International Journal of Innovative Research and Scientific Studies, 8(1) 2025, pages: 458-468

IJIRSS
International Journal of Innovative Research & Scientific Studies

ISSN: 2617-6548

URL: www.ijirss.com

The construction of mental images as a cognitive strategy to improve comprehension of expository texts in children

Guido Ayay-Arista[1*], Yersi-Luis Huaman-Romani[2], Jose-Walter Coronel-Chugden[3], Francisco Martin Fernandez Uceda[4], Mirta Margoth Julon-Sanchez[5]

[1]*Universidad Nacional Intercultural Fabiola Salazar Leguia de Bagua. Bagua, Peru.*
[2]*National Amazonian University of Madre de Dios, Puerto Maldonado, Peru.*
[3]*National Frontier University, Sullana, Peru.*
[4]*Jose Santos Public Pedagogical Higher Education Institute, Bagua Grande, Peru.*
[5]*Universidad Nacional Toribio Rodriguez de Mendoza de Amazonas. Chachapoyas, Peru.*

Corresponding author: Guido Ayay-Arista (*Email: gayay@unibagua.edu.pe*)

Abstract

The purpose of this study was to evaluate the efficacy of the construction of mental images as a cognitive strategy to improve comprehension of expository texts in elementary school children. Since these texts require greater cognitive effort, we investigated whether the creation of mental images facilitates the reading comprehension process. A quantitative approach with a quasi-experimental design and a hypothetico-deductive method was used. Fifty-four elementary school students participated (mean age = 9.24, SD = 0.43; 31 boys and 23 girls), distributed in two groups: an experimental group, which applied the strategy during eight 90-minute sessions, and a control group, which received conventional instructions. The results indicated that the experimental group showed a significant improvement in the comprehension of expository texts, with 63% of the students reaching a satisfactory level of achievement, while the control group did not present relevant advances. In conclusion, the strategy of constructing mental images proved to be effective in the development of reading comprehension skills, improving the literal, inferential, and critical levels. The practical implications indicate that implementing this strategy as a key pedagogical tool could positively impact reading comprehension in primary education.

Keywords: Construction of mental images, Education, Expository text, Learning strategy, Mental images, Students, Text comprehension.

DOI: 10.53894/ijirss.v8i1.4179
Funding: This study received no specific financial support.
History: Received: 26 August 2024/**Revised:** 27 December 2024/**Accepted:** 6 January 2025/**Published:** 17 January 2025

Competing Interests: The authors declare that they have no competing interests.
Authors' Contributions: All authors contributed equally to the conception and design of the study. All authors have read and agreed to the published version of the manuscript.
Transparency: The authors confirm that the manuscript is an honest, accurate, and transparent account of the study; that no vital features of the study have been omitted; and that any discrepancies from the study as planned have been explained. This study followed all ethical practices during writing.
Institutional Review Board Statement: The Ethical Committee of the National Amazonian University of Madre de Dios, Peru has granted approval for this study (Ref. No. 072-2023-UNAMAD-VRI).
Publisher: Innovative Research Publishing

1. Introduction

Comprehension of expository texts represents a significant challenge for elementary school students due to the inherent complexity of their vocabulary, structure, and the abstract concepts they present [1, 2]. Unlike narrative texts, which are usually easier for children to process, expository texts require greater cognitive effort, limiting the development of deep comprehension [3]. This limitation can lead to learning difficulties, affecting students' academic performance and motivation to engage with this type of material [4]. Despite the presence of expository texts in educational curricula, current didactic strategies do not seem to adequately address students' needs, as they focus on literal levels of comprehension without promoting the development of inferential and critical skills.

The successful comprehension of a text requires the mental construction of its meaning; therefore, readers must create effective methodologies to achieve it [5] however, the existence of a low level of text comprehension raises theoretical and educational concerns [6] for example, several investigations recognize the importance of mental digressions when reading and understanding expository texts [7] as well as distinguishing between intentional and non-intentional forms [8]. On the other hand, individual differences in reading comprehension are related to working memory and executive functions that determine comprehension [9]; this is associated with the limited number of effective and powerful strategies that measure the comprehension processes of expository texts, which becomes a latent problem in elementary school students [10].

Expository texts primarily aim to present information to the reader [11] and facilitate students' assimilation of the contained information, ensuring they learn the necessary information from their reading [12]. Expository texts are present in education curricula and are the most used by teachers and students when constructing or communicating knowledge [13] However, researchers agree that this type of text presents greater difficulty in the comprehension of schoolchildren [11] due to the unusual vocabulary [10] the distance between prior knowledge and scientific concepts used [12], and the textual superstructure [14]. In short, it requires a greater cognitive effort, so that some difficulties can be overcome by applying comprehension methodologies and strategies [6].

In this context, it has been found that classroom activities related to text comprehension in primary education are focused on the development of literal-level skills [11, 12] and, in some cases, they reach selective levels, such as solving questionnaires or selecting examples of concepts and inferences, without considering experimental and analytical activities [15]. These facts lead teachers to use methodologies within their reach and to lag behind innovation in effective strategies aimed at developing reading competence [16] and, as a consequence, there are few methods, techniques, strategies, and ways of teaching text comprehension [17]. Similarly, in terms of comprehension of expository texts, both informative and specialized, their methodologies are precarious [18]. It appears that the low level of reading comprehension is also linked to poor comprehension strategies in general, and specifically to the absence of comprehension strategies for expository texts.

1.1. Theoretical Foundation

In this context, the construction of mental images emerges as a cognitive strategy that helps to improve reading comprehension due to the existence of the dual processing theory, which suggests that people understand better when they integrate verbal and visual representations; this strategy allows students to create internal representations of the text, facilitating memorisation and deep comprehension [19]. However, the effectiveness of this technique in improving reading comprehension of these expository texts in children has not been widely researched, which allows for a wide field of research relevant to improving education.

Reading comprehension of expository texts is a process of constructing a mental representation of what the text says and is represented at three levels [20]. The first level corresponds to the mental representation of the surface of the text, although it does not necessarily imply comprehension. The second level involves the mental representation of the text base, enabling the acquisition of the text's meaning and its expression in one's own words. Finally, at the third level is the mental representation of the situation described in the text and goes beyond text-based meaning [20, 21] that is, the learner who has reached the third level has not only constructed a model of the message by constructing images but can also visualize the content and reality reflected in the text. Among the higher-order skills, prior knowledge and inferences are considered the most important predictors of reading comprehension [22].

