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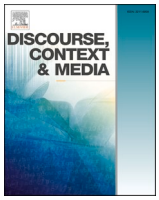

Disseminating research results in *The Conversation*: An analysis of comprehensibility strategies

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A B S T R A C T

Recognizing the key role of knowledge dissemination in socio-economic progress, *The Conversation* is a news website intended to promote the public understanding of science. When using this platform to disseminate their own findings, scholars need to recontextualize their published research to make it suitable for a wide audience. However, despite the potential of this website for improving science literacy, there is little research on the strategies used to render scientific knowledge comprehensible for the general audience. This article studies the recontextualization strategies that researchers utilize to facilitate understanding when reporting their own research in *The Conversation*. For this purpose, we analyze a dataset consisting of 50 Environment articles. Adopting a multimodal perspective, we propose an analytical framework that can account for the various semiotic resources employed to aid comprehensibility. We analyze the frequency, function and formal features of the following elements that facilitate understanding: (i) verbal in-text elaboration (exemplification, reformulation, definition, analogy and explicitation); (ii) visuals; and (iii) hyperlinks to supplementary information. The results show that the technological features of *The Conversation* (e.g., hyperlinking, multimodal embedding) shape how researchers adapt and reframe their discourse, enabling a distinctive form of knowledge dissemination. Through this analysis, we aim to shed light on the multimodal recontextualization strategies that facilitate effective knowledge dissemination in science news websites.

1. Introduction

Scientists are increasingly expected to communicate their research to the general public, in accordance with the principles of Open Science. This movement advocates for the democratization of scientific knowledge, ensuring that research outputs are not only freely available to other scholars and to society but also comprehensible to a wide audience (Fecher and Friesike, 2014). Web 2.0 technologies help researchers achieve this goal by providing platforms and supporting digital genres that facilitate the widespread dissemination of scientific content. The technological affordances of digital genres (e.g., the seamless integration of multimodality and hyperlinking) enable researchers to share their findings in innovative ways, bridging the gap between expert knowledge and public understanding, and facilitating the engagement of audiences with various degrees of expertise (Luzón and Pérez-Llantada, 2022).

One platform that has acquired enormous relevance in the dissemination of research is *The Conversation* (Zardo et al., 2018), a science news website funded by universities all over the world, intended to promote the public understanding of science and help different stakeholders (e.g., individuals, industry) make well-informed decisions. This platform enables researchers across all disciplines to share their knowledge on topical issues and communicate their work and findings to the interested public. The articles in *The Conversation* are published under Creative Commons licenses, which means that they can be accessed and republished freely by individuals, organizations or news outlets around the world (The Conversation, 2025). In this way, *The Conversation* facilitates the wide circulation of and accessibility to scholars' work (Bartleman et al., 2024). The annual survey of their Australian readership shows that this platform actually helps to bridge the gap between academic research and real-world applications (Zardo et al., 2018). Readers utilize these articles for practical purposes, such as developing policies, supporting business decisions, and changing personal behaviors and attitudes.

The Conversation is an example of "academic explanatory journalism" (Bartleman et al., 2024: 3). The articles are written by academics and researchers, who work together with professional journalists. This collaboration ensures that the content is trustworthy and based on research evidence and that the final article is appealing and comprehensible for a non-academic audience, who may include policy makers, funders or the general public. While researchers may write articles to provide expert insights and analyses of science-related topics in their

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field, they also use this news outlet to disseminate their own research findings. They therefore need to recontextualize their published research and adapt it to make it suitable for the broad non-expert audience of *The Conversation*. However, despite the potential of this website for disseminating academic knowledge and improving science literacy, there are few studies on the discourse features of articles in *The Conversation* (see Herrando, 2023), and even fewer on the strategies used in these articles to make scientific knowledge accessible for the lay audience (see Mur, 2024).

The study reported here contributes to filling this gap by analyzing the recontextualization strategies used by researchers to facilitate understanding when reporting their own research in *The Conversation*. Adopting a multimodal perspective, we propose an analytical framework to examine the various semiotic resources employed to aid comprehensibility in these articles. We analyze the frequency, function and formal features of the following elements that facilitate understanding: (i) verbal in-text elaborations (e.g., examples, reformulations, definitions or analogies); (ii) visuals (e.g., pictures, graphs); and (iii) hyperlinks to supplementary information. We also examine how these elements contribute to the recontextualization of the discourse of the research articles into *The Conversation* articles. Through this analysis, we aim to shed light on the range of recontextualization strategies that facilitate effective knowledge dissemination in digitally mediated science news discourse, particularly in *The Conversation*.

2. Literature review

2.1. Recontextualization

Many articles in *The Conversation* recontextualize the scientific discourse of research articles to make it comprehensible, relevant and engaging for a heterogeneous audience with various degrees of expertise. Recontextualization has been widely explored as a process by which elements from one social context are shifted and adapted to another to serve new rhetorical purposes (e.g., Bezemer and Kress, 2008; Van Leeuwen, 2008). Bezemer and Kress (2008: 184) define recontextualization as follows:

> moving meaning material from one context with its social organization of participants and its modal ensembles to another, with its different social organization and modal ensembles. (…) [R]econtextualization involves the re-presentation of the meaning materials in a manner apt for the new context in the light of the available modal resources.

Since digital communication is inherently multimodal, this definition of recontextualization is particularly relevant for digital genres, because it acknowledges the importance of "available modal resources" in the new context and highlights that the adaptation and representation of meaning materials is constrained and shaped by the modes that are available and appropriate in the new context. The analysis of recontextualization in digital genres requires going beyond linguistic strategies and considering how multimodal resources contribute to meaning-making, engagement, and accessibility in the new context. Digital media allow for the integration of text, visuals of different types (e.g., pictures, graphs, videos), and hyperlinks, creating rich, multimodal texts. Multimodality plays a crucial role in the recontextualization of scientific discourse within digital genres, with authors combining various semiotic resources to make complex information accessible to a broader audience. Studies of digital genres for science dissemination have shown that recontextualizing knowledge involves using the variety of modes available in the genre (e.g., Carter-Thomas and Rowley-Jolivet, 2020; Luzón, 2019; Xia, 2023). For instance, in online videos produced by research groups, the orchestration of verbal and visual semiotic resources helps to make the message more understandable for the lay audience (e.g., definitions or descriptions may be accompanied by visuals representing the object or concept) (Luzón, 2019).

