Exploring CEFR-Basic Readers' Eye Movements Through Text Features in Two Different Reading Tasks

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ABSTRACT

This study examines how the Basic Readers of the Common European Framework of References (CEFR) allocate attention to different text structures by analysing their eye movements while reading narrative, expository, and infographic texts. The data collection involved eighty 12-year-old learners, identified using a Cambridge Assessment English diagnostic tool. Eye-tracking data were gathered with Tobii Pro Glasses 2 (100Hz), and participants were split into two groups (n=40 for each group). Each group read three types of texts (narrative, expository, infographic) and completed one of two post-reading tasks: a three-option multiple-choice questionnaire (MCQ) or a verbal report. The main data for analysis came from total fixation durations, extracted using Tobii Pro Lab software, and were further contextualized with gaze-plot recordings analysis, validated by two expert reviewers. The study found that participants had difficulty understanding the functional roles of textual features, where the process is often interrupted by desegmentation in eye movements. This finding emphasizes the importance of guiding eye navigation during reading using interventions like graphic organizers or audio-assisted reading techniques. By profiling these readers, this research offers novel insights into how CEFR-Basic readers at Malaysian primary schools fixate on various text types and structures.

Keywords: CEFR, Text Structures, Text Types, Cognitive Reader Profiles, Eye Movements

Introduction

Contrary to the common belief that reading is a simple task everyone can master, Rayner et al. (2012) highlight its inherent complexity in demanding more than just surface-level decoding. The mere ability to blend sounds represents but an initial step toward understanding written text. Many second language learners encounter challenges progressing beyond this stage. Complications arise, particularly when the expectations for acquiring first-language reading

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skills do not align with those having second-language proficiency. Furthermore, the situation is compounded when courses fail to demonstrate developmental growth in reading abilities. Therefore, the belief that everyone can easily learn to read is a misconception that needs to be addressed, especially among English Language Teaching (ELT) professionals. As Rayner et al. (2012) contend, each educational context must develop and establish its own readers' profiles to record the details of their textual understanding repertoires, informed by evidence, to ensure continuous improvement in teaching reading across various levels of instruction.

Building upon this premise, this paper represents our fourth endeavour in systematically unravelling reading skill complexities by investigating the dynamic relationship between text features and readers' attention (past endeavours reported in Mihat et al., 2023; Azman et al., 2021; Mihat et al., 2018). The primary objective of this study is to explore how CEFR-Basic level readers respond to different text structures from different types of text: 1. story plots, 2. topic-and-supporting sentences, and 3. word-graphic interactions. The study utilised the three theoretical models discussed in the abovementioned papers and added one new model. Additionally, the study observed eye movements when participants were given two different tasks: 1. a three-option multiple-choice questionnaire (MCQ) and 2. a verbal summary. Unlike previous studies that often focused on single contexts to support their arguments, this study stands out by considering multiple contexts, providing robust data to clarify readers' attention behaviours.

Literature review

What constitutes reading materials?

Reading materials are more than mere conveyors of information. They are structured compositions shaped by authors' perspectives and intended communicative goals. These texts reflect underlying schemata that align with or challenge, the cognitive frameworks that readers bring to the act of comprehension (Grabe & Stoller, 2013; Grabe, 2009). Understanding the structural elements of texts is thus critical for writers, readers, and researchers, as these elements influence interpretative processes (van der Schoot et al., 2012). Aebersold and Field (1997) identify three key characteristics that differentiate texts: the organisation of information, syntax and grammar, and vocabulary. Each characteristic contributes to the complexity and dynamism of reading materials, necessitating nuanced analytical approaches.

Among these characteristics, the organisation of information stands out as a foundational element that reflects the rhetorical intentions of the author (Krashen, 2004). Texts may adopt structures from different genres such as narrative, expository, or infographic formats, each serving distinct communicative purposes. Narrative texts, for instance, employ elements like characters and plots, often adhering to Freytag's pyramid (introduction, rising action, climax, falling action, and resolution) to convey fictional or biographical accounts (Medina & Piloneata, 2006; Fisher et al., 2016). In contrast, expository texts prioritise factual explanations, utilising technical terminology to elucidate topics such as scientific processes (Eason et al., 2012; Westby et al., 2010). Infographic texts, meanwhile, integrate graphics and concise directives, demanding functional literacy to interpret signboards or instructional manuals

(Siricharoen & Siricharoen, 2015; Mohd Yusof et al., 2019; Jaafar & Thang, 2020; Thang & Abdul Aziz, 2019).

Reading texts are further differentiated through sentence structures and linguistic rules. This variation underscores the interplay between grammatical structures and textual purpose. Syntax governs word order, such as the subject-verb-object sequence in English. Sentence complexity (simple, compound, or complex) varies across genres (Pallotti, 2015; Hands, 2013) and includes text development in terms of main idea and supporting sentences. Although texts typically combine sentence types, certain syntactic patterns are genre-specific. For example, narrative phrases like "once upon a time" rarely featured in expository or infographic materials (Martohardjono et al., 2005; Aebersold & Field, 1997).

Building on this, vocabulary introduces another layer of differentiation that significantly impacts comprehension. Unfamiliar terminology, particularly in specialised domains, can hinder understanding for both novice and proficient readers (Field & Aebersold, 1990; Cain & Oakhill, 2011; Grabe, 2009). Ambiguity exacerbates this challenge, as polysemous words may be interpreted differently across languages, complicating second-language comprehension (Frenck-Mestre & Pynte, 1997; Wonnacott et al., 2015). Such lexical intricacies necessitate tailored pedagogical strategies, particularly given evidence that children comprehend narrative texts more readily than expository ones (Best et al., 2008; Diakidoy et al., 2005). These characteristics collectively underscore the diversity of reading materials and their implications for research. Comparative studies across genres are essential, as findings from one text type may not be generalised to others (Graesser et al., 2011). A holistic understanding of reading processes thus demands interdisciplinary approaches, integrating insights from linguistics, education, and cognitive psychology to address the multifaceted nature of textual comprehension.