On the other hand, studies on the use of drawing as a strategy to teach learning show that it promotes learning and allows errors to be identified and corrected by recalling information [23, 24] visual representations are a powerful tool because they help what is not seen to be seen and what is complex to become simple [25] drawing can provide feedback on possible gaps in understanding on the part of the student, which can then be used to revise the text in order to fill those gaps [26]. By drawing, the learner ceases to be a passive consumer of information and knowledge and becomes involved in the cognitive processes of selecting, organizing, and integrating the information to be learned [27]. Drawing serves as a strategy for understanding expository text for two reasons: 1) it is a powerful tool for thinking and communicating, regardless of discipline, and 2) drawing is a process skill that is integral to the practice of science [25].

Similarly, there is evidence of various strategies aimed at improving comprehension of expository texts, for example, a study that provided metacognitive cues as a strategy for comprehension of expository texts (experimental group) outperformed students in the control group who did not use metacognitive cues [28] while another study found that readers comprehend a text better if prior knowledge and metacognition are activated as a strategy [22]. Despite efforts, research has shown that people have difficulty comprehending expository texts [18, 29] or that narrative texts are, in general, easier to comprehend than expository ones [30] although contradictorily, a study conducted with preschool children reflected that 5-year-olds prioritise information from the expository genre over fantasy narrative while university students achieved higher relative accuracy in metacomprehension than schoolchildren and older adults [31] according to García, et al. [32] rhetorical competence also makes a unique contribution to the comprehension of expository texts in primary school students.

1.2. Justification and Objectives of the Research

In this context, the main objective of the present study is to evaluate the effectiveness of the construction of mental images as a cognitive strategy to improve comprehension of expository texts in elementary school children. The research questions guiding this study are (1) to what extent does mental imagery construction improve levels of literal, inferential, and critical comprehension compared to conventional instruction, and (2) how does this strategy affect students' overall performance when interacting with complex expository texts? Addressing these questions not only provided valuable information about a possible solution to reading comprehension difficulties but will also contribute to the development of more effective educational methodologies that promote critical thinking and meaningful learning in the early years of schooling.

In this logic, as a hypothesis, it was proposed that applying the didactic strategy of constructing mental images when reading an expository text significantly improves reading comprehension in elementary school children. Since the strategies promote all levels of comprehension and support the student to fill gaps through interaction with the text to respond to the difficulties that may arise [33]. On the other hand, comprehension of expository text requires a multifaceted process of decoding meanings [34] activation of prior knowledge, identification of relationships between elements in the text, and creation of various forms of mental models and memory representations [35]. It is there, where the strategy of constructing mental images, with its procedures, mobilizes a set of competencies to achieve its purpose. In this sense, the main objective of this research is to evaluate the effect of the strategy of constructing mental images in the comprehension of expository texts, for which we will resort to different methodological strategies that are oriented to improve the comprehension of expository texts from the classroom while the student reads a text, paragraph by paragraph.

This study is significant because it seeks to fill a gap in the literature on reading comprehension strategies in elementary education. By exploring an innovative methodology such as the construction of mental images, it is intended not only to offer an effective intervention to improve comprehension of expository texts but also to provide tools for teachers to face one of the greatest educational challenges: the development of deep comprehension skills in their students.

2. Methodology

2.1. Research Design

The present study was developed under a quantitative approach with a quasi-experimental design of two non-equivalent groups: an experimental group and a control group. The objective was to evaluate the effectiveness of the construction of mental images as a cognitive strategy to improve comprehension of expository texts in elementary school children. A hypothetical-deductive method was used to make comparisons between the results obtained before and after the intervention in both groups.

2.2. Research Population

The research included 54 elementary school students from an educational institution in northern Peru. The mean age of the participants was 9.24 years (SD = 0.43), of which 31 were boys and 23 girls. The participants were equally distributed in two groups: 27 in the experimental group (15 boys and 12 girls) and 27 in the control group (16 boys and 11 girls). All students were native Spanish speakers and had no special educational needs. The students were selected by non-probabilistic convenience sampling.

2.3. Instruments

The Text Comprehension Test, constructed to evaluate expository texts, was used as an instrument. The test consists of two subtests: subtest of comprehension of expository texts and subtest of specialized expository texts.

The text comprehension test as a whole consists of 30 multiple-choice items with correct or incorrect answer criteria, comprising five different expository texts, from simple structure to a higher degree of complexity. The subtest of comprehension of informative expository texts consisted of 13 items that evaluated the following levels: literal (4 items), inferential (6 items), and critical (3 items). The subtest of specialized expository texts consisted of 17 items that evaluated the following levels: literal (9 items), inferential (7 items), and critical (1 item).

An ordinal scale of achievement levels, based on lower ability (pre-initial) and higher ability (satisfactory), determines the ratings of the instrument. The scales and scores in reading were: pre-beginning (0 to 13 points), beginning (14-26 points), process (27-38 points), and satisfactory achievement (39 to 51 points). The maximum test score was 51 points. A student who obtained a score prior to the beginning means that they did not achieve the necessary learning for their age and grade, while the student who achieved satisfactory achievement means that his/her performance is adequate and is in conditions to face any level of comprehension according to their age and grade.

The comprehension test of expository texts and the methodological construction of the didactic strategy were submitted to a validity and reliability process. The content validity was carried out by the opinion of five experts in research and scientific production, showing a high correlation (r= 0.800) and an adequate reliability index ($\alpha = 0.990$). Likewise, in the methodological construction of the didactic strategy to carry out the experimentation process, a general validity index (r= 0.864) and an adequate reliability index ($\alpha = 0.965$) were evidenced.

Finally, data were collected according to the described instrument from the eight sessions and processed with SPSS version 25.0 statistical software. The results were presented at a descriptive level in frequency tables and percentages, box plot, descriptive statistics such as mean (median), standard deviation (SD), and mean standard error (SEM). Also, at the inferential level, the research hypothesis was contrasted by applying the parametric T-student statistic to test the significant

differences in the mean scores of the control and experimental groups before and after applying the strategy of constructing mental images.

2.4. Validity and Reliability Tests

A panel of five experts in educational research determined the content validity of the instrument by evaluating the relevance of the items of the study's objectives. The correlation obtained was high (r = 0.800). The reliability of the instrument was evaluated using Cronbach's alpha coefficient, yielding a value of α = 0.990, indicating excellent internal consistency. Likewise, the methodological design was validated, obtaining a reliability index of α = 0.965.

2.5. Experimentation Procedures

The experiment was developed over eight learning sessions, each lasting 90 minutes. The sessions followed a three-phase structure: initiation, development, and closure. The initiation phase presented the expository text to be read and the materials to use. In the development phase, the students in the experimental group applied the strategy of constructing mental images, while the control group followed conventional teaching without additional interventions. Finally, in the closing phase, students in the experimental group shared and discussed their visual representations of the text, which fostered metacognition and critical reflection.

