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Effects of graphic organizers on aesthetic reading experience

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The aesthetics of reading have received relatively little research attention, particularly in the context of foreign language readers. In this study, we investigate the impact of text mining-powered graphic organizers (GOs) on aesthetic reading experience with English as a foreign language (EFL) readers. Shusterman's framework of aesthetics was applied to measure reading comprehension, experience, and literary beauty perception. A between-group experiment design ($N = 52$) was conducted, where Norwegian students enrolled in the International Baccalaureate classes of Lillestrøm High School were recruited. Participants in the experimental condition interacted with GOs before reading the first three chapters of English versions of *Pride & Prejudice*, while those in the control condition solely read the same texts without interacting with GOs. A statistically significant enhancement in comprehension scores across all subdomains —summarization, vocabulary, and overall comprehension—was associated with the use of GOs. However, the introduction of GOs did not improve or hinder the reading experience or the perceived literary beauty of the text. These findings highlight the efficacy of automatically extracted GOs in improving specific aspects of the aesthetic reading experience. The implications of such findings for individual domains of reading aesthetics and foreign language readers are discussed.

KEYWORDS

aesthetic, reading, experience, comprehension, text mining, graphic organizers

1 Introduction

Advancements in integrating new reading technologies have predominantly focused on enhancing reading comprehension (Alqahtani, 2020; Capodieci et al., 2020). However, reading is a multifaceted process that encompasses not only comprehension but also the perception of the reading experience and the perceived beauty of the text. These elements are crucial for understanding the aesthetic dimensions of reading. Popular models of aesthetics suggest that aesthetic reading experiences involve parallel processes of liking and understanding, operating both consciously and subconsciously (Chatterjee and Vartanian, 2016; Graf and Landwehr, 2015; Jacobs, 2015; Leder and Nadal, 2014; Leder et al., 2004).

Incorporating visual representations alongside textual content has proven instrumental in structuring and organizing information effectively (Stull and Mayer, 2007). These visual aids, known as Graphic Organizers (GOs)—also referred to as knowledge maps, mind maps, or concept diagrams—integrate textual and visual elements to restructure information, reflecting the interdisciplinary nature of research associated with them (Jeon et al., 2023). GOs play pivotal roles across various stages of ideation, planning, organization, and presentation of information. Supported by cognitive linguistic theories such as constructivism, schema theory, dual coding theory, and cognitive load theory (Amadieu et al., 2009; Amadieu and Salmerón, 2014), GOs help scaffold learners' understanding, particularly for complex materials.

1.1 Use of graphic organizers

Research has consistently demonstrated the efficacy of GOs in improving comprehension across various educational activities, including writing and reading. Their positive scaffolding influence has been systematically documented across multiple meta-analytical reports (Batdi, 2014, 2015; Dexter and Hughes, 2011; Guo et al., 2020; Kansizoglu, 2017; Moore and Readence, 1980). GOs are frequently employed in educational contexts and have been studied extensively with non-fictional texts (Bangsri and Phusawisot, 2020; Damayanti, 2019; Hernández-Chérrez et al., 2020). Their utility and effectiveness with complex reading materials, such as fictional text types and/or foreign language texts, are not entirely understood (Kurniaman and Zufriady, 2019; Heidarifard, 2014).

As of 2022, fictional texts account for over 52.88% of book sales in the US (Curcic, 2023), and their popularity has increased in the last two decades with the rise in EFL. While fictional reading in EFL is cognitively demanding, readers must judiciously choose important textual information for the reading task (Imsa-ard, 2022). Using GOs with fictional text materials, they effectively helps create and update a basic schema, therefore helping in the judicious usage of cognitive resources of an EFL reader (Guastello et al., 2000).

Despite this need, the utilization of GOs has predominantly focused on non-fictional text types, with few exceptions (Sam and Rajan, 2013; Uba et al., 2017). Uba et al. (2017) investigated the integration of fictional texts alongside GOs, although their study encompassed both fictional and non-fictional types, underscoring a lack of dedicated focus on fictional narratives. Similarly, Sam and Rajan (2013) included the use of GOs with fictional readings but not as the primary focus of their investigation. In a related study, Albufalasa (2019) examined the impact of GOs on the reading comprehension of fictional narratives among EFL students. The results indicated a significant improvement in student performance when utilizing GOs to navigate short storylines compared to traditional story grammar. Moreover, students exhibited enhanced motivation toward reading and learning English literature, manifested through increased self-confidence, reduced language anxiety, and heightened participation and independent engagement in reading tasks.