CEFR basic level reading materials

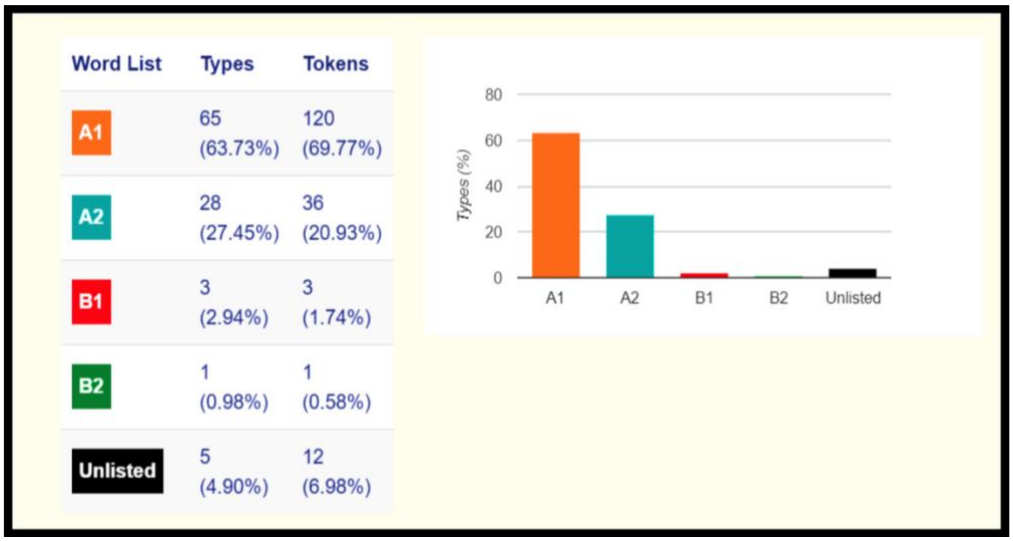
Reading in Malaysian primary schools, as outlined in the national curriculum framework, emphasises a structured, gradual progression in literacy skills across six years of education (CDD, 2018). Beginning with foundational abilities such as recognizing letters and phonemes (e.g., blending sounds like CVC and CCV) in early years, the curriculum progresses towards more advanced skills, including understanding main ideas, extracting specific details, and using context clues to infer meaning in texts. Pupils are introduced to various text types, both linear and non-linear, print and digital, while gradually advancing from simple words and sentences in Year 1 to longer, multi-paragraph texts by Year 6. The use of tools like picture dictionaries and basic monolingual dictionaries is encouraged, alongside independent reading for information and enjoyment, which fosters confidence and engagement with fiction and non-fiction materials. This structured approach ensures a balance between technical reading skills and a broader appreciation for texts.

As outlined in the Malaysian Reading Standards for primary schools, by the end of Year 6, pupils are expected to derive enjoyment from a variety of reading materials (CDD, 2019). A cursory examination of classroom textbooks reveals a categorization of reading materials into narratives, expository texts, and infographics, among others (Elsworth & Rose, 2021).

However, owing to their alignment with the CEFR framework, textbook writers or material developers must adhere to specific criteria in material development (Weir & Khalifa, 2008; Weir, 2005). Foremost among these criteria is the lexical choice within the texts, primarily drawn from A1 and A2 wordlists corresponding to learners' proficiency levels (CA, 2018). Figure 1 below presents an analysis of words within an A2-level material conducted through the English Vocabulary Profile (EVP), a CEFR-associated analysis tool. The findings reveal that 90% of the words utilized in the text align with the A1 and A2 word lists.

Figure 1.

EVP of a sample text used in this study



In conjunction with the lexical selection, the syntax and grammar employed in A2-level reading materials are meticulously tailored to match learners' proficiency levels, guided by the English Grammar Profile (EGP). The overarching objective is to facilitate pupils' ability to comprehend short and straightforward texts. For example, basic-level texts would predominantly feature simple sentences, occasionally augmented by a few compound and complex structures (CA, 2019).

Complementing the choice of vocabulary and syntactical structures, the organisation of information within A2-level texts is designed to be straightforward and less intricate compared to materials targeting higher proficiency level ability. For instance, narrative texts at the basic level typically comprise a title and plot elements, while expository texts commonly include a title alongside paragraphs containing a clear topic sentence and supporting details. Similarly, infographic texts usually incorporate a title, accompanying text, and relevant graphics (Elsworth & Rose, 2021). However, it is imperative to recognise that these conventions represent only a subset of the typical features found in CEFR-aligned textbooks at the basic level. Publishers may also integrate additional text features such as captions, headings, and subheadings to enhance comprehension and engagement (Elsworth & Rose, 2021). In line with this, the present study will focus on the cognitive processes of the story plots (introduction, rising plot, climax, falling, and ending) in the narrative text, topic sentence, and supporting sentences in expository text and, graphic and speech bubble in the infographic text.

Observing the effects of text structures: Theoretical perspective

Our prior research on CEFR-basic readers' reading profiles established a theoretical framework for interpreting eye movement patterns in text processing (Mihat et al., 2023; Azman et al., 2022; Mihat et al., 2018). This framework synthesizes three foundational theories: the Simple View of Reading (SVR) (Joshi, 2019), the E-Z Reader Model of Eye Movement (Reichle et al., 2013), and the Cognitive Process of Reading Comprehension Model (Weir & Khalifa, 2008). The SVR delineates reading behaviour into two strata: decoding (word recognition) and language comprehension, while the E-Z Reader Model operationalizes eye movements as sequential, attention-driven processes with an important element, the integration failures, which provides explanation for regression in eye movement. The cognitive engagement was analyzed using eye-tracking metrics such as first fixation, regression, and total fixation. First fixation denotes the initial gaze on a region of interest, regression reflects backward revisits and total fixation quantifies cumulative cognitive effort (Holmqvist et al., 2011). These metrics, grounded in the E-Z Reader Model, enable systematic attribution of eye movements to decoding and comprehension processes (Reichle et al., 2013).

Critically, eye-tracking data revealed distinct patterns among CEFR-basic readers interacting with text-only materials. In structurally dense texts (e.g., expository passages with hierarchical topic/supporting sentences), readers exhibited prolonged fixations and frequent regressions, particularly at the decoding stratum, suggesting heightened cognitive load during graphemic processing (Mihat et al., 2023). Such patterns align with SVR's emphasis on decoding proficiency as a bottleneck for basic readers (Joshi, 2019). The absence of visual scaffolding likely exacerbated split-attention effects, forcing readers to allocate excessive effort to orthographic parsing rather than structural comprehension (Sweller et al., 2011). Notably, even in narrative texts with linear story plots, basic readers struggled with cohesive gaze patterns, as evidenced by erratic saccades between key plot points, a behaviour linked to underdeveloped inferential skills (Weir & Khalifa, 2008).