Understanding how information is recontextualized in digital genres aimed at disseminating scientific knowledge requires taking into account the diversified audiences of these genres. Content originally written for a specialized audience must be recontextualized to accommodate a heterogeneous audience, which may range from experts and researchers in various disciplines to policymakers and industry professionals, educators, students, and laypersons with varying levels of scientific literacy. This merging of audiences has been referred to as "context collapse" (Marwick and Boyd, 2011), which involves that authors need to anticipate and address the diverse expectations and knowledge levels of various audiences. Genres such as science blogs or articles in *The Conversation* are clear examples; in these texts authors must translate complex scientific findings into accessible information for less expert audiences, while still providing content of interest for expert readers. In research blogs, authors employ strategies such as explanation of terms or reformulations to bridge the gap between experts and non-experts, but they also include hyperlinks to original studies which may be of interest for experts (Luzón, 2013). In addition, it should also be noted that there is not a clear-cut distinction between expert and non-expert audiences, and that the interested public may have sufficient knowledge to understand scientific information (Luzón, 2013; Oliveira et al., 2024). Oliveira et al. (2024) highlight that, although it is important to help the audience understand scientific findings, non-expert audiences may have the capability to process scientific information and also interest in accessing the data underlying scientific findings. Therefore, recontextualization is not merely about simplifying scientific content but about adapting it to accommodate a diverse audience, acknowledging their varying levels of expertise while respecting their capacity to engage meaningfully with complex information.

Given the centrality of adapting specialized knowledge to disseminate it to diversified audiences, there is an abundant body of research on the recontextualization strategies employed in a variety of digital genres for science dissemination, e.g., science blogs (Luzón, 2013), research digests (Lorés, 2023), research group videos (Luzón, 2019) and three-minute thesis presentations (Carter-Thomas and Rowley-Jolivet, 2020). This research has identified three major types of strategies: comprehensibility, engagement and credibility strategies. Comprehensibility strategies (Luzón, 2013, 2019; Lorés, 2023) are intended to make complex information accessible to diverse audiences and tailor information to the interests and information needs of these audiences, e.g., reformulations, examples, or explanatory visuals (Luzón, 2013). Engagement strategies are intended to attract and maintain the audience's interest and make scientific content relatable, e.g., the use of informal discourse and inclusive pronouns, questions, or self-disclosure (Carter-Thomas and Rowley-Jolivet, 2020; Luzón, 2013). Credibility strategies seek to establish the speaker's authority, e.g., hyperlinks to academic publications (Herrando, 2023; Lorés, 2023; Luzón, 2019). Although the three types of strategies play an important role in the articles in *The Conversation*, in this paper we focus on comprehensibility strategies.

2.2. Comprehensibility strategies

Given the need to ensure accessibility of scientific knowledge, there has recently been considerable interest in analyzing comprehensibility strategies in genres intended for general or diversified audiences (e.g., Liu et al., 2023; Lorés, 2023; Luzón, 2013; Mur, 2024; Xia, 2023). This research has revealed the important role of three elements: (i) Verbal in-text elaborations; (ii) visuals (e.g., pictures, tables, graphs); and (iii) hyperlinks.

2.2.1. Verbal in-text elaborations

The term "verbal in-text elaboration" is used here to refer to information provided to the audience through written language which facilitates the comprehension of a concept or fragment of text. The

modifier "in-text" helps to distinguish elaborations within the article from elaborations through a hyperlinked text. These strategies have been widely analyzed in various genres, under different names, e.g., code glosses (Hyland, 2007; Liu et al., 2023), explanation strategies (Mattiello, 2019) and simplification strategies (Kathpalia, 2024). Hyland (2007: 268) uses the term "code glosses" to refer to textual elaborations that make a text comprehensible "by rephrasing, explaining or elaborating what has been said" (Hyland, 2007: 268). He distinguishes two main types of "code glosses": reformulation and exemplification. Reformulation is a process whereby information is rephrased or restated in different words to aid comprehension. Exemplification is a process whereby a concept or argument is clarified by using concrete examples or cases to illustrate it. In their study of code glosses in 3MT presentations, Liu et al. (2023) extend Hyland's (2007) original classification by adding two categories, namely definitions and analogies. Definitions "explain concepts unfamiliar to non-specialist audiences", and include explanations with explicit markers of the "defining" act (e.g., "is defined as") and those with implicit markers (e.g., copular verb "be"), as well as explanations through syntactic appositions (Liu et al., 2023: 5). Analogies create a likeness between two concepts, helping audiences understand unfamiliar phenomena by drawing on more familiar concepts. A study on comprehensibility strategies particularly relevant for the current research is Mur (2024) because it compares the use of what she refers to as "explanatory strategies" in three genres, namely articles in *The Conversation*, feature articles and research digests. For this comparison, she categorizes verbal strategies into five types: elaboration (i.e., expanding on specific concepts to make specialized information accessible to a broad audience), explicitation (i.e., providing specific details or peculiarities to clarify concepts), exemplification, enumeration (of elements before explaining them), and comparison/analogy.

2.2.2. Visuals

Visuals have always been present in academic and scientific discourse to facilitate the understanding of complex scientific information (Rowley-Jolivet, 2002). While in research articles visuals are essential for presenting new findings, allowing readers to interpret and validate data, in science popularizations visuals are adapted to the audience's background knowledge, serving mainly to attract the reader and facilitate comprehension (Miller, 1998). Rowley-Jolivet (2002) developed a framework to classify the visuals in conference presentations, distinguishing the following types: (i) Figurative I visuals: ordinary photographs; (ii) Figurative II visuals**:** images enhanced through photographic techniques, such as MRI images; (iii) Graphical visuals: monosemic conceptual images, such as charts and tables, where each element has a single value or meaning; and (iv) Scriptural visuals: slides with writing or text. These visuals have a variety of purposes, including providing evidence, presenting summaries of findings, engaging the audience, and enhancing the overall presentation (Rowley-Jolivet, 2002). This framework has been used in other studies, such as Xia's (2023) analysis of visuals in TED Talks.

