Analysis of hypertext in the communication and dissemination of science: National Geographic Kids as a case study

Análisis del hipertexto en la comunicación y difusión de la ciencia: National Geographic Kids como caso de estudio

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Resumen

Se investiga la aplicabilidad discursiva del hipertexto en *National Geographic Kids*, para construir mensajes adaptados al intelecto del lector infantil. La metodología analiza lo publicado durante un año en @NGKids mediante un análisis de contenido del tipo cuantitativo centrado en seis variables (cantidad, calidad, procedencia, modalidad, rendimiento documental y diseño). Se concluye que hay unas reglas de producción basadas en una narrativa multilineal asentada en una planificación estructural tanto en los nodos de anclaje como en los nodos de destino; que el rendimiento documental se usa para contextualizar la información, explicar conceptos, o redireccionar a libros de la editorial; y que hay una redundancia visual de la señalización de unos enlaces que son principalmente dinámicos e internos, para informar y educar al público infantil. Un patrón de uso de interés para enseñar en las aulas y para impartir a través de cursos de transferencia a profesionales en activo y en formación.

Palabras clave: hipertexto, divulgación científica, comunicación científica, niños, *National Geographic Kids*.

Abstract

This article investigates the discursive application of hypertext in *National Geographic Kids* to construct content adapted to the intellect of child readers. Content published on @NGKids over the period of a year was analysed using a quantitative content analysis focused on six variables (quantity, quality, origin, type, documentary function and design). It is concluded that the production rules follow a multilinear narrative based on a structural plan in both the anchor and destination nodes. Moreover, the documentary function contextualises information, explains concepts or redirects the reader to the publisher's books. In addition, visual emphasis is noted in a number of links that are primarily dynamic and internal and that are intended to inform and educate children, a pattern of use that is of interest for teaching in classrooms and for teaching active and training professionals through transfer courses.

Keywords: hypertext, science dissemination, science communication, children, *National Geographic Kids*.

Sumario: 1. Introduction and literature review. 1.1. Hypertext in children's science magazines. 2. Objectives and methodology. 3. Analysis and results. 4. Discussion. 5. Conclusions. 6. References.

1. Introduction and literature review

This study analyses hypertext practices used by the magazine *National Geographic Kids* to provide information about animals, nature, technology, history, geography and exploration for children, understanding hypertext as "a text that contains interlinked elements or documents from which other information can be accessed" (García-García, Arévalo and Hernández, 2019, p. 290).

This study may be considered significant because the dissemination of information to children is governed by specific narratives that are necessary to meet the challenge of informing using understandable, entertaining and rigorous language. Until now, these discursive practices have been analysed exclusively in print formats, determining semantic and pragmatic aspects or functional semantic components used and the discursive techniques applied in the construction of content for the child reader (Massarani, 2004; González-Arribas, 2007; Vallejos and Pamucci, 2011; Eduarda, 2012; Tosi, 2016). However, the strategies used to disseminate science to these audiences through digital resources have yet to be identified, conceptualised and classified. Indeed, researchers from a variety of interdisciplinary backgrounds have stressed the need for studies of the characteristics of online science dissemination aimed at children (Thoms, Jaiser, Nell and Riecker, 2017).

Given this need, this study analyses how information is transmitted through hypertext, since it is considered the "main distinctive strategy of digital narrative (Salaverría, 1999; Armentia *et al.,* 2000a, 2000b; Rost, 2003; Oblak, 2005; Larrondo, 2009a, 2009b, 2010; Rubio and Blanco, 2010; Steensen, 2011)" (Barredo, 2003, p. 89). Its use in the construction of content has several advantages, including giving meaning and understanding to scientific dissemination (Milena and Tejedor, 2020) and allowing the construction of clearer informative texts adapted to the intellect of the child reader. As Krenca et al. (2024) report, children's ability to understand what they read on screens is affected by hovering hyperlinks and scrolling.

In addition, hypertext information processing is only effective in children when it is adequately designed relative to regular linear text (Klois *et al*. 2013). And to achieve these pedagogical outcomes, hypertext structures suited to children's cognitive capacities are needed so that they can freely choose what to read through logical, easy-to-understand exploration. Because of that, the field of cognitive psychology calls for studies that provide hypertext designs or scaffolding strategies that facilitate

cognitive flexibility (Soria, 2015), which is the aim of this study. A line of research that is the main objective of the Cognitive Flexibility Theory (CFT), a general learning theory that focuses mainly on the use of hypertext to learn complex content, and the interactive narrative theory for studying the design of science dissemination content (Zhao and Yang, 2024).