However, when visual-word integrations were introduced, the limitations of text-only frameworks became apparent, necessitating the integration of Dual Coding Theory (DCT) (Paivio, 1986). DCT posits that simultaneous activation of verbal and nonverbal systems enhances encoding, a principle validated by eye-tracking studies. In multimodal materials, basic readers demonstrated synchronized saccadic shifts between text and relevant visuals, particularly in topic sentence-visual pairings, marked by shorter text fixations and rapid transitions to graphics (Holmqvist et al., 2011; Mayer, 2021). This contrasts starkly with text-only contexts, where disjointed attentional patterns predominated. Well-aligned visuals reduced regressions and cognitive load, while incongruent imagery triggered prolonged fixations, signaling dissonance (Korbach et al., 2017). For instance, in story plots supplemented with sequential visuals, readers exhibited smoother gaze transitions between narrative text and corresponding images, suggesting enhanced coherence monitoring. Learners with higher visuospatial aptitude further optimized dual-channel processing, achieving smoother gaze transitions (Jaafar & Thang, 2020; Hegarty & Waller, 2005). Thus, while the SVR and E-Z Reader Model explain foundational processes, DCT bridges gaps in multimodal contexts, offering empirical strategies to enhance readability through text-structural adaptations and

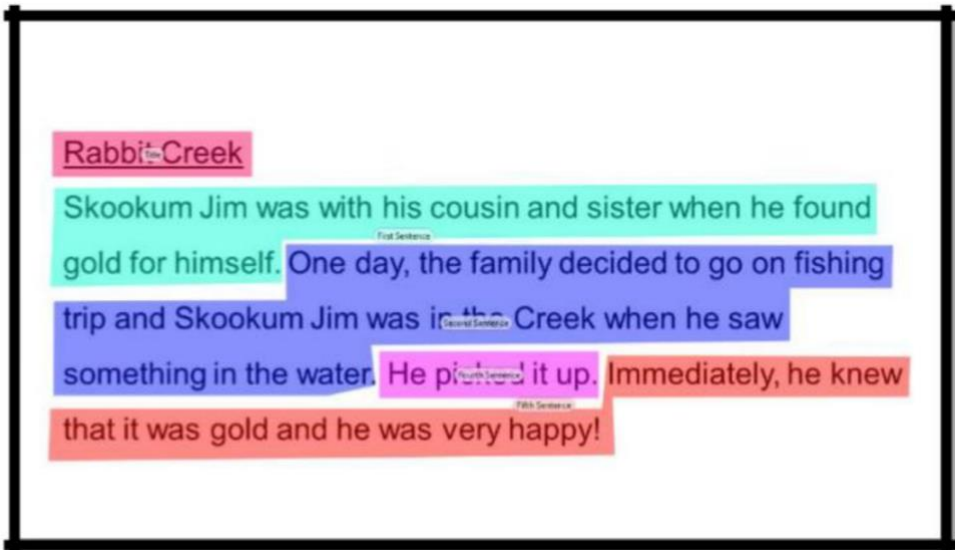
ocular behaviour analysis (Korbach et al., 2017).

Research method

Design of the Study

This study is a sequential mixed methods study that employs saccadic data in millisecond *ms* gathered from the numbers of fixation in the region of interest (ROI) (see Figure 2). This study is considered process-based research which aims to understand and capture how CEFR Basic level readers' eyes move across the text. The use of an eye tracker would allow the researchers to investigate the cognitive aspects of the reading process (Godfroid et al., 2020). The fixation data were collected using Tobii Pro Glasses operating at 100Hz with a single calibration.

Figure 2.
Region of interests from a sample text used in this study



Participants

The term 'CEFR-basic readers' refers to those who scored between 28 and 44 on the Key English Test (KET). The scores reflect that students were at A1 high and A2 mid proficiency level CA (2017). Out of the 230 students, 80 (35%) were selected for the study, including an equal number of Malay boys and girls. There were 40 students in each group and each group received a different reading task. The rest were not included because their scores were below the target proficiency levels, either higher than A2 mid or below A1 high. All selected students had normal or corrected-to-normal vision, as declared by their parents.

Stimuli & Post-Reading Tasks

Three texts of different genres (Narrative, Expository, and Infographic) and topics were randomly chosen from a CEFR international textbook (Capel & Sharp, 2013). All texts had never been used in the classrooms based on the teachers' feedback. The international texts were used as they were aligned with the current practice in Malaysian reading classrooms. Then, two tasks were chosen, and each task was assigned to a group of students to ensure they had a purpose to read the text. The region of interest is set at sentence level (Godfroid, 2019).

Data Collection Procedure

The data collection process began with a briefing to inform participants of their tasks. This was followed by a dummy trial, where participants read a paragraph and performed, mirroring the actual data collection procedure as outlined in the guidelines. This ensured participants understood their responsibilities during the data collection. Subsequently, participants read three texts, presented in one of the three sequences as did in Mihat et al. (2023), with a five-minute break after the first and second texts. These breaks were incorporated to reduce cognitive fatigue and maintain consistent attention levels, ensuring the reliability of participants' responses across all reading tasks.

Data Analysis Procedure

The research reported in this study is the extension of the discussion from Mihat et al. (2023). The data interpretation, which includes attention data, was performed using the E-Z Reading Model (Reichle et al. 2013) and Dual Coding Theory (DCT) (Paivio, 1986). This model elucidates that eye movements occur in a sequential manner, transitioning from one fixation point to the next. During this process, short words that can be skipped, such as 'a/the', and automatically processed words are often skipped. However, if the integration of information is unsuccessful, a regression (or re-reading) of the word takes place, leading to an extended fixation duration on that particular word. Common perspectives on these metrics suggest that a high First Pass Duration (FPD) typically indicates issues in word identification, while an extended Second Pass Duration (SPD) signals challenges in processing words within a sentential context (Godfroid, 2019; Godfroid et al., 2025). Given that the number of participants in this study exceeds 30 (n = 40 students per group), the analysis adheres to the Central Limit Theorem, which is crucial for subsequent inferential statistical analysis.

This study also observed 30 randomly chosen gaze plot recordings to further understand the eye movements during reading. The observation was conducted by examining the gaze plot sequence. The video playback was decelerated during the analysis. The purpose of this observation is to find significant eye movement patterns that can explain the quantitative data. To ensure the validity of the gaze plot analysis, the study engaged two independent expert reviewers to validate the observations derived from the 30 recordings, a method aligned with established protocols for minimising interpretive bias and enhancing methodological rigour (Michelene, 1997). The reviewers, selected for their expertise in eye-tracking research and schema-based text comprehension, cross-examined the quantitative metrics, such as fixation durations, saccadic movements, and regression frequencies, against qualitative interpretations of gaze plot patterns (Michelene, 1997). This dual-review process ensured consistency in coding and strengthening of inter-rater reliability.

Findings

RQ 1: Which area in the narrative plots receives a higher fixation duration?

Figure 3.