Due to the multimodal affordances of digital texts, visuals play a particularly important role in digital genres for science dissemination. For example, the visuals in TED Talks are an integral component of this genre, used to ensure that scientific concepts are accessible and engaging (Xia, 2023). Mur (2024) highlights the importance of visual representations, specifically pictures, in the articles in *The Conversation*, describing them as a "multimodal knowledge enhancement process" (p. 108). In the digital context, visuals can be moved easily across texts and used for new purposes. As Mehlenbacher (2019: 126) notes, "visuals travel across genres, and as they do, they mean differently within them" and can reach diverse readerships. When transferred to another context, they can also be modified and combined with text to facilitate comprehension of content in the new context. Luzón (2013) found that science bloggers sometimes incorporate visuals from the papers they discuss. These visuals are usually enhanced with additional explanatory text to make them more accessible, or with modifications to ensure clarity, such as highlighting specific parts.

2.2.3. Hyperlinks

Hyperlinking is a key affordance of digital genres for science communication and dissemination, playing an important role in how information is accessed and comprehended. Kim (2000) categorized the motivations for hyperlinking in scholarly electronic articles into three groups: scholarly, social, and technological. Key scholarly motivations included providing additional or background information, followed by offering examples or illustrations, and giving supportive evidence. Authors also used hyperlinks to supply visual images of what they were talking about, definitions of terms, historical background, and data or statistics. In addition, social motivations, including promoting others' work, acknowledging contributions, and fostering professional networks, as well as technological motivations, such as facilitating convenient access to information and saving space in the main text, were identified. Kim's (2000) study suggests that these links help make complex concepts more accessible and illustrate points more effectively. In her analysis of recontextualization strategies in science blogs, Luzón (2013) found that hyperlinking was the most common strategy for tailoring information to readers. This feature, unique to digital genres, sets blogs apart from printed popularizations. Hyperlinks are used in research blogs and in research digests to aid comprehension, by offering access to explanations of specialized terms or background information in other sites, and to provide supporting evidence by incorporating other voices (Lorés, 2023; Luzón, 2013).

Although previous studies have analyzed the role of verbal elaboration, visuals and hyperlinking in facilitating comprehensibility, these elements have often been examined separately. The present study adopts a multimodal perspective to analyze how these diverse semiotic resources are integrated to enhance the comprehensibility of research-based articles in *The Conversation.*

3. Methodology

This study examines a dataset of 50 articles published in *The Conversation* (hereafter "CAs")—totaling 45,569 words—that report on environmental research (see Appendix). The 50 CAs were retrieved from the Global edition of *The Conversation*. Starting from the date of collection (September 26, 2024) and following a reverse chronological order, we selected the first 50 articles under the category Environment that contained a hyperlink to a related research article (RA) by the same author(s) and recontextualized such RA. The hyperlinked RAs (hereafter "source RAs") were also collected, since they were used as reference texts to trace how scientific content had been adapted for broader audiences in the recontextualization process. Metadata such as date of publication, title, URL, and title and website of the source RA were recorded on a Microsoft Excel sheet. Both the CAs and the source RAs were saved as PDF files and named with a number code.

The purpose of this study is to examine how the content selected from the RAs has been adapted to the new context of *The Conversation*, focusing on the strategies used to enhance comprehensibility. Given that CAs are multimodal texts, we adopt a multimodal perspective to the analysis of these strategies. Accordingly, we coded and analyzed the following elements that facilitate understanding in these articles: (i) verbal in-text elaborations; (ii) visuals; and (iii) hyperlinks to supplementary information.

All instances of these comprehensibility strategies were identified, coded and annotated using Atlas.ti. For the codification of verbal in-text elaborations, we started with Liu et al.'s (2023) categories of code glosses (i.e., reformulation, exemplification, definition and analogy), to which we added "explicitation" from Mur's (2024) framework. The reason is that these five strategies seem to be functionally distinct and encompass the categories in other taxonomies. See Table 1 for a description of these categories. For the codification of visuals, we

Table 1
Categories of verbal in-text elaboration.

Category	Definition
Exemplification	Using concrete or everyday examples to illustrate and support a concept or an argument
Definition	Explaining a concept to clarify its meaning. This includes definitions with explicit lexical signals and without explicit lexical signals, as well as acronyms.
Analogy	Using analogies based on experiences and concepts from areas outside the specialist field
Reformulation	Restating a fragment of text in different words to facilitate comprehension
Explicitation	Providing specific details of a concept to make it clearer to the audience

initially used Rowley and Jolivet's (2002) categories, but added another category derived from the data: videos/animations. For the codification of hyperlinks, we developed our own coding scheme, according to the type of source to which they linked. We followed an iterative process and created the coding scheme as we identified instances of each type of linked source.

All the strategies were coded and annotated by the two authors. In order to develop and refine a coding scheme appropriate for our data, 15 articles (30 % of the articles) were coded independently by both authors, with an inter-rater agreement of 96 %. Discrepancies in the coding of individual cases were solved through discussions among the authors, which resulted in refining the coding scheme and subsequently recoding the data in the 15 articles and coding the remaining of the data by the two authors. This new coding was discussed again and differences were solved.

We further analyzed the formal features of each category of verbal in-text elaboration—how it was expressed and, where applicable, its subtypes—as well as their function in discourse. The analysis of visuals also focused on their function, specifically how they contributed to meaning-making in relation to the surrounding text. To this end, we applied Unsworth's (2008) framework, which distinguishes between concurrence (i.e., the visual and text convey the same meaning) and complementarity. Complementarity includes extension (i.e., the text adds information not present in the visual) and enhancement (i.e., the text highlights particular information in the visual). Finally, for the hyperlinks, we focused on each of the main types of sources linked to (e.g., research articles, government websites) and examined the specific functions these links fulfilled within the text (e.g., clarification, expansion of background knowledge).

