Multimodal science communication: from documentary research to infographic via mind mapping

Sílvia Araújo [1], Radia Hannachi [2]

[1] *University of Minho, Rua da Universidade, Braga, 4710-057, Portugal*
[2] *University of Southern Brittany, 4 Rue Jean Zay, Lorient, 56100, France*

Abstract [1]

In this article, we present the results of a pedagogical experiment conducted in a university context. The experiment aims to introduce students to active methodologies through a pedagogical approach in three stages. The students were divided into pairs and were asked to complete the following tasks:

i) documentary research of five scientific articles related to an active methodology chosen by the students (such as flipped learning or project-based learning) using platforms and journals specialized in the field of language didactics (e.g., HAL open archive, lidil, AILE, Alsic, among others). In a context of information overload, this process of searching for and validating information requires the implementation of an efficient methodology to exploit the documentary wealth of the open scientific web [1]. To help the students undertake a search for information on the web, they were encouraged to rely on a method such as the WWWWHW (Who? What? Where? When? How? Why?) which 'is a real Swiss Army knife for formulating a problem' [2].

ii) transfer of the documentary research into a mind map. The mind mapping technique, popularised by the English psychologist Tony Buzan in the 1970s [3], makes it possible to select and prioritise the key and significant elements from the documentary research carried out in the previous stage. Mind maps are hierarchical diagrams where a central concept branches out into several nodes and subnodes. These nodes and subnodes (which can be equated with topics and subtopics) are connected to each other by lines [4]. A schematic representation of a mind map is displayed in figure 1.

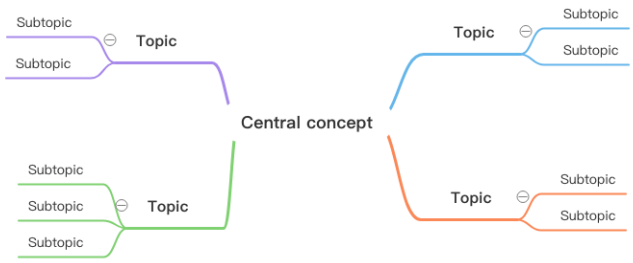

Figure 1: Visual representation of mind mapping

There are several web-based and user-friendly tools for creating mind maps, such as *GitMind*, *Miro*, *MindMeister* and *MindMup*. Thanks to its radiant structure, mind mapping is a creative and yet logical technique for organising information, which allows us to group together and communicate ideas in a visual way [5,6]. Thus the mind map, whether in electronic or paper format, can serve as a basis to create infographics.

[1] CLEF 2021 – Conference and Labs of the Evaluation Forum, September 21–24, 2021, Bucharest, Romania.
EMAIL: saraujo@ilch.uminho.pt (A. 1); radia.hannachi@univ-ubs.fr (A. 2);
ORCID: 0000-0003-4321-4511 (A. 1)
This abstract proposal is based on the paper to be presented at the INFORSID Conference (1-4 June 2021, Dijon, France).

iii) creation of an infographic version of the mind map which presents the strengths and limitations of the chosen methodology. By advocating a multimodal approach that cleverly combines keywords, pictograms and colors [7, 8], a well-designed and executed infographic can spark the public's curiosity on a given topic. All the student pairs involved in the experiment stated that they had transferred most of the information from the mind map to the infographic.

The process takes place through a padlet used as a collaborative workspace, contributing to the implementation of a digital portfolio that brings together the material produced in the previous steps. In order to assess the students' perceptions of the proposed approach, a questionnaire was submitted. Data processing was carried out using a mixed-methods approach (closed-ended and open-ended questionnaire). On a likert scale from 1 (Very dissatisfied) to 5 (Very satisfied), each pair of students rated their infographic according to seven parameters: P1: Quality of the information (the essential information is present and the reading direction is appropriate); P2: Quality of the language used (clear language, relevant to the topic, without typos/grammatical errors); P3: Pleasant visual impact; P4: Clear and highlighted titles; P5: Texts/images (complementary); P6: Unsaturated layout; P7: Legibility of the infographic (choice of font, contrasting colors for background and texts, etc.). It is worth noting that all the parameters obtained an arithmetic average between 4.00 and 4.29, with the exception of parameter 4 which obtained a (slightly lower) average of 3.57. Overall the students rated their final output very favorably, despite the technical, methodological and/or purely aesthetic difficulties mentioned by them. Many parameters could have been considered to assess infographics [9], but judging by the comments made by the students to choose the most successful infographic, it would seem that P3 (impact of the colors) and P5 (quantity of visible information) played a key role. The results corroborate the positive impact of the approach both in terms of the appropriation of didactic concepts and the development of digital literacies.