In this context, the aim of this study is to investigate the practical application and scaffolding strategy of hypertext in a popular science magazine aimed at children. According to Rogge and Jensen (1980) and Lehmkuhl (2008), such magazines are "dedicated to the explanation of both natural and social phenomena whose contents may, but do not necessarily have to, originate from the field of science, and whose main interest is the dissemination of knowledge whilst not excluding the application of elements of entertainment and fun" (as cited in Thoms *et al.,* 2017, p. 39). This format was selected as these magazines aim to "have a positive impact on the learning processes, critical thinking and informal education of their readers" (González-Arribas, 2007, p. 12). Moreover, they represent a link between current affairs and children. The knowledge they provide through non-formal education has been highlighted by Morrow and Lesnick (2001), Massarani (2004) and Yilar (2007).

This study focuses on the magazine *National Geographic Kids*, the children's version of the magazine published by the National Geographic Association, an organisation recognised with the Prince of Asturias Award for Communication and Humanities in 2006 and which operates on the basis of a strong commitment to educational pedagogy. First launched in 1975 under the name National Geographic Word, it is aimed at 7–12-year-olds and enjoys a wide readership and applications in the classroom (Vrla *et al.,* 2020). Moreover, it has been nominated for and won the Weddy Awards, which recognise digital projects with a level of excellence that enables them to serve as a model and international leader on the Internet.

This study explores hypertext writing by analysing: 1) the design applied so that children can identify the links in the text, as this is a basic principle of this discursive practice (Salaverría, 2005); 2) the hypertextual quality of the links, as "redirecting the user to web pages that are not really thematically related to the text leads to its hypertextual 'richness' losing all its usefulness" (Hassan and Martín Fernández, 2021, p. 7); 3) the origin of the links (internal or external), as "the relationship between source and target content is the focus of most studies on hypertextuality in journalism" (Arías and García Avilés, 2018, p. 283); and 4) the documentary function (communicative function or type of information provided by the links) (Fondevila *et alt.,* 2014). These variables are considered fundamental to analyse whether the multilinear narrative structure or scaffolding strategy that governs the production of the magazine has a structured, fixed hyperlink pattern that represents a deliberate communication strategy to mitigate the cognitive overload inherent in non-linear navigation, thus aiming for meaningful learning.

This study therefore aims to determine the most common hypertext production rules or structures in *National Geographic Kids*' digital narrative through which children, according to its website, enjoy reading and browsing the website without even realising they are learning.

1.1. Hypertext in children´s science magazines

Hypertext is a non-sequential mode of writing because the text is broken up by documents that are linked through words, phrases or images, called links or anchors, which can be activated with the keyboard or a mouse. When "the word, phrase or image is activated, the specified object document appears on the screen and a hypertextual 'jump' is said to have taken place" (García Marcos, 1996, p. 11).

Its potential to communicate science has already been described by Vannevar Bush, "one of the fathers of automated documentation, through his proposal of a relational documentary system, which is the direct predecessor of the hypertext proposed by Theodore Nelson, remote from the World Wide Web" (García Marcos, 1996, p. 186). The most significant studies on its use in journalism date back to the end of the 20th century: Rich (1998) provided the first classification of "hypertextual models for the construction of journalistic information" (Salaverría, 2005, p. 518). In the 21st century, the first empirical research began to address the use of this resource in the general media at the international level. We can take as a reference study focused on the press in the United States (Coddington, 2012), Sweden (Larsson, 2012), Slovenia (Vobic, 2013), France (Sire, 2017), Latin America (Llano, 2005; Castellanos, 2011); and Spain (Barredo, 2013; Pérez Marco, 2003; Arias-Robles y García-Avilés, 2018; Fondevila *et alt.*, 2013).

Previous research that has analysed hypertextual writing exclusively for the dissemination of science is shaped by the contributions of the researchers De Vicente and Cea (2019), who established the first conceptualisation of links aimed at informing about scientific/technological content, classifying them into five typologies according to their documentary function: curricular, organisational, methodological/scientific, bibliographical, terminological and archival. Subsequently, Sierra and De Vicente (2020) reveal the strategies used by the heads of the science sections of the main Spanish national newspapers to explain, and clarify terminology for the lay public. This study also addressed the Spanish Foundation for Science and Technology's news agency SINC (De Vicente y Sierra, 2021).

