p. 302). Although the accompanying texts are not demanded in submission, the author exploits them to promote the research and meet the diversified needs of the likely audiences in the digital communication context.

Our research raises pedagogical implications for gaining a finer understanding of resemiotization in the digital genre of graphical abstracts.

The analysis has revealed how this digital genre facilitates visibility to the researchers by showing more information about the whole research before they access the full article. Despite a relatively small-scale study, this study opens avenues for further studies to examine the communicative strategies deployed in different disciplines.

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References

Akbaş, E., & Farnia, M. (2021). Exploring rhetorical moves in a digital academic genre: A cross-disciplinary study of the highlights section. *Ibérica*, *Journal of the European Association of Languages for Specific Purposes, 42*, 85–114. https://doi.org/10.17398/2340-2784.42.85

Bartling, S., & Friesike, S. (Eds.). (2014). *Opening Science*. Springer International Publishing. https://doi.org/10.1007/978-3-319-00026-8

Bateman, J. A. (2008). *Multimodality and genre: A foundation for the systematic analysis of multimodal documents*. Palgrave Macmillan.

Bhatia, V. K. (1993). *Analysing genre: Language use in professional settings*. Longman.

Biber, D., Connor, U., & Upton, T. A. (2007). *Discourse on the move: Using corpus analysis to describe discourse structure*. John Benjamins.

Breeze, R. (2016). Tracing the development of an emergent part-genre: The author summary. *English for Specific Purposes*, *42*, 50–65. https://doi.org/10.1016/j.esp.2015.11.003

Bucher, H.-J., & Niemann, P. (2012). Visualizing science: The reception of powerpoint presentations. *Visual Communication*, *11*(3), 283–306. https://doi.org/10.1177/1470357212446409

Coccetta, F. (2021). Medical video abstracts and their subgenres: A phase-based approach to the detection of generic structure patterns. *European Journal of English Studies*, *25*(3), 316–333. https://doi.org/10.1080/13825577.2021. 1988264

Desnoyers, L. (2011). Toward a Taxonomy of Visuals in Science Communication. *Technical Communication*, *58*(2), 119–134. https://doi.org/10.1177/107554701 1409954

Dharnidharka, V. R. (2023). The Visual Abstract: Why, when, what and how. *Pediatric Transplantation*, *27*(1), e14413. https://doi.org/10.1111/petr.14413

Djonov, E., & Zhao, S. (Eds.). (2014). *Critical multimodal studies of popular discourse*. Routledge.

Fecher, B., & Friesike, S. (2014). Open science: One term, five schools of thought. In S. Bartling & S. Friesike (Eds.), *Opening science: The evolving guide on how the internet is changing research, collaboration and scholarly publishing* (pp. 17–47). Springer.

Florek, C. S., & Hendges, G. R. (2023). A multimodal move analysis of graphical abstracts in

medicine and chemistry. *ESP Today*, *11*(2), 237–260. https://doi.org/10.18485/esptoday.2023.11.2.3

Hafner, C. A. (2018). Genre innovation and multimodal expression in scholarly communication: Video methods articles in experimental biology. *Ibérica*, *Journal of the European Association of Languages for Specific Purposes, 36*, 15–42. https://doi.org/10.1007/978-3-319-91376-6_19

Hendges, G. R., & Florek, C. (2019). The graphical abstract as a new genre in the promotion of science. In M. J. Luzón & C. Pérez-Llantada (Eds.), *Science Communication on the Internet: Old genres meet new genres* (pp. 59–79). John Benjamins. https://doi.org/10.1075/pbns.308.04hen

Hullman, J., & Bach, B. (2018). Picturing science: Design patterns in graphical abstracts. In *Diagrammatic Representation and Inference: 10th International Conference, Diagrams 2018, Edinburgh, UK, June 18-22, 2018, Proceedings 10* (pp. 183–200). Springer.

