DiSIGMA PUBLICATIONS

Journal of Language and Culture in Education
ISSN: 2945-2864
Issue 2, Volume 2, Pages 117-131, May 2025
DOI: 10.5281/zenodo.15411121
https://lce.disigma.gr/index.php/lce

Available online at **https://lce.disigma.gr/index.php/lce**

The impact of an intervention program on the reading comprehension and writing quality of multimodal expository texts

Koloka Ourania-Eirini, Spantidakis Ioannis, Gaki Eirini, Vasilaki Eleni and **Thomou Paraskevi**
University of Crete

Abstract

The objective of this research was to examine the interactive relationship between reading comprehension and writing skills. This study formed part of a wider investigation, during which an intervention programme was designed, implemented, and evaluated. This programme focused on enhancing the reading comprehension of multimodal comparative expository texts, as well as the writing and metacognition of fifth-grade elementary students. This study employed a qualitative quasi-experimental case study design with action research elements. It was conducted in two co-located urban primary schools in Heraklion, Crete. The sample consisted of 41 students. The findings indicated that teaching reading comprehension strategies that consider multimodal features and text structure, along with utilising social and procedural scaffoldings, led to improved comprehension outcomes and a positive impact on the writing quality of the sample.

Keywords: reading and writing connections, expository texts, visual literacy

Introduction

The socio-cultural and technological conditions that prevail in the contemporary era require individuals to manage diverse and complex information simultaneously in order to construct meaning from texts. The abilities that were previously regarded as indispensable are no longer sufficient to meet the requirements of contemporary writers and readers in an effective manner (Avgerinou & Pettersson, 2020).

The incorporation of socio-cultural conventions through various genres and semiotic elements is a common feature of multimodal texts. However, despite this, readers frequently overlook the role of visuals in multimodal texts (Avgerinou & Pettersson, 2020). This issue is particularly evident in expository texts, where primary school students often encounter difficulties in interpreting meaning effectively. During the critical transition from learning to read to reading to learn, a lack of suitable metacognitive strategies can result in misunderstandings and biased interpretations, underscoring the need for instructional support (Bogaerds-Hazenberg et al., 2021; Botsas, 2017).

Contemporary educational approaches emphasise the significance of harnessing the interconnection between reading and writing abilities to empower learners and cultivate conducive learning environments (Graham, 2020; Taylor & Clarke, 2021). Notwithstanding this recognition, a substantial proportion of the research has focused on the content of instruction, frequently neglecting the necessity for a structured collaborative framework to facilitate the development of these skills (Bogaerds-Hazenberg et al., 2021). It is therefore imperative to create encouraging, dynamic and supportive learning environments in which to teach reading comprehension strategies and image interpretation skills. These are crucial for student engagement and social, cognitive and academic success (Alves et al., 2020; Botsas, 2017; Graham, 2020).

This research forms part of a wider study and builds on previous research to design, implement and assess a teaching intervention with the aim of improving the reading comprehension and writing of multimodal comparison texts, as well as their metacognitive skills (Αγγίδου, 2021; Bogaerds-Hazenberg et al., 2021; Botsas, 2017; Papadopoulou, 2017). The study focuses on the relationship between reading and writing, investigating whether teaching reading comprehension strategies with social and procedural scaffolding enhances reading comprehension and improves writing quality.

Literature Review and Theoretical Framework

21st Century Literacy

The concept of literacy is understood to be a socially and historically situated practice that influences human relationships and reflects ideological influences (Mirra & Garcia, 2020; Wong et al., 2021). It comprises a variety of competencies that individuals deploy to interpret and engage with texts. As a medium for the expression of identity and the transmission of socio-cultural values, language is now operating in an environment shaped by rapid technological advancement and the pervasive influence of AI-driven content. This context demands enhanced literacy skills (Kirschner & Stoyanov, 2020; Mirra & Garcia, 2020; Papadimitriou, 2020). Nevertheless, the rapid and direct interaction between individuals and texts is hindered by the inability to critically process new information, which in turn prevents active engagement with the social, cultural and political context (Sachdeva & Tripathi, 2019; Wong et al., 2021).

The objective of educational institutions is to cultivate students' critical awareness and facilitate the application of knowledge in authentic contexts, thereby promoting the development of both cognitive and emotional competencies (Cope & Kalantzis, 2000; Sachdeva & Tripathi, 2019). The socioprocedural model of teaching multiliteracies, which draws on both critical and modern pedagogical approaches, is designed to foster the development of literate citizens who are equipped to meet the demands of the contemporary era (Vasarmidou & Spantidakis, 2015).

Multiliteracies

The theory of multiliteracies is predicated on the tenets of linguistic and cultural diversity, multimodality, and the polysemy of information. The theory encourages engagement with a range of authentic texts. The pedagogy of multiliteracies emphasises the deliberate and reflective utilisation of linguistic and multimodal resources to construct meaning (Cope & Kalantzis, 2000, 2015; Kress & van Leeuwen, 2021).