Specifically, the hypertextual discursive practices used in popular science magazines have been analysed in the Spanish edition of *Muy Interesante* (De Vicente y Carballeda, 2021a) and *National Geographic* (De Vicente y Carballeda, 2021b). However, research that analyses hypertexts collaterally along with other variables is also noteworthy: this is the case of Bolufer (2016), who studied 1,356 journalistic texts published in the magazines *Muy Interesante*, *Quo* and *Materia* to determine whether there were any differences between the information strategies used in print and digital media, analysing the presence and quantity of hypertexts; and Bricio (2016), who investigates the same differences in *Muy Interesante*, *National Geographic* and *Investigación y Ciencia*, focusing on whether the links provided useful additional information. In addition, Tejedor, Portales and Pueyo (2018) studied the use of Web 2.0 resources by examining the presence and origin of hypertext in *Muy Interesante*, *National Geographic*, *Quo*, *Investigación y Ciencia*, *Año Cero* and *Enigmas*.

The aim here is to contribute new data to this field of study by analysing hypertext but in a popular science journal aimed at a child audience. This type of study has only been carried out previously in the magazine *Muy Interesante Junior* (De Vicente *et alt.*, 2022) but here we will look at *National Geographic Kids*.

Previous studies focusing on National Geographic Kids have analysed, in their print editions, the lexical, structural and semantic parameters of terminologies (Sheludchenko y Sheludchenko, 2013); the representation of animals (Vrla *et alt.,* 2020); the themes, text type and visual content in the German edition (Thoms *et alt.,* 2017); the textual content and illustrations in the Spanish edition (López Romero y Borda, 2015; González-Arribas, 2007); and whether the concepts inserted in the Turkish edition comply with the ministerial objectives set for primary education (Dedeoğlu *et alt*., 2011). Thus, new data are now being contributed to this line of research on the construction of the message but in the digital environment, focusing on hypertextual writing.

2. Objectives and methodology

The main aim of this study is to answer the following questions: Which hypertext design does National Geographic Kids use to inform and educate children? What is its hypertext scaffolding strategy?

The objectives are to research the presence of hypertext in the construction of the informative message of the *National Geographic Kids* magazine; to analyse hypertextual quality (whether they provide information related to the linked term in relation to what is provided in the informative piece); to identify the origin of the link; and to determine the documentary or communicative function of the links.

The methodology is based on the following phases:

-Bibliographic review in international databases (Dialnet, B-on, Google Scholar, Scopus, Wos,SAGEJournals online, Taylor & Francis) using the keywords: science communication, science journalism, science dissemination, children, child audience, *National Geographic Kids*, digital magazine and science dissemination magazines.

-Sample selection: all the news pieces posted on the *National Geographic Kids* Twitter feed (called X from 2023 onwards) from 21 January 2021 to 21 January 2022 (n= 194) were collected and the webpage was accessed through the link to carry out the content analysis. Retweeted or repeated pieces, pieces that insert visual content without text.

-Units of analysis: semantic hypertexts are analysed (n= 751), "that is, those that directly link different content [...] to generate meaning, to associate content, beyond the rigid and immovable structuring that imprints categories" (Rost, 2003, p. 176). Therefore, a level 1 hypertextual analysis is carried out, which consists of studying the relationship between the article, called the parent text, and the texts that will be consulted by clicking on them, called linked texts (Saemmer, 2012), was carried out.

-Analysis block:

a) The presence of hypertexts was analysed using a binomial system (yes/no). Their presence in the total sample under study was determined by means of the following coding: 1. Very high (between 100 and 90 %); 2. High (between 89 and 75 %); 3. Medium (between 74 and 50 %); 4. Low (between 49 and 25 %); 5. Very low (below 25 %). The number of hyperlinks per item, was analysed using the link detection code of Barredo (2013): 1. One or two; 2. Three or four; 3. Five or six; 4. Seven or eight; 5. Nine or ten; 6. Eleven or more. It also analyses whether the links are inserted in the body of the text or in a visual medium, giving a 1 for text and a 2 for images.

