EXPLORING IMAGE CHOICE IMPACT ON UNIVERSITY STUDENTS' COGNITION AND READING COMPREHENSION PROCESSES. SOME PEDAGOGICAL IMPLICATIONS

LARA MORATÓN GUTIÉRREZ
Universidad Complutense de Madrid

ELENA DOMÍNGUEZ
Universidad Complutense de Madrid

ALICIA LASSO LICERAS
Universidad Complutense de Madrid

1. INTRODUCTION

In our society, we are constantly receiving visual stimuli. Our students are continuously exposed to a stream of dynamic videos and images. This modern reality has a profound influence on how we shape and present educational content. It has become imperative to complement classroom materials with multimedia components that aid comprehension, enhance engagement, and make lessons more appealing.

The concept of multimodality emerged in the past twenty years as a form of communication that integrates diverse semiotic modes in texts and communicative occasions. These modes encompass speech, writing, gesture, as well as still and moving images (Flores et al., 2016). Over the recent years, multimodality has experienced widespread adoption. Our daily lives are now characterized by constant exposure to an abundance of information presented through various screens. An illustrative instance of this multimodal approach is the utilization of audiovisual materials, which effectively alleviate cognitive burden.

Integrating verbal and nonverbal elements in the English as a Foreign Language/English as a Second Language (EFL/ESL) classroom aligns

with theories of information processing and represents a fundamental aspect of effective instructional practices for students. Extensive research has demonstrated that employing a combination of input modes significantly enhances the learning experience (Tragant et al, 2019).

However, the task of selecting suitable videos or images can present its own set of challenges. When choosing any multimodal resource, factors such as age, motivation, and cultural background must be carefully considered (Canning-Wilson, 2001). Moreover, the arrangement and placement of these multimodal elements on the canvas demand attention (Kress, 2006). Kress's multimodal social semiotic theory delves into the grammar of graphic design, drawing upon Michael Halliday's functional model of language.

With all this information in mind, it becomes evident that locating videos or images that effectively complement and support lesson ideas requires significant effort. Occasionally, this process results in the selection of videos or images that do not directly align with the teaching content. Consequently, the impact of these choices of multimodal materials on the learner's cognitive experience remains largely unknown. If the objective of using images alongside text is to alleviate the cognitive load, what are the consequences when the chosen image does not appropriately serve its intended purpose?

This research paper investigates the influence of teacher-centered multimodal choices on the cognitive processes and content comprehension of our students using eye-tracking technology. Specifically, the study explores how university-level English as a Foreign Language (EFL) learners interact with two texts accompanied by images. One image is directly relevant to the text's content, while the other image has a more tenuous connection to it.

To answer this question the following information is analyzed: The level of comprehension of the text, and the information regarding the study of the cognitive load of the students gathered through the recording of readings using eye-tracking technology. Fixations, its distribution in the texts and regression depict the cognitive work carried out by ESL learners

The remainder of this paper are organized as follows: Section 2 provides a detailed description of the methodology, including information on participants, materials, procedures, and recording techniques. Section 3 presents and analyzes the obtained results, while Section 4 summarizes the key findings and highlights potential avenues for future research.

2. METHODOLOGY

2.1. PARTICIPANTS

In our study, we selected a group of 43 undergraduate Spanish learners of English as a Second Language (ESL) that pursue the Degree in English Studies at Universidad Complutense de Madrid (UCM). All participants were native speakers of Spanish and were students aged 20-25 who had a B2 level of English proficiency. Prior to the experiment, participants were fully informed about the nature of the study and provided written consent to participate. It was essential that participants had normal or corrected-to-normal vision for their gaze to be accurately recorded by the eye-tracker.

The participants were divided into two groups, with each group assigned to read a different text. Furthermore, within each group, the students were further divided into two subgroups. One subgroup read a text accompanied by an image directly related to its content (RG), while the other subgroup read a text with an image that bore an indirect relation to the text's content (NRG). The participants were not informed beforehand whether the image accompanying their text was directly or indirectly related to its content. During the reading task, participants silently read the assigned texts, while the eye-tracker captured their eye movements. These eye movements were recorded to analyze their fixations, patterns and regressions, and subsequently relate them to their cognitive effort. Upon completing the reading task, participants responded to a brief questionnaire regarding the content of the texts.

During the data processing stage, we encountered technical issues with the eye-tracker recording or the experimental software for four

participants. Consequently, their data had to be excluded from the analysis. Therefore, the remaining 39 trials provided valid data for our study.

2.2. MATERIALS

The experiment design included the selection of two texts and two images to accompany them (see Appendix). After the reading took place a short questionnaire was designed to assess the comprehension of the texts.

2.1.1. Selection of the texts

The criteria for selection of the texts had to take into consideration: the age of the participants, their cultural background and their level of English.

In order to ensure that all these aims were met the texts were taken from the materials offered by the web page of the British Council in their reading section. The text chosen were: The biography of Kilian Jornet (T1) and Life on Mars (T2). The first text dealt with the life of a well-known Spanish mountain runner and the second one, as its title suggest, with the possibility of finding life on Mars.

Both texts were adequate for the ESL level of the participants (B2) and for the level of knowledge, reading and interpretation skills demanded from students of the characteristics of our research participants. Besides data comparability of the two texts can be seen on Table 1 below:

TABLE 1: *Detail of the texts used in the experiment (Haiyang et al, 2010)*

Text title	Lines	Words	Lexical Density	Number of diff. words	Lexical word variation
The biography of Kilian Jornet (T1)	100.10	612	0.52	302	0.7
Life on Mars (T2)	92.111	520	0.54	243	0.69

Source: Authors' creation

The next stage involved choosing appropriate images to accompany the text, considering their suitability and relevance to the content. Two aspects were taken into account in this regard: the placement of the image

within the canvas and its relationship with the text, as well as the selection of the images themselves.