2.6. Procedures of the Didactic Strategy

The didactic strategy of constructing mental images consisted of the visual representation of the texts read [36]. Students in the experimental group were required to read a paragraph of the text silently, close their eyes to mentally visualize what they had read, and subsequently draw what they had imagined in a blank space next to the text. They were asked questions to guide their visualization, such as "What is the paragraph about?", "Who is the main character?" or "What happens in this part of the text?". Each session ended with the presentation of the drawings by the students, which facilitated reflection on the comprehension process.

2.7. Data Analysis

The data collected in the pretest and post test were analysed using SPSS version 25.0 statistical software. Descriptive analyses were performed to evaluate the means, standard deviations, and percentages of achievement levels in both groups. At the inferential level, Student's t-test for independent samples was applied to determine whether there were significant differences between the groups in reading comprehension of expository texts before and after the intervention. A significance level of $p < 0.05$ was established to evaluate the hypotheses.

Finally, the approach allowed us to validate the hypothesis that the construction of mental images significantly improves students' reading comprehension of expository texts, highlighting the impact of this teaching strategy on the development of critical and reflective reading skills.

3. Results

Table 1 shows descriptive information on the achievement level of comprehension of expository texts before and after applying the didactic strategy of constructing mental images in the control (CG) and experimental (GE) groups. In the pretest, there was no variation in the achievement levels between the control group (CG) and the experimental group (GE). On the other hand, when applying the strategy of constructing mental images (posttest), a significant improvement of 63% was evidenced in the comprehension of expository texts in the GE with respect to the CG at the satisfactory level of achievement; thus, it is clearly evident that the students achieved the necessary and expected learning for the grade and cycle.

Table 1.
Comparison of the achievement level of the control and experimental groups in the pretest and posttest.

Level of achievement	Score	Pretest				Postest			
		GC	%	GE	%	GC	%	GE	%
Prior to startup	[0.13]	8	30	8	30	12	44	0	0
At startup	[14-26]	12	44	12	44	12	44	0	0
In process	[27-38]	5	19	6	22	2	7	9	33
Satisfactory	[38-51]	2	7	1	4	1	4	18	67
Total		27	100	27	100	27	100	27	100

Note: CG = Control group; EG = Experimental group.

Table 2 provides a descriptive analysis of the variable "comprehension of expository texts" and its dimensions (literal, inferential, and critical) in the control (CG) and experimental (EG) groups, evaluated at pretest and posttest. Measures include sample size (n = 27 for both groups), mean (M), standard deviation (SD), and standard error of the mean (SEM).

In the pretest, the results indicate that both control and experimental groups had comparable levels of reading comprehension before the intervention. For example, at the literal level, the means of both groups were practically the same (GC = 1.56; GE = 1.59), as well as at the inferential level (GC = 3.93; GE = 4.11) and at the critical level (GC = 2.74; GE = 2.89). The groups maintain these similarities in their comprehension of informative and specialized texts, demonstrating very close means (GC = 8.22 and GE = 8.59 in informative texts; GC = 9.04 and GE = 9.52 in specialized texts). This suggests

that the groups started from a comparable level of comprehension before the intervention, which reinforces the validity of the quasi-experimental design.

Table 2.
Descriptive statistics of the variable comprehension of expository texts and dimensions in the control and experimental groups of the pretest and posttest.

Group-test	Variables and dimensions	Group	n	M	SD	SEM
GC and GE-pretest	Literal level	GC	27	1.56	0.974	0.187
		GE	27	1.59	1.010	0.194
	Inferential level	GC	27	3.93	2.601	0.501
		GE	27	4.11	2.722	0.524
	Critical level	GC	27	2.74	2.654	0.511
		GE	27	2.89	2.736	0.527
	Informative expository texts	GC	27	8.22	5.395	1.038
		GE	27	8.59	5.590	1.076
	Literal level	GC	27	3.15	2.231	0.429
		GE	27	3.26	2.086	0.402
	Inferential level	GC	27	4.96	2.794	0.538
		GE	27	5.04	2.377	0.458
	Critical level	GC	27	0.93	1.107	0.213
		GE	27	1.22	0.934	0.180
	Specialized expository texts	GC	27	9.04	4.719	0.908
		GE	27	9.52	4.145	0.798
	Comprehension of expository texts	GC	27	17.26	9.53	1.83
		GE	27	18.11	9.22	1.77
GC and GE-postest	Literal level	GC	27	1.19	0.681	0.131
		GE	27	3.33	0.620	0.119
	Inferential level	GC	27	3.89	2.607	0.502
		GE	27	9.85	1.916	0.369
	Critical level	GC	27	2.33	2.184	0.420
		GE	27	6.67	2.094	0.403
	Informative expository texts	GC	27	7.41	4.551	0.876
		GE	27	19.85	3.538	0.681
	Literal level	GC	27	2.85	2.070	0.398
		GE	27	8.15	1.460	0.281
	Inferential level	GC	27	4.81	2.760	0.531
		GE	27	9.93	3.012	0.580
	Critical level	GC	27	1.33	0.734	0.141
		GE	27	2.44	0.751	0.145
	Specialized expository texts	GC	27	9.00	4.323	0.832
		GE	27	20.52	4.273	0.822
	Comprehension of expository texts	GC	27	16.41	8.400	1.617
		GE	27	40.37	6.611	1.272

Note: CG = Control group; EG = Experimental group; n = Sample size; M = Mean, SD = Standard deviation; SEM = Standard error of the mean.

In the posttest, after the implementation of the mental image construction strategy in the experimental group, the results show clear differences between the two groups. At the literal level, the experimental group improved significantly, obtaining a mean of 3.33 compared to 1.19 in the control group. At the inferential level, the experimental group also showed a notable improvement (9.85 vs. 3.89 in the control group), indicating that the intervention had a positive impact on interpretation skills. Likewise, on the critical level, the experimental group scored significantly higher (6.67 vs. 2.33 in the control group), reflecting an improvement in critical thinking and analytical skills.

As for informative and specialized expository texts, the experimental group also showed significant improvements. In the informative texts, the experimental group achieved a mean of 19.85, far surpassing the control group (7.41). Similarly, in the specialized texts, the experimental group obtained a mean of 20.52, while the control group reached 9.00.