b) The classification created by De Vicente and Cea (2019) was used as a basis for analysing documentary function: 1. Curricular (they provide the researcher's research profile); 2. Organisational (connects to the cited body); 3. Methodological/scientific (redirecting to scientific study); 4. Bibliographic (redirects to cited book); 5. Terminological (explains terminology); 6. Archival (contextualises the information). The category "other" was also added.

c) For the origin of the links, the following code was established: 1. Internal (they direct to information from the same medium); 2. External (they report to external sites). Correlations between provenance and documentary function were then established.

d) The hypertextual quality was carried out with a two-part analysis. The first investigated whether the links are dynamic (leading to pages thematically related to the text) or dysfunctional (unrelated). The second aspectanalysed the presence of dysfunctions in the linked word or phrase according to McAdams and Berger's (2001) classification using the following code: 1. False twin links (two links with similar wording that do not lead to the same thing); 2. Non-identical twin link (two links with very different wording leading to the same thing); 3. Mystery links (obscure words that do not give a hint of what to expect); 4. Trick link (leading to false expectation).

e) The design of the link was analysed using a binomial system (yes/no) to study how they are identified and how those links already visited are signposted. The type of design was determined using the following code: 1. Text link (words or phrases acting as nodes); 2. Graphic link (icons that act as anchors).

3. Analysis and results

The results obtained regarding the presence, quantity, origin, quality, design and communicative function of the hypertexts in *National Geographic Kids* are shown in Table 1:

Table 1. *Most relevant variables.*

	Total
Total semantic hypertext	(751)
Design of the link	%
Text link	100
Graphic link	0,0
Hypertexts per piece	
1-2	39,6
3-4	22, 2
5-6	9,0
7-8	9,0
9-10	4,8
More than 10	15,3
Documentary function	
Curricular	0,0
Organisational	0,0
Methodological/Scientific	0,0
Bibliographic	4,8
Terminological	6,5
Archival	85,8
Other	3,4
Origin	
Internal	95,2
External	4,8
Hypertextual quality	
Dynamic	93,3
Dysfunctional	6,7

Source: Author's own creation.

The data obtained on the presence of hypertext indicate that 80,2 % of the sample under study has hypertexts. Just 19,8 % lacke this resource. Therefore, its level of applicability is high because it has been used in almost 82 % of the information published in the year under study. It should also be noted that hypertexts are mainly absent in informative pieces that are photographic galleries accompanied by captions, which indicates that *National Geographic Kids* is implementing hypertext in the construction of their verbal messaging (signs and symbols of written language) but not in the construction of their visual messaging to improve understanding or to add information in the images. This is corroborated by the fact that they never insert links in the images accompanying the informative pieces: 100 % of the sample are textual links.

And regarding the number of links in each informative piece, the results reveal that there is no uniformity in the number of textual links per news item in *National Geographic Kids*. 39,6 % of the sample under study have one or two, 22,2 % having three or four, 15,3 % having more than ten, 9 % having between five and six, 9 % having seven or eight, and 4,8 % having nine or ten. These links in 75 % of the cases are inserted by decreasing order in: a toponym or demonym (33,7 %); the common name or taxonomy of an animal (24,6 %); an event or historical figure (4,1 %); a work published by *National Geographic* (6,3%); habitats (3,3 %); identification of a natural disaster (0,5 %) or nature park (1,2 %); a planet or star (1,1%) and others 25,8 %.

In terms of documentary function, the results show that the links are, in decreasing order: archival (85,8 %); bibliographic (4,7 %); terminological (6,5 %); and other (3,4 %). And un the case of terminological, it should be noted that they are usually anchored when the following taxonomies of animals are insert in the information piece: mammals, birds, reptiles, amphibians, invertebrates and fish. In “others”, a new type of link stands out that, when clicked, does not show other information but allows the reader to read a photograph caption in its entirety.

The origin of these links (archival, bibliographic and terminological) is 95,2 % internal (from the archive or historical collection of *National Geographic Kids*) and 4,8 % external. The results indicate that 100 % of the archival and terminological links are internal, and the bibliographic links are 100 % external, with the added peculiarity that they all lead to the website that sells the published works of *National Geographic* cited in the text from which the information for the informative piece has been obtained. As such, all the linked information is connected to *National Geographic*.