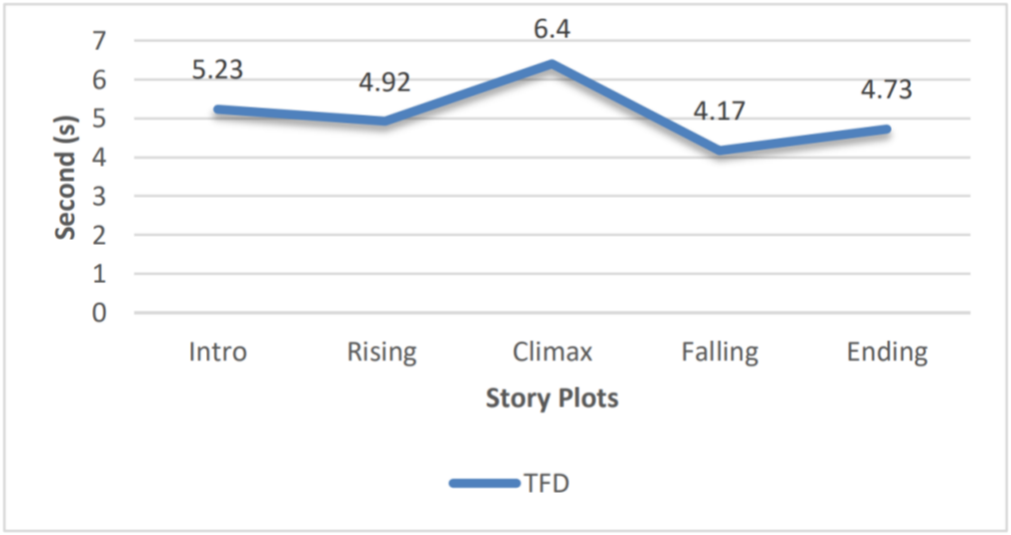


Figure 3 above describes how the information ineach plot is being processed based on the Total Fixation Duration (TFD) in both settings. Figure 4 shows that participants spent 5.23s at the introduction of the story. Then, the TFD rate decreased to 4.92s at the rising point before inflating to (6.4s) again during the climax.The TFD for the following plots (falling point and ending) were at 4.17s and 4.73s.

Figure 4.

TFD according to the plots (verbal summary)

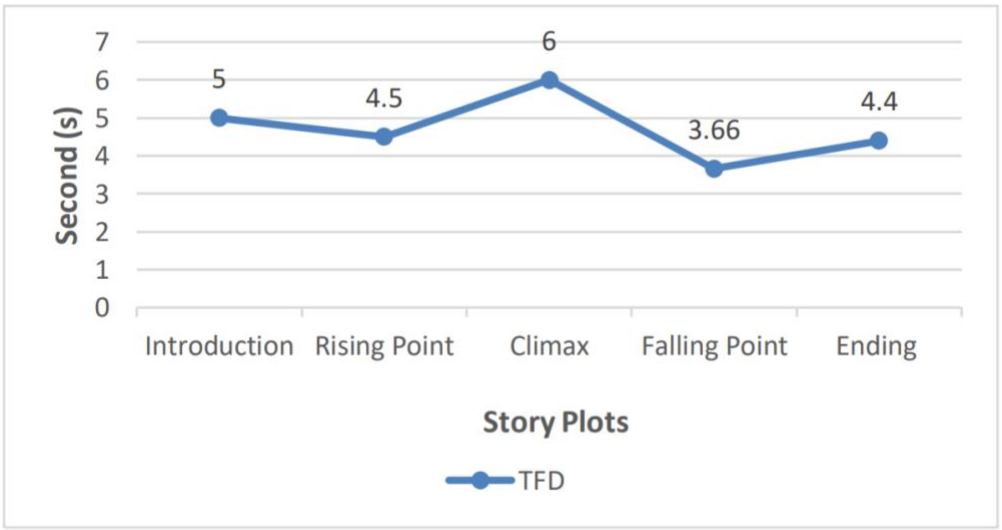
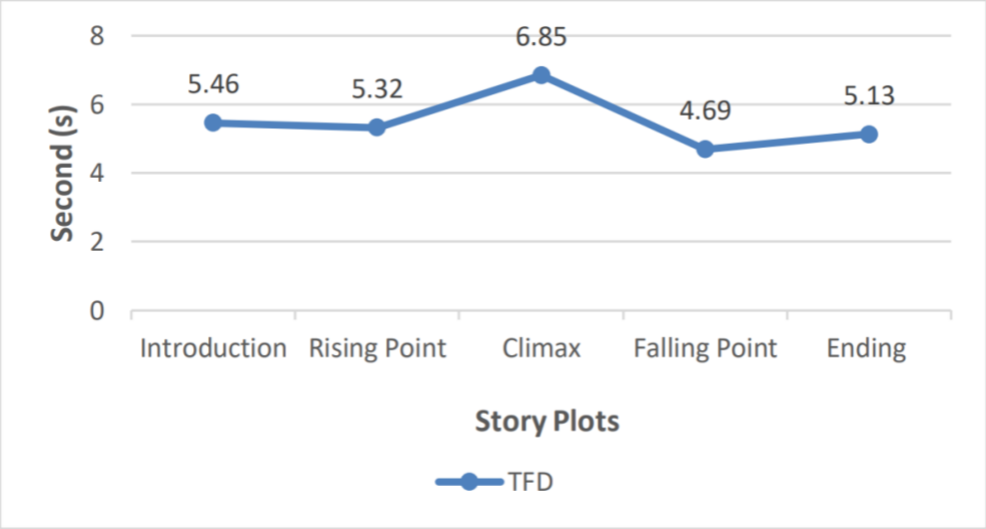


Figure 4 above describes how the information in each plot is being processed based on the Total Fixation Duration (TFD) in the verbal summary task. Figure 5 shows that participants spent 5.46s at the introduction of the story. Then, the TFD rate decreased to 4.5s at the rising point before inflating to 6.0s again during the climax. The TFD forthe following plots (Falling point

and Ending) were at 3.66s and 4.4s.

Figure 5.
TFD according to the plots (3-option MCQ)



Similarly, the discussion here also deals with specific context for the 3-Option MCQ task. Figure 5 above describes how the information in each plot is being processed based on the Total Fixation Duration (TFD) in the 3-Option MCQ task. Figure 6 underscores that participants spent 5.46s at the introduction of the story. Then, the TFD rate decreased to 5.32s at the rising point before inflating to 6.85s again during the climax. The TFD for the following plots (Falling point and Ending) were at 4.69s and 5.13s. Based on the discussion above, the data indicate that participants' attention in each plot is associated with each other. The discussion here is further supported by the Pearson Correlation analysis (Table 1).