The results of the posttest confirm that the strategy of constructing mental images applied to the experimental group had a positive impact on all dimensions of comprehension of expository texts, significantly surpassing the control group. The improvements are not only reflected in literal comprehension but also in inferential and critical skills, suggesting that this strategy promotes a deeper and more reflective understanding of textual content.

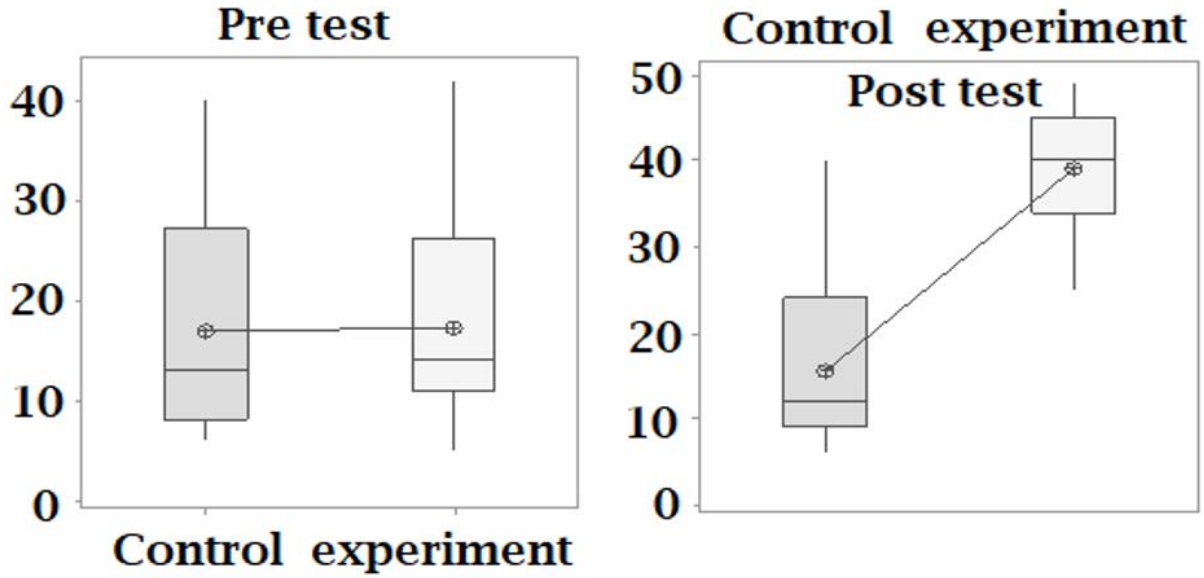

Figure 1.
Pre-and post-test averages in comprehension of expository texts.

In Figure 1, it is observed graphically in the box plot that there is a statistically significant difference in the averages obtained in the GC and GE of the pre- and post-test; in the pretest of the GC and GE scores of 17.26 and 18.11, respectively, were evidenced, resulting in very similar descriptively; in the post-test of the GC and GE scores, an average of average of 16. 41 and 40.37 points respectively, showing an increase of 23.96 points, demonstrating that after applying the strategy of constructing mental images, in the CG the average score in the comprehension of expository texts improved significantly in comparison with the CG, which did not suffer the same effect.

Table 3 displays the results of the T-test for independent samples between the control group (CG) and the experimental group (EG) in the pretest and posttest, analyzing different dimensions of comprehension of expository texts (literal, inferential, critical, and text types). In the pretest, the results indicate that there are no statistically significant differences between the control and experimental groups in all the variables evaluated. For example, at the literal level, the t-value = -0.137 and a bilateral significance (p = 0.891) show that the means of both groups are very similar, with a minimum difference of -0.04 between the means. The inferential level (p = 0.799) and at the critical level (p = 0.841) repeat this pattern, with practically insignificant mean differences. Likewise, the results for comprehension of expository and specialized texts do not show significant differences either (for example, in expository texts p = 0.805).

To sum up, the pretest results show that both groups started out with similar levels of understanding of expository texts. This proves that the samples were similar and lets us compare them properly after the intervention. However, in the posttest, after the implementation of the mental image construction strategy in the experimental group, highly significant differences are observed between both groups in all the dimensions evaluated. At the literal level, the value of t = -12.114 and p = 0.000 show a notable difference between the groups, with a mean difference of -2.148 in favor of the experimental group, reflecting a positive impact of the intervention. The 95% confidence interval ranges from -2.504 to -1.792, reaffirming the robustness of this result.

At the inferential level, the differences are equally significant, with t = -9.578 and p = 0.000, and a mean difference of -5.963, indicating a considerable improvement in the inferential ability of the experimental group. The confidence interval varies between -7.212 and -4.714, which reinforces the confidence in these results. Similarly, the critical level also shows significant differences between the groups, with t = -7.442 and p = 0.000, reflecting that the experimental group improved its ability to analyze and evaluate information. The mean difference is -4.333, and the confidence interval ranges from -5.502 to -3.165.

As for the expository divulgative texts, the analysis shows that the experimental group also significantly outperformed the control group, with t = -11.218 and a mean difference of -12.444 (CI between -14.671 and -10.218). The results for specialized texts are equally significant, with t = -9.846 and a mean difference of -11.519, indicating that the experimental group significantly improved their comprehension of more complex texts.

Finally, in the general variable of comprehension of expository texts, the value of t = -11.649 and p = 0.000 reflect a marked difference between the groups, with a mean difference of -23.963 (CI between -28.091 and -19.835). These results suggest that the intervention had a significant effect on improving the reading comprehension of the experimental group.

Table 3.
T-test for independent samples of the control and experimental groups in the pre-test and post-test.