The utilisation of a variety of semiotic systems provides a multitude of benefits in the process of meaning-making. Through the processes of synaesthesia and transduction of meaning, knowledge is constructed by transforming information into forms of communication that are familiar to the individual. The transformation process is contingent upon a number of factors, including aesthetics, functionality, effectiveness and context (Cope & Kalantzis, 2000, 2015; Papadimitriou, 2020). The principle of condensation permits the rapid extraction of meaning from images, while the Dual Coding Theory posits that multimodal elements facilitate enhanced information processing and memory recall. The Learning by Design model facilitates cognitive development through experiences that require the conceptualisation, analysis and application of knowledge. It is recommended that students initially learn through modelling, which provides a foundation for their understanding. Once these concepts have been grasped, the knowledge can be applied in a creative manner (Avgerinou & Pettersson, 2020; Wong et al., 2021).

There is an increasing necessity for educational pluralism and a multidimensional methodology with regard to the analysis of texts in the classroom. This approach places an emphasis on collaboration and reflection among students as they engage with new knowledge. By fostering an environment that values diverse perspectives and collaborative learning, educators can better equip students to navigate complex information and develop critical thinking skills (Cope & Kalantzis, 2015).

Visual Literacy and Multimodality

The concept of visual literacy is an interdisciplinary and multidimensional one that is closely related to that of linguistic literacy (Avgerinou & Pettersson, 2020; Kress & van Leeuwen, 2021; Pettersson, 2021). Images frequently convey more information than text, represent cultural artefacts and facilitate immediate meaning-making (Spantidakis, 2010). In an educational context, the use of visual information is beneficial for achieving a range of learning objectives, facilitating visual thinking and enhancing learning skills (Grosdos, 2011).

As posited by Avgerinou and Pettersson (2020), visual literacy is comprised of several fundamental elements, including visual language, thought, perception, communication, and learning. The visual language in question is characterised by a set of conventions that confer functional, semantic and aesthetic benefits, thereby enabling the individual to assume a defined role within a given context. In his work on social semiotics, Barthes differentiates between the denotative and connotative functions of images, underscoring the implicit meanings conveyed through representations. Similarly, Kress and van Leeuwen (2021) describe the metafunctions of images, drawing parallels with Halliday's linguistic metafunctions. Pettersson (1993, in Avgerinou & Pettersson, 2020, p. 62) posits that the abilities required to create and comprehend visual messages are analogous to those necessary for reading comprehension and writing.

Given that visual messages transcend the boundaries of linguistic communities, it is imperative to educate and enhance abilities that facilitate effective comprehension (Avgerinou & Pettersson, 2020).

Reading Comprehension and Image Interpretation

The reading of visual information is a holistic process that does not occur universally. While visual codes underlie both reading and writing, the strategies employed when reading multimodal texts differ significantly (Sachpatzidis, 2020; Spantidakis, 2010). In contemporary sociocognitive and sociocultural approaches, effective reading comprehension is contingent upon an individual's capacity to construct both surface and deeper meanings of texts. This process is shaped by a multitude of factors, including

the text's purpose, intended audience, medium, structural elements, and contextual factors (Kintsch & Kintsch, 2005; Vasarmidou & Spantidakis, 2015).

The relationship between linguistic and visual texts, as well as the quantity and quality of visual elements, can engender variations in meaning. The Construction-Integration Model posits that meaning is constructed in stages, beginning with the text-base representation and culminating in the situational model (van Dijk & Kintsch, 1983). In their 2021 work, Visual Grammar, Kress and van Leeuwen identify three metafunctions that images employ in representing reality and shaping social relationships: representational, interpersonal and textual. The establishment of complementary or contrasting relationships along a horizontal axis is facilitated by the use of informational axes, whereas a vertical axis conveys either desired or real information (Avgerinou & Pettersson, 2020; Grosdos, 2011; Kress & van Leeuwen, 2021). In order to enhance memory and construct a situational model of the text, strategies derived from the Information Processing Model and the Landscape Model are frequently employed (Yeari & van den Broek, 2011).

Nevertheless, in the context of education, the utilisation of images is often constrained to merely triggering the activation of prior knowledge. This narrow focus can give rise to interpretative challenges and difficulties in deriving meaning from multimodal texts (Grosdos, 2011). The ability to engage in metacognition is essential for the attainment of reading objectives. It entails the utilisation of metacognitive knowledge and strategies to oversee, direct and regulate cognitive processes (Botsas, 2017). During the act of reading, a variety of strategies are employed, including planning, monitoring, evaluating, and critically processing information. Prior to reading, objectives are established through either top-down or bottom-up processes, and hypotheses are formulated. During reading, readers attempt to bridge any gaps in their understanding of the text, and subsequently evaluate whether they have achieved their reading goals and assess the efficacy of the strategies they employed (Botsas, 2017; Roehling et al., 2017). In this process, both linguistic and visual information are employed to develop reasoning, address cognitive challenges and ultimately ensure that the writer's intent is effectively communicated with the reader's engagement (Vasarmidou & Spantidakis, 2015).

The joint utilisation of these two semiotic systems serves to enhance textual cohesion, improve memory retention and impact both reading comprehension and pedagogical practices (Avgerinou & Pettersson, 2020; Kress & van Leeuwen, 2021).

Text Genres

The text-centered approach emphasises the interconnection between the linguistic and social functions of language in the act of reading. The Text-Centered Process-Oriented Model posits that it is crucial to exemplify the process of meaning-making through the instruction of text genres and their structural characteristics (Vasarmidou & Spantidakis, 2015; Spantidakis, 2010).