Table 2 indicates a more interesting association when analyzed in the specific context. While the general data, when combined, indicate low to high positive associations, the specific context shows some negligible associations. For example, the climax and falling plots in the verbal summary task have no association (p=.270). In the researcher's opinion, the depletion of attention strength and negligible associations between plots highlight the need for more macro rereading. Perhaps, the reduction of attention may herald the depletion of information about that particular plot as it is carried forward through the next and other plots during the reading process. Concurrently, this phenomenon may also suggest the need for a reading strategy to retain past information as basic readers try to comprehend new information.

Table 1.
Pearson correlation among the story plots

		Introduction	Rising	Climax	Falling	Ending
		General				
Introduction	Pearson Correlation	1	.774**	.526**	.442**	.519**
	Sig. (2-tailed)		.000	.000	.002	.000
	N	80	80	80	80	80
Rising	Pearson Correlation	.774**	1	.602**	.662**	.561**
	Sig. (2-tailed)	.000		.000	.000	.000
	N	80	80	80	80	80
Climax	Pearson Correlation	.526**	.602**	1	.527**	.827**
	Sig. (2-tailed)	.000	.000		.000	.000
	N	80	80	80	80	80
Falling	Pearson Correlation	.442**	.662**	.527**	1	.570**
	Sig. (2-tailed)	.000	.000	.000		.000
	N	80	80	80	80	80
Ending	Pearson Correlation	.519**	.561**	.827**	.570**	1
	Sig. (2-tailed)	.000	.000	.000	.000	
	N	80	80	80	80	80
		Specific (Verbal summary)				
Introduction	Pearson Correlation	1	.803**	.610**	.483**	.749**
	Sig. (2-tailed)		.000	.000	.002	.000
	N	40	40	40	40	40
Raising	Pearson Correlation	.803**	1	.574**	.625**	.738**
	Sig. (2-tailed)	.000		.000	.000	.000
	N	40	40	40	40	40
Climax	Pearson Correlation	.610**	.574**	1	.270	.759**
	Sig. (2-tailed)	.000	.000		.092	.000
	N	40	40	40	40	40
Falling	Pearson Correlation	.483**	.625**	.270	1	.422**
	Sig. (2-tailed)	.002	.000	.092		.007
	N	40	40	40	40	40
Ending	Pearson Correlation	.749**	.738**	.759**	.422**	1
	Sig. (2-tailed)	.000	.000	.000	.007	
	N	40	40	40	40	40
		Specific (3-Option MCQ)				
Introduction	Pearson Correlation	1	.743**	.416**	.343*	.300
	Sig. (2-tailed)		.000	.008	.030	.061
	N	40	40	40	40	40
Raising	Pearson Correlation	.743**	1	.575**	.644**	.363*
	Sig. (2-tailed)	.000		.000	.000	.021
	N	40	40	40	40	40
Climax	Pearson Correlation	.416**	.575**	1	.718**	.858**
	Sig. (2-tailed)	.008	.000		.000	.000
	N	40	40	40	40	40
Falling	Pearson Correlation	.343*	.644**	.718**	1	.619**
	Sig. (2-tailed)	.030	.000	.000		.000
	N	40	40	40	40	40
Ending	Pearson Correlation	.300	.363*	.858**	.619**	1
	Sig. (2-tailed)	.061	.021	.000	.000	
	N	40	40	40	40	40

**. Correlation is significant at the 0.05 (2-tailed)

RQ 2: Which area in the expository text receives a higher fixation duration?

Unlike narrative texts, where researchers can investigate the text organization through the plots of the story, expository texts are often investigated through the roles of the topic sentence (TS) and supporting sentence (SS) (Hyönä et al. 2002). Topic sentences entail the main point of the paragraph, whereas the supporting sentences support, explain, illustrate, or provide evidence for the idea expressed in the topic sentence. At the A2 level, pupils are expected to be able to identify the main idea and supporting ideas of a text. These two skills are two of the reading focuses to be taught in the classroom (CDD 2018). Hence, it brings this study to question which area in the expository text receives higher fixation duration by the readers.

Figure 6.
TFD between TS and SS (Combined Data)

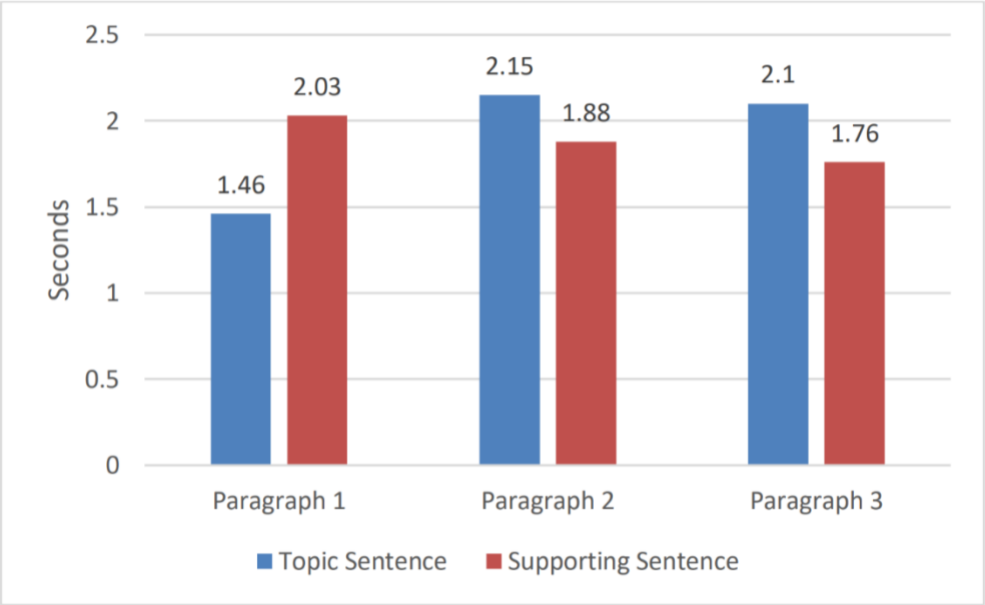


Figure 6 presents the average Total Fixation Duration (TFD) for topic sentences and supporting sentences, based on aggregated data. The TFD for topic sentences ranges from 1.46 to 2.15 seconds, whereas supporting sentences fall within a narrower range of 1.76 to 2.03 seconds. In Paragraphs 2 and 3, topic sentences exhibit descriptively higher TFDs than their corresponding supporting sentences, suggesting that basic readers may allocate greater attentional resources to topic sentences. However, this pattern does not hold for Paragraph 1, where supporting sentences receive a higher TFD than the topic sentence. This deviation may be attributed to what Hyönä et al. (2002) refer to as the transition effect. When a new topic is introduced in a subsequent paragraph, readers tend to increase their engagement with the text. As a result, the initial sentence of the new paragraph, the topic sentence, becomes a focal point of attention.