The results reveal that there is also a structural plan in the information children receive through the destination nodes. Thus, the anchor inserted into a geographic area, an animal, a planet, or a US president, within the informational piece, almost always leads to or redirects content, structured in parts, with a format similar to the index cards in academic books. Specifically, the anchor for each country or city redirects to an information sheet divided into some of these categories: official name, nickname, form of government, largest city, abbreviation, official languages, statehood, capital, population, currency, state bird, state flower, main mountain range, main rivers, geography, people and culture, and nature.

Animals include information on: common name, scientific name, type, diet, group name, average life in the wild, size, weight, and a location map. The following data is provided for US presidents: name, nicknames, date of birth, date of death, time in office, vice president, and political party, along with other data structured into sections (which always include "Fun Facts" and "Childhood"), and a reference to the publisher's book from which the information was taken.–And the file linked to each planet includes three parts: “quick facts” (location, distance from the Sun, average temperature, duration of space travel from Earth, gravity), a couple of paragraphs, and a section called “Did you know...?”

Other links, with very little representation of the main anchor terms, often lead to information files and expand the information through other formats (photo galleries, videos, or text articles. They also link to fun material, such as quizzes to assess the child's level of knowledge, content downloads, and games.

The data obtained on hypertextual quality show that 93,3 % of the cases under study have hypertextual quality (they are dynamic) compared to 6,7 % that show dysfunctions. The few malfunctions found are due to two reasons: poorly connected links that prevent access to the target link (1,7 %), and links that provide content that is not related to the linked word or phrase (4,9 %). In the case of mis-linked links, the user detects them because during the process of connecting from one node to another they are notified that "something went wrong", or because the duration on the screen of a blank page allows them to conclude that there has been an operational error.

Regarding the dysfunctions classified by McAdams and Berger (2001), the data reveal that there is no "mystery link" or "trick link", as the content dysfunctions observed can be considered technical failures not intended deceiv the child by offering information unrelated to that indicated in the anchor term; however, 0,3 % of links are examples of "false twin links", providing divergent information on two identical words inserted in the text. And a 0,5 % of the samples under study are "non-identical twin links", although it is justified because in the destination node information is provided that contextualises both links.

In 100 % of cases, these links are textual and comply with one of the basic principles of hypertextual writing: to identify them clearly within the informative piece so that the child reader can understand that this word or phrase leads to other information. In particular, they are highlighted with an underline consisting of a thin yellow line below the word or phrase that links to the target text.

The results also reveal that in 100% of the informative pieces, once the anchored word is consulted hey never take on a different colour or specific signage to remind the child that they have already consulted it.

4. Discussion

The results obtained on the presence of hypertext concur with those obtained by De Vicente, Carballeda and Cea (2022) in their study of the magazine *Muy Interesante Junior*: 74 % of the articles analysed contained links compared to 24 % that lacked them. The insertion of anchors mainly in terms referring to various semantic fields (the toponym or demonym, the common name or taxonomy of an animal; an event or historical figure; a work published by *National Geographic*; habitats; identification of a natural disaster, or nature park; a planet or star) is a strategy that has been used in teaching units so that children learn contextualised vocabulary and identify a set of common words belonging to the same semantic group (Landone, 2001).

The number of links varies in each informative piece depending on the presence of the terms selected to be anchored in the construction of the informative message. This allows us to interpret that their inclusion is not determined by a requirement to insert an exact or approximate number of links in each informative piece, but rather to fulfil a specific communicative function that is reasoned and justified by means of a prior planning process, as described by Puntambekar and Stylianou (2005). They therefore adhere to the argument that what really affects the cognitive load is the reading order so that, regardless of the number of hypertext links, readers who read in a more coherent order experience less cognitive load (Madrid and Cañas, 2009; Madrid, Van Oostendorp and Puerta, 2009) compared to those who

believe that the greater the number of hyperlinks, the greater the cognitive load on the reader's working memory (Parush, Shwartz, Shtub, 2005).

Analysis of the communicative function of hypertexts suggests that the use of archival, terminological and bibliographic hypertexts is intended to expand information, explain concepts and show references to books or readings. However, the absence of methodological/scientific and organisational links was deemed logical as children are not trained to read a scientific article nor are they able to assess the importance of an organisation.

The fact that that the content provided through the anchor words appears in the form of a data-structured academic sheet is considered to be part of the didactic strategy that helps children to not only know in which semantic fields they will find a link but also to know what information they will get from each category. In this regard, Maeyer (2013) highlights that links should be used when relevant and are only valuable when triangulated with other web-based and offline methods. In this case, the aim is to promote active, meaningful learning through a scaffolding strategy that corresponds to an organised way of arranging and relating data.