Expository texts are particularly suited to the conveyance of objective knowledge, employing a range of techniques including representation, analysis, interpretation and evaluation of reality. A specific subcategory of expository texts, comparative texts, is designed to facilitate comprehension of the distinctive attributes of two elements by means of a comparative analysis. Such texts are frequently encountered across a range of subject areas. The teaching of students in the analysis of comparative expository texts provides them with the requisite skills to approach texts that have a systematic influence on society. This, in turn, contributes to academic success and fosters communicative independence (Bogaerds-Hazenberg et al., 2021; Botsas, 2017; Roehling et al., 2017).

Reading and Writing Relationship

The processes of reading and writing are intimately connected, constituting two fundamental aspects of communication. Prior to this, the two skills were considered distinct, with minimal research conducted

into their interrelationship (Alves et al., 2020). However, the concept of the reader as a «meaning maker» has prompted a surge of interest and research in this field (Graham, 2020; Tierney & Pearson, 1983).

The objective of reading comprehension is to decode a message, whereas the aim of writing is to encode it (Jiménez et al., 2020). However, despite their shared linguistic foundation, reliance on the writing system, and common cognitive abilities, such as world knowledge, both reading and writing also have distinct characteristics (Tierney & Pearson, 1983). From a critical literacy perspective, both abilities necessitate active engagement with textual material (Wong et al., 2021) and are contingent upon four categories of shared knowledge: content and procedural knowledge, metacognitive awareness of rhetorical objectives and textual structure (Stavans et al., 2020).

The socio-cognitive model posits that both reading and writing are tools for facilitating effective communication between the writer and the reader. Flower's Negotiated Meaning Model (1994, cited in Vasarmidou & Spantidakis, 2015) posits that individuals construct meaning through a process of negotiation, whereby they align their personal interpretations, the author's intent and the conventions of their community (Tierney & Pearson, 1983). In this context, individuals draw upon a range of textual conventions, in conjunction with their linguistic, communicative, critical and metacognitive abilities (Alves et al., 2020; Taylor & Clarke, 2021).

A number of approaches have been developed to examine the relationship between reading and writing skills (Alves et al., 2020; Mirra & Garcia, 2020). The reading-to-writing model posits that reading a text facilitates the development of the capacity to compose structured and effective texts. The Writing-to-reading Model posits that the development of writing skills can positively impact reading comprehension. The model emphasises that knowledge of word morphology facilitates decoding, while an understanding of sentence construction enhances overall text comprehension. The Interactive Model (Jiménez et al., 2020) proposes that reading and writing influence each other in a reciprocal manner. The final model, the Independent Processes Model, posits that reading and writing are distinct abilities that can be integrated to achieve specific learning objectives (Stavans et al., 2020).

For effective communication to occur, it is essential that both the writer and the reader possess a similar linguistic foundation and have aligned objectives (Stevens et al., 2020; Wong et al., 2021). The utilisation of this interactive relationship in an educational setting facilitates the attainment of broader learning objectives (Graham, 2020; Taylor & Clarke, 2021).

The Fundamentals of Designing Learning Environments for Reading Comprehension

The process of learning is inextricably linked to the formation of one's identity and is a fundamental aspect of personal development (Cakmakci et al., 2020). In accordance with Cognitive Load Theory, this process entails the interpretation and evaluation of novel information, while simultaneously balancing long-term and short-term memory (Vasarmidou & Spandidakis, 2015).

It is of the utmost importance to establish learning environments that adhere to the tenets of the Cognitive Apprenticeship Model in order to facilitate this process. This model encourages the creation of a supportive and dynamic learning environment for students (Vasarmidou & Spandidakis, 2015). The act of learning in a collaborative manner allows students to share a collective working memory, thereby fostering mutual cognitive interdependence. This, in turn, enables them to establish a shared communication code and construct meaning collectively (Kirschner et al., 2018). Consequently, they develop enhanced cognitive and metacognitive abilities, learn the conventions of language, and enhance their writing and reading skills, thereby empowering them to critically assess texts (Graham, 2020).

The implementation of differentiated instruction is of paramount importance in the democratisation of the learning process (Magableh & Abdullah, 2022). The implementation of contemporary sociocognitive and sociocultural pedagogical principles enables educators to establish inclusive learning envi-

ronments, mitigate metacognitive biases and facilitate the transformation of intentional strategies into lifelong skills (Spantidakis, Gaki & Vasarmidou, 2018).

Research Methods

Purpose and Research Questions

The objective of this research was to devise and implement an intervention programme with the aim of enhancing fifth graders' reading comprehension of multimodal expository comparison texts and evaluating its impact on their writing quality. The primary objective of this study is to ascertain whether the teaching intervention, which is supported by social and procedural scaffoldings, affects students' comprehension of multimodal expository comparison texts and the quality of multimodal expository comparison texts produced by students. This study forms part of a wider project which sought to develop, implement and evaluate an intervention programme designed to enhance students' skills in reading comprehension, writing of multimodal expository comparison texts and metacognitive abilities. The intervention was designed to teach reading strategies and to address the following research questions:

1. How does the teaching intervention, supported by social and procedural scaffoldings, affect students' comprehension of multimodal expository comparison texts?
2. How does the teaching intervention, supported by social and procedural scaffoldings, influence the writing quality of multimodal expository comparison texts?