A systematic review by Guo et al. (2020) highlighted a dearth of attention toward fictional text types when compared to non-fiction, with only 8 out of 39 analyzed research articles incorporating them. Thus, the efficacy of GOs with fictional texts remains underexplored, especially among EFL learners, leaving the impact of GOs on the aesthetic reading experience of fiction underinvestigated.

1.2 Recent developments in GOs research

Recent studies have continued to explore the impact of reading interventions on comprehension and other reading-related variables. Wang et al. (2021) examined the effects of computer-based concept mapping on EFL learners' reading comprehension and found significant improvements. Similarly, Jeon et al. (2023) investigated the use of digital GOs and reported positive effects on students' engagement and understanding. Li et al. (2022) explored the impact of reading strategy instruction on Chinese university EFL students, finding that while reading strategies significantly improved comprehension and strategy use, they did not significantly impact motivation and self-efficacy. This suggests that interventions may enhance certain aspects of reading without necessarily affecting others.

Advancements in technology have facilitated the integration of computational techniques like Text Mining (TM) to extract GOs automatically, offering a unique advantage in creating visual representations tailored to specific texts (Feldman and Sanger, 2007). TM involves extracting meaningful patterns and knowledge from large amounts of textual data, combining techniques from data mining, machine learning, natural language processing, and statistics. By applying TM techniques, we can generate GOs that assist in reading comprehension and enhance the reading experience (Boulineau et al., 2004; Mendhakar, 2022; Mendhakar and Darshan, 2023).

Studies have shown that pre-made GOs extracted through computational techniques outperform self-generated ones by reducing cognitive load and improving recall and retention (Colliot and Jamet, 2018). Providing readymade GOs significantly improved recall of macrostructure information and hierarchical relations, with readers using readymade GOs performing markedly better than those generating their own. These findings are supported by successive studies on the potential of computer-generated GOs (Massey, 2018; Pirnay-Dummer and Ifenthaler, 2011; Wang et al., 2021). Therefore, using TM to automatically extract GOs significantly reduces the manual effort of generating and curating them.

Despite these advancements, the integration of TM to extract GOs for fictional narratives remains largely unexplored. Instead of focusing solely on reading comprehension, this study aims to investigate the effects of TM-powered GOs on the aesthetic reading experience, conceptualized as a combination of comprehension, experience, and literary beauty perception.

1.3 Aesthetic aspects of reading experience

Defining an aesthetic reading experience is highly debated. In this study, we utilize the four-element framework of aesthetics—evaluative, phenomenological, semantic, and demarcation-definitional—as suggested by Shusterman (1997) and apply it to reading. An aesthetic reading experience has an *evaluative dimension* that determines whether it is pleasurable and rewarding, a *phenomenological dimension* assessing whether it was absorbing and striking, and a *semantic dimension* focusing on comprehension, leading to the *demarcational-definitional dimension* that labels the experience as aesthetic or not (Balling, 2016; Specker et al., 2023).

Complementing this framework, the Neurocognitive Poetics Model (NCPM) by Jacobs (2015) describes the aesthetic reading experience through a dual-route model involving aesthetic appreciation and narrative absorption. This model suggests that factors such as reading comprehension, experience, and literary beauty manifest through foregrounding and backgrounding processes during reading. Readers judiciously use cognitive resources across these routes to achieve an aesthetic experience

(Willems and Jacobs, 2016). Measuring how we comprehend, appreciate, and rate the overall reading experience will help estimate the aesthetic reading experience.

1.4 Purpose of the study

The review, so far, points to the clear adoption of GOs in teaching different non-fictional texts in a classroom setting (Jiang and Grabe, 2007; Grabe and Stoller, 2018; Reategui and Epstein, 2015; Stull and Mayer, 2007). These structured reports on using GOs focus majorly on students' reading comprehension with EFL readers. Previous reports have shown that comprehension and experience are intertwined (Fayn et al., 2015; Kuijpers and Hakemulder, 2018; Kraaykamp and Van Eijck, 2005; Schutte and Malouff, 2004). We hypothesize that the interaction of GOs before reading fiction might not only facilitate better comprehension in EFL readers but also improve the reading experience and appreciation of beauty. This is conceptualized as an aesthetic reading experience, which is a combination of reading comprehension, experience, and perceived beauty in EFL users. The specific questions considered in this study were:

(1) Do TM-powered GOs enhance reading comprehension with the fictional reading of EFL speakers?
(2) Do TM-powered GOs enhance the reading experience with the fictional reading of EFL speakers?
(3) Do TM-powered GOs enhance literary beauty perception with the fictional reading of EFL speakers?