Also notable is the observation that, through the destination nodes, they provide photo galleries, a resource also identified in previous studies focusing on science websites for children (Diani and Sezzi, 2020) and games to teach in an enjoyable way. The scaffolding strategy and the narratives used therefore take into account the content level and the age characteristics of the children in the dissemination of science as recommended by Lin and Gerasymenko (2025).

Given the high number of internal links, it is worth noting that previous studies indicate that the low number of external links is due to a fear of losing the audience by referring them to another site (Vobic, 2014) or because of the possible legal ramifications that external links may generate (Hall, 2001). However, it is considered that *National Geographic Kids* uses internal links to allow the child to learn more about the information using the same informative method (explanation and exposition of thematic content) adapted by the magazine to the intellect of child audiences to provide them with specific educational competencies. This theory is corroborated by the correlation between link provenance and documentary function. As such, all the linked information is connected to *National Geographic*. Given these results, it can be interpreted that by using hypertexts, *National Geographic Kids* aims to fulfil two functions: to document and educate children on specific aspects of the main themes of the magazine and to publicise the association's publications aimed at children, parents and educational institutions.

These data allow us to interpret that the type of hypertext used in this magazine is didactic, since it is used to contextualise and explain vocabulary and to provide images for reading comprehension. Therefore, their scaffolding strategy is considered to address this warning: that the technical possibilities of hypertext are of little use without a pedagogical conception of learning that is exploratory, meaningful, and discovery-based.

Regarding hypertext quality, all the destination nodes are related to the linked word. Price and Price (2002) recommend that each link or one-way connection between two web nodes should contribute something and not hinder the coherence of the page.

In the case of mis-linked links, the user detects them because during the process of connecting from one node to another they are notified that "something went wrong", or because the duration on the screen of a blank page allows them to conclude that there has been an operational error. Lamarca (2018)

defines them as non-operational, broken, dead or forbidden links because they lead to a file not found or to a page with an incorrect URL because it is not available or has disappeared forever. Regarding content dysfunctions, we can highlight two forms; offering information unrelated to the linked words; and linking two terms together offering information only from one of them. because it is not available or has disappeared forever.

Moreover, the design of these links complies with one of the basic principles of hypertext writing: to identify them clearly within the informative piece so that the child reader can understand that this word or phrase leads to other information. In particular, they are highlighted with an underline consisting of a thin yellow line below the word or phrase that links to the target text. And while blue underlining, as shown by Canavilhas (2007, p. 101), has become a standard characterisation for this, we can conclude National Geographic Kids have opted for yellow because it is the characteristic colour of the box that frames the cover image of the National Geographic Association's magazines, together with its characteristic Laurel leaf in the central part, as they have been the pillars of the magazine's design since 1979 (De Vicente, 2011).

It is also revealed that they also make use of other elements that allow the children to confirm it is a link: the transformation of the cursor into a hand and the yellow highlighting of the whole word or phrase when the cursor passes over it. This disregards the guideline recommended by Serrano (2010) to identify a link of the informative piece to avoid misleading the child audience, as noted by Garrand (2006).

5. Conclusions

The aim of this study was to analyse the applicability of hypertext in the construction of the informative message of the *National Geographic Kids* magazine and it is concluded that the magazine is characterised by a pattern of use to inform and educate the child audience through hypertextual writing.

Specifically, the data from this study, which contribute to the advancement of knowledge in this line of research, indicate that the scaffolding design or strategy used by *National Geographic Kids* is based on the following characteristics:

The editorial criterion consists of attaching the anchor nodes to certain terms that form part of the same semantic or thematic group. These entities or concepts (words that refer to a specific element of the real world) are primarily: toponyms or demonyms of a geographic area; the common name or taxonomy of an animal; a historical event or figure; a work published by *National Geographic*; a habitat; identification of a natural disaster; a natural park; a planet or star. Thus, *National Geographic Kids* use them to delve deeper into geographical, biological, astronomical and historical content, along with the bibliography published by the publisher on these topics, which are the pillars of this magazine.

This structure implies that there is no specific number of links per informative piece, as this depends on the presence or inclusion of the terms selected by the publisher to insert an anchor node. Thus, it is emphasised, the granularity or autonomous parts of the text have meaning, utility and communicative function.