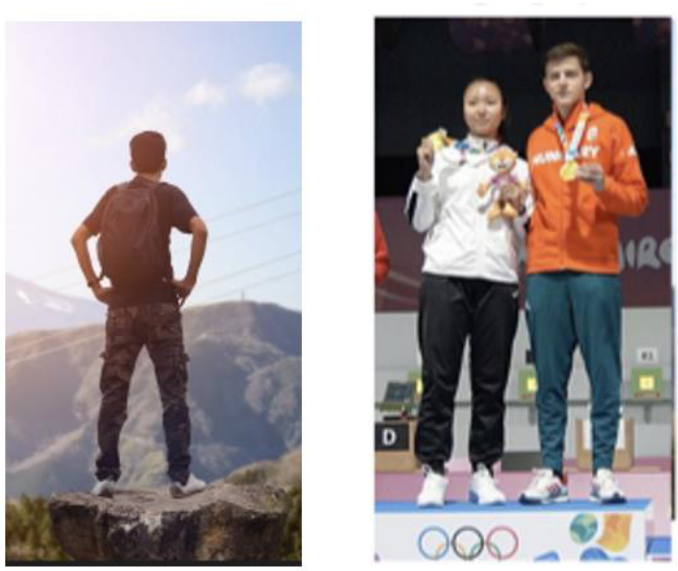
Regarding the first of these two factors, Kress (2010) points out that making deliberate choices about the placement, sequencing, and interaction of the different elements (text and images in this particular case) create a coherent and meaningful communication experience. The organization of images and texts, can shape the overall message, influence the interpretation of individual elements, and impact the engagement and comprehension of the audience. These considerations include factors such as spatial arrangement, temporal sequencing, hierarchy of information, and the use of visual cues or textual annotations to guide interpretation. According to Kress, in this paper the selection of the images respond to spatial arrangement attending to their information value: the image is positioned on the left side of the canvas, its salience is determined by using the relative size of the text and the absence of framing between the image and the text. Thus composition points to the image not just as a mere illustration of the verbal text but treating both elements as a whole (Kress, 2010:177). This distribution is considered by Kress in Hallidayan terms of given and new information as: "More generally, if the left contains a picture and the right is verbal text, the picture is presented as Given, as a well-established point of departure for the text, and the text contains the New." (Kress, 2010:183). It is this point of departure that the role of the image is going to play in this experiment, considering this image information as a point of departure of participant. Thus, if this is the theoretical approach the relatedness or non-relatedness of this image as point of departure (given information) should impact the cognitive processing of the rest of the text (new information). For if this elements are not logically related they should suppose a burden for the reader.

2.1.2. Selection of Images

Regarding image selection there were two images chosen related to the content of the text and another two non-related (see Appendix). For T1 we extracted a similar photo to the original from the British Council from FreeDigitalPhotos an image courtesy of etaphop. The image

depicted the back of a man on the peak of a mountain. The unrelated image chosen for T1 was that of two athletes, a man and a woman on the podium of an Olympic game. The lack of relation relies in the fact that there are two people in the photo whereas in the text it only talks about one person: Kilian Jornet. The common element is that both photos are related to sports.

***IMAGE 1**. Related and Non-related images to Text 1: The biography of Kilian Jornet*



Source: Images courtesy of Wikimedia and FreeDigitalPhotos.net

Nevertheless the choice could not be that non-related that the image served as a distraction to the participants that is the reason the picture is related to sports. In the second text: Life on Mars the related image shows the planet Mars (extracted from All images were resized and placed on the left side of the text (see Appendix).

***IMAGE 2**. Related and Non-related images to Text 2: Life on Mars*

Source: Images courtesy of Ngenespanol and Wikimedia

In choosing both photos, we maintained a connection between them to ensure they did not divert or excessively shift the participants' focus away from the text.

After having read the texts, participants answered a questionnaire to assess their level of comprehension. Before they proceeded to the reading, participants were told that after the reading they would answer a few questions to ensure that they understood the text and to force that the level of the cognitive effort carried out in the reading process was relevant enough as to be analyzed afterwards.

Questionnaires were taken from the downloadable resources available from the British Council on their web page. For T1, Task 2 was selected, it consists of a six multiple choice questionnaire with four options to choose from. For T2 the questionnaire is an eight true-false questionnaire (see Appendix). To analyze the results of both questionnaires data was normalized. The questionnaires were handed in to the participants in paper format and were answered immediately after they finished their reading.

2.1.3. Procedure

The experimental session was conducted individually in a quiet room on the faculty premises. The experiment took about 20 minutes in a well

illuminated room distant from external noises and only with two persons present during the reading process: the researchers conducting the experiment, who kept absolute silence during the recording.

The participants received general information about eye-tracking (what it measures: fixations, patterns, regressions, saccades…) and the steps the experiment consisted of. They were informed that they would read a text in English. They were not informed that they would visualize an image in the text that may be related or not to its content. And they were told that they would be asked a few questions about the story after the experiment to assess their understanding of the text.

Then the participants sat in front of a laptop with the bar of the eye-tracker. This was calibrated with a standard 9-point calibration to ensure spatial resolution error of 0.4 degrees of visual angle. Texts were shown in their entirety and no scroll was necessary to read the full text. Each participant read one text and they were not given a time limit to finish their reading, navigating the text freely. After they finished their reading, researchers turned off the eye-tracker and provided the students the questionnaire.

2.1.4. Recording

Participants' eye movements were sampled at 60 Hz with a laptop bar of 259 x 25 x 28 mm dimensions. The portable bar is developed by the Spanish company Irisbond and the portable model used for this recording is the model HIRU. HIRU is a multiplatform on-chip eye-technology operating in a Windows laptop for our present purposes. Stimuli were presented on a 15.6'' laptop monitor with a refresh rate of 59.98 Hz and a resolution of 1920x1080 p. Distance from participants' eyes to the stimulus monitor was of about 50 cm. Although both binocular and monocular recordings were possible, but monocular recording was used. The stimulus was controlled by Iribond Hiru Systray (version 01.01.03.03). Recordings were locally kept to be later analyzed. The information gathered from the participants was anonymized and kept for its posterior analysis.

3. DISCUSSION AND RESULTS

Comprehension of the texts was first checked to make sure that it was similar in the two groups. Independent sample t-tests showed that there were no significant differences between the comprehension scores.

Three eye tracking measures were examined: average fixation duration (i.e., the mean of the duration of each individual fixation), patterns (the distribution of the fixations in the text) and regressions (i.e., the average number of times that the participant goes back to a part of the text already seen or read). Repeated measures t-tests were run and the level of significance was set at 0.05. Prior to data analysis, eye-movement data were inspected for outliers.

Data from four participants were excluded from the analysis because the quality of the recording was below 70%. The final sample thus comprised 39 valid trials.