Research Method, Context and Sample of the Study

During the research, the principles of ethics and deontology were observed. The study was conducted over a period of nine weeks during the 2021-2022 academic year. It employed a semi-experimental qualitative case study design with action research elements and was conducted at two co-located urban elementary schools in Heraklion, Crete. The tables included are derived from content analysis of the written texts, categorization of responses and data observation. No statistical analysis was conducted. The study employed a combination of typical and convenience sampling, with a total of 41 fifth-grade students participating: The experimental group comprised 21 students, while the control group consisted of 20 students.

Research Tools

The researcher's diary was utilised throughout the intervention programme, as documented in the studies by Christodoulou (2016) and Creswell (2016). The data from the researcher's diary were analyzed, categorized and observed. In order to assess reading comprehension at various levels, two adapted multimodal expository comparison texts were provided. The initial text was accompanied by a series of comprehension questions, while the subsequent text was accompanied by a fill-in-the-blank task. Both texts target surface understanding, inferential understanding, vocabulary comprehension and critical reading (Aggidou, 2021; Meneses et al., 2018). The evaluation of text writing quality focused on several aspects, including the use of structural features, lexical and grammatical choices, coherence, the inclusion of visual information and the relationship between visual and linguistic elements (Noprianto, 2017; Papastathopoulou, 2017; Zuana, 2020).

Conceptual-Theoretical and Instructional Framework

The research was conducted in three phases: a pretest, an intervention programme, and a posttest. The objective of the intervention programme was to establish a supportive learning environment with

the intention of enhancing students' comprehension of multimodal expository comparison texts. The intervention programme was informed by sociocognitive, sociocultural and sociotextual theories and employed cognitive apprenticeship with procedural scaffoldings. This approach was aligned with the recommendations put forth by Vasarmidou and Spantidakis (2015) regarding the importance of effective comprehension strategies, which should be employed before, during, and after the reading process.

The process was conducted as follows:

1. The inaugural meeting was held in February, 2022. The negotiation of the teaching topic and the provocation of cognitive conflicts led to the necessity of learning reading strategies for multimodal texts and teaching the structural elements of expository comparison texts.
2. Modelling is a key element of the learning process. The desired strategies were presented, accompanied by a clear outline of the objectives and the utilisation of all social and procedural scaffoldings.
3. Group Execution: The implementation of collaborative and multisensory activities utilising multiple texts.
4. Independent execution of the aforementioned strategies. The assumption of individual responsibilities and the adaptation of strategies to meet the specific needs of each student.
5. The final meeting took place in March, 2022. The students presented their work, evaluated the project, conducted a self-assessment of their actions, and utilized a Web 2.0 tool (Visme) for the collaborative creation of a poster, with the objective of sharing the project with an authentic audience.

Results

Reading Comprehension results between the Experimental and Control Group

Tables 1 and 2 show the successful responses to surface and deep reading comprehension questions by students in the Experimental and Control Group before and after the intervention program.

At the outset of the study, the majority of students in the experimental group demonstrated a cursory engagement with the texts. The highest number of correct responses (13) was observed in the true/false content questions. In the case of combined questions that required the integration of linguistic and visual information, seven correct answers were given for question 3b and eight for question 3c. In the domain of vocabulary comprehension, the majority of students demonstrated proficiency in answering question 4b correctly (15), although the levels of critical evaluation exhibited were generally limited. It was observed that students demonstrated a greater level of engagement with the text in the fill-in-the-blank exercise. In the post-test, students allocated a greater proportion of time to the material. The majority of students demonstrated accurate responses to surface comprehension questions and effectively utilised visual information for inferential questions. There was a notable improvement in vocabulary comprehension, with eight students answering question five correctly and six answering question one, part c, correctly. This indicates a more effective utilisation of prior knowledge and text structure. In the second text, all students completed at least half of the blanks accurately, with twice as many making no errors compared to the pretest.

In the preliminary assessments of the control group, a considerable number of students encountered difficulties in comprehending the texts' central ideas. The students demonstrated a greater proficiency in responding to closed-type questions, with approximately half of them providing accurate responses to surface comprehension questions. The greatest number of correct responses were given

Table 1 *Text Comprehension for Reading Comprehension Questions*

	Control group		Experimental group	
	Pretest	**Posttest**	**Pretest**	**Posttest**
Surface Comprehension Questions				
1a) Text structure question	10	**13**	11	**20**
1b) Text structure question	1	**2**	1	**13**
3a) Text substance question	9	**10**	13	**20**
3d) Text substance question	11	**13**	13	**19**
4a) Text substance question	9	**7**	11	**18**
Inferential Questions				
2) Combination of linguistic and visual text	1	**3**	3	**10**
3b) Combination of different linguistic text points	13	**11**	7	**18**
3c) Combination of linguistic and visual text	7	**8**	8	**17**
4d) Combination of linguistic and visual text	1	**1**	3	**12**
Vocabulary Comprehension Questions				
4b) Direct extraction	17	**16**	15	**19**
4c) Extraction from the context	7	**9**	7	**12**
Critical evaluation Questions				
1c) Critical evaluation	1	**1**	2	**6**
5) Critical evaluation	4	**6**	1	**8**