Its multilinear narrative not only corresponds to a script, decision or structural planning to insert anchors, primarily in specific words. The destination nodes are also characterised by having a structured design. For example, the names of animals, a geographic area or the president of a government have a structured format, which is different for each category (the words of each semantic field) but all similar

to the factsheets in academic textbooks intended for children. Thus, when an animal's common name or taxonomy is shown, the destination node displays a factsheet with the following data: common name, scientific name, type, diet, group name, average life span, size, weight and a location map.

If it is a country or city, the data provided (all or some) include: official name, nickname, form of government, biggest city, abbreviation, official language(s), statehood, capital, population, money, area, state bird, state flower, major mountain range, major rivers, geography, people&culture, nature. Along with this information, photos or videos are provided, with a few paragraphs containing information on the specific concept divided into various sections. In the case of the name of a U.S. president, the information provided includes: name, nicknames, born, died, time in office, vice president and political party, along with information divided into sections, always coinciding in two of them (fun fact and early life), and the publisher's book from which the information comes.

Another type of learning factsheet is the one provided in the destination node when a planet is linked. In this case, the content is divided into three parts: "fast facts" (location, distance from the Sun, average temperature, length of space journey from Earth to the planet; gravity), a couple of paragraphs and a "Did you know?", a format that also includes photographs. The information provided in the other links expands the information through other formats, such as photo galleries, videos, text articles or fun material (quizzes or games). Therefore, a fun, informative learning strategy is also used, to try to generate a positive effect on the child.

This planning allows children to become familiar with hypertext writing, learning not only when the magazine will insert a hypertext but also the type of information that each type will provide, which implies that this planning has a functional objective that is considered coherent and usable for children to learn. In other words, a pedagogical design has been chosen to manage cognitive load through semantic coherence (the quality whereby the anchor and destination nodes of a text make sense with each other and are related logically and consistently).

The types of hypertexts used are primarily archival (contextual), followed by terminological (explanation of a technical term) and bibliographic (redirecting to the cited book). Therefore, the documentary function of the hypertexts is to provide further information, explain concepts and show references to books or reading matter. However, a new type of hypertext stands out: a content expansion link used in photo captions characterised by an anchored word that, when expanded, provides the entire content of the caption that was previously summarised or truncated. Thus, this new hypertext format can be added to the current classification used in this research in future studies.

National Geographic Kids uses structured knowledge by limiting random exploration: the links are mainly internal and thematic, which can guarantee the semantic coherence necessary for young audiences to build scientific concepts. The information provided through the hypertexts usually takes the reader to content previously published by the magazine, a practice referred to as structured journalism.

Hypertext quality is characterised by having dynamic links (redirecting to pages thematically related to the text or word). Moreover, they lack the dysfunctions analysed: false twins (two links with similar wording that do not lead to different destinations); non-identical twins (two links with very different wording that lead to the same page); mystery links (obscure words that make it hard to guess what to expect); trick links (creating a false expectation).

The results obtained in this study indicate that this line of work is a path that should be followed in order to explore how the format type presenting hypertextual information can be improved for a scientific dissemination narrative that is easily understood, as well as the processing, understanding and subsequent retrieval of this information by the child audience. Thus, this model contributes to achieving a communication solution to the cognitive challenges of non-linear reading in childhood.

The practical applicability of this study to journalism is to identify a hypertext model for scientific dissemination aimed at children in order to understand and document current dominant structures. This is of interest to working professionals and for classroom use, as digital storytelling is one of the subjects taught in journalism degrees. With regards to teaching, it provides a learning model for creating reading plans, using them in teaching units and applying them to education programmes developed by teachers. This material may also be useful for literacy in educational technologies by identifying a scaffolding strategy that allows children to independently construct knowledge without getting lost while navigating and to relate concepts to each other.

The study's limitations include the fact that it was conducted on a single journal, a specific case study, which will be expanded in future studies to other popular science journals aimed at children with the aim of combining the various categories of this discursive practice (approaches, variants, divergences) in this sector's digital narrative.

Future lines of research will analyse the empirical validation of cognitive effectiveness and meaningful learning. In other words, analysing the degree of effectiveness of this cognitive structure in associating concepts, delving deeper into information and establishing semantic relationships, activating meaningful learning. Other lines of study will focus on analysing children's reading and reading comprehension experiences with this type of hypertextual writing.

7. Referencias

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