By using different digital tools (virtual collaborative wall, mind map, creation of an infographic, etc.), the students are introduced to new learning environments that involve a productive dialogue between documentary research and multimodal communication of this research in the digital age. The methodology proposed is part of an approach that leads students to be active not only in terms of reception but also production, as they are required to read and understand (scientific) texts in order to extract important information and organize it in a new visual communication format using digital tools available online. Applied to education, this approach to science communication based on the creation of multimodal content (such as mind maps or computer graphics, for example) aims to develop the analytical and summarizing abilities as well as soft skills such as autonomy, creativity, collaboration and digital literacy. The development of these skills stems from the implementation of a methodology that gives an active role to the learners. Nevertheless, professional and academic benefits could be gained from automating the transition from documentary research to mind maps, or even from the latter to infographics in the context of scientific simplification and dissemination. This quest for automation covers important challenges for various fields such as information retrieval and automatic language processing. These challenges entail not only selecting the aspects to consider when designing an automatic mind mapping workflow [10, 11], but also reflecting on ways of integrating automatic visual generation tools (mind maps or others) into pedagogical practice. Our teaching experiment has been replicated in other contexts with other university students, and the resulting data can be used to train Artificial Intelligence models. The creation of these visuals requires the identification of simplification methods and selection criteria, both semantic and aesthetic. To meet the growing need for information synthesis and simplification, the literature on the so-called visual thinking techniques (mind mapping, sketchnoting, whiteboarding, scribing, live-sketching, graphic facilitation, among others) proliferates on the internet [12, 13, 14]. By combining words and images, these different techniques allow targeted content to be communicated in a visual and synthetic way [15, 16]. Indeed, visualization is a widely used approach to present and simplify data. Reinforced by the development of Big data and Open data [17], data visualization constitutes, as Lehmans and Cardoso [18] rightly note, one of the important issues in the development of educational uses of open data.

Keywords
Active methodology, mind map, infographic, visual thinking, multimodal communication

Acknowledgements

This research is partially supported by the PortLinguE project (PTDC/LLT-LIG/31113/2017), funded by the European Regional Development Fund (ERDF) and the Foundation for Science and Technology of Portugal.

References

[1] B. Pochet, Comprendre et maîtriser la littérature scientifique. Presses agronomiques de Gembloux, 2015.
[2] X. Delengaigne, C. Deschamps, P. Mongin, Organisez vos données personnelles : L'essentiel du Personal Knowledge Management. Eyrolles Éditions d'Organisation, 2011.
[3] T. Buzan, B. Buzan, Mind Map - Dessine-moi l'intelligence. Paris, Les Éditions d'Organisation, 2020. URL: http://www.intralinea.org/specials/article/2515
[4] S. Araújo, A. Correia, Using speechmaking and consecutive interpreting as tools to help students develop writing and public speaking skills: a hybrid teaching methodology based on mind mapping. inTRAlinea Special Issue: Technology in Interpreter Education and Practice, 2020. URL: http://www.intralinea.org/specials/article/2515
[5] D. Régnard, Apports pédagogiques de l'utilisation de la carte heuristique en classe. Études de Linguistique Appliquée, nº 2, pp. 215-22, 2010. doi: 10.3917/ela.158.0215.
[6] P. Mongin, F. de Broeck, Enseigner autrement avec le Mind Mapping. Cartes mentales et conceptuelles - 2e édition. Collection : La Boîte à Outils du professeur. Dunod, 2019.
[7] M. Lebrun, N. Lacelle, Le Document Multimodal : Le Comprendre et le produire en classe de français. Repères, nº 45, p. 81-95, 2012. doi: 10.4000/reperes.141.
[8] L. Chatenet, S. Cardoso, Du graphique à l'infographie. De l'art de faire parler les images. Interfaces numériques, 9 (3), 2020. doi: 10.25965/interfaces-numeriques.4408.
[9] Canva (s.d). Les 9 clés d'une infographie réussie. URL: https://www.canva.com/fr_fr/decouvrir/infographie-reussie/
[10] T. J. Chen, V. R. Krishnamurthy, Investigating a Mixed-Initiative Workflow for Digital Mind-Mapping. Journal of Mechanical Design, 142(10), 2020. 01404. doi: 10.1115/1.4046808
[11] T. J. Chen, S. G. Subramanian, V. R. Krishnamurthy, QCue: Queries and Cues for Computer Facilitated Mind-Mapping. In Proceedings – Graphics Interface, pp. 125 - 136. University of Toronto, 28 - 29 May 2020, Canadian Human-Computer Communications Society / Société canadienne du dialogue humain-machine, 2020. doi: 10.20380/GI2020.14.
[12] A. Akoun, Travailler avec le sketchnoting comment gagner en efficacité et en sérénité Collection Les guides Buzan, 2003.
[13] É. Appert, Penser, dessiner, révéler : toutes les méthodes pour accompagner les idées, les équipes et la vie par le dessin. Paris, Eyrolles, 2018.
[14] W. Brand, Visual thinking : la méthode qui révolutionne vos idées sketchnoting, scribing, facilitation graphique pour tous. Paris, Éditions Vuibert, 2020.
[15] L. Imbeau, Comprendre et communiquer la science. 3e édition. Presses de l'Université Laval, 2020.
[16] V. Schafer, Information et communication scientifiques à l'heure du numérique. Paris, CNRS Éditions, 2020.
[17] O. Desfriches Doria, Quels dispositifs numériques pour appréhender la datavisualisation ?. I2D – Information, données & documents, A.D.B.S., 2015, Dossier

Datavisualisation, des données à la connaissance, 52 (2), 2015, p. 88. doi: 10.3917/i2d.152.0054.

[18] A. Lehmans, S. Cardoso, Datavisualisation des données ouvertes et design pédagogique dans les formats de connaissances. Conférence internationale H2PTM'2017 : Le numérique à l'ère des designs (contenus, interactions, espaces, environnements, services, objets, œuvres, programmes..) : de l'hypertexte à l'hyper-expérience, Oct 2017, Valenciennes, France, 2017. ⟨hal-01638054⟩