The discussion with reference to Figure 6 has engendered an intriguing question at this level: Does a specific context observation hold for a similar pattern? Figure 7 shows the TFD of Topic and Supporting Sentences for expository text with the verbal summary task. While the range for topic sentences is between 1.6s and 2.1s, the range for supporting sentences is between 1.7s and 2.1s. There were two events when the Topic Sentences were higher than the supporting sentences (see Contents 2 and 3 in Figure 8).

Figure 7.
Topic sentence and supporting sentence (Verbal summary)

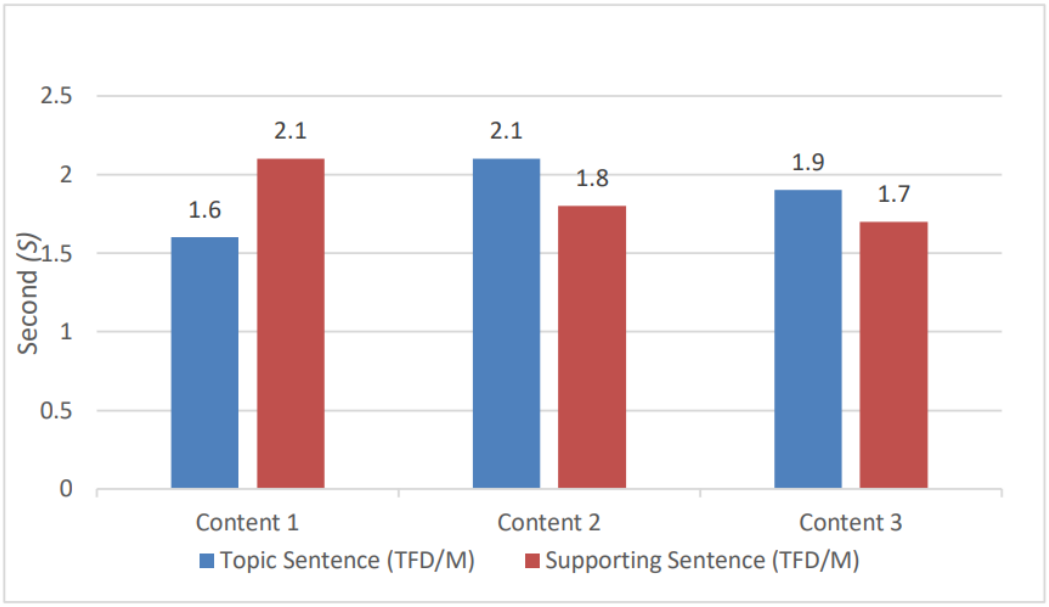
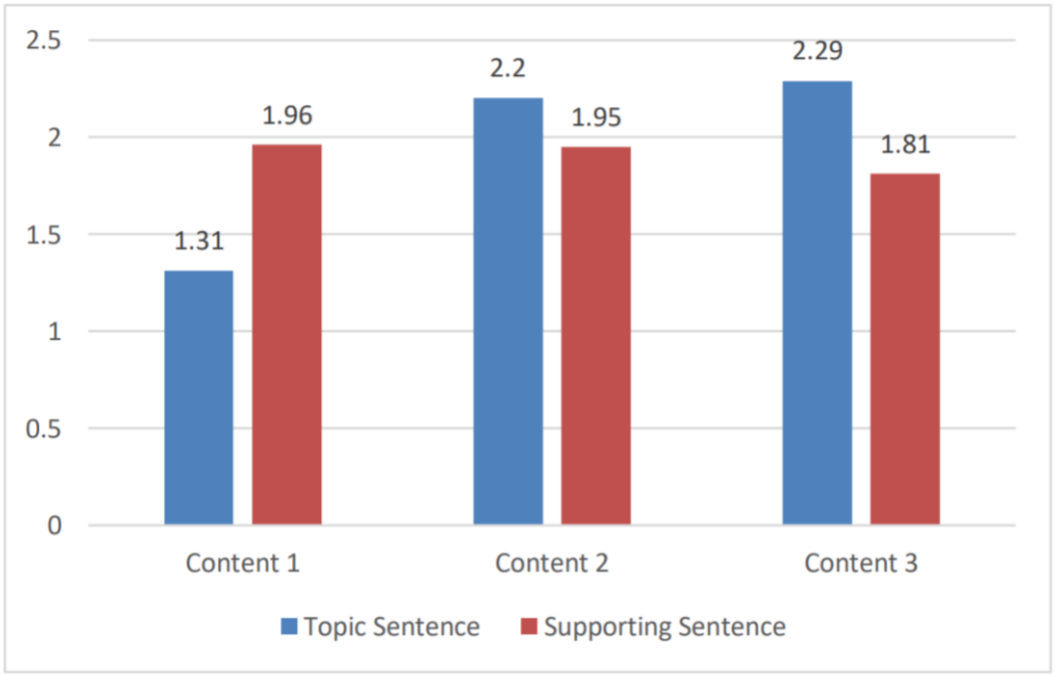


Figure 8.
Topic sentence and supporting sentence (3-Option MCQ)



Notably, a similar pattern is also seen in the TFD of the topic sentence and supporting sentence for the 3-Option MCQ task. Figure 8 shows the mean of TFD for Topic and Supporting Sentences. The range for the topic sentence is between 2.01s and 5.87s; meanwhile, the supporting sentence is between 3.82s and 4.93s. There were also two events when the Topic Sentences exceeded the supporting sentences (see Contents 2 and 3 in Figure 8). The discussion of the specific context (based on the task) here indicates that the patterns are consistent with

this general (combined data) analysis.