Group -test	Variable and dimensions	Levene's test for equality of variances		T-test for independent samples					CI of mean difference 95%	
		F	Sig.	t	gl	Sig. (Bilateral)	Mean difference	Standard error	Lower limit	Upper limit
GC y GE-pretest	Literal level	0.011	0.919	-0.137	52	0.891	-0.04	0.27	-0.58	0.50
	Inferential level	0.075	0.785	-0.256	52	0.799	-0.19	0.72	-1.64	1.27
	Critical level	0.000	0.989	-0.202	52	0.841	-0.15	0.73	-1.62	1.32
	Informative expository texts	0.041	0.840	-0.248	52	0.805	-0.37	1.50	-3.37	2.63
	Literal level	0.006	0.938	-0.189	52	0.851	-0.11	0.59	-1.29	1.07
	Inferential level	1.479	0.229	-0.105	52	0.917	-0.07	0.71	-1.49	1.34
	Critical level	0.776	0.383	-1.063	52	0.293	-0.30	0.28	-0.86	0.26
	Specialized expository texts	0.738	0.394	-0.398	52	0.692	-0.48	1.21	-2.91	1.94
	Comprehension of expository texts	0.033	0.857	-0.334	52	0.740	-0.85	2.55	-5.97	4.27
GC y GE-postest	Literal level	0.205	0.653	-12.114	52	0.000	-2.148	0.177	-2.504	-1.792
	Inferential level	1.872	0.177	-9.578	52	0.000	-5.963	0.623	-7.212	-4.714
	Critical level	0.351	0.556	-7.442	52	0.000	-4.333	0.582	-5.502	-3.165
	Informative expository texts	1.585	0.214	-11.218	52	0.000	-12.444	1.109	-14.671	-10.218
	Literal level	3.494	0.067	-10.865	52	0.000	-5.296	0.487	-6.274	-4.318
	Inferential level	0.107	0.745	-6.501	52	0.000	-5.111	0.786	-6.689	-3.533
	Critical level	1.417	0.239	-5.498	52	0.000	-1.111	0.202	-1.517	-0.706
	Specialized expository texts	0.090	0.766	-9.846	52	0.000	-11.519	1.170	-13.866	-9.171
	Comprehension of expository texts	1.480	0.229	-11.649	52	0.000	-23.963	2.057	-28.091	-19.835

Note: Sig.(Bilateral): The test is statistically significant $p<0.05$.
CI = Confidence interval; gl = Degrees of freedom; CG = Control group; EG = Experimental group; t = t-test.

4. Discussion

This study aims to contribute with a didactic strategy oriented to improve comprehension of expository texts in primary school children, since several reading comprehension interventions focus their objective on the management of strategies to activate readers' previous knowledge, on information retrieval, or on comparison strategies that allow grouping readers into bad or good readers, leaving aside the global comprehension of the text at a higher order level of thought. In this context, the main innovation contributed by this study is that the child's knowledge and comprehension are strengthened faster as he/she uses the strategy of constructing mental images when reading; that is, at the beginning, for each paragraph he/she reads, he/she will have to draw a picture, but later on he/she will no longer do so, since the mind reaches an automated level of learning and with a greater comprehension of the text.

In this logic, the findings showed that the didactic strategy of constructing mental images while children read increased by 63% the level of satisfactory achievement of comprehension of expository texts, and the gap identified in the pretest decreased by 30 and 44% in the levels prior to the beginning and at the beginning. The children who were initially placed at the pre-beginning and beginning levels only managed to answer questions at the literal level, presenting difficulties for more complex inferential and critical-valuative levels. This could potentially elucidate why expository texts embody a more abstract comprehension system compared to others [37] or connect to the reading habits of individuals with varying comprehension levels [38]. In this regard, Collins, et al. [38] provide evidence that students experience greater comprehension difficulties with expository texts [37]. They tend to demand more cognitive effort from the reader than narrative texts [38]. Despite these limitations, the strategy of constructing mental images appears to overcome them.

On the other hand, people with low comprehension levels seem to adopt a moderate reading style for expository texts [34, 38] since beginning readers must adjust their reading strategy to expository texts, a genre with which they are often unfamiliar, to optimize comprehension [18, 22]. Despite various limitations that may influence the comprehension of expository texts, the strategy of constructing mental images shows sufficient evidence to help improve comprehension levels in children; Figure 1 shows favorable scores in the post-test of the experimental group, whose average difference with respect to the pretest was 22.26 points, very significant results compared to the control group; therefore, it allows us to infer and contrast the general hypothesis that the strategy of constructing mental images significantly improves the comprehension of expository texts.

This study also allowed us to group two types of expository texts: informative and specialized. The subject matter of informative expository texts is aimed at a wide audience of general interest, so their structure is less complex [39], while specialized expository texts have greater lexical and conceptual complexity, requiring knowledge for their comprehension [39]. They are organized with varied structures, contain a dense and less familiar vocabulary, and include a greater number of abstract connections [40]. In this sense, a first specific hypothesis was to demonstrate that the strategy of constructing mental images significantly improves comprehension of expository informative texts in elementary school children.

The findings corroborate that the average of the posttest in the expository divulgate texts increased by 11.26 points with respect to the pretest in the experimental group; however, in the control group there were no significant differences. Such results were caused by the didactic strategy of constructing mental images; this may be due to the fact that a motor image has its roots in the individual motor memory of the image maker [41]. That is, mental images seem to be a complex process similar to perception that could appeal to all our senses [41, 42] and the sensory impression of imagined actions depends on specific action demands [41]. Similarly, a study with blindfolded group revealed that the experimental subjects were also able to improve their knowledge by constructing mental images; they just needed a little more experience [43]. Likewise, another study employing drawing metrics was related to performance on comprehension tests [22] and the generation of organizational drawings improved students' metacomprehension and reading comprehension accuracy [44].

In the same logic, the levels of literal, inferential, and critical-evaluative comprehension, evaluated both in the variable and in the dimensions, determined quite significant results in the GC and GE posttest ($T=-11.649$, $Sig.=0.000<0.05$), which did not necessarily happen with the GC and GE pretest ($T=-0.334$, $Sig.=0.740>0.05$). The findings are positive, despite the fact that, in order to construct a mental representation, readers do not simply repeat the information word for word from the passage; rather, they engage in higher-level cognitive processes to generate inferences and build a consolidated understanding of the text [40]. To the above, we can add that comprehension of expository texts has unique demands that are based on efficiency, change, and inhibition of word reading [30] although also, vocabulary and planning/organization are predictors of comprehension, regardless of the type of text, especially for oral recall [30].

Similarly, a second specific hypothesis was to demonstrate that the strategy of constructing mental images significantly improves comprehension of specialized expository texts in elementary school children. The findings corroborate that the average of the posttest in specialized expository texts increased by 11 points with respect to the pretest in the experimental group; however, in the control group there were no significant differences. Such results provide evidence of significant advances despite the fact that the comprehension of "this type of text requires higher-order cognitive processes considered as a complex human activity" [45]. However, other studies found that expository texts elicited fewer correct inferences and more invalid inferences than narratives, since children are influenced by the demands of the text [46]. In this study, constructing mental images as a strategy allowed children to have better abilities to decode and make inferences about the requested information.

The present study, to the extent it has been investigated, is the first to experiment with the strategy of constructing mental images as children read text, and we report quite promising findings for the purpose we are pursuing with our schoolchildren. The process of rethinking what was read in order to construct the picture makes it possible for the reader's brain to associate inferences during and after reading, since processes associated with memory, such as paraphrasing and inference during reading, contribute to subsequent text recall [47] and children with higher word reading efficiency show a faster growth rate

for comprehension of expository text [30] likewise, Karlsson, et al. [47] recorded that inferences after reading contribute to overall text learning.