3.1. COMPREHENSION OF THE TEXTS:

Although there was no significant difference found in the responses to the questionnaires there are slightly better results shown by RG with 6.20 average correct responses than NRG with 5.4 (see Table 2).

***TABLE 2**: Correct answers to the questionaries from RG and NRG (Average normalized data)*

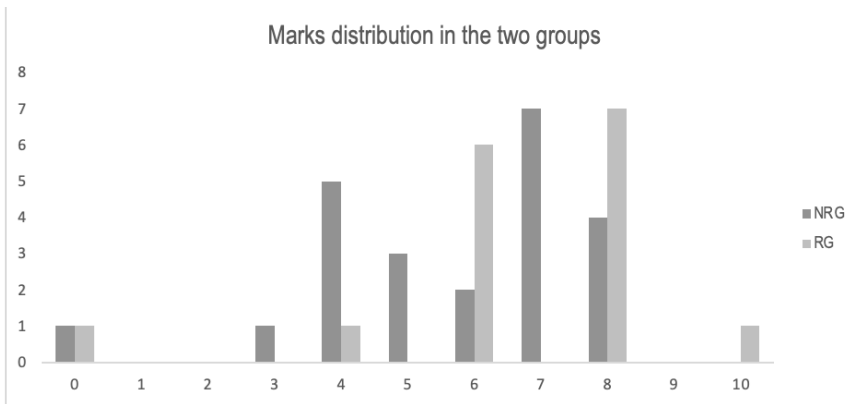
	Average mark
Related	**6.20**
Text 1	6.29
Text 2	6.07
Non-related	**5.4**
Text 1	6.17
Text 2	4.90
TOTAL	39

Source: Authors' creation

The responses in T1 and T2 in RG exhibited similar behavior, with slightly lower average scores (6.07) observed for T2 compared to T1 (6.29). As mentioned earlier, T1 utilized an eight-question multiple-choice questionnaire, while T2 employed a six-question true-false format. However, based on the average number of correct responses, it appears that the questionnaire format did not significantly influence participants' answers.

Examining the distribution of marks between the two groups (as shown in Graph 1), it is evident that participants in RG achieved higher marks, ranging from 8 to 10 points. In contrast, NRG did not have any participants scoring above 8 points. Notably, both groups had one participant who did not answer any question correctly. However, RG had only one participant with the lowest mark of 4 points, while NRG had six participants with marks between 3 and 4 points.

***GRAPH 1**: Marks distribution per groups*



Source: Authors' creation

It is in T2 where the main differences are shown between RG and NRG, when turning to analyze in detail these responses. NRG average answers given for T2 were lower (4.9) in a greater extent than the ones given for T1 of 6.17.

According to these data the Non-related image of T2, depicting the Earth in relation to the text of Mars had a more significant influence on the

participants' comprehension. However, it is important to note that these interpretations should be further supported by examining the rest of the variables that will be analyzed in the remainder of the paper.

On the contrary, looking at T1 there are almost no differences between RG (6.29) and NRG (6.17). The images chosen to accompany the text included one showing athletes on a mountain peak and another depicting two medal winners on an Olympic podium. The seemingly minimal impact of these photos on the readers' responses could be attributed to the fact that, in RG, the image portrayed the back of a man, not showing his face and being difficult to determine whether he is the protagonist of the biography or not. In what has to do with NRG the image represented two people, a man and a woman, unknown to the readers and that do not have anything to do with the content of the text. Although, when asked about the picture, participants had initially thought that it could be the main character of the story along with another climber winning an Olympic medal. Based on these responses, it appears that neither of the two images of T1 provided informative cues for the students of both the RG and NRG.

3.2. Fixations

Both text and image fixations are analyzed in this study. Table 3 reveals that the average number of fixations in RG is slightly higher (634.5) compared to NRG (619.04). Although there is no significant difference in the average fixation data between the two groups, the somewhat higher number of fixations in RG contradicts expectations. Fixations are typically associated with the processing of information, and the purpose of the images is to alleviate the participants' cognitive load (RG) or and to otherwise prove that it is increased with the use of non-related images (NRG). According to these data, the cognitive load is not diminished nor augmented in direct correlation to the relationship of the pictures and the text.

TABLE 3: *Average number of fixations per Group and Text*

	Fixations
Related	**634.50**
Text 1	684.44
Text 2	570.29
Non-related	**619.04**
Text 1	679.40
Text 2	572.61

Source: Authors' creation

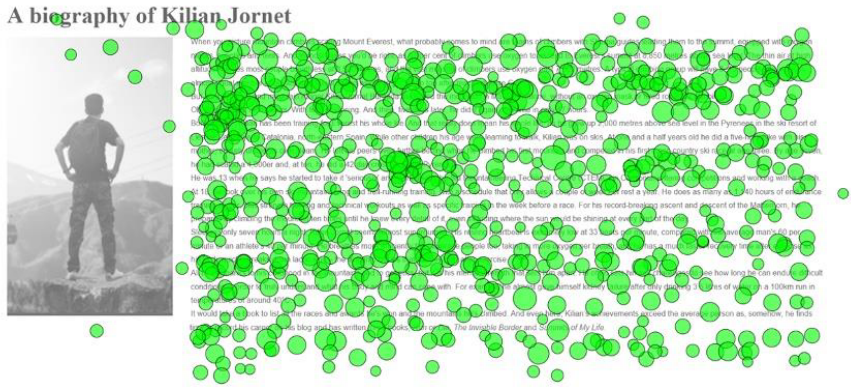
In particular, focusing on the analysis of fixation distribution among texts, T1 shows almost no difference between RG (684.44) and NRG (679.40). As mentioned above these points that there does not seem to be an impact of neither of the images in text processing.

These data offer insights into the average number of fixations, but it is also important to extract relevant information regarding the distribution of these fixations across the image and the text.

Image 3 presents a representative scan-path illustrating the distribution of fixations for RG in T1. The scan-path represents in green dots the individual fixations identified by the eye-tracker across the image and the text. Their size is an indicator of the duration of these fixations.

The scan-path indicates a greater concentration of fixations within the text, with only a few fixations on the image itself. The gaze is primarily directed towards the top of the picture and briefly one towards the bottom part of it.