Finally, we examined the transformations involved in the use of these strategies as part of the recontextualization process. For each instance of a verbal in-text elaboration in the CAs, we identified the corresponding "elaborated discourse unit" in the source RA—that is, the concept or fragment that was defined, exemplified, reformulated, or clarified through analogy or explicitation. This allowed us to analyze how the same content was expressed in the original scientific article and to gain a deeper understanding of how it was adapted for a broader audience. Our analysis drew on Van Leeuwen (2008), who discusses four transformations that take place in the process of recontextualization: substitution (i.e., replacing elements of the original discourse with others that better suit the new context), deletion (i.e., removing elements that are not appropriate for the new context), rearrangement (i.e., changing the sequence or organization of discourse elements), and addition (i.e., inserting new elements not present in the original discourse). In the case of visuals, we also explored their recontextualization by identifying their source—whether they were directly taken from the RA or introduced from another source—and examining any modifications made during the transfer to the CA.

4. Results

In this section we discuss the different comprehensibility strategies, paying particular attention to processes of recontextualization. In what follows, we adopt the following conventions: the "elaborated discourse unit" is indicated in **bold**, the elaboration in *italics*, and hyperlinks are underlined.

4.1. Verbal in-text elaboration

Table 2 shows the frequency of verbal in-text elaborations in the dataset of CAs.

There were 376 instances of verbal in-text elaborations in the dataset, with an average of 7.52 instances per CA. Exemplification was the most frequent category, being used as frequently as the other categories combined, followed by definitions. This result is consistent with previous findings in both specialized genres (Hyland, 2007) and science dissemination genres, where exemplification has been shown to play a central role in making specialized content accessible (Liu et al., 2023; Mur, 2024). Authors provide examples to help readers understand technical and non-technical terms (e.g., 1) or to strengthen claims and arguments, and make them more relatable to the audience (e.g., 2). In example (2), the example of the "osprey" was not present in the source RA, but was added to the CA to make the previous claim more tangible.

(1) Our new research showed **solitary hunters** *such as bears, tigers and Eurasian lynx* have higher individual kill rates than **social predators** *such as wolves and lions*. (CA05)
(2) **Drones terrify many species of wildlife, causing them to break cover**, try to escape or to become aggressive. *In Western Australia, for instance, an osprey suffered injuries after a photographer flew their drone into it.* (CA24)

Definitions took a variety of forms: (i) formal definition with copular verb ("A term/phrase + copular BE + defining unit") (e.g., 3); (ii) definition through apposition ("A term/phrase + appositive noun phrase") (e.g., 4–6); (iii) naming (e.g., 7–8); (iv) acronyms (e.g., 9); (v) extended definitions, consisting of more than one sentence; (vi) definitions not signaled syntactically (e.g., 10).

(3) By definition, **a mesa** is an isolated flat-topped landform, elevated from its surrounding landscape by steep sides. (CA22)
(4) We examined carnivore **"kill rates"** – the number of prey killed over time. (CA05)
(5) The world's large areas of **permafrost** (permanently frozen ground) (CA09)
(6) …**frequent fire** (at least once every 15 years) (CA08)
(7) The modified fin male guppies use to inseminate females (**gonopodium**) was also larger in these males. (CA17)
(8) Then the frogs were placed in enclosures with artificial structures that heat up in the sun, called **"frog saunas"**. (CA38)
(9) **"HPAI"** stands for Highly Pathogenic Avian Influenza (CA06)
(10) We classified the different types of fences as turtle-friendly, or not. In **turtle-friendly fences**, the mesh or wire spacing is greater than the body size of the turtle. **Unfriendly fences**, in contrast,

Table 2
Frequency of verbal in-text elaborations.

Category	Raw frequency	Per 1000 words
Exemplification	189	4.15
Definition	116	2.5
Reformulation	36	0.79
Analogy	21	0.46
Explicitation	14	0.3
Total	376	8.25

have mesh or wire spacing smaller than turtle, barring their passage. (CA07)

The most frequent types were appositional definitions (n = 43), which often involve the use of commas, dashes, or parentheses to provide the additional explanatory information, and naming (n = 23). Appositions help to explain technical terms or to clarify how the authors are using a term in the article in a less disruptive way than formal definitions. In the context of digitally mediated discourse, they offer a concise means of supporting readers' understanding, without overloading them with excessive detail, thus maintaining the flow and readability expected in online science communication. Similarly, naming helps the authors provide the technical name of a concept (e.g., 7), or provide the name of the concept for further use in the article without disrupting the flow of discourse (e.g., 8). In most of these cases, the technical terms (e.g., "permafrost", "gonopodium") are used in the source RA without any explanation, assuming that the expert audience will understand them. Extended definitions are often used to present key concepts in the article, offering context and deeper explanations to help readers understand their significance and relevance to the article's subject matter. For instance, CA17 included an extended definition of Prozac, focusing on its effects on people and on the environment, so that readers can understand the author's research on how fluoxetine (Prozac) pollution affects freshwater fish.

Analogies, also found in the dataset of CAs analyzed by Mur (2024), contribute to facilitating comprehension by relating complex scientific concepts to familiar everyday concepts and experiences (see examples 11–13).

(11) This method [**ecoacoustics**] is ecologically akin to a doctor using a stethoscope and listening to a patient's heartbeat to assess their health. (CA21)
(12) They're the pirates of the seabird world, stealing hard-earned meals from other species. (CA06)
(13) When wildfire smoke is in the air (…) [trees] respond a bit like us, it turns out: Some trees essentially shut their windows and doors and hold their breath. (CA50)

In example (11) ecoacoustic monitoring is likened to a doctor using a stethoscope, and in example (12) large seabirds are compared to pirates, which helps readers understand their predatory tactics. This strategy is frequent in other digital genres for science dissemination, such as science blogs (Luzón, 2013) or 3MT presentations (Carter-Thomas and Rowley-Jolivet, 2020; Liu et al., 2023). As in 3MT presentations (Liu et al., 2023), authors of CAs may employ extended analogies or imaginary scenarios, which make the description more vivid and relatable. An illustrating example is the extended analogy in CA50, titled "Trees don't like to breathe wildfire smoke, either – and they'll hold their breath to avoid it" (e.g., 13). The article compares the way trees and plants react to smoke with humans' response, describes tree stomata as being similar to human mouths and states that plants "inhale" carbon dioxide and "exhale" oxygen. Through this analogy, the authors humanize trees' response to fire, helping the readers understand it and raising their empathy and awareness of the problem.