As usual, the study included the following limitations and guidelines that should be taken into account in future research. One limitation is typical of the quasi-experimental designs that were used in the research; this type of design is used in circumstances where rigorous experimental control is almost impossible [48] such as occurs in the environment in which education is developed, where the researcher cannot perform total control over the experimental conditions, nor has the ability to randomly assign the subjects to the study groups. "This fact of non-randomization creates a problem with reference to bias due to selection" [48]. In order to address this issue, we compared the average pretest scores of the control and experimental groups, homogenized the sample based on their demographic characteristics, and determined the equivalence of the groups.

Despite the positive results, this study has some limitations that should be considered. First, the study limited the sample to 54 students, potentially limiting the generalizability of the results to a larger population. A larger sample size in future studies could allow a better understanding of the impact of the strategy in different educational contexts. In addition, the use of a quasi-experimental design without randomization introduces a possible selection bias. Despite the pretest comparison between the control and experimental groups, we cannot rule out the possibility of other uncontrolled factors influencing the results. Future studies should consider the use of more rigorous experimental designs, such as random assignment of participants, to mitigate this type of bias [48].

Another possible limitation is that the study focused exclusively on expository texts. Although this type of text is fundamental in primary education, it would be interesting to explore whether the construction of mental images could be equally effective in other textual genres, such as narrative or descriptive ones. Future studies should broaden the scope to diverse text types and scrutinize the adaptability of this strategy to diverse content types.

On the other hand, with respect to the application of the strategy of constructing mental images, it is worth clarifying that it was not applied in the comprehension of texts of other types, such as narrative or descriptive texts widely used in basic education; therefore, future research should take it into account and make a broader analysis of it. In addition, future work should also examine the initial, primary, and adolescent strata and identify the effects of each of the processes that contribute most to comprehension; for example, it is worth considering that theory of mind is more important for narrative than for comprehension of informative texts [49] or that there are no differences between narrative and expository texts [21].

Finally, it is worth alerting that in future studies, the conditions under which reading competence is assessed should be taken into account; that is, whether this is done in terms of coherent comprehension, retention, or reproduction of text information [50] or whether we are looking for readers to go beyond the literal level of comprehension [46, 51] or that if we want children to only approach the text [46, 47]. The use of a comprehension pretest may have influenced participants' performance [29] as well as other factors such as text, judgment, verbal ability, working memory, or knowledge [52]. Therefore, additional studies on these characteristics are necessary to enhance our understanding of the significance of comprehension.

5. Conclusion

The present study has shown that the construction of mental images is an effective cognitive strategy to improve comprehension of expository texts in elementary school children. The results obtained show a significant increase in the levels of literal, inferential, and critical comprehension in students who applied this methodology compared to those who received conventional instruction. The strategy not only facilitated the processing and retention of information but also fostered active student participation in their own learning process, allowing a deeper interaction with the text.

The children's ability to create visual representations of textual content allowed them to overcome barriers associated with the complexity of expository texts, such as technical vocabulary and dense conceptual structures. This suggests that the incorporation of visual strategies in the teaching of reading comprehension could be particularly useful in contexts where students present difficulties in processing this type of material.

In conclusion, the construction of mental images offers a promising approach for the development of reading comprehension skills in primary education. Various educational settings can apply this strategy to foster critical thinking and meaningful learning. Future studies should consider the possibility of implementing this strategy in combination with other cognitive techniques, as well as evaluating its long-term impact on overall academic performance. In addition, it is recommended to investigate its application in different types of texts and educational levels to broaden its scope and effectiveness.

5.1. Limitations

The study has several limitations. First, the sample, composed of 54 students, is small and may not be representative of a larger population, which limits the generalizability of the results. Furthermore, the use of a quasi-experimental design, which does not randomly assign participants, increases the risk of uncontrolled factors influencing the results. Also, the sustainability of the effects of the strategy over the long term was not addressed, suggesting the need for subsequent follow-up. The focus on performance measurement, without assessing cognitive processes or student perception, represents another limitation. Finally, the study does not consider external variables like family and socioeconomic context, despite their potential to influence reading comprehension results. For future studies, a larger and more diverse sample, a randomized experimental design, and a longitudinal evaluation are recommended.

References

[1] G. E. M. Ferro, L. J. R. Camacho, and J. V. R. González, "Effects of complexity and the presence of subtitles in expository texts on reading comprehension in undergraduate students," *Folios*, vol. 50, pp. 51–64, 2019. https://doi.org/10.17227/folios.50-10177

[2] T. A. Keller, R. A. Mason, A. E. Legg, and M. A. Just, "The neural and cognitive basis of expository text comprehension," *NPJ Science of Learning*, vol. 9, no. 1, pp. 1-12, 2024. https://doi.org/10.1038/s41539-024-00232-y

[3] X. Aparicio, S. Belaïd, T. Baccino, and O. Megalakaki, "Reading-comprehension performances of expository and narrative texts on interactive-whiteboards and paper: Evidence from 5th grade children," *Educational Technology Research and Development*, vol. 70, no. 4, pp. 1151-1168, 2022. https://doi.org/10.1007/S11423-022-10121-Z/METRICS

[4] C. Reina-Reina, P. J. Conesa, and J. A. Duñabeitia, "Impact of a cognitive stimulation program on the reading comprehension of children in primary education," *Frontiers in Psychology*, vol. 13, p. 985790, 2023. https://doi.org/10.3389/FPSYG.2022.985790/BIBTEX

[5] A. Volodina, B. Heppt, and S. Weinert, "Relations between the comprehension of connectives and school performance in primary school," *Learning and Instruction*, vol. 74, p. 101430, 2021. https://doi.org/10.1016/j.learninstruc.2020.101430

[6] P. Delgado and L. Salmerón, "The inattentive on-screen reading: Reading medium affects attention and reading comprehension under time pressure," *Learning and Instruction*, vol. 71, p. 101396, 2021. https://doi.org/10.1016/j.learninstruc.2020.101396

[7] P. Seli, E. F. Risko, D. Smilek, and D. L. Schacter, "Mind-wandering with and without intention," *Trends in Cognitive Sciences*, vol. 20, no. 8, pp. 605-617, 2016. https://doi.org/10.1016/j.tics.2016.05.010

[8] A. Soemer and U. Schiefele, "Text difficulty, topic interest, and mind wandering during reading," *Learning and Instruction*, vol. 61, pp. 12-22, 2019. https://doi.org/10.1016/j.learninstruc.2018.12.006

[9] P. Li and R. B. Clariana, "Reading comprehension in L1 and L2: An integrative approach," *Journal of Neurolinguistics*, vol. 50, pp. 94-105, 2019. https://doi.org/10.1016/j.jneuroling.2018.03.005

[10] N. A. Vega López, G. Bañales Faz, A. Reyna Valladares, and E. Pérez Amaro, "Teaching strategies for understanding expository texts with sixth grade elementary school students," *Revista Mexicana de Investigación Educativa*, vol. 19, no. 63, pp. 1047-1068, 2014.