Hyland, K. (2001). Humble servants of the discipline? Self-mention in research articles. *English for Specific Purposes*, *20*(3), 207–226. https://doi.org/10.1016/S0889-4906(00)00012-0

Hyland, K. (2004). *Disciplinary discourses: Social interactions in academic writing*. University of Michigan Press.

Hyland, K. (2005). *Metadiscourse: Exploring interaction in writing*. Continuum.

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

Jewitt, C. (2013). Multimodal methods for researching digital technologies. In S. Price, C. Jewitt & B. Brown (Eds.), *The Sage handbook of digital technology research* (pp. 250–265). Sage.

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

Jiang, F., & Hyland, K. (2017). Metadiscursive nouns: Interaction and cohesion in abstract moves. *English for Specific Purposes*, *46*, 1–14. https://doi.org/10.1016/j.esp.2016.11.001

Jiang, F., & Hyland, K. (2023). Changes in research abstracts: Past tense, third person, passive, and negatives. *Written Communication*, *40*(1), 210–237. https://doi.org/10.1177/07410883221128876

Jiang, F., & Qiu, X. (2022). Communicating disciplinary knowledge to a wide audience in 3MT presentations: How students engage with popularization of science. *Discourse Studies*, *24*(1), 115–134. https://doi.org/10.1177/14614456211037438

Katsampoxaki-Hodgetts, K. (2022). The emergence of a new inclusive meta-scientific genre; 'the Bigger Picture.' *Journal of English for Academic Purposes*, *57*, 101114. https://doi.org/10.1016/j.jeap.2022.101114

Kress, G., & Leeuwen, T. van. (2006). *Reading images: The grammar of visual design* (2nd ed). Routledge.

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

Lemke, J. L. (1998). Multiplying meaning: Visual and verbal semiotics in scientific text. In J. R. Martin & R., Veel (Eds.), *Reading Science: Critical and functional perspectives on discourses of science* (pp. 87–113). Routledge.

Liu, L., Jiang, F., & Du, Z. (2023). Figure legends of scientific research articles: Rhetorical moves and phrase frames. *English for Specific Purposes*, *70*, 86–100. https://doi.org/10.1016/j.esp.2022.11.005

Luzón, M.-J. (2023). Multimodal practices of research groups in Twitter: An analysis of stance and engagement. *English for Specific Purposes*, *70*, 17–32. https://doi.org/10.1016/j.esp.2022.10.006

Millar, B. C., & Lim, M. (2022). The role of visual abstracts in the dissemination of medical research. *The Ulster Medical Journal*, *91*(2), 67–78.

Miller, T. (1998). Visual persuasion: A comparison of visuals in academic texts and the popular press. *English for Specific Purposes*, *17*(1), 29–46. https://doi.org/10.1016/S0889-4906(97)00029-X

Oska, S., Lerma, E., & Topf, J. (2020). A picture is worth a thousand views: A triple crossover trial of visual abstracts to examine their impact on research dissemination. *Journal of Medical Internet Research*, *22*(12), 2–7. https://doi.org/10.2196/22327

Ostergren, M. (2013). *How scientists develop competence in visual communication.* [University of Washington]. https://www.semanticscholar.org/paper/How-Scientists-Develop-Competence-in-Visual-Ostergren/f6590d0d2828d6b404b408bf9e53df76cc83ecff

Pérez-Llantada, C. (2013). The article of the future: Strategies for genre stability and change. *English for Specific Purposes*, *32*(4), 221–235.

https://doi.org/10.1016/j.esp.2013.06.004

Pérez-Llantada, C. (2016). How is the digital medium shaping research genres? Some cross-disciplinary trends. *ESP Today*, *4*(1), 22–42.