Reformulation is not a frequent strategy in the CAs, probably because the process of transferring text from the source RA to the CA already involves substantial reformulation. For example, the sentence in the RA "We observed occluded stomatas with near-zero stomatal conductance" has been reworded in CA50 to: "We (…) discover[ed] that the tree's pores were completely closed and photosynthesis was nearly zero", making it comprehensible to the readers. The functions of reformulation in CAs are similar to those in 3MT presentations (see Liu et al., 2023) (see examples 14–18).

(14) Within these areas we look for **scats** (*poo*) (CA01)
(15) **Low levels of fluoxetine also decreased sperm motility**. *This means the sperm of exposed males were poor swimmers compared to the sperm of unexposed males*. (CA17)
(16) The Black Summer bushfires burned through about **1.5 million hectares**, *or more than six times the size of the Australian Capital Territory*. (CA42)
(17) "HPAI" stands for **Highly Pathogenic Avian Influenza**, *meaning the virus can more readily cause severe disease and death*. (CA06)

Reformulation is used to simplify technical terms (e.g., 14) or complex statements (e.g., 15), making the information more digestible for a general audience. It also helps to translate abstract figures into relatable scenarios, as in example (16), where "more than six times the size of the Australian Capital Territory" helps readers visualize the scale and impact of the problem. Finally, reformulation helps to clarify a concept focusing on the practical implications (e.g., 17).

Explicitation is used to make implicit information in the text explicit by adding details or clarifications (see Mur, 2024). In example (18) a stage of plant life which might be overlooked (seeds underground) is explicitly highlighted.

(18) Our findings point to the importance of researching plants at **all stages of their life cycles**, *including their largely invisible time as seeds below ground*. (CA08)

The analysis of verbal in-text elaborations involved not only identifying their types and functions but also examining how they relate to recontextualization processes (Van Leeuwen, 2008). One common recontextualization process involving verbal in-text elaborations is addition, which entails including clarifications, examples or explanations that were not present in the source RA. These additions contribute to ensuring that the content is accessible to a general audience who may not be familiar with technical or scientific jargon. For instance, the definitions of "mesa", "permafrost" or "gonopodium" (examples 3, 5, 7 above) were not present in the source RAs but were introduced in the CAs to support reader comprehension. Substitution is also frequent: examples or definitions that appear in the source RA are often replaced with other examples or definitions expressed in simpler, more accessible language. For instance, Table 3 illustrates how examples and definitions in the RA are reformulated in the corresponding CA.

When taking up the example in (19), the authors have replaced all the elements, generalizing some of them ("brown bears, Ursus arctos"-"bears") and particularizing others ("most felids"-"tigers and Eurasian lynx"). In example (22) the specific numeric data have been translated into a clear explanation, which makes it easy to see the practical implication (i.e., turtles can pass through them). In many cases some elements of definitions present in the source RAs are deleted (i.e., omitted) when the definition is moved to the CA. Deletion usually involves selecting the basic information presented in the RA to understand the concept, while omitting detailed technical information and references.

Table 3
Examples and definitions in RAs and CAs.

Source RAs	CAs
(19) solitary carnivores (e.g., brown bears, Ursus arctos and most felids)	solitary hunters such as bears, tigers and Eurasian lynx (CA05)
(20) Kill rates, typically measured as the number of prey killed per individual predator per unit time	carnivore "kill rates" – the number of prey killed over time (CA05)
(21) frequent fire (every ≤ 15 years)	frequent fire (at least once every 15 years) (CA08)
(22) Friendly fences were defined as those with mesh dimensions >130 mm or with bottom wires >30 mm above ground level	In turtle-friendly fences, the mesh or wire spacing is greater than the body size of the turtle (CA07)

These transformations—addition, substitution, and deletion—highlight how researchers actively reshape content to meet the communicative demands of the genre. While verbal in-text elaborations such as definitions, examples, and reformulations are also present in specialized scientific discourse (Hyland, 2007), recontextualizing these RAs in the CAs involves the addition of more elaborations and the modification (through substitution or deletion) of those occurring in the article. Verbal in-text elaborations in the CAs are shaped by the editorial norms of *The Conversation*, which explicitly value clarity and accessibility. In line with Mur (2024), this analysis also suggests that recontextualization in *The Conversation* involves not simply adapting scientific discourse, but also maintaining and explaining specialized terms. This may be a strategy to avoid excessive simplification that could weaken credibility and to negotiate a balance between accessibility and authority.

4.2. Visuals

Table 4 provides an overview of the types and frequency of visuals that contribute to facilitating comprehension in the dataset. It shows not only the total number and percentage of each type, but also the average number of such visuals per CA. This includes visuals embedded directly in the main article text, as well as those appearing in embedded tweets (3 Figurative I visuals and 3 videos/animations).

Figurative I visuals are by far the most frequent type in the dataset. As in Xia's (2023) study of TED Talks and Mur's (2024) study of articles in *The Conversation*, these visuals dominate because they are easier for non-expert readers to process and interpret. Figurative II visuals and Graphical visuals are much less frequent, despite the fact that Graphical visuals are prevalent in the source RAs. This is consistent with findings by Luzón (2013) and Mehlenbacher (2019), who note that visuals are often selected and adapted to optimize accessibility in new contexts. Scriptural visuals, commonly employed in spoken academic genres like conference presentations (Rowley-Jolivet, 2002) and TED Talks (Xia, 2023), are notably absent in the CAs.

Figurative I visuals in this dataset of environment-related CAs include a diverse range of photographs which improve the understanding of environmental issues. They usually represent various species and their habitats, environmental impact and environmental management methods. Only six out of the 96 Figurative I visuals were taken from the source RAs. Two of these photographs were modified when transferred to the CA by adding text and other elements, such as lines—an editorial practice also common in science blogs (Luzón, 2013) to guide the viewer's attention and facilitate understanding of visual information. A large proportion—93.75 %—of Figurative I visuals were additions (i.e., not present in the source RA), introduced to improve comprehensibility and reader engagement. These were typically provided by the authors of the article or sourced from external websites or stock image banks. Photographs in the CAs can also be used to replace other types of graphics in the source RA. An example is provided in CA07, which deals with the problems that fences pose for freshwater turtles. In the source RA one of the figures is a schematic drawing of a "chicken wire fence", showing uniform hexagonal mesh structure (see Fig. 1). In the CA, this drawing has been replaced with a photograph of the "chicken wire fence" and a turtle unable to pass through it, with the caption "Chicken wire fencing should be avoided because the mesh diameter is too small to allow turtles (…) to pass through" (see Fig. 2).