to question 1a. In the context of inferential questions, it was observed that students did not make reference to the visual information presented. A total of 17 responses were correctly identified as correct for question 4b, while only 7 were identified as correct for question 4c. In terms of critical evaluation, four responses were deemed acceptable. In the fill-in-the-blank task, only one student demonstrated proficiency without any errors. The results of the post-test demonstrated a consistency in performance when compared to the pretest results, with students continuing to demonstrate a preference for closed-type questions. The greatest number of correct responses were given to questions pertaining to substance in the domain of surface comprehension (13). The responses to combined questions remained unchanged. The vocabulary question, designated «4b,» elicited the greatest number of correct responses (14). With regard to critical evaluation, question 5 elicited six correct responses, while question 1c received one. In the fill-in-the-blank task, 14 students demonstrated moderate proficiency, while two students exhibited exceptional accuracy in filling in the blanks. The majority of students demonstrated a mere surface-level comprehension and constrained utilisation of imagery, with some scores even exhibiting a decline in the post-test.

Both groups demonstrated a lack of comprehension at the outset, exhibiting comparable performance on surface comprehension, inferential, and vocabulary questions, with the control group exhibiting a slight advantage. It was evident that neither group made use of images as a source of information. In the fill-in-the-blank section, the experimental group exhibited superior performance. In the post-test,

Table 2 *Text Comprehension for Fill-in-the-Blank task*

Participants	Control group		Experimental group	
No.	**Pretest**	Posttest	**Pretest**	Posttest
1	13	**13**	15	**15**
2	12	**10**	13	**15**
3	6	**7**	15	**15**
4	11	**14**	15	**15**
5	14	**14**	13	**13**
6	8	**9**	11	**11**
7	12	**2**	11	**12**
8	12	**10**	12	**15**
9	14	**14**	13	**13**
10	5	**4**	13	**15**
11	10	**10**	11	**13**
12	7	**12**	14	**15**
13	14	**15**	15	**15**
14	15	**15**	13	**15**
15	13	**11**	15	**15**
16	14	**14**	15	**15**
17	7	**14**	10	**12**
18	13	**14**	9	**10**
19	11	**12**	1	**9**
20	11	**11**	13	**15**
21			3	**8**

the control group exhibited no discernible improvement, whereas the experimental group demonstrated notable progress, effectively utilising information from both text and images, as well as demonstrating an understanding of structural elements.

Writing Results Between Experimental and Control Group

The tables below present the writing results before and after the intervention program, which are analyzed in detail.

As illustrated in Table 3, the initial performance of the experimental group students was unsatisfactory, with a tendency to overlook structural elements, the intended purpose of the writing, and the intended audience. Fifteen students failed to utilise any structural elements, five only provided basic descriptive comparisons and the majority demonstrated a lack of punctuation and essential grammar. Only one student demonstrated effective use of visuals, while seven exhibited moderate performance

Table 3 *Analysis of Writing Results for the Experimental Group*

Writing quality of the Experimental Group						
	Pretest			Posttest		
	Performances					
Assessment points	Low	Moderate	Sufficient	**Low**	**Moderate**	**Sufficient**
Text structure	16	5	0	**10**	**8**	**3**
Lexicogrammatical data	21	0	0	**16**	**5**	**0**
Coherence	19	2	0	**12**	**5**	**4**
Multimodality	13	7	1	**10**	**8**	**3**

and 13 exhibited low performance. The language was frequently concise and informal, with a lack of organisation in the multimodal elements. It was observed that none of the students were able to create a text that was cohesive in its structure and style. Two students demonstrated a moderate level of proficiency, while eighteen students exhibited a low level of proficiency. In the post-test, an improvement in cohesion was observed, accompanied by a greater use of structural and grammatical elements. Three students demonstrated a proficiency that exceeded expectations in terms of comparing elements, while eight students performed at a moderate level and ten students exhibited an ineffective or absent use of structural elements. Five students employed linking words and comparative language, and there was a slight improvement in multimodal use. Three students used images effectively, and eight demonstrated moderate use. Overall, four students demonstrated proficiency in creating cohesive texts, five exhibited a moderate level of performance, and twelve demonstrated a low level of proficiency.

Table 4 *Analysis of Writing Results for the Control Group*

Writing quality of the Control Group						
	Pretest			Posttest		
	Performances					
Assessment points	Low	Moderate	Sufficient	**Low**	**Moderate**	**Sufficient**
Text structure	14	5	1	**14**	**5**	**1**
Lexicogrammatical data	18	2	0	**18**	**2**	**0**
Coherence	18	0	2	**18**	**1**	**1**
Multimodality	15	5	0	**15**	**5**	**0**

As illustrated in Table 4, the pretest results demonstrated that students in the control group produced texts of limited length and depth, frequently failing to consider the intended audience, the purpose of their writing, and the structural elements that would facilitate effective communication. The majority of students provided a straightforward definition of the compared elements or offered a brief account of their similarities and differences, with the aid of illustrative examples. The language employed was characterised by a lack of complexity and a tendency towards the use of abbreviations, with poor punctuation

and an absence of clear organisation. All exhibited elements of orality, as evidenced by statements such as «Now I will talk about the gaseous form...» or «Here we have the wind turbines...» Only one student demonstrated effective utilisation of structural elements, while five exhibited moderate performance. No student demonstrated proficiency in lexicogrammatical characteristics, and only two revised their writing. None of the students effectively utilised multimodal elements, although five demonstrated moderate use of images. The visual information presented was primarily representational in nature. Those who attempted to combine linguistic and visual texts relied on images sourced from the school textbook. Some students attempted to create meaning solely through images, but their efforts were unsuccessful. The results of the post-test demonstrated no discernible differences in the utilisation of structural and lexicogrammatical features, the cohesion of the texts, or the deployment of multimodal elements.