Pérez-Llantada, C. (2021). *Research genres across languages: Multilingual communication online*. Cambridge University Press. https://doi.org/10.1017/9781108870528

Pongrácz, P., & Camerlink, I. (2023). Your message in pictures – Adding a graphical abstract to your paper. *Applied Animal Behaviour Science*, *263*, 105946. https://doi.org/10.1016/j.applanim.2023.105946

Reimann, D., Struwe, M., Ram, N., & Gaschler, R. (2022). Typicality effect in data graphs. *Visual Communication*, 147035722211304. https://doi.org/10.1177/14703572221130445

Rhoten, D., & Powell, W. W. (2007). The frontiers of intellectual property: Expanded protection versus new models of open science. *Annual Review of Law and Social Science*, *3*(1), 345–373. https://doi.org/10.1146/annurev.lawsocsci.3.081806.112900

Ruiz-Madrid, N., & Valeiras-Jurado, J. (2020). Developing multimodal communicative competence in emerging academic and professional genres. *International Journal of English Studies*, *20*(1), 27–50. https://doi.org/10.6018/ijes.401481

Sancho Guinda, C. (2015). Genres on the move: Currency and erosion of the genre moves construct. *Journal of English for Academic Purposes*, *19*, 73–87. https://doi.org/10.1016/j.jeap.2015.07.001

Sancho Guinda, C. (2016). Semiotic Shortcuts. The Graphical Abstract Strategies of Engineering Students. *Journal of Language and Communication in Business*, *55*, 61–90. https://doi.org/10.7146/hjlcb.v0i55.24289

Sancho Guinda, C. (2019). Promoemotional science? In J. L. Mackenzie & L. Alba-Juez (Eds.), *Emotion in Discourse* (pp. 357–386). John Benjamins.

Sancho Guinda, C. (2021). This has changed: 'Out-of-the-box' metadiscourse in scientific graphical abstracts. In L. D'Angelo, A. Mauranen & S. Maci (Eds.), *Metadiscourse in digital communication* (pp.81–114). Springer.

Sancho Guinda, C. (2022). Scientific Stylisation or the 'Democracy Dilemma' of Graphical Abstracts. *Publications*, *10*(1), Article 1. https://doi.org/10.3390/publications10010011

Sitek, D., & Bertelmann, R. (2014). Open access: A state of the art. In S. Bartling & S. Friesike (Eds.), *Opening science: The evolving guide on how the Internet is changing research, collaboration and scholarly publishing* (pp. 139–153). Springer International Publishing. https://doi.org/10.1007/978-3-319-00026-8_9

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

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

Swales, J. M. (2014). Afterword. In M. Bondi & R. Lorés Sanz (Eds.), *Abstracts in academic discourse* (pp.319–323), Peter Lang.

Vicente-Saez, R., & Martinez-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

West, C. C., Lindsay, K. J., & Hart, A. (2020). Promoting your research using infographics and visual abstracts. *Journal of Plastic, Reconstructive & Aesthetic Surgery*, *73*(12), 2103–2105. https://doi.org/10.1016/j.bjps.2020.08.054

Yang, W. (2017). Audioslide presentations as an appendant genre: Keywords, personal pronouns, stance and engagement. *ESP Today*, *5*(1), 24–45. https://doi.org/10.18485/esptoday.2017.5.1.2

Yoon, J., & Chung, E. (2017). An investigation on graphical abstracts use in scholarly articles. *International Journal of Information Management*, *37*(1), 1371–1379. https://doi.org/10.1016/j.ijinfomgt.2016.09.005

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NOTES

[1] Introduction to the graphical abstracts on its official website: https://www.elsevier.com/authors/tools-and-resources/visual-abstract

[2] Examples are taken from our corpus with moves annotated in brackets and disciplinary sources noted in parentheses. Official permission is gained from the respective publishers for the use of the above images and examples. The sources of Figure 1 and Figure 2: https://www.sciencedirect.com/science/article/pii/S1748013222001426.

[3] The source of example (1): https://www.sciencedirect.com/science/article/pii/ S2213231721002287

[4] The source of example (2): https://www.sciencedirect.com/science/article/abs/pii/S1369702120303874

[5] The source of example (3): https://www.sciencedirect.com/science/article/pii/ S2213231721003803

[6] The source of Figure 3: https://www.sciencedirect.com/science/article/pii/S014296 1221004877

[7] The source of Figure 4: https://www.sciencedirect.com/science/article/abs/pii/S0266 353821004899