Table 4
Frequency of visuals that aid comprehension in the dataset.

Type of visual	Number of visuals	% of visuals	Mean use per text
Figurative I	96	73.28	1.92
Figurative II	2	1.52	0.04
Graphical	14	10.68	0.28
Videos/animation	19	15.5	0.38
Total	131	100	2.62

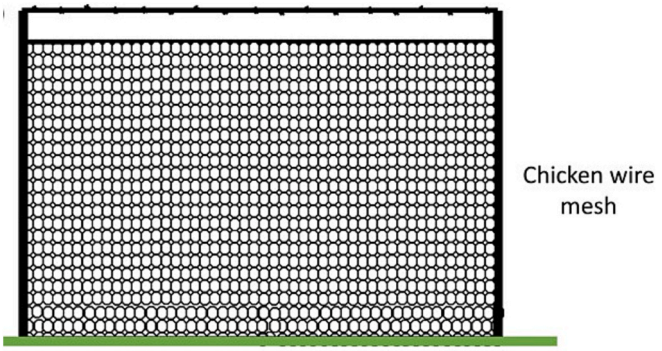

Fig. 1. Figure representing a "chicken wire fence" in the Source RA. Reprinted from "The influence of fence design on the movement patterns of eastern long-necked turtles", by J.M. Dowling, D.S. Bower, R. Boscarino-Gaetano, and E.J. Nordberg, 2024, The Journal of Wildlife Management, 88(8), p. 5. Copyright 2024 by J.M. Dowling, D.S. Bower, R. Boscarino-Gaetano, and E.J. Nordberg, published under the terms of following license: https://creativecommons.org/licenses/by/4.0/.

Fig. 2. Figure representing a "chicken wire fence" in CA07. Reprinted with permission of the author from "Farm fences trouble turtles in search of water. Here's how to help", by E. Nordberg, D. Bower, and J. Dowling, 2024, *The Conversation*. Copyright 2024 by J. Nordberg, published under the terms of the following license: https://creativecommons.org/licenses/by-nd/4.0/.

The photograph and the caption in the CA improve the audience's comprehension and also their engagement, since they are offered a real-world example of the problem.

As in TED Talks (Xia, 2023), the relation between Figurative I visuals and the text is usually one of extensive complementarity (Unsworth, 2008): the visuals serve to illustrate and extend the information presented in the text, while the text also extends the visually presented information, providing additional context or details. For instance, in CA24, concerned with the danger of posting photos of animals in social media, the text describes how this has affected "the critically endangered blue-crowned laughingthrush". The authors have added a picture of the bird with the following caption: "Many people want to take photos of the blue-crowned laughingthrush. But the pressure of human interest puts these rare birds on edge – and can even affect their breeding". The three elements (the article text, the picture and the caption) work together to help the audience understand the challenges faced by the blue-crowned laughingthrush. The text gives factual information about the species' critical situation and limited population. The picture

visually represents the bird, helping the readers recognize it and promoting emotional engagement, and the caption expands on the negative impact of photography on this species.

Graphical visuals, which represent only 10.7 % of the visuals in the CA, mostly consist of infographics (n = 7, 50 %) or various types of maps (n = 5, 35 %). While Mur (2024) found a complete absence of tables, graphs, or figures in digital dissemination texts, this study qualifies her finding by showing that Graphical visuals are actually present in CAs, although the types of graphics used (infographics and maps) are rather accessible visuals designed to convey contextual information without requiring specialist knowledge. Four of the maps in the dataset were taken from the source RA, and two of them were modified when transferred to the CA, to improve contextual understanding. In one of these cases, two maps present in the source RA were simplified and combined into a single map, thus presenting complex information in a more digestible manner for a broader audience. In this case, the visual also complements and extends the textual content of the article (Unsworth, 2008). The article where this visual appears describes the Arid Zone Monitoring project. The text provides a general overview of the project and the visual offers a detailed view of the survey sites in the project, illustrating its scope and diversity.

Seven out of the 50 articles include an infographic, either taken from another source or created by the authors. For instance, CA41 incorporates an infographic depicting the "biological pump", taken from an IAEA (International Atomic Energy Agency) webpage targeted at lay audiences. The article is concerned with how "zooplankton appetites influence the biological pump" and the infographic and the accompanying caption help the readers visualize and understand the processes involved in the biological pump and the effect of zooplankton grazing. Infographics may also be used to resemiotize (i.e., substitute) textual information in the source RA to make it easier to process. This is the case of the infographic in CA21 (see Fig. 3), an article about ecoacoustics, and the accompanying caption: "We used a metal probe connected to a microphone to capture and record the sounds made by tiny animals in the soil, while using headphones to listen in". The infographic depicts the setup of the different elements used to capture and record the sounds. The detailed, technical and complex description of the equipment and methodology presented in the source RA is resemiotized into a clear and simple visual, which makes the setup understandable at a glance. The visual extends the information provided in the text of the CA and in the caption by showing the actual placement of the different elements and how they are connected, which might be harder to visualize from text alone.

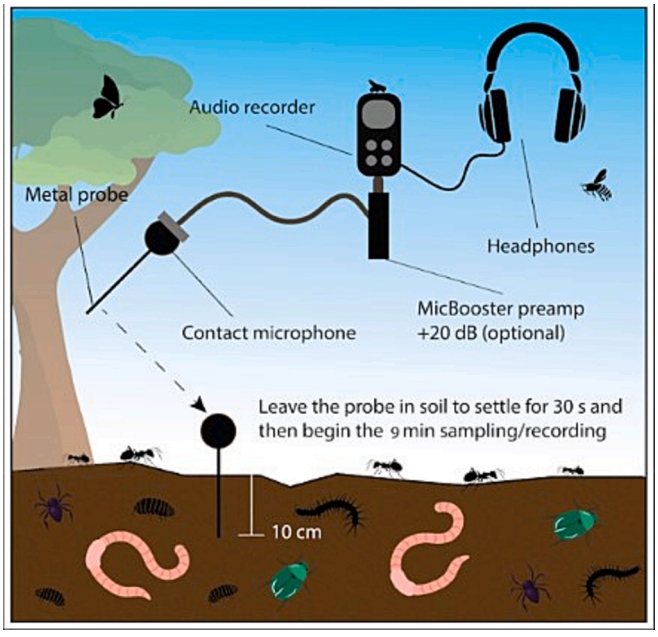

Fig. 3. Infographic in CA21. Reprinted with permission of the authors from J. M. Robinson and M. Breed, "Crackles, clicks and pops – now we can monitor the 'heartbeat' of soil", 2024, *The Conversation*. Copyright 2024 by Flinders University, published under the terms of the following license: https://creativecommons.org/licenses/by-nd/4.0/.