2 Method

2.1 Participants

Fifty-two students enrolled in the International Baccalaureate program at Lillestrøm High School, Oslo, Norway, participated in the study. Participants were aged between 15 and 18 years and were EFL learners with an English language proficiency level of B2 based on the Common European Framework of Reference for Languages.

2.2 Exclusion criteria

1. Signs of cognitive, language and reading impairments (screened using the Montreal Cognitive Assessment—MoCA (Nasreddine et al., 2005). MoCA is a brief, 30-question, highly sensitive tool for the early detection of cognitive impairment.
2. Avid readers based on the reading habits questionnaire- RHQ (Kuijpers, 2020).
3. Participants who have already read the novel of *Pride* and *Prejudice*.

2.3 Design

A between-subject design was employed to compare the effects of TM-powered GOs between control (without - GOs) and experimental (with + GOs) groups. The treatment variable of 15 min of pre-reading (Winn, 1991) interaction with GOs was introduced in the experimental condition.

- **Experimental Group:** Participants interacted with GOs for 15 min before reading the text.
- **Control Group:** Participants began reading without any pre-reading GOs interaction.

Subsequent aesthetic reading behavior was evaluated in terms of comprehension, experience and literary beauty of both conditions.

2.4 Materials

The first three chapters of the novel *Pride* and *Prejudice* were used as the text material in this study. TM-powered GOs were used as the treatment variable in the experimental condition. Two GOs extracted using TM, namely cirrus graph and collate graphs, were presented in the experimental condition (Figure 1). Each participant in the experimental condition was given 15 min to interact with the GOs before the reading task started. Initially, one word and its relation to other words was presented in the collate graph. Similarly, the top 25 words were highlighted in the cirrus graph. Participants were instructed to manipulate the number of words and associated relationships across both the GOs for better insights into the text.

2.5 Experimental setting and procedure

The text was presented on a 22-inch LCD screen [Dell PC with 8 GB of RAM, Intel (R) Core i5-6300U 2.5 GHz CPU, and a 64-bit Windows 7 operating system] with a screen resolution of 3000 by 2000 pixels. Each participant was seated comfortably in front of the screen at a distance of 100 centimeters. The text material was presented as a standard e-reading platform. The participants were free to determine the text properties for reading, such as text size, font, and line height. Once the participant chooses the ideal settings, s/he could not change the text properties further while reading. Other text presentation factors, such as background lighting and font color, were constant. At the end of the reading section, the participants were asked to complete post-reading questionnaires measuring comprehension, experience and literary beauty. The study was conducted in a single 60-min session, aligning with standard classroom periods to minimize disruption and participant fatigue. Previous studies have shown such interventions effective (Li et al., 2022), demonstrating that focused sessions can impact reading comprehension and related variables.

2.6 Measures and analysis

Three measurements were recorded after the participants completed the reading: reading comprehension, experience, and literary beauty. Reading comprehension was evaluated using a