The intervention programme on reading comprehension skills was found to have a positive impact on the writing skills of the experimental group, particularly among those with limited experience of writing. Although no significant differences were observed between the evaluations, notable changes were evident. In particular, students demonstrated an improvement in their use of structural elements and appropriate lexicogrammatical features. Additionally, a modest enhancement was observed in the incorporation of visual elements, which were introduced with the objective of establishing a connection between linguistic and visual texts.

Discussion

The Impact of the Intervention Program on Reading Comprehension

The data obtained from the pretests indicated that students' approaches to learning and reading comprehension were significantly influenced by traditional teaching methods (Aggidou, 2021; Avgerinou & Pettersson, 2020). It became evident at the outset that the entire experimental group encountered difficulties in processing complex and extensive multimodal expository texts, despite adhering to curriculum guidelines and demonstrating developmental capabilities. Consequently, their overall reading comprehension levels were found to be low, in accordance with the findings of Aggidou (2021) and Gatsou (2011). In contrast to the findings of Meneses and colleagues (2018), the students appeared to prioritise the linguistic text, with a tendency to overlook its relationship with the visual elements. This proclivity can be attributed to their restricted prior knowledge of effective strategies for the processing of multimodal texts.

Following the implementation of the teaching intervention, notable enhancements were discernible. It is noteworthy that explicitly teaching the structure of texts has been demonstrated to enhance students' reading performance (Stevens et al., 2020). Furthermore, the Cognitive Apprenticeship model facilitated a transformation in the learning process and enhanced student interaction (Cakmakci et al., 2020). By adopting a text-centred approach to writing, utilising scaffoldings, teaching specific strategies and assessing comprehension at all levels, students enhanced their capacity to engage with both visual and linguistic information (Bogaerds-Hazenberg, 2021). Nevertheless, challenges persisted, particularly in the context of unfamiliar vocabulary and the integration of information from the surrounding context (Aggidou, 2021; Roehling et al., 2017).

The results of the comprehension tests demonstrated that the teaching intervention was beneficial for both experienced and inexperienced readers. Despite encountering alternative strategies, experienced readers continued to rely on their established skills. In contrast, during the brief period of the final evaluation, inexperienced readers encountered difficulties in effectively utilising their existing strategies, such as rereading. While they concentrated on the visual information, they did not engage in more profound processing, a finding that corroborates Christodoulou's conclusions (2016). It is noteworthy that visuals appeared to offer particular benefit to inexperienced readers, providing a support-

ive framework that facilitated the formation of a coherent understanding of the material (Avgerinou & Pettersson, 2020).

The teaching intervention appeared to have a beneficial impact on reading comprehension, with improvements noted in both the comprehension of the linguistic text and the interpretation of images.

The Impact of the Intervention Program on Writing skills

Before the teaching intervention, students struggled to produce effective and communicative texts. They tended to present information concisely, often recording their thoughts in an associative manner and misusing visuals.

Although comparison texts are not a complex text type, they did not help all students produce effective communicative texts. This finding supports Papastathopoulou's (2017) conclusion that fourth and sixth graders performed better in writing expository texts that described sequences of events than in comparison texts. As noted by Gatsou (2011), while school textbooks feature multimodal texts, students often lack the skills to utilize visual information effectively. Many students relied on creating only images, perceiving this as an easier task than engaging with the linguistic text. Consequently, their lack of understanding of both text and image grammar led to a series of incorrect choices (Graham, 2020; Papastathopoulou, 2017; Taylor & Clarke, 2021).

Following the teaching intervention, minor enhancements were discernible in the written outputs of the students and their capacity to interlink visual and linguistic texts. Notwithstanding the persistently low level of performance, the students made significant efforts to produce texts that were similar to those they had engaged with during the intervention, particularly in terms of structural elements and lexical choices (Taylor & Clarke, 2021). For those lacking experience in writing, heightened awareness of structural elements assisted in clarifying the desired outcomes of their writing, thereby enhancing the effectiveness of their texts. Furthermore, some writers were able to effectively utilise the linguistic and visual tools at their disposal, resulting in the production of longer and more cohesive texts.

As evidenced in the literature, the teaching intervention had a positive impact on students' writing skills, with some students demonstrating an enhanced understanding of how to utilise images and structure effectively (Alves et al., 2020; Graham, 2020; Taylor & Clarke, 2021).