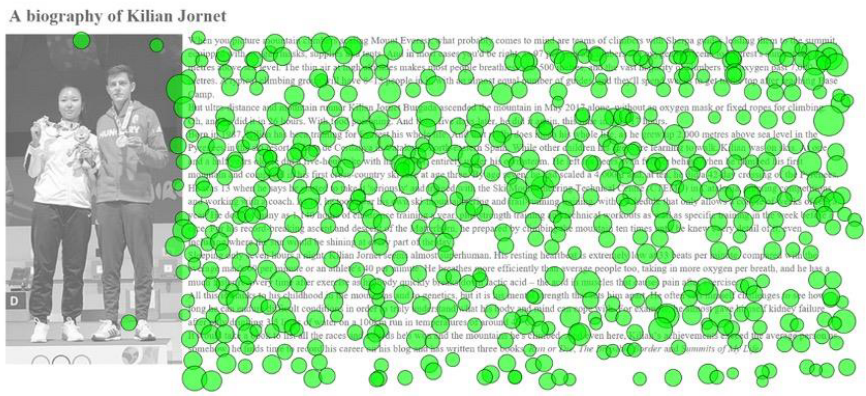
***IMAGE 3**: Scan-path fixation distribution for T1 in RG*



Source: Authors' creation

Image 4 shows a very similar pattern than the one followed for RG. The fixations are concentrated in the text and only the top and bottom of the image account for a few brief fixations.

***IMAGE 4**: Scan-path fixation distribution for T1 in NRG*



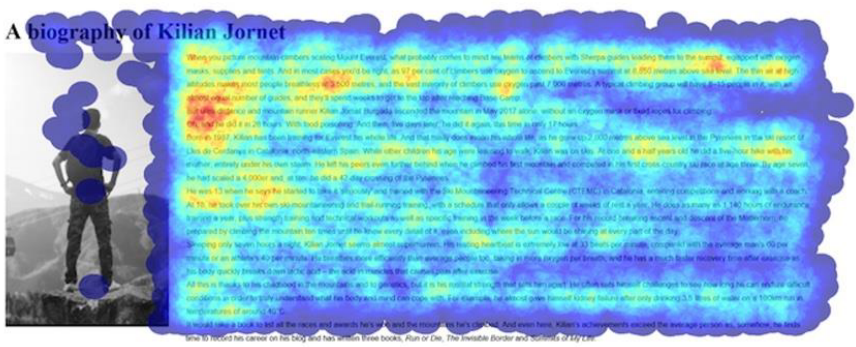
Source: Authors' creation

Since these examples are specific to individual participants in the experiments, they may not be generalizable to accurately represent the overall information of all readers of each text. For this purpose the following heatmaps were created. They contain the average gaze distribution of all RG and NRG reading T1 (images 5 and 6).

Heatmaps gather and visualize data about the most and least attention capturing sections and elements on the presented stimuli. The data is collected based on the frequency of participants' gaze on individual elements and the duration of their fixations, which is then represented in the form of an eye-tracking heatmap. In the following heatmaps, the areas in red indicate the parts of the text that receive the highest visual attention (considering the number of fixations, as the length of fixations is not within the scope of the present study). The colors progressively shift to orange, yellow, and light blue, representing areas with less intense and fewer fixations. The areas in purple, with the least average fixations, correspond to the regions around the text and inside the image that have received less attention.

These images (5 and 6) serve to further corroborate the trend observed in the individual scan-path examples depicted in images 3 and 4. Image 5 refers to the average gaze attention of participants who read T1, and the majority of fixations are concentrated on the text. The few fixation that are drawn towards the image are briefly focused on the head and feet of the man on the peak of the mountain.

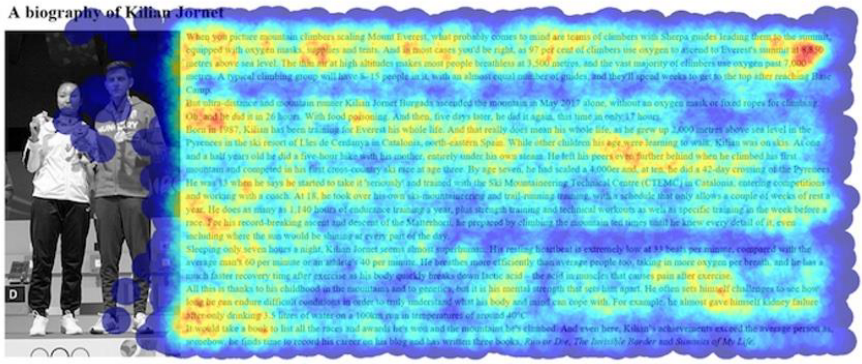
IMAGE 5: *Fixation distribution heatmap for T1 in RG*



Source: Authors' creation

Image 6 provides the same distributional pattern. Fixations are concentrated in the area of the text and only very few are directed toward the image of the two athletes, these are concentrated on their faces and some more are located on the man's face.

***IMAGE 6**: Fixation distribution heatmap for T1 in RG*

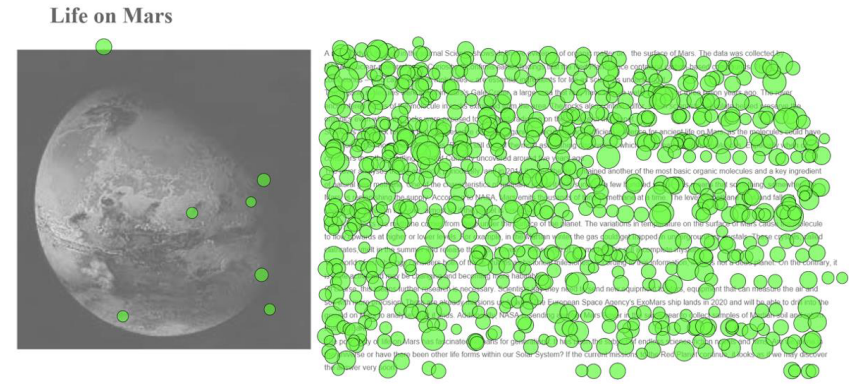


Source: Authors' creation

Nor the number of fixations neither the number of correct responses to the questionnaire suggest that any of the two images had any impact on the readers. While further analysis of the variables is necessary to validate this information, the current data interpretation suggests that the images were irrelevant for the readers in both cases. This lack of relevant impact could be attributed because in RG the image does not show the face of the story's protagonist, and in NRG, the athletes were not familiar to the readers.