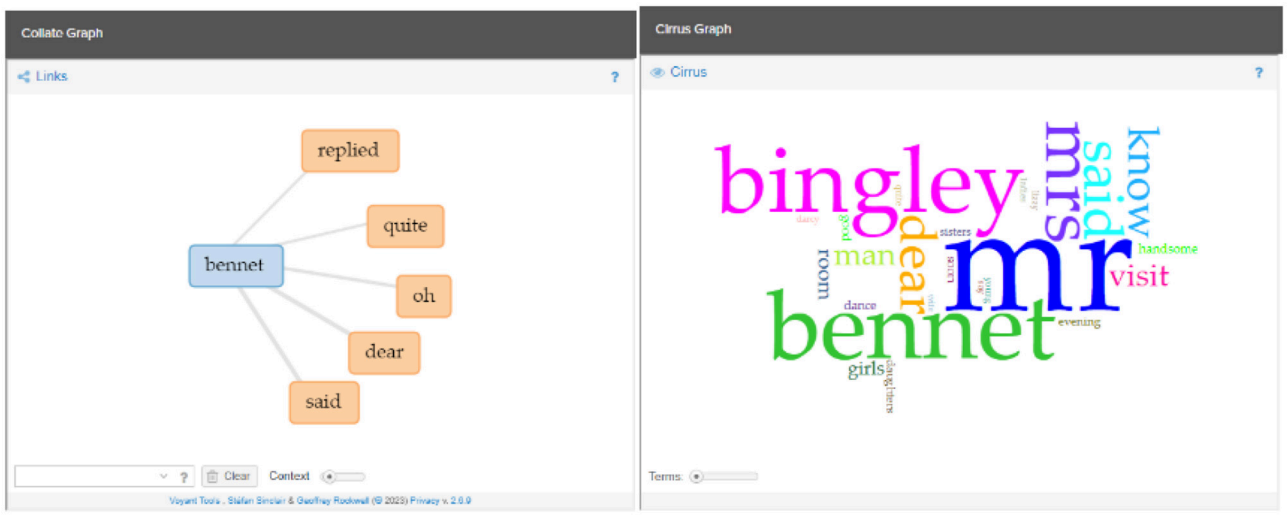

FIGURE 1
Interactive cirrus and collate graphs used as graphic organizers in this study.

custom-made test (Appendix I) focusing on three critical aspects of comprehension (i.e., summarization, literal and inferential comprehension, and vocabulary). Each participant was asked to provide a quick summary of their reading (summarization), followed by a few multiple-choice questions about the story they read (literal and inferential comprehension). At the end of the comprehension questionnaire, the participants were asked to choose which words were used in the text they read (vocabulary). Summarisation was scored based on a simple measure of the number of words used in the reported summary. Questions related to literal and inferential comprehension were scored +1 for the correct answer and 0 for the wrong answer for 14 questions. Hence, the possible score range was from 0 to 14. Vocabulary was scored +1 for correct answers and −1 for wrong answers for 15 vocabularies. Hence, the possible score range was from −15 to 15. The reading experience was measured using the short User Experience Questionnaire (sUEQ) (Appendix II), followed by the Literary Beauty scale. sUEQ was rated on a 7-point rating scale, whereas the literary beauty scale was rated on a 5-point rating scale (Appendix III). sUEQ evaluated the pragmatic, hedonistic and overall quality of the experience. The pragmatic score signifies the practical purpose and utility of reading in acquiring knowledge. This includes aspects such as efficiency, perspicuity, and dependability. At the same time, the hedonistic score describes the pleasure, enjoyment, and intrinsic satisfaction of reading. This includes aspects such as stimulation and novelty. The overall score of the questionnaire combines both pragmatic and hedonic dimensions to provide a holistic assessment of the reading experience, considering factors such as attractiveness, efficiency, stimulation, and dependability. As the text excerpts used in the study are standard literature, any perceived changes in the literary quality of the text were reflected in the literary beauty ratings at the end of the reading. The aggregated scores across the different subsections were compared across the experimental and control conditions.

3 Results

The data from the experiment were subjected to statistical analysis, with significance set at alpha < 0.05. The Shapiro-Wilk test assessed whether the data adhered to the normality assumption. The findings indicated that the data deviated from a normal distribution ($ps < 0.05$). Hence, non-parametric tests (Mann-Whitney U tests) were used to assess differences between the groups across all the measures.

3.1 Reading comprehension

Table 1 shows the descriptive statistical analysis for the three reading comprehension measures, i.e., Summarisation, Literal and inferential comprehension, Vocabulary, per condition. Figure 2 shows the violin plots and distributions for each measure.

Mann-Whitney U test revealed a statistically significant difference in the comprehension scores in all subdomains of comprehension across the two groups ($U = 278$, $p < 0.05$, $d = 0.76$). A 13% boost in overall comprehension score was noted as a factor of GOs interaction. Further differences across individual differences across conditions have been depicted in Figure 2C. In contrast, we did not find any statistically significant differences across the groups in Summarization (Figure 2A; $U = 145$, $p = 0.081$) and Vocabulary (Figure 2B) scores ($U = 295$, $p = 0.062$).

3.2 Reading experience

The reading experience was evaluated using the sUEQ-based questionnaire, divided into three sub-scores: pragmatic experience, hedonic quality, and overall experience (Hinderks et al., 2018). Considering the possible score range of the pragmatic and hedonistic experience domain is from −1 to 2.5, the participants

TABLE 1 Descriptive statistics of reading comprehension across control and experimental groups.