[11] M. V. De Mier, B. Amado, and M. E. Benítez, "Difficulties in understanding expository texts in children in the first grades of primary school," *Psykhe (Santiago)*, vol. 24, no. 2, pp. 1-13, 2015. https://doi.org/10.7764/psykhe.24.2.708

[12] R. A. Disla Rosario, D. A. Capellán Ureña, A. M. Haché de Yunén, and L. M. Acosta Caba, "Written comprehension in first and fourth year philosophy students. Writing strategies used to summarize and level of difficulty of expository texts," *Perfiles Educativos*, vol. 41, no. 166, pp. 8-20, 2019. https://doi.org/10.22201/iisue.24486167e.2019.166.59031

[13] E. Melguizo-Moreno and J. L. Gallego-Ortega, "A rubric for evaluating expository texts," *Revista Electrónica Educare*, vol. 24, no. 3, pp. 454-468, 2020. https://doi.org/10.15359/ree.24-3.22

[14] M. E. Bustamante, S. Hernández, M. V. Restrepo, and P. A. Ríos, "Reading comprehension strengthened by expository texts," *Ciencias Sociales y Educación*, vol. 8, no. 16, pp. 133–147, 2019. https://doi.org/10.22395/csye.v8n16a8

[15] J. López-Olóriz, V. Pina, S. Ballesta, S. Bordoy, and L. Pérez-Zapata, "Petit UBinding project: Method for acquiring and improving reading in first grade effectiveness study," *Revista de Logopedia, Foniatría y Audiología*, vol. 40, no. 1, pp. 12-22, 2020. https://doi.org/10.1016/j.rlfa.2019.06.001

[16] R. Gutiérrez-Fresneda, "Effect of the interactive groups in the learning of the reading by means of familiar collaboration," *Revista de Psicodidáctica (English ed.)*, vol. 24, no. 2, pp. 138-144, 2019. https://doi.org/10.1016/j.psicod.2019.02.001

[17] D. Vidal-Moscoso and L. Manriquez-López, "The teacher as a mediator of reading comprehension in university students," *Revista de la Educación Superior*, vol. 45, no. 177, pp. 95-118, 2016. https://doi.org/10.1016/j.resu.2016.01.009

[18] D. J. Follmer and R. A. Sperling, "Interactions between reader and text: Contributions of cognitive processes, strategy use, and text cohesion to comprehension of expository science text," *Learning and Individual Differences*, vol. 67, pp. 177-187, 2018. https://doi.org/10.1016/j.lindif.2018.08.005

[19] G. G. D. L. Ojeda-Criollo, "The comprehension of expository texts in students: A systematic review study between 2017-2022," *International Journal of Membrane Science and Technology*, vol. 10, no. 4, pp. 412–422, 2023. https://doi.org/10.15379/IJMST.V10I4.2057

[20] C. W. Kintsch, *Comprehension: A paradigm for cognition*, 1st ed. United States of America: Cambridge University Press, 1998.

[21] W. Wannagat, V. Steinicke, C. Tibken, and G. Nieding, "Same topic, different genre: Elementary school children's mental representations of information embedded in narrative and expository texts," *Learning and Instruction*, vol. 80, p. 101559, 2022. https://doi.org/10.1016/j.learninstruc.2021.101559

[22] C. Tarchi, "Fostering reading comprehension of expository texts through the activation of readers' prior knowledge and inference-making skills," *International Journal of Educational Research*, vol. 72, pp. 80-88, 2015. https://doi.org/10.1016/j.ijer.2015.04.013

[23] K. Schleinschok, A. Eitel, and K. Scheiter, "Do drawing tasks improve monitoring and control during learning from text?," *Learning and Instruction*, vol. 51, pp. 10-25, 2017. https://doi.org/10.1016/j.learninstruc.2017.02.002

[24] C. Leopold and D. Leutner, "Science text comprehension: Drawing, main idea selection, and summarizing as learning strategies," *Learning and Instruction*, vol. 22, no. 1, pp. 16-26, 2012. https://doi.org/10.1016/j.learninstruc.2011.05.005

[25] K. Quillin and S. Thomas, "Drawing-to-learn: A framework for using drawings to promote model-based reasoning in biology," *CBE—Life Sciences Education*, vol. 14, no. 1, pp. 1-16, 2015. https://doi.org/10.1187/cbe.14-08-0128

[26] P. Van Meter and C. Firetto, "Cognitive model of drawing construction," *Learning Through Visual Displays*, pp. 247-280, 2013.

[27] A. Schmeck, R. E. Mayer, M. Opfermann, V. Pfeiffer, and D. Leutner, "Drawing pictures during learning from scientific text: Testing the generative drawing effect and the prognostic drawing effect," *Contemporary Educational Psychology*, vol. 39, no. 4, pp. 275-286, 2014. https://doi.org/10.1016/j.cedpsych.2014.07.003

[28] M. Ter Beek, M.-C. Opdenakker, A. W. Spijkerboer, L. Brummer, H. W. Ozinga, and J.-W. Strijbos, "Scaffolding expository history text reading: Effects on adolescents' comprehension, self-regulation, and motivation," *Learning and Individual Differences*, vol. 74, p. 101749, 2019. https://doi.org/10.1016/j.lindif.2019.06.003

[29] D. L. Dinsmore, S. M. Loughlin, M. M. Parkinson, and P. A. Alexander, "The effects of persuasive and expository text on metacognitive monitoring and control," *Learning and Individual Differences*, vol. 38, pp. 54-60, 2015. https://doi.org/10.1016/j.lindif.2015.01.009

[30] Y. Wu, L. A. Barquero, S. E. Pickren, A. T. Barber, and L. E. Cutting, "The relationship between cognitive skills and reading comprehension of narrative and expository texts: A longitudinal study from grade 1 to Grade 4," *Learning and Individual Differences*, vol. 80, p. 101848, 2020.