Similarly, data related to the fixations of T2 (RG 570,29 and NRG 572,61) does not show any statistical significant difference although the slight higher amount of fixations in NRG may point to an interpretation closer to the expectations. Reviewing the individual examples of fixations distributions in the scan-paths. Images 7 and 8 exhibit a slightly distinct distribution compared to the one observed in T1. Image 7 showcases a depiction of Mars (as the well-known red planet), with only a few brief fixations dispersed across it.

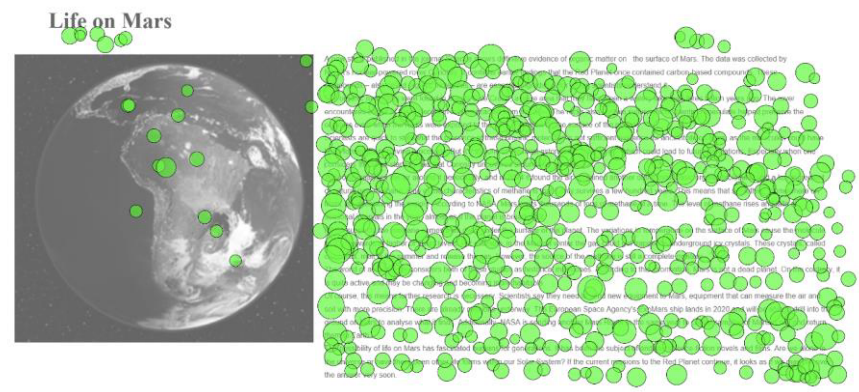
***IMAGE 7**: Fixation distribution scan-path for T2 in RG.*



Source: Authors' creation

However, Image 8 demonstrates that the image of our blue planet garners more visual attention compared to the image of Mars. Additionally, the title of the text has also captured the reader's gaze. This information is intriguing as it suggests that readers have observed the image, recognized it, and then returned to the title to reconcile this contradiction.

***IMAGE 8**: Fixation distribution scan-path for T2 in NRG.*

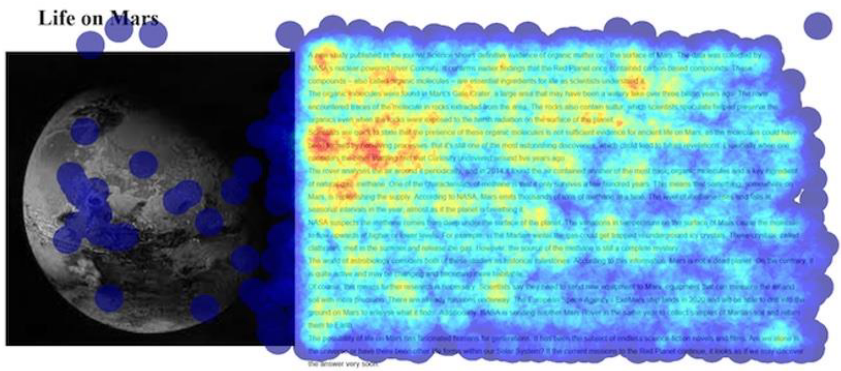


Source: Authors' creation

The comprehensive heatmaps depicted in images 9 and 10 further support the information presented by the individual user example. The main

number of fixations are centered on the text area and some are shown in the illuminated area of the red planet.

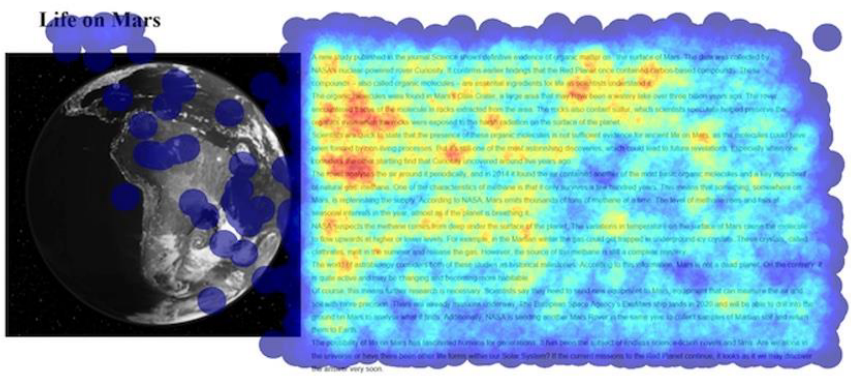
***IMAGE 9**: Fixation distribution heatmap for T2 in RG.*



Source: Authors' creation

In image 10, which represents the fixation distribution for NRG, the majority of fixations are concentrated in the text area. However, compared to image 9, there are more fixations observed in the title and the image of the Earth.

***IMAGE 10:** Fixation distribution heatmap for T2 in NRG*



Source: Authors' creation

In contrast to the evenly distributed fixations observed in T1 for both RG and NRG, the distribution of fixations in T2 appears to be influenced by the impact of the pictures on the readers. In T2, both pictures are familiar and informative to the readers, conveying relevant information to the participants. The starting point established in T2, as mentioned by Kress (see above), establishes a common ground that the text content must fulfill. However, in the case of NRG, readers find this premise contradictory, leading to a different interpretation of the text. This likely explains the significance of fixations on the title. To confirm this interpretation, it would be beneficial to examine the sequence in which these fixations occur, even though this aspect is beyond the scope of the current project.

3.3. Regressions

Regressions or regressive saccades are shifts to the text behind, these are associated with the need for the reader of further clarifications or interpretations.

Table 4 shows the data gathered for both groups and texts analyzed. As in the sections above related to the comprehension and fixations analysis there is no significant difference found between these two groups. RG shows a slightly higher number of average number of regressions of 94.44 and NRG of 93.57.

TABLE 4: *Average number of regressions per Group and Text*

	Regressions
Related	**94.44**
Text 1	92.111
Text 2	97.43
Non-related	**93.57**
Text 1	100.10
Text 2	88.538

Source: Authors' creation

Upon analysing both groups in T1, it becomes evident that the number of regressions in NRG is significantly higher (100.10) compared to RG, which exhibits a lower count of 92.11. Typically, the number of regressions is correlated with the number of fixations in the text. However, in this case, despite the fewer fixations in NRG, there are more regressive movements observed compared to RG. This suggests that the group viewing the image of the two athletes experiences a greater need for clarification than RG. These findings further complete the interpretation mentioned earlier and indicate that the picture with the man in RG fails to alleviate the cognitive load, while the one of the two athletes in NRG has a negative impact or a confusing effect on the reader due to its inconsistency with the information presented in the text.