	Summarization	Literal and inferential comprehension	Vocabulary
	Mean *(SD)*	Mean *(SD)*	Mean *(SD)*
Control	70.11 *(25.51)*	7.38 *(1.30)*	4.00 *(1.88)*
Experimental	95.15 *(32.76)*	9.07 *(2.51)*	7.07 *(1.98)*

in both conditions had an above-average pragmatic experience (Control: $M = 1.5$, $SD = 0.395$; Experimental: $M = 1.25$, $SD = 0.672$). Similarly, the hedonistic quality of the experiences were rated above average, with a rating of 0.92 ($SD = 0.473$) for control and 0.99 ($SD = 0.561$) for the experimental conditions. Even the overall quality was rated to be above-average experience (Figure 3) between the two conditions.

Mann-Whitney U tests were performed using each sub-score as the dependent variables, showing no significant main effects of groups in all scores (Pragmatic experience: $U = 187$, $p = 0.683$, Hedonic quality: $U = 245$, $p = 0.826$, Overall experience: $U = 198$, $p = 0.672$). Therefore, it was inferred that the interaction of GOs did not change the reading process.

3.3 Literary beauty

An average literary beauty rating scores were 3.88 ($SD = 0.71$) and 3.65 ($SD = 0.68$), separately for the control and experimental groups (Figure 4). Mann-Whitney U Test, using the beauty rating score as the dependent variable, revealed no significant main effect of the group *($U = 210$, $p = 0.719$)*, suggesting that the introduction of GOs did not improve nor hinder the perceived literary beauty of the text.

4 Discussion

The current experiment explored the effects of automatically extracted TM-powered GOs on reading fictional texts. It was hypothesized that interaction with GOs would boost EFL readers' comprehension, experience and the literary beauty perception. The findings show that interaction with GOs supports basic comprehension, an integral element of the aesthetic reading experience, but does not improve nor hinder the reading experience and beauty. The following section discusses the results of the three research questions we set in the present study.

4.1 Do TM-powered GOs facilitate reading comprehension with fictional texts?

A positive association between GOs and fictional comprehension was observed. The present study demonstrated that a 15-min interaction with GOs was significantly linked to higher reading comprehension scores for fictional texts. This finding is in line with the previous reports of GOs on non-fictional text types (e.g., Boykin, 2015; Hernández-Chérrez et al., 2020; Bangsri and Phusawisot, 2020; Sathongeay and Prasansaph, 2019). As Winn (1991) noted, mere glances at GOs can trigger memory recall of key information related to the text (see also Baxendell, 2003; Yahya and Hashim, 2013). Hence, it is reasonable to find an effect on reading comprehension for more complex reading materials such as fiction with a 15-min GOs interaction.

Furthermore, GOs have been shown to help EFL readers recognize, decode, order, analyse, evaluate, synthesize, and generalize information (Leu et al., 2015, 2004; McNamara and Magliano, 2009; Singer, 2013). Introducing the GOs before the start of reading has helped the readers create a basic schema and update it during their reading session. This conceptualization of schemas before reading helps the judicious utilization of cognitive resources as suggested by constructivism and cognitive load principles (Dymock and Nicholson, 2010; Cliftion and Slowiaczek, 1981; Guastello et al., 2000). While we assume that the reduction of cognitive load and restructuring of the schemas cause a boost in comprehension, previous reports support these claims (Boyle, 1997). They suggest that GOs reduce cognitive load, as noted by the activation of brain regions associated with sensory perception, memory retrieval, and decoding (Song et al., 2021; Glisky, 2007; Li and Lindenberger, 2002; Mar, 2004). While these studies are established with non-fictional text types, further neuroimaging studies are needed to explore similar activation patterns with fictional texts (Bråten et al., 2008; Bråten and Strøms, 2003).

While previous research has primarily focused on boosting comprehension in non-fictional text reading, our study addresses the gap by examining their impact on fictional text comprehension. The results act as a replication report for EFL in a classroom setting (Erkens et al., 2016; Reategui et al., 2019, 2012, 2022) and highlight the new paradigms that can be technologically driven to produce an aesthetic reading experience (Lao and Krashen, 2000; Lee et al., 2015; Yamashita, 2008). Additionally, the results obtained in this experiment highlight the role of GOs in simplifying the complex linguistic structure of fictional texts and elucidating relationships between characters, patterns, and concepts. This simplification fosters an in-depth understanding of the text, aiding the organization, retention, and relation of information (Jiang and Grabe, 2007; Glynn and Di Vesta, 1977; Liu et al., 2010; Reategui and Epstein, 2015; Reategui et al., 2020).

4.2 Does TM-powered GOs enhance the reading experience with fictional texts?

Reports on the impact of GOs on the reading experience are relatively scarce compared to those focusing on comprehension (Mackey, 2002; Mackey et al., 2004). In this study, the findings from the sUEQ questionnaire consistently indicated an above-average reading experience across both conditions regardless of the presence of GOs. This suggests that introducing GOs did not facilitate a better reading experience.