Table 2.
Significant difference between topic sentences and supporting sentences

Types of Texts	Topic Sentence M(SD)	Supporting Sentence M(SD)	Paired T-Test Results	Cohen's D
General (Combined)				
P1_TS/P1_SS	1.46s (.55)	2.03s (.64)	t(79)=-6.41, p = 0.00*	d=0.87
P2_TS//P2_SS	2.15s (.90)	1.88s (.57)	t(79)=2.81, p = 0.00*	d=0.35
P3_TS/P3_SS	2.1s (.70)	1.7s (.60)	t(79)=3.88, p = 0.00*	d=0.61
Specific (Verbal summary)				
P1_TS/P1_SS	1.6s (.65)	2.1s (.70)	t(39)=-4.15, p = 0.00*	d=0.74
P2_TS//P2_SS	2.1s (.90)	1.8s (.50)	t(39)=2.04, p = 0.49	d=0.41
P3_TS/P3_SS	1.9s (.60)	1.7s (.60)	t(39)=1.49, p = 0.14	d=0.33
Specific (3-Option MCQ)				
P1_TS/P1_SS	1.31s (.50)	1.96s (.60)	t(39)=-4.89, p = 0.00*	d=0.9
P2_TS//P2_SS	2.20s (.90)	1.95s (.60)	t(39)=1.92, p = 0.06	d=0.33
P3_TS/P3_SS	2.29s (.80)	1.81s (.60)	t(39)=4.63, p = 0.00*	d=0.67

* P is significant at 0.05; P = Paragraph; TS = Topic Sentence; SS = Supporting Sentence

This study then further investigates whether there are differences between topic and supporting sentences. A paired t-test was conducted between topic and supporting sentences to identify whether participants treated both types of sentences equally (see Table 2). The results indicate that all conditions, topics, and supporting sentences, were processed differently. However, the effect size values (Cohen's D) show that only the first condition (P1_TS/P1_SS) has a strong effect (d=0.87) compared to P2_TS//P2_SS and P3_TS//P3_SS, where the effects are small and medium effect size, respectively (d=0.35; d=0.61).

RQ 3: Which area in the infographic text receives a higher fixation duration?

Having discussed the text features in the narrative and expository texts, the next part of the discussion will look at the differences between graphics and sentences. The features of infographic texts are not similar to the narrative and exploratory texts (Siricharoen & Siricharoen 2015). Therefore, it is interesting to investigate how the engagement between the graphics and the sentences is made during reading. The coordination of information, where they are situated, and how they are presented to readers should also be considered in searching for the association between the pictures and the sentences (Jaafar & Thang 2020). This study conducted a paired t-test to describe the difference between responses to sentences in bubbles and pictures. The results are as follows:

Table 3.
Differences between bubbles and pictures

Types of Texts	Means of Bubble and Picture (M/SD)		Paired T-Test Results	Cohen's D
		General (Combined)		
B1_P1	3.61s (1.0)	1.58s (.65)	t(79)=12.01, p = 0.00*	d=1
B2_P2	4.10s (1.2)	1.77s (.55)	t(79)=14.41, p = 0.00*	d=1
B3_P3	3.56s (1.1)	1.48s (.40)	t(79)=10.29, p = 0.00*	d=1
B4_P4	1.74s (.53)	1.85s (.42)	t(79)=-1.21, p = 0.231	d=0.2
		Specific (Verbal summary)		
B1_P1	3.18s (1.0)	1.47s (.65)	t(39)=8.07, p = 0.00*	d=1
B2_P2	3.69s (1.2)	1.96s (.85)	t(39)=8.22, p = 0.00*	d=1
B3_P3	3.20s (1.1)	.94s (.40)	t(39)=9.03, p = 0.00*	d=1
B4_P4	1.49s (.53)	1.91s (.70)	t(39)=-2.33, p = 0.025*	d=0.67
		Specific (3-Option MCQ)		
B1_P1	4.16s (1.0)	1.46s (.65)	t(39)=10.82, p = 0.00*	d=1
B2_P2	4.51s (1.2)	1.45s (.85)	t(39)=815.23, p = 0.00*	d=1
B3_P3	3.93s (1.1)	1.57s (.40)	t(39)=7.25, p = 0.00*	d=1
B4_P4	1.85s (.53)	1.79s (.70)	t(39)=-.414, p = 0.68	d=0.1

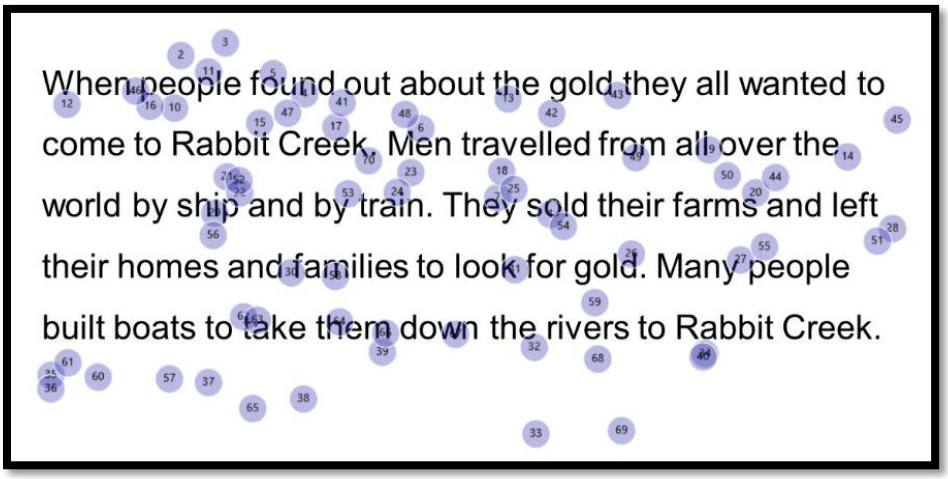
* *P* is significant at 0.05; B = Bubble text; P = Picture

Paired t-tests were conducted between the TFD of the sentences in the bubbles (B1-B4) and the pictures (P1-P4) (see Table 3). The results indicate that attentionin bubbles and pictures was not equally the same for B1_P1 (t(79)=12.01, p = 0.00), B2_P2 (t(79)=14.41, p = 0.00), and B3_P3 (t(79)=10.29, p = 0.00), indicating a large difference between the variables investigated. These results underscore that the participants spent more time referring to the words in the bubble than looking at the pictures. Only P4 is fixated higher than its bubble partners (B4). A similar pattern can also be seen in B1-3 and P1-3 for the verbal summary and the 3-Option MCQ tasks at specific context analysis. However, a difference could not be found in B4_P4 because the bubble (B4) value in the verbal summary task is lower than that of B4 in the 3-Option MCQ task. The discussion now moves to the next point of investigation captured in RQ4.

RQ4: What was the most salient eye movement pattern that could have influenced the quality of the eye movement?

While the first part of the analysis provides quantitative data to establish the ground for discussion, the second part of the analysis looks at how the eyes move across the sentence and between sentences through the gaze plot recordings. This step was important as it helped to identify reasons for the fixation duration inflation. Based on the gaze plot recording analysis, this study found desegmentation behaviour among the readers as a possible factor that accounts for the duration inflation (Mihat et al., 2023).