Conclusions

Notwithstanding the restricted duration of the intervention and the qualitative nature of the variable analysis, meaningful insights were obtained. The findings of the research indicate that curricula should be designed to incorporate pedagogical practices that leverage the diverse skills of students. This encompasses consistent teaching, the utilisation of multiple texts and social and procedural scaffolding (Bogaerds-Hazenberg et al., 2018; Botsas, 2017).

The intervention, which was designed to enhance comprehension of expository texts, encouraged active engagement with complex materials. The students were instructed in the monitoring of their cognitive processes through the utilisation of text grammar and strategic reading techniques. Furthermore, it was acknowledged that meaning is shaped by the interplay between the reader, the context, the author, the intricacy of multimodal texts and their intended outcomes (Bogaerds-Hazenberg et al., 2021; Cakmakci et al., 2020).

Furthermore, the focus on reading comprehension had a beneficial effect on writing skills, enabling students to reinterpret the purpose of writing and to utilise text grammar in an effective manner. The students attempted to adopt the perspectives of both readers and writers (Vasarmidou & Spantidakis, 2015; Taylor & Clarke, 2021). The observed improvements in writing foster positive expectations regarding the pedagogical benefits of linking these skills (Alves et al., 2020).

The emphasis on reading comprehension as a process and the utilisation of multiliteracies indicate that effective learning occurs when various semiotic systems are employed in conjunction with one another (Avgerinou & Pettersson, 2021; Meneses et al., 2018). This integration has been shown to enhance reading comprehension and writing, meet diverse learning needs and promote educational equity (Roehling et al., 2017).

Limitations and Future Research

The limited sample size may constrain the generalizability of the findings. Future research would benefit from larger and more diverse educational settings to enhance external validity. Moreover, external factors such as students' prior knowledge, motivation for engagement and the duration and frequency of instruction may have influenced the results. A more comprehensive investigation into the long-term effects of the teaching intervention on reading comprehension and writing of multimodal expository texts would yield valuable research insights. Furthermore, implementing the intervention on a larger scale with a quantitative data analysis would enhance the reliability of the findings, while examining its applicability across different educational levels could offer meaningful pedagogical implications.

Bibliography

Aggidou, C. (2021). *Fifth and sixth grade children's ability to recognize important information of the text during reading comprehension of historical expository texts* (Master's thesis, Aristotle University of Thessaloniki). doi:10.26262/heal.auth.ir.331421

Alves, R. A., Limpo, T., & Joshi, R. M. (Eds.). (2020). Reading-Writing Connections. *Springer International Publishing*. doi:10.1007/978-3-030-38811-9

Avgerinou, M., & Pettersson, R. (2020). Visual literacy theory: Moving forward. In S. Josephson, J. D. Kelly, & K. L. Smith (Eds.). *Handbook of visual communication: Theory, methods, and media* (2nd ed.). 433-464. Routledge.

Bogaerds-Hazenberg, S. T. M., Evers-Vermeul, J., & Bergh, H. (2021). A Meta-Analysis on the Effects of Text Structure Instruction on Reading Comprehension in the Upper Elementary Grades. *Reading Research Quarterly*, 56(3), 435-462. doi:10.1002/rrq.311

Botsas, G. (2017). Differences in Strategy Use in the Reading Comprehension of Narrative and Science Texts Among Students With and Without Learning Disabilities. *Learning Disabilities: A Contemporary Journal*, 15(1), 139-162. Retrieved from https://eric.ed.gov/?id=EJ1141985

Cakmakci, G., Aydeniz, M., Brown, A., & Makokha, J. M. (2020). Situated Cognition and Cognitive Apprenticeship Learning. In B. Akpan, & T. J. Kennedy (Eds.), Science Education in Theory and Practice. *Springer Texts in Education*. doi:10.1007/978-3-030-43620-9_2

Cope, B., & Kalantzis, M. (2000). *Multiliteracies: Literacy Learning and the Design of Social Futures*. Routledge.

Cope, B., & Kalantzis, M. (Eds.). (2015). *A Pedagogy of Multiliteracies*. Palgrave Macmillan.

Creswell, J. (2016). *Research in education: Planning, conducting, and evaluating quantitative and qualitative research* (N. Kouvarakou, Trans.). Ion.

Gatsou, C. (2011). *Comprehension of expository texts by sixth grade primary school students* (Master's thesis, Aristotle University of Thessaloniki). doi:10.26262/heal.auth.ir.127336

Graham, S. (2020). The Sciences of Reading and Writing Must Become More Fully Integrated. *Reading Research Quarterly*, 55(S1). doi:10.1002/rrq.332

Grosdos, S. (2011). Image and Language Teaching: The Educational Use of Multimodal Texts. *Nea Paideia*, 138, 66–83.

Jiménez, J. E., García, E., Naranjo, F., de León, S. C., & Hernández-Cabrera, J. A. (2020). An Analysis and Comparison of Three Theoretical Models of the Reading-Writing Relationships in Spanish-Speaking Children. In Alves, R. A., Limpo, T., & Joshi, R. M. (Eds.), *Reading-Writing Connections. Springer International Publishing*. doi:10.1007/978-3-030-38811-9

Kintsch, W., & Kintsch, E. (2005). Comprehension. In S. G. Paris, & S. A. Stahl (Eds.), *Children's Reading Comprehension and Assessment* (pp. 71-92). Mahwah, NJ: Ablex.