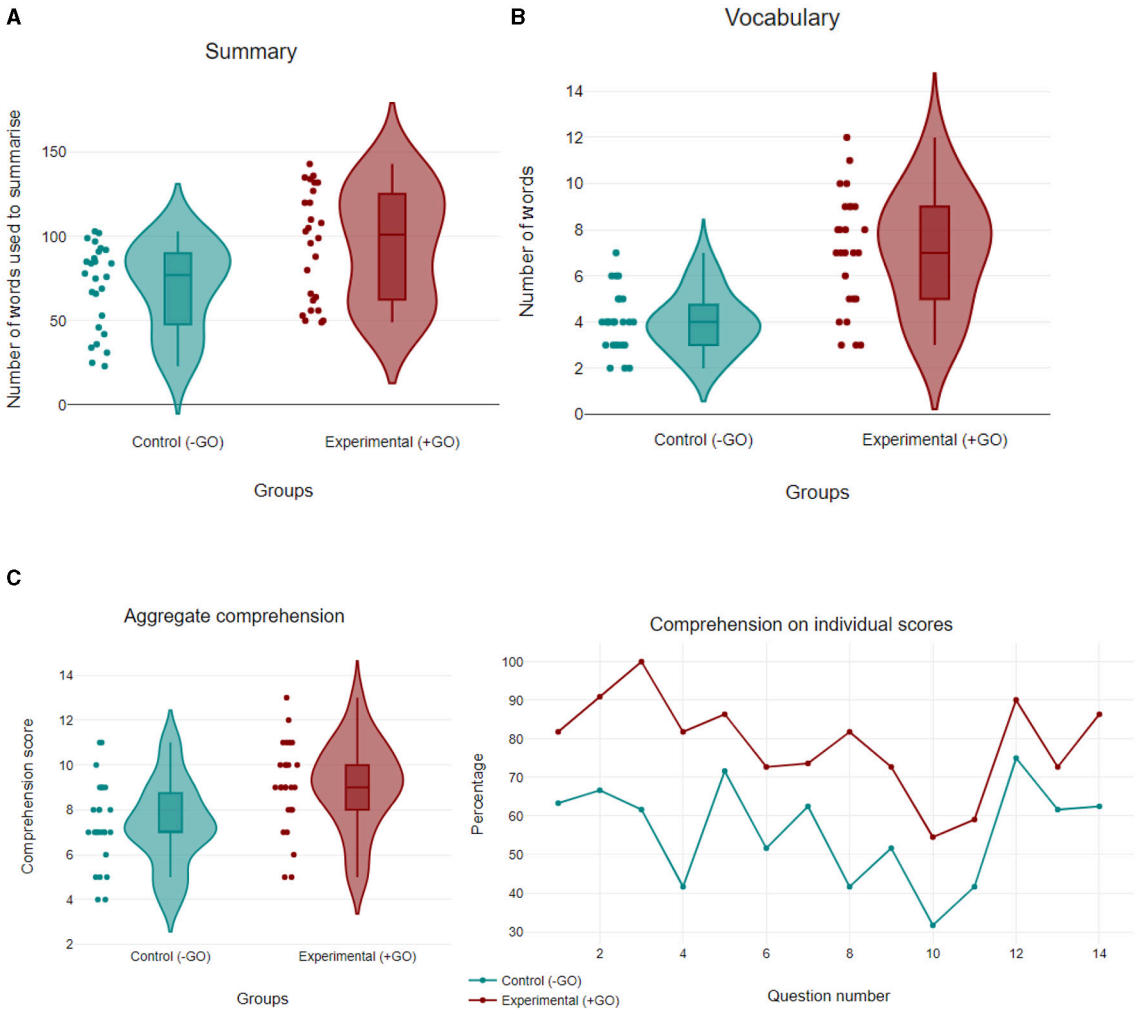

FIGURE 2
(A) Summary scores. **(B)** Vocabulary scores. **(C)** Overall comprehension scores across conditions.