Although to support and extend this interpretation more test are needed. T2 behaves in the exact opposite way. The number of regressions is higher in RG (97.43) than in the NRG (88.53). However, this information does not contradict the distributional patterns described in the previous section. The non-related image attracted more attention than the related one but this does not necessarily need to be reflected on regressions in the text, but it has to be reflected on the overall number of fixations (see above).

4. CONCLUSIONS

Based on the findings, participants who read the text with a related image (RG) achieved higher scores in the questionnaires compared to those in the non-related image group (NRG). The average number of fixations for RG indicated lower cognitive effort in understanding the texts compared to NRG. The study provides evidence that young learners engage with both written verbal information and visual information in multimodal materials. The fixation patterns revealed that more time was dedicated to processing the text than the visual component. However, the selection of images proved to be crucial in distributing the cognitive load. In cases where images were clearly recognizable and informative, such as in T2 with the planets, participants' attention was drawn to comprehend the content of the picture and its relation to the title, thereby

affecting comprehension results (T2 RG: 6.07 vs NRG: 4.90). The impact on the number of regressions, however, was not consistent.

In terms of less informative picture selection, as seen in T1, the number of fixations and regressions exhibited opposite behaviour compared to T2. Fixations were higher in RG and regressions were lower, and the impact on text comprehension appeared to be absent. As there is no statistical significance observed in either group, it is not possible to definitively conclude that the related image alleviates the cognitive load while the non-related picture increases it. Nonetheless, it can be inferred that the accompanying picture does influence the text. Further analysis is needed to explore this influence in more depth and gain a comprehensive understanding of its effects. To gain more insights into these aspects, it is important to focus on the type of picture presented alongside the text, as the informativeness of the selected picture seems to play a crucial role in determining its impact on the cognitive load.

In conclusion, this study has provided valuable insights into how young learners interact with pictorial multimodal materials. Further research is needed to examine whether the processing patterns observed in this study align with the observed differences in comprehension. The use of eye-tracking technology in multimodal learning offers a promising avenue for future investigations in the field of second language (L2) research. It enables a more comprehensive understanding of the cognitive processes involved in engaging with visual and verbal information, contributing to a deeper understanding of L2 learning and instruction.

5. ACKNOWLEDGEMENTS

We would like to express our heartfelt gratitude to the Innova Project from Universidad Complutense de Madrid (INNOVA Project 2022-2023, no. 251) for their support, which has been instrumental in the successful completion of this study. Each member of our team has contributed their dedication and hard work, and we are immensely grateful for their contributions.

We would also like to extend our sincere appreciation to Irisbond S.L. for their collaboration. Through our Collaboration Agreement, they

provided us with their cutting-edge technology, the Hiru eye-tracker, which has been invaluable in conducting this research. The exceptional support and unwavering commitment of their team members have significantly contributed to the outcomes of this study.

Lastly, we would like to acknowledge the support provided by the Spanish Ministry of Science and Innovation (MCIN) and the European Regional Development Fund (ERDF) through the Research Project with reference number PID2021–125327NB-I00, titled "Stance strategies in immigration and racism-related discourse: Analysis and applications in affective learning practices (RACISMAFF)".

6. REFERENCES

Ai, H., & Lu, X. (2010). A web-based system for automatic measurement of lexical complexity. Paper presented at the 27th Annual Symposium of the Computer-Assisted Language Consortium (CALICO-10). Amherst, MA. June 8-12.

Canning-Wilson, C. (2001). Choosing EFL/ESL Visual Assessments: Image and Picture Selection on Foreign and Second Language Exams.

Carter, B. T., & Luke, S. G. (2020). Best practices in eye tracking research. International Journal of Psychophysiology, 155, 49-62.

Godfroid, A. (2019). Eye tracking in second language acquisition and bilingualism: A research synthesis and methodological guide. Routledge.

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

Kress, G. R. (2010). Multimodality: A social semiotic approach to contemporary communication. Taylor & Francis.

Lu, Xiaofei (2012). The Relationship of Lexical Richness to the Quality of ESL Learners' Oral Narratives. The Modern Language Journal, 96(2):190-208.

Rayner, K. (2009). Eye movements and attention in reading, scene perception, and visual search. The quarterly journal of experimental psychology, 62(8), 1457-1506.

Romero, E., & Maíz-Arévalo, C. (2010). Multimodality and listening comprehension: testing and implementing classroom material. Language Value, 2, 100-139.

Xerri, D. (2012). Poetry teaching and multimodality: Theory into practice. Creative Education, 3(04), 507

Tragant, E., & Pellicer-Sánchez, A. (2019). Young EFL learners' processing of multimodal input: Examining learners' eye movements. System, 80, 212-223

APPENDIX

TEXTS

T1. RG

Text source: https://learnenglish.britishcouncil.org/sites/podcasts/files/LearnEnglish-Reading-C1-A-biography-of-Kilian-Jornet.pdf

Photo source: FreeDigitalPhotos Image courtesy of etaphop photo at FreeDigitalPhotos.net

A biography of Kilian Jornet

When you picture mountain climbers scaling Mount Everest, what probably comes to mind are teams of climbers with Sherpa guides leading them to the summit, equipped with oxygen masks, supplies and tents. And in most cases you'd be right, as 97 per cent of climbers use oxygen to ascend to Everest's summit at 8,850 metres above sea level. The thin air at high altitudes makes most people breathless at 3,500 metres, and the vast majority of climbers use oxygen past 7,000 metres. A typical climbing group will have 8–15 people in it, with an almost equal number of guides, and they'll spend weeks to get to the top after reaching Base Camp.

But ultra-distance and mountain runner Kilian Jornet Burgada ascended the mountain in May 2017 alone, without an oxygen mask or fixed ropes for climbing.

Oh, and he did it in 26 hours. With food poisoning. And then, five days later, he did it again, this time in only 17 hours.