[31] E. Aydin, H. Ilgaz, and J. W. Allen, "Preschoolers' learning of information from fantastical narrative versus expository books," *Journal of Experimental Child Psychology*, vol. 209, p. 105170, 2021. https://doi.org/10.1016/j.jecp.2021.105170

[32] J. R. García, E. Sanchez, K. Cain, and J. M. Montoya, "Cross-sectional study of the contribution of rhetorical competence to children's expository texts comprehension between third-and sixth-grade," *Learning and Individual Differences*, vol. 71, pp. 31-42, 2019. https://doi.org/10.1016/j.lindif.2019.03.005

[33] V. Valdebenito and D. Durán, "Forms of interaction involved in promoting reading comprehension strategies through a peer tutoring program," *Revista Latinoamericana de Psicología*, vol. 47, no. 2, pp. 86-92, 2015. https://doi.org/10.1016/j.rlp.2014.07.001

[34] K. A. Ritchey, "How generalization inferences are constructed in expository text comprehension," *Contemporary Educational Psychology*, vol. 36, no. 4, pp. 280-288, 2011. https://doi.org/10.1016/j.cedpsych.2011.03.002

[35] M. A. Villagrán, E. A. Mendizabal, J. I. N. Guzmán, C. D. Casas, and E. M. Consejero, "Analysis of the saint matthew effect in a longitudinal study on reading development during primary education (1st to 5th grade)," *European Journal of Education and Psychology*, vol. 10, no. 1, pp. 23-32, 2017. https://doi.org/10.1016/j.ejeps.2016.07.001

[36] H. Sánchez and C. Reyes, *Methodology and designs in scientific research*, 5th ed. Lima Perú: Business Support Aneth, 2017.

[37] S. M. Kosslyn, "Stephen M. Kosslyn," *Current Biology*, vol. 25, no. 4, pp. 134–136, 2015. https://doi.org/10.1016/j.cub.2014.12.018

[38] A. A. Collins, D. L. Compton, E. R. Lindström, and J. K. Gilbert, "Performance variations across reading comprehension assessments: Examining the unique contributions of text, activity, and reader," *Reading and Writing*, vol. 33, no. 3, pp. 605-634, 2020. https://doi.org/10.1007/s11145-019-09972-5

[39] A. Kraal, P. W. van den Broek, A. W. Koornneef, L. Y. Ganushchak, and N. Saab, "Differences in text processing by low-and high-comprehending beginning readers of expository and narrative texts: Evidence from eye movements," *Learning and Individual Differences*, vol. 74, p. 101752, 2019. https://doi.org/10.1016/j.lindif.2019.101752

[40] S. R. Tapia, "Specialized, semi-specialized and informative texts: A proposal for qualitative analysis and quantitative classification," *Signa: Revista de la Asociación Española de Semiótica*, vol. 25, pp. 987-1006, 2016. https://doi.org/10.5944/signa.vol25.2016.16926

[41] J. Tilstra and K. L. McMaster, "Cognitive processes of middle grade readers when reading expository text with an assigned goal," *Learning and Individual Differences*, vol. 28, pp. 66-74, 2013. https://doi.org/10.1016/j.lindif.2013.09.011

[42] B. Krüger, A. Zabicki, L. Grosse, T. Naumann, and J. Munzert, "Sensory features of mental images in the framework of human actions," *Consciousness and Cognition*, vol. 83, p. 102970, 2020. https://doi.org/10.1016/j.concog.2020.102970

[43] A. Moran, M. Campbell, P. S. Holmes, and T. MacIntyre, "Mental imagery, action observation and skill learning," in Skill acquisition in sport": Research, theory and practice. N. J. Hodges and M. Williams, Eds., Routledge (Taylor and Francis),," 1st ed. London: Routledge Taylor & Francis Group. https://doi.org/10.4324/9780203133712, 2012, pp. 94–111.

[44] T. Graven and C. Desebrock, "Bouba or kiki with and without vision: Shape-audio regularities and mental images," *Acta Psychologica*, vol. 188, pp. 200-212, 2018. https://doi.org/10.1016/j.actpsy.2018.05.011

[45] K. W. Thiede, K. L. Wright, S. Hagenah, J. Wenner, J. Abbott, and A. Arechiga, "Drawing to improve metacomprehension accuracy," *Learning and Instruction*, vol. 77, p. 101541, 2022. https://doi.org/10.1016/j.learninstruc.2021.101541

[46] J. P. Barreyro, I. Injoque-Ricle, A. Álvarez-Drexler, J. Formoso, and D. I. Burin, "Generating explanatory inferences in the comprehension of expository texts: The role of working memory and specific prior knowledge," *Suma Psicológica*, vol. 24, no. 1, pp. 17-24, 2017. https://doi.org/10.1016/j.sumpsi.2016.09.002

[47] J. Karlsson, P. van den Broek, A. Helder, M. Hickendorff, A. Koornneef, and L. van Leijenhorst, "Profiles of young readers: Evidence from thinking aloud while reading narrative and expository texts," *Learning and Individual Differences*, vol. 67, pp. 105-116, 2018. https://doi.org/10.1016/j.lindif.2018.08.001

[48] I.-A. N. Diakidoy, T. Mouskounti, A. Fella, and C. Ioannides, "Comprehension processes and outcomes with refutation and expository texts and their contribution to learning," *Learning and Instruction*, vol. 41, pp. 60-69, 2016. https://doi.org/10.1016/j.learninstruc.2015.10.002

[49] Y.-S. G. Kim, R. Dore, M. Cho, R. Golinkoff, and S. J. Amendum, "Theory of mind, mental state talk, and discourse comprehension: Theory of mind process is more important for narrative comprehension than for informational text comprehension," *Journal of Experimental Child Psychology*, vol. 209, p. 105181, 2021. https://doi.org/10.1016/j.jecp.2021.105181

[50] N. Latini, I. Bråten, and Y. E. Haverkamp, "Breadth and depth of strategic processing during text comprehension," *Learning and Individual Differences*, vol. 91, p. 102058, 2021. https://doi.org/10.1016/j.lindif.2021.102058

[51] M. T. L. Prieto and M. D. Alonso-Cortés, "Shared reading and reading comprehension strategies in early childhood education," *Revista Iberoamericana de Educación*, vol. 71, pp. 151-172, 2016. https://doi.org/10.35362/rie7109

[52] A. Prinz, S. Golke, and J. Wittwer, "How accurately can learners discriminate their comprehension of texts? A comprehensive meta-analysis on relative metacomprehension accuracy and influencing factors," *Educational Research Review*, vol. 31, p. 100358, 2020. https://doi.org/10.1016/j.edurev.2020.100358