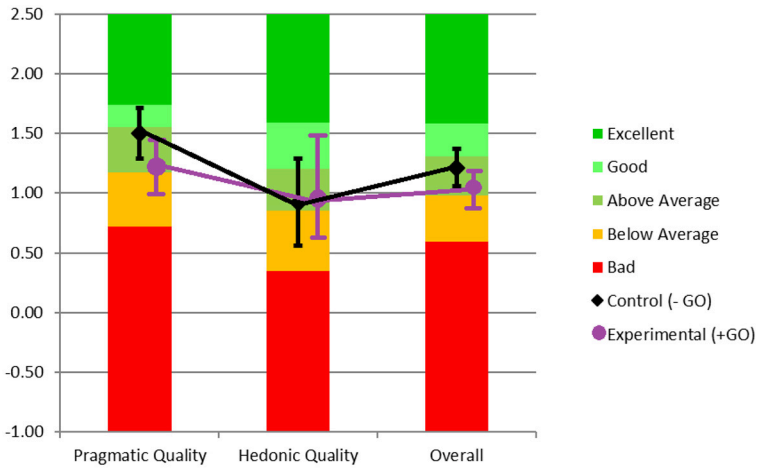

FIGURE 3
Pragmatic, hedonic and overall reading experience across conditions.

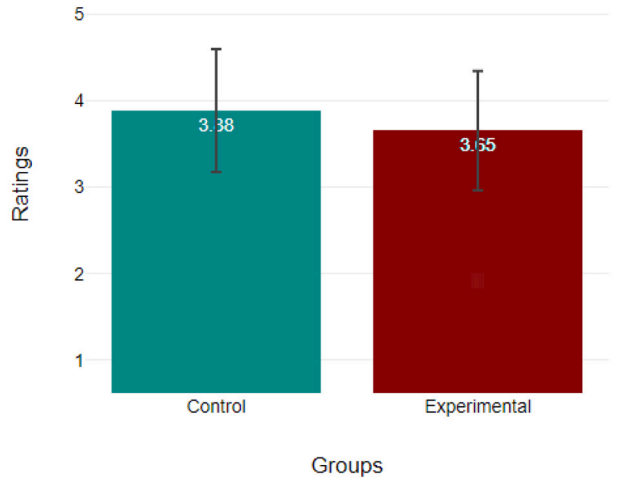

FIGURE 4
Literary beauty ratings across conditions.

This finding aligns with Li et al. (2022), who found that while reading strategy instruction significantly improved reading comprehension among Chinese university EFL students, it did not significantly impact motivation and self-efficacy. Their study suggests that while interventions can enhance cognitive aspects of reading, they may not immediately affect experiential or affective components. Furthermore, some participants in our experimental group reported that while the GOs helped them understand the text better, they felt it interrupted the flow of reading. For example, one participant noted, "The GOs were helpful, but I found myself focusing more on them than enjoying the story." This qualitative feedback suggests that GOs may sometimes detract from the immersive experience of reading fiction.

Meanwhile, contrary to popular opinion, the null effect of GOs on reading experience also highlights the potential of using technological aids to assist comprehension without causing hindrance, as many literature scholars believe. We associate this null effect of GOs with the uniformity of our sample in terms of reading preferences, background, and familiarity with digital tools, which may have contributed to the absence of observed differences (Chow et al., 2015; Li et al., 2022). Additionally, factors such as individual differences in learning styles and/or prior knowledge of the topic might have resulted in a positive effect of GOs in some participants while not with others. While the prior knowledge about the text material was controlled in this experiment, individual learning styles are challenging to control. A close estimate of individualistic style and differences can be the measure of variability across the ratings. The variability in ratings noted as standard deviations suggests a relatively variable hedonistic quality compared to the pragmatic or the overall quality of the reading experience. These findings contrast with prior research, which has shown significant variability and individual differences in readers' experiences (e.g., Altmann et al., 2014; Hartung et al., 2017; Hsu et al., 2014; Nijhof and Willems, 2015).

Recent reports (Jacobs, 2015; Jacobs and Lüdtke, 2017; Riddell and van Dalen-Oskam, 2018) have pointed to an interactive reading process in terms of comprehension and experience. This effect was also supported in our experiment, where we found that even in non-avid readers like EFL readers, experience and comprehension are intertwined and form the basis of aesthetic experience (Fayn et al., 2015; Kuijpers and Hakemulder, 2018; Kraaykamp and Van Eijck, 2005; Schutte and Malouff, 2004). Further research is warranted to replicate the null effect of GOs on the reading process and its association with comprehension. Additional measures of perception of reading, enjoyment and engagement associated with reading can provide a better insight into individual readers' perceptions of reading (Cox and Guthrie, 2001; Touré-Tillery and Fishbach, 2014).