Born in 1987, Kilian has been training for Everest his whole life. And that really does mean his whole life, as he grew up 2,000 metres above sea level in the Pyrenees in the ski resort of Lles de Cerdanya in Catalonia, north-eastern Spain. While other children his age were learning to walk, Kilian was on skis. At one and a half years old he did a five-hour hike with his mother, entirely under his own steam. He left his peers even further behind when he climbed his first mountain and competed in his first cross-country ski race at age three. By age seven, he had scaled a 4,000er and, at ten, he did a 42-day crossing of the Pyrenees.

He was 13 when he says he started to take it 'seriously' and trained with the Ski Mountaineering Technical Centre (CTEMC) in Catalonia, entering competitions and working with a coach. At 18, he took over his own ski-mountaineering and trail-running training, with a schedule that only allows a couple of weeks of rest a year. He does as many as 1,140 hours of endurance training a year, plus strength training and technical workouts as well as specific training in the week before a race. For his record-breaking ascent and descent of the Matterhorn, he prepared by climbing the mountain ten times until he knew every detail of it, even including where the sun would be shining at every part of the day.

Sleeping only seven hours a night, Kilian Jornet seems almost superhuman. His resting heartbeat is extremely low at 33 beats per minute, compared with the average man's 60 per minute or an athlete's 40 per minute. He breathes more efficiently than average people too, taking in more oxygen per breath, and he has a much faster recovery time after exercise as his body quickly breaks down lactic acid – the acid in muscles that causes pain after exercise.

All this is thanks to his childhood in the mountains and to genetics, but it is his mental strength that sets him apart. He often sets himself challenges to see how long he can endure difficult conditions in order to truly understand what his body and mind can cope with. For example, he almost gave himself kidney failure after only drinking 3.5 litres of water on a 100km run in temperatures of around 40°C.

It would take a book to list all the races and awards he's won and the mountains he's climbed. And even here, Kilian's achievements exceed the average person as, somehow, he finds time to record his career on his blog and has written three books, *Run or Die*, *The Invisible Border* and *Summits of My Life*.

T1. NRG

Text source:

https://learnenglish.britishcouncil.org/sites/podcasts/files/LearnEnglish-Reading-C1-A-biography-of-Kilian-Jornet.pdf

Photo source:

https://commons.wikimedia.org/wiki/File:Shooting_at_the_2018_Summer_Youth_Olympics_%E2%80%93_10m_Air_Rifle_Mixed_International_Victory_Ceremony_%2886%29.jpg

A biography of Kilian Jornet

When you picture mountain climbers scaling Mount Everest, what probably comes to mind are teams of climbers with Sherpa guides leading them to the summit, equipped with oxygen masks, supplies and tents. And in most cases you'd be right, as 97 per cent of climbers use oxygen to ascend to Everest's summit at 8,850 metres above sea level. The thin air at high altitudes makes most people breathless at 3,500 metres, and the vast majority of climbers use oxygen past 7,000 metres. A typical climbing group will have 8–15 people in it, with an almost equal number of guides, and they'll spend weeks to get to the top after reaching Base Camp.

But ultra-distance and mountain runner Kilian Jornet Burgada ascended the mountain in May 2017 alone, without an oxygen mask or fixed ropes for climbing. Oh, and he did it in 26 hours. With food poisoning. And then, five days later, he did it again, this time in only 17 hours.

Born in 1987, Kilian has been training for Everest his whole life. And that really does mean his whole life, as he grew up 2,000 metres above sea level in the Pyrenees in the ski resort of Lles de Cerdanya in Catalonia, north-eastern Spain. While other children his age were learning to walk, Kilian was on skis. At one and a half years old he did a five-hour hike with his mother, entirely under his own steam. He left his peers even further behind when he climbed his first mountain and competed in his first cross-country ski race at age three. By age seven, he had scaled a 4,000er and, at ten, he did a 42-day crossing of the Pyrenees. He was 13 when he says he started to take it 'seriously' and trained with the Ski Mountaineering Technical Centre (CTEMC) in Catalonia, entering competitions and working with a coach. At 18, he took over his own ski-mountaineering and trail-running training, with a schedule that only allows a couple of weeks of rest a year. He does as many as 1,140 hours of endurance training a year, plus strength training and technical workouts as well as specific training in the week before a race. For his record-breaking ascent and descent of the Matterhorn, he prepared by climbing the mountain ten times until he knew every detail of it, even including where the sun would be shining at every part of the day.

Sleeping only seven hours a night, Kilian Jornet seems almost superhuman. His resting heartbeat is extremely low at 33 beats per minute, compared with the average man's 60 per minute or an athlete's 40 per minute. He breathes more efficiently than average people too, taking in more oxygen per breath, and he has a much faster recovery time after exercise as his body quickly breaks down lactic acid – the acid in muscles that causes pain after exercise.

All this is thanks to his childhood in the mountains and to genetics, but it is his mental strength that sets him apart. He often sets himself challenges to see how long he can endure difficult conditions in order to truly understand what his body and mind can cope with. For example, he almost gave himself kidney failure after only drinking 3.5 litres of water on a 100km run in temperatures of around 40°C.

It would take a book to list all the races and awards he's won and the mountains he's climbed. And even here, Kilian's achievements exceed the average person as, somehow, he finds time to record his career on his blog and has written three books, *Run or Die*, *The Invisible Border* and *Summits of My Life*.

T2. RG

Text source: https://learnenglish.britishcouncil.org/skills/reading/c1-reading/life-mars

Photo source: https://commons.wikimedia.org/wiki/File:How_easily_will_spacecraft_on_Mars_talk_to_Earth%3F_ESA195490.jpg

Life on Mars

A new study published in the journal Science shows definitive evidence of organic matter on the surface of Mars. The data was collected by NASA's nuclear-powered rover Curiosity. It confirms earlier findings that the Red Planet once contained carbon-based compounds. These compounds – also called organic molecules – are essential ingredients for life as scientists understand it.

The organic molecules were found in Mars's Gale Crater, a large area that may have been a watery lake over three billion years ago. The rover encountered traces of the molecule in rocks extracted from the area. The rocks also contain sulfur, which scientists speculate helped preserve the organics even when the rocks were exposed to the harsh radiation on the surface of the planet.

Scientists are quick to state that the presence of these organic molecules is not sufficient evidence for ancient life on Mars, as the molecules could have been formed by non-living processes. But it's still one of the most astonishing discoveries, which could lead to future revelations. Especially when one considers the other startling find that Curiosity uncovered around five years ago.