Some articles also embed videos, including animated videos, usually taken from other websites. Only in one CA the embedded videos were taken from the source RA. These videos often extend or add information to the text, making complex or abstract concepts more concrete. Animated videos use engaging visuals and straightforward language to simplify complex information for a general audience, such as the explanation of microgrids in a video produced by Western Power (CA36). Other videos provide direct visual demonstration or evidence of what is described in the text, thus enhancing understanding and adding realism to the verbal description in the article, e.g., a video showing the flotation of vehicles in water, which illustrates what is said in the text ("A small car can float in just 15 cm of water") (CA37), or a video showing the behavior of inebriated kererū pigeons after eating fermented fruit (CA40).

Visuals play a key role in enhancing the comprehensibility of scientific content in the CAs. *The Conversation's* capacity to integrate multimedia seamlessly influences what kind of resources are employed to recontextualize scientific knowledge for a diversified audience and how these resources are orchestrated to serve this purpose. The embedding of visuals within the flow of the article reflects a recontextualization pattern shaped by the affordances of the platform, where image and text interact to construct meaning. As shown, most of these visuals are additions—i.e., they do not appear in the source RAs—introduced to enhance accessibility and engagement for non-specialist readers. However, some visuals are transferred from the source RA, sometimes with modifications. Other visuals substitute elements in the source RA, for instance by resemiotizing content originally conveyed through language or through a different type of visual. These practices demonstrate that visuals in *The Conversation* are not simply replicated from the source RAs or other sources; they are recontextualized to fit a new discursive space. As Mehlenbacher (2019) notes, visuals, as rhetorical artifacts, travel across contexts and may undergo changes shaped by the affordances of the medium, genre conventions, and the new communicative demands.

4.3. Hyperlinks to supplementary information

The CAs analyzed include different types of links intended to help readers better understand the content. The different sources to which these links lead and the number of instances are shown in Table 5.

A significant number of hyperlinks (53.08 %) lead to research articles aimed at specialized audiences. These links act as citation devices and provide evidence for and more information about a specific claim or statement in the sentence (e.g., 23). This citation purpose of hyperlinks

Table 5
Main types of hyperlinked sources.

Source	Number of links	% of links	Mean use per text
Research articles	379	53.08	7.58
Government's websites or documents	104	14.56	2.08
Other sources	80	11.2	1.6
Popular news websites	52	7.28	1.04
Articles in *The Conversation*	35	4.9	0.7
Websites/documents with specialized or technical content	33	4.62	0.66
Online encyclopaedias	17	2.38	0.34
Research project websites	14	1.96	0.28
Total	714	100	14.28

is common in online scholarly and science dissemination genres (Herrando, 2023; Kim, 2000; Lorés, 2023; Luzón, 2013). There are 143 instances of hyperlinks to the authors' own research articles, often introduced through noun phrases such as "our research" (e.g., 24), and in these cases, the hyperlink also has a promotional function (see also Herrando, 2023; Lorés, 2023).

(23) Their populations across South and Western Australia have declined by more than 60 % over the past 40 years. (CA26)
(24) However our research shows adaptive management is often poorly suited to managing impacts on groundwater. (CA46)

There are also links to other websites or documents with specialized or technical content such as reports or data, which often offer information in the form of graphs (e.g., 25). This type of hyperlink allows readers to check the information that supports specific statements and gives a sense of credibility, while giving access to related data that is not specifically mentioned in the text. Likewise, links can lead to research project websites, often offering non-technical information about their objectives and results, among other aspects, so that non-expert audiences can understand its relevance (e.g., 26).

(25) Now that we know this, authorities can use this technique to accelerate Australia's world-leading uptake of rooftop solar even further. (CA14)
(26) More and more species are becoming threatened, and populations of threatened species keep declining. (CA19)

Some links lead to various types of governmental (.gov) webpages, whose official character endows the data presented with credibility. These include, for instance, webpages with general information on environmental topics (such as mass fish deaths in example 27), with relevant information about a specific species (e.g., 28), or with tips and explanations for the population as to how to proceed in specific circumstances or avoid risks (for instance, how to prepare against floods, storms or tsunamis, in example 29). In other cases, hyperlinks lead to webpages that inform the reader of policies adopted by the government (e.g., 30), or to official data and documents (e.g., 31), which allow readers to access and check official information and learn more about specific regulations. This seems to be especially relevant in the field of Environmental Sciences.

(27) Lack of oxygen in rivers and lakes have already become a major cause of mass fish deaths. (CA45)
(28) The brolga is listed as vulnerable in New South Wales. (CA11)
(29) Every year in Australia, people driving into floodwaters drown and many more are rescued. (CA37)
(30) The idea is any damage to the environment can be managed along the way. This has been the norm for large coal mines and gas developments in Australia since 2013. (CA46)
(31) We found an important relationship between the ice core record and the Forest Fire Danger Index, used by authorities to measure bushfire weather. (CA42)

Hyperlinks to encyclopaedic entries provide long explanations and/or descriptions of a concept. Rather than to general encyclopedias, these links tend to lead to environmental related websites, for instance the website "weeds Australia" (https://weeds.org.au/)–which seeks to provide information on invasive weeds in Australia–in example (32), and to collaborative platforms such as Wikipedia (e.g., 33).