4.3 Do TM-powered GOs enhance the perception of the literary beauty of fictional texts?

Measurement of the aesthetic reading experience hinges on the perceived beauty of the text (Hakemulder, 2004; Stockwell, 2020). This study measured beauty by drawing parallels from the popular theories of aesthetic appreciation (Leder et al., 2004; Leder and Nadal, 2014) and NCPM (Jacobs, 2015). While emotional measures (De Agostini et al., 2010; Powell and Schirillo, 2011; Treiman and Allaith, 2013; McManus and Stöver, 2014; Chahboun et al., 2017) are often employed for the measurements of beauty, our study utilized a Likert rating scale to evaluate perceived beauty. This was done to ease testing and avoid external factors that might hinder the reading experience.

The text materials used in our study were extracted from a well-regarded literary novel known for its literary style and beauty. Therefore, it is not surprising that literary beauty was rated higher on the 5-point rating scale in the control condition. By interaction with GOs, EFL readers' overdependence on understanding the text was expected to reduce with subsequent influence on beauty ratings. This effect was not observed in the present study, nor did it support the finding that texts perceived as challenging to comprehend are often deemed more beautiful (Płużyczka et al., 2024).

We attribute the high ratings obtained in control and experimental conditions to show a ceiling effect due to the complexity and language structure of the text excerpts. While the experimental results indicate no facilitatory or inhibitory influence of GOs on literary beauty, a couple of cautionary considerations are needed. As we asked participants to rate the text for being literary beautiful, without defining beauty as either stylistic or emotional beauty, we cannot pinpoint what each participant considered for deciding on a rating for beauty, i.e., whether the cognitive or emotional aesthetic process was dominant in their ratings (Leder et al., 2004; Leder and Nadal, 2014). Future studies can aim to replicate these findings and further explore how positive reading experiences and comprehension influence perceptions of literary beauty (Page et al., 2017).

This study has several limitations that should be acknowledged. First, the sample size was relatively small and limited to students from a single high school in Norway, which may affect the generalizability of the findings to other populations. Additionally, while efforts were made to randomize participants, it is important to note that the between-subject design does not eliminate the possibility of initial differences between the groups. Future research could include pre-intervention measurements to confirm equivalency. Second, the intervention was conducted over a short duration (60 min), which may not capture long-term effects on reading experience and literary appreciation. Third, the study focused on a specific text (*Pride & Prejudice*), and results may vary with different literary works or genres. Finally, while we collected some qualitative feedback, a more systematic qualitative analysis could provide deeper insights into readers' experiences. Future research should consider larger, more diverse samples, longer intervention periods, and a broader range of text.

5 Conclusion

The results of the present study indicate that interacting with GOs aids in basic comprehension, which is crucial for the aesthetic reading experience. Though the speculated influence on reading experience and literary beauty was not observed, GOs did not hinder them either. Given the sample size and the data distribution, using Mann-Whitney *U* tests was appropriate for non-normally distributed data. Non-parametric tests are robust and suitable when the assumptions of parametric tests are violated (Field, 2018). Future studies with larger sample sizes might yield normally distributed data, allowing for parametric analyses and a detailed exploration of each variable on aesthetic reading experience. The boost in comprehension with fiction supports that reading fiction involves cognitive or affective and interactive processes (Jacobs, 2015; Jacobs and Lüdtke, 2017). While past research has mainly focused on GOs in non-fictional texts, our study fills a gap by examining their impact on comprehension in fictional texts. The findings replicate previous results in EFL classroom settings and underscore the potential for technologically driven methods to enhance the aesthetic reading experience.

However, future studies should explore introducing GOs at different reading stages and comparing associated reading behaviors, utilizing larger sample sizes, diverse reading groups and different text stimuli. In conclusion, our study provides valuable insights into the interplay between guided reading interventions, cognitive processes, and the multifaceted nature of the reading experience. By laying the groundwork for future research, we aim to refine our understanding of how technological aids shape our interaction with textual content further, ultimately enhancing literacy outcomes.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

Ethical approval was not required for the study involving human samples in accordance with the local legislation and institutional requirements. Written informed consent for participation in this study was provided by the participants' legal guardians/next of kin.

Author contributions

AM: Conceptualization, Methodology, Writing – original draft, Writing – review & editing. MP: Methodology, Supervision, Conceptualization, Funding acquisition, Writing – review & editing. HL: Methodology, Supervision, Conceptualization, Funding acquisition, Writing – review & editing.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Publisher's note

Supplementary material

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/flang.2025.1472429/full#supplementary-material

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