Kirschner, P. A., Sweller, J., Kirschner, F., & Zambrano R., J. (2018). From Cognitive Load Theory to Collaborative Cognitive Load Theory. *International Journal of Computer-Supported Collaborative Learning*, 13(2), 213–233. doi:10.1007/s11412-018-9277-y

Kirschner, P. A., & Stoyanov, S. (2020). Educating Youth for Nonexistent/Not Yet Existing Professions. *Educational Policy*, 34(3), 477–517. doi:10.1177/0895904818802086

Kress, G., & Van Leeuwen, T. (2021). *Reading images: The grammar of visual design* (3rd ed.). Routledge.

Magableh, I. S., & Abdullah, A. (2022). Differentiated instruction effectiveness on the secondary stage students' reading comprehension proficiency level in Jordan. *International Journal of Evaluation and Research in Education (IJERE)*, 11(1), 459. doi:10.11591/ijere.v11i1.2197

Meneses, A., Escobar, J. P., & Véliz, S. (2018). The effects of multimodal texts on science reading comprehension in Chilean fifth-graders: text scaffolding and comprehension skills. *International Journal of Science Education*, 40(18), 2226-2244. doi:10.1080/09500693.2018.1527472

Mirra, N., & Garcia, A. (2021). In Search of the Meaning and Purpose of 21st-Century Literacy Learning: A Critical Review of Research and Practice. *Reading Research Quarterly*, 56(3), 463–496. doi:10.1002/rrq.313

Noprianto, E. (2017). Student's Descriptive Text Writing in SFL Perspectives. *Indonesian Journal of English Language Teaching and Applied Linguistics*, 2(1), 65–81. doi:10.21093/ijeltal.v2i1.53

Papadimitriou, E. (Ed). (2020). *Critical Social (Multi)Literacies: Transmodal Meaning-Making in Formal and Informal Learning Communities*. Gutenberg.

Papastathopoulou, A. (2017). *Understanding the Text Structure of Informational Texts Among 4th and 6th Grade Primary School Students* (Master's thesis, University of Patras). Retrieved from http://hdl.handle.net/10889/10935

Petterson, R. (2021). *Image design*. Institute for Infology.

Roehling, J. v., Hebert, M., Nelson, J. R., & Bohaty, J. J. (2017). Text Structure Strategies for Improving Expository Reading Comprehension. *The Reading Teacher*, 71(1), 71-82. doi:10.1002/trtr.1590

Sachdeva, P., & Tripathi, D. (2019). A Critical Education for 21st Century: A Study on Youth and Media literacy. Journal of Content, *Community and Communication*, 10(9). doi:10.31620/JCCC.12.19/07

Sachpatzidis, D. A. (2020). Visual Literacy: A Bet to Be Earned, ASAP. *European Journal of Teaching and Education*, 2(1), 66-71. doi:10.33422/ejte.v2i1.171

Spantidakis, I., Gaki, E., & Vasarmidou, D. (2018). Reading Comprehension in online environments. *Epistimes Agogis*, 115-123. doi:10.26248/.v2018i4.762

Spantidakis, I. (2010). *Socio-cognitive Multimedia Learning Environments for Writing*. Gutenberg.

Stavans, A., Seroussi, B., Rigbi, A., & Zadunaisky-Ehrlich, S. (2020). The Contribution of Reading Abilities to the Writing Quality of Expository Text Structure in Hebrew Speaking Elementary School Children. In Alves, R. A., Limpo, T., & Joshi, R. M. (Eds.). *Reading-Writing Connections* (pp. 21-37). Springer International Publishing. doi:10.1007/978-3-030-38811-9

Stevens, E. A., Vaughn, S., House, L., & Stillman-Spisak, S. (2020). The Effects of a Paraphrasing and Text Structure Intervention on the Main Idea Generation and Reading Comprehension of Students with Reading Disabilities in Grades 4 and 5. *Scientific Studies of Reading*, 24(5), 365–379. doi:10.1080/10888438.2019.1684925

Taylor, L., & Clarke, P. (2021). We read, we write: reconsidering reading–writing relationships in primary school children. *Literacy*, 55(1), 14–24. doi:10.1111/lit.12235

Tierney, R., & Pearson, P. D. (1983). Toward a composing model of reading. *Reading Education Report*, 43, 1-27.

Van Dijk, T. A., & Kintsch, W. (1983). *Strategies of discourse comprehension*. New York: Academic Press.

Vasarmidou, D., & Spantidakis, I. (2015). *The Learning and Teaching of Writing*. Gutenberg.

Wong, S. S. H., Kim, M., & Jin, Q. (2021). Critical Literacy Practices Within Problem-Based Learning Projects in Science. *Interchange*, 52(4), 463–477. doi:10.1007/s10780-021-09426-4

Yeari, M., & van den Broek, P. (2011). A cognitive account of discourse understanding and discourse interpretation: The Landscape Model of reading. *Discourse Studies*, 13(5), 635–643. doi:10.1177/1461445611412748

Zuana, M. M. M. (2020). An analysis of student's writing assignment of analytical exposition text. *JETAL: Journal of English Teaching & Applied Linguistics*, 2(1), 14-23. doi:10.36655/jetal.v2i1.189