(32) These rodents are chowing down on one of Australia's worst invasive plants, African boxthorn. (CA31)
(33) Almost half (45 %) of the entire NT is pastoral land – public land leased for use as cattle stations. (CA19)

Links to popular news websites such as The Guardian or ABC News are similarly used to allow the reader to learn more about a specific topic or fact (e.g., the reasons for the increase of solar panels in Australia in example 34). Likewise, links to other articles in *The Conversation* also give readers the chance to read more about a specific subject-matter, in this case written by experts, and, in addition, they can help keep users in the platform.

(34) Two decades ago, solar panels were a rare sight on Australian rooftops. Now, around a third of all households have them. (CA14)

There are also links to a variety of other sources which offer content that seems to cater for the information needs of non-expert audiences (even if they can also be of interest for experts), such as blog entries, videos, leaflets, popular magazines or websites of apps or tools. In some cases, links lead to webpages of associations and organizations that give information about what they seek to protect, sometimes with fund-raising purposes.

Regarding recontextualization processes, in most cases hyperlinks in CAs are used to add new information that was not present in the source RA. However, in some cases, rather than adding new information, hyperlinks substitute for information that was present in the source RA. This is the case of the link in example (35). The source RA includes a long and highly technical definition of "quaking aspen" (e.g., "it exists as nearly mono-specific stands of mixed genotypes"), supported by references to other academic works. In the CA the technical definition is replaced by a link to the webpage "Know your trees: aspen"–hosted in a governmental website (https://www.fws.gov/)–which offers a long definition or description of the species in a language easy to understand by non-experts.

(35) Quaking aspen (Populus tremuloides) is the most widespread tree species in North America. (CA02)

The use of hyperlinks in CAs exemplifies a unique affordance of digital environments, supporting the integration of multiple sources and enabling technologically mediated elaboration. As in science blogs (Luzón, 2013) and research digests (Lorés, 2023), hyperlinks in CAs facilitate recontextualization by providing access to various layers of related knowledge, from research papers and official documents to background explanations. Since accessing linked content is optional, hyperlinks cater to diverse information needs and expertise levels without disrupting the linearity of the main text.

5. Conclusions

This study has examined the comprehensibility strategies employed by researchers when adapting scientific content for publication in environment-related articles in *The Conversation*. It introduces a new analytical framework for examining recontextualization strategies in digital science dissemination genres, one that accounts for the range of semiotic resources employed and their interaction. This framework also addresses how these strategies contribute to the recontextualization processes involved in transforming RAs into CAs. The findings show the strategic co-deployment of verbal in-text elaborations, visuals and links to enhance comprehensibility and help readers better understand results of scientific research. Verbal strategies provide accessible clarification and explanation of complex concepts, visuals complement textual information by offering alternative modes of representation that both facilitate comprehension and foster engagement, and hyperlinks extend the scope of the information. The interplay of these strategies contributes to the goal of promoting public understanding of environmental issues, enabling readers to make well-informed decisions and adopt more sustainable behaviors and attitudes.

Among verbal in-text elaborations, exemplification and definition

play a key role in enhancing comprehension. The preference for concise, integrated forms of definition, such as apposition and naming, suggests an effort to maintain and clarify specialized terms without disrupting the flow of discourse, thus ensuring both credibility and readability. As for the visuals, their type appears to be influenced by the environmental focus of the dataset, the platform's communicative aims and the affordances of the medium. The use of Figurative I visuals, maps and infographics is consistent with the goal of making the content accessible and relatable to non-expert audiences. The prevalence of Figurative I visuals, consisting mainly of photographs of species and their habitats, suggests that the authors seek both to illustrate the content vividly and to arouse emotional engagement with environmental issues. This predominance of Figurative I visuals supports Xia's (2023) findings on TED Talks, and points to the key role of these visuals in science dissemination. The relationship between text and visuals in the CAs is usually one of extensive complementarity (Unsworth, 2008), with visuals reinforcing or extending the textual content. Finally, hyperlinks reflect the importance of credibility (see Herrando, 2023) and access to specialized content. The frequent linking to research articles and specialized websites aligns with *The Conversation*'s mission to provide trustworthy information (The Conversation, 2025) and suggests that authors consider that a large part of their readers may be interested in this specialized content (see Oliveira et al., 2024). Overall, the diverse range of sources linked in the CAs caters to readers with various levels of expertise, enabling them to engage with the content at their desired depth.

The findings also highlight the relation between the strategies explored in this study and two types of transformations involved in the recontextualization process: the addition of various elements not present in the source RA to enhance comprehensibility and amplify information (i.e., verbal and visual elements and hyperlinks); and the substitution of some elements present in the original RA with others that are easier to understand by non-expert audiences. Recontextualizing the content of RAs into CAs frequently involves the addition of clarifications, examples, and explanations absent in the source RAs, and the simplification of definitions present in the source RA by using more accessible language and omitting highly technical details and references.

Recontextualization processes for visuals exhibit a distinct pattern. Visuals from the source RAs are rarely reused in the CAs, and when they are, they are often modified to enhance accessibility for a broader audience. However, new visuals taken from other sources—particularly photographs, infographics, and animated videos—are frequently added to improve comprehensibility and appeal. This practice is facilitated by the technological affordances of online publishing platforms, which enable the easy adaptation and embedding of visual content from other digital sources, thus shaping the multimodal composition of CAs. There are also cases of resemiotization, where textual elements in the source RAs are replaced with infographics in CAs, which help to explain complex ideas through visual representations. Finally, the addition of hyperlinks transforms the articles in *The Conversation* into a network of connected texts, which expands the information available to the interested readers.

By adopting a multimodal analytical framework, this study contributes to a better understanding of how academic knowledge is recontextualized for broader audiences on platforms like *The Conversation*. It highlights the importance of integrating diverse semiotic resources not only to bridge the gap between specialized knowledge and public understanding but also to cater to varying levels of expertise and interest among readers. It is hoped that the results can help researchers who seek to communicate their research to diversified audiences on this or other similar platforms, contributing to making scientific knowledge accessible to audiences beyond the academic community.

CRediT authorship contribution statement

María-José Luzón: Writing – review & editing, Writing – original draft, Visualization, Validation, Supervision, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Conceptualization. **Sofía Albero-Posac:** Writing – review & editing, Writing – original draft, Visualization, Validation, Methodology, Investigation, Formal analysis, Data curation.

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Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.dcm.2025.100920.

Data availability

The data can be accessed from the appendix

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