Figure 9.
An example of desegmentation from a sample recording



Desegmentation refers to a disruption in the typical linear reading process when a reader connects segments (phrases or parts) of different sentences before fully processing the previous sentence. From the 30 recordings, this study observed versed this movement in 25 recordings. In other words, readers make abrupt shifts between sentences (e.g., fixating on a segment in Sentence 2, then jumping to a segment in Sentence 3, then returning to Sentence 1). This eye movement behaviour creates disjointed comprehension, as the reader jumps between unrelated text portions, resulting in incoherent mental integration of information and a high cognitive load. For example, Figure 9 shows an example of desegmentation among the CEFR-Basic readers. This pattern was found to exist in all three types of texts used in this study. As a result, the readers may find the process of comprehending reading materials challenging, especially in areas that contain more information such as the supporting sentences and climax.

Discussion and implementation

This study investigates the attention patterns of CEFR-Basic readers when engaging with different text structures. Eye-tracking data revealed distinct behaviour, particularly in response to narrative texts. Readers consistently allocated more attention at the introduction and climax, while paying significantly less attention to the rising and falling actions. Task type also influenced attention distribution. During verbal summarization tasks, readers showed minimal engagement with the rising and falling actions. This is likely due to the high cognitive demand of reconstructing the narrative independently, which emphasizes local coherence and places strain on working memory. In contrast, multiple-choice questions (MCQs) prompted slightly more attention to these middle sections. This reflects task-driven strategies aligned with the Cognitive Process of Reading Comprehension Model (Weir & Khalifa, 2008), whereby readers adjust their focus based on task goals. Overall, the findings suggest that CEFR-Basic readers tend to fixate on "anchor points" such as the introduction and climax but struggle to integrate intermediate plot elements, thereby impairing holistic comprehension. This imbalance suggests a gap in global text coherence, an advanced comprehension skill within the Simple View of Reading (SVR) framework (Joshi, 2019), although the materials were designed at their target

language proficiency level.

In expository texts, readers tend to focus on topic sentences, particularly when new concepts are introduced. This behaviour aligns with the hierarchical nature of reading described in the Cognitive Process of Reading Comprehension Model (Weir & Khalifa, 2008), which emphasises processing main ideas, subtopics, and details. However, context-specific analysis sometimes reveals a notable discrepancy between fixations on topic sentences versus supporting sentences. This may indicate the use of metacognitive monitoring, a critical skill for comprehension (Joshi, 2019). Yet, when topic and supporting sentences are processed unevenly, it may also signal misdirected metacognitive focus. Such misfocus can stem from increased cognitive load. Readers may struggle to process information at the sentence level rather than grasping the overall meaning.

When interpreting infographics, readers often focus more on textual elements (e.g., bubble text) than on visual components. This behaviour reflects 'piecemeal-text-processing' rather than integrated comprehension. It contradicts the principle of dual-channel learning, where combining text and visuals enhances understanding (Paivio, 1986). This fragmented approach resembles the split-attention effect (Mayer, 2021), where separate layouts force readers to process visuals and text independently, thereby increasing cognitive load (Sweller et al., 2011).

Based on gaze plot recordings, this study found that desegmentation is a potential factor influencing the quality of attention among CEFR-Basic readers. Desegmentation reflects inefficient attentional control, wherein readers struggle to maintain cohesive engagement with structurally connected elements. This phenomenon is characterised by unpredictable saccades between non-adjacent sections of the text, such as abrupt shifts from the first sentence in the introduction directly to the second sentence in the rising point (example from a narrative text). Such patterns disrupt the natural flow of narrative processing, as described by the E-Z Reader Model (Reichle et al., 2013). This finding supports the views of Joshi (2019) and Weir and Khalifa (2008), who assert that comprehension involves not only decoding textual cues but also synthesizing information across textual hierarchies.

Desegmentation may occur when readers face difficulty organizing information due to weak executive functioning and limited working memory capacity (Sweller et al., 2011). In expository texts, this is observed as frequent regressions between topic and supporting sentences, suggesting a high cognitive load in processing and integrating information from both categories. This pattern is consistent with Cognitive Load Theory, which posits that even logically segmented texts can strain working memory, prompting frequent backtracking as readers attempt to piece together discrete ideas (Sweller et al., 2011). In infographics, desegmentation appears as abrupt shifts between textual and visual elements, impairing the integrative attention necessary for connecting visual and verbal content.

These findings highlight critical cognitive processes at play when CEFR-Basic readers engage with texts that are nominally aligned with their proficiency level. Decoding and literal meaning may be adequately supported, yet more complex operations like structural integration and multimodal synthesis remain in development. Despite exposure to CEFR A1 and A2 vocabulary lists and sentence structures, many participants still experienced difficulty comprehending the

texts holistically.

To address these gaps, pedagogical practices should be informed by relevant theoretical insights. For narrative texts, the use of visual timelines may enhance plot coherence (Amini et al., 2020). In expository reading, pairing hierarchical outlines with flowcharts could support deeper processing. For infographic tasks, strategies such as graphic-text labelling and organizing information along a specific spatial direction (e.g., top-down or left-right) may better leverage learners' visuospatial strengths for CEFR-Basic readers (Traboco et al., 2022). Additionally, eye navigation training through audio-assisted reading materials could help guide visual attention more effectively across different text formats (Bangoy et al., 2024). Finally, instructional emphasis on vocabulary and sentence-level comprehension, as outlined in the Malaysian primary school reading curriculum should be revisited and reinforced to strengthen foundational reading skills.

Conclusion

In conclusion, this study investigated the attentional behaviours of CEFR-Basic readers by analysing their eye movements. The aim was to enhance our understanding of how CEFR-Basic readers process information in relation to reading instruction in schools. The findings suggest that CEFR-Basic readers, in the context of our study and despite of using the target CEFR-aligned materials, have yet to fully recognize that each text type possesses distinct structural and linguistic features as envisioned in the CEFR-aligned syllabus. Based on the patterns observed, this study proposes several pedagogical strategies to further support CEFR-Basic readers, including the use of visual timelines, audio-assisted reading to guide eye navigation, and linear infographics in which text is organized in a top-down or left-to-right format.

While these recommendations show promise, they warrant further empirical investigation through an eye-movement paradigm and offer potential directions for future research. For example, how the use of audio-assisted reading affects readers' eye movements and guides comprehension, or how cognitive load and comprehension differ between linear and non-linear infographics. Implementing these strategies could align classroom reading practices with evidence-based approaches grounded in cognitive and educational research, especially now that reading can occur in both physical and online settings (Jaafar et al., 2022). Despite limitations, particularly the small sample size and students' background, the findings provide valuable insights and contribute meaningfully to ongoing discussions about eye-tracking applications and reading comprehension among CEFR-Basic readers. More broadly, this research enriches the growing body of literature on the reading behaviours of CEFR-Basic learners.

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