

Effects of Digital Comics on Reading Comprehension among Eighth-Grade EFL Students: A Pre-Experimental Study in Ecuador

Efectos de los cómics digitales en la comprensión lectora de estudiantes de octavo año que aprenden inglés como lengua extranjera: un estudio preexperimental en Ecuador

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Abstract

Reading in English can be challenging. Learners frequently struggle to identify main ideas, infer meaning, interpret vocabulary, and track the sequence of events within a text, a recurring pattern that motivated this research. Given this challenge, the study set out to assess how students' reading comprehension changed following the use of digital comics. Data were collected from thirty-three eighth graders at María Angélica Idrobo High School participating in this one-group, pre-experimental study. The intervention took place in four periods of regular English class. A pretest and a posttest measuring four areas, main ideas and details, vocabulary in context, sequencing, and inference, were administered. A Likert scale questionnaire served to measure the learners' views regarding digital graphic narratives as reading material. The results of the descriptive statistics indicated that the proportion of correct pretest responses was 54.04%, whereas the posttest percentage of correct answers was 71.21%. A t-test for related samples indicated that the observed gain reached statistical significance, $t(32) = 6.39$, $p < .001$. The participants' perceptions of the reading material were positive overall with regard to ease of comprehension of the digital comics and their usefulness in the English classroom. Thus, digital comics appear to function as a potentially useful multimodal tool for supporting EFL reading comprehension. Since the design did not incorporate a control group, causal interpretation should be made cautiously.

Keywords: digital comics; reading comprehension; English as a foreign language; multimodal learning.

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Resumen

La lectura en inglés puede ser desafiante, porque los estudiantes enfrentan problemas para identificar ideas principales, inferir significados, interpretar vocabulario y seguir la secuencia de acontecimientos en un texto. La investigación identifica cómo cambiaría la comprensión lectora de los alumnos después