The rover analyses the air around it periodically, and in 2014 it found the air contained another of the most basic organic molecules and a key ingredient of natural gas: methane. One of the characteristics of methane is that it only survives a few hundred years. This means that something, somewhere on Mars, is replenishing the supply. According to NASA, Mars emits thousands of tons of methane at a time. The level of methane rises and falls at seasonal intervals in the year, almost as if the planet is breathing it.

NASA suspects the methane comes from deep under the surface of the planet. The variations in temperature on the surface of Mars cause the molecule to flow upwards at higher or lower levels. For example, in the Martian winter the gas could get trapped in underground icy crystals. These crystals, called clathrates, melt in the summer and release the gas. However, the source of the methane is still a complete mystery.

The world of astrobiology considers both of these studies as historical milestones. According to this information, Mars is not a dead planet. On the contrary, it is quite active and may be changing and becoming more habitable.

Of course, this means further research is necessary. Scientists say they need to send new equipment to Mars, equipment that can measure the air and soil with more precision. There are already missions underway. The European Space Agency's ExoMars ship lands in 2020 and will be able to drill into the ground on Mars to analyse what it finds. Additionally, NASA is sending another Mars Rover in the same year to collect samples of Martian soil and return them to Earth.

The possibility of life on Mars has fascinated humans for generations. It has been the subject of endless science-fiction novels and films. Are we alone in the universe or have there been other life forms within our Solar System? If the current missions to the Red Planet continue, it looks as if we may discover the answer very soon.

T2. NRG

Text source: https://learnenglish.britishcouncil.org/skills/reading/c1-reading/life-mars

Photo source: https://www.ngenespanol.com/el-espacio/fotos-tierra-desde-el-espacio-scott-kelly/

Life on Mars

A new study published in the journal Science shows definitive evidence of organic matter on the surface of Mars. The data was collected by NASA's nuclear-powered rover Curiosity. It confirms earlier findings that the Red Planet once contained carbon-based compounds. These compounds – also called organic molecules – are essential ingredients for life as scientists understand it.

The organic molecules were found in Mars's Gale Crater, a large area that may have been a watery lake over three billion years ago. The rover encountered traces of the molecule in rocks extracted from the area. The rocks also contain sulfur, which scientists speculate helped preserve the organics even when the rocks were exposed to the harsh radiation on the surface of the planet.

Scientists are quick to state that the presence of these organic molecules is not sufficient evidence for ancient life on Mars, as the molecules could have been formed by non-living processes. But it's still one of the most astonishing discoveries, which could lead to future revelations. Especially when one considers the other startling find that Curiosity uncovered around five years ago.

The rover analyses the air around it periodically, and in 2014 it found the air contained another of the most basic organic molecules and a key ingredient of natural gas: methane. One of the characteristics of methane is that it only survives a few hundred years. This means that something, somewhere on Mars, is replenishing the supply. According to NASA, Mars emits thousands of tons of methane at a time. The level of methane rises and falls at seasonal intervals in the year, almost as if the planet is breathing it.

NASA suspects the methane comes from deep under the surface of the planet. The variations in temperature on the surface of Mars cause the molecule to flow upwards at higher or lower levels. For example, in the Martian winter the gas could get trapped in underground icy crystals. These crystals, called clathrates, melt in the summer and release the gas. However, the source of the methane is still a complete mystery.

The world of astrobiology considers both of these studies as historical milestones. According to this information, Mars is not a dead planet. On the contrary, it is quite active and may be changing and becoming more habitable.

Of course, this means further research is necessary. Scientists say they need to send new equipment to Mars, equipment that can measure the air and soil with more precision. There are already missions underway. The European Space Agency's ExoMars ship lands in 2020 and will be able to drill into the ground on Mars to analyse what it finds. Additionally, NASA is sending another Mars Rover in the same year to collect samples of Martian soil and return them to Earth.

The possibility of life on Mars has fascinated humans for generations. It has been the subject of endless science-fiction novels and films. Are we alone in the universe or have there been other life forms within our Solar System? If the current missions to the Red Planet continue, it looks as if we may discover the answer very soon.

QUESTIONAIRES

T1

Source: https://learnenglish.britishcouncil.org/sites/podcasts/files/LearnEnglish-Reading-C1-A-biography-of-Kilian-Jornet.pdf

BRITISH COUNCIL LearnEnglish

Biography of Kilian Jornet

Circle the best answer.

1. The majority of climbers on Everest ...
   a. need oxygen to finish their ascent.
   b. are accompanied.
   c. make slow progress to the top.
   d. (all of the above)
2. Kilian Jornet is unlike most Everest climbers because ...
   a. he is a professional climber.
   b. he ascended faster.
   c. he found the climb difficult.
   d. (all of the above)
3. In his training now, Kilian ...
   a. demands a lot of himself.
   b. takes a lot of rest periods.
   c. uses a coach.
   d. (none of the above)
4. Kilian partly owes his incredible fitness to ...
   a. the way he makes extra time for sleep.
   b. his ability to recover from injury.
   c. where he grew up.
   d. (all of the above)
5. His training includes ...
   a. psychological preparation.
   b. making sure he drinks enough water.
   c. trying to reduce his recovery time.
   d. (none of the above)
6. Kilian's books are ...
   a. a long list of races and awards.
   b. discouraging to average people.
   c. best for an expert audience.
   d. another example of his impressive accomplishments.

Task 2

1. d
2. b
3. a
4. c
5. a
6. d

T2

Source: https://learnenglish.britishcouncil.org/sites/podcasts/files/LearnEnglish-Reading-C1-Life-on-Mars.pdf

BRITISH COUNCIL LearnEnglish

Life on Mars

Are the sentences true or false or is the information not given?

1. The study in the journal *Science* was written by NASA scientists.

   True False Not given

2. This is not the first study to suggest that life existed on Mars in the past.

   True False Not given

3. A scientific vehicle found very small elements of an organic molecule within water extracted from the planet.

   True False Not given

4. It is believed that this conclusively proves that there was once life on the planet.

   True False Not given

5. Methane is a natural molecule that is a sign of life.

   True False Not given

6. All organic molecules have a limited lifespan.

   True False Not given

7. Mars can be said to have a winter and a summer.

   True False Not given

8. There are at least two more scientific expeditions heading to Mars.

   True False Not given

Task 1

1. Not given
2. True
3. False
4. False
5. True
6. Not given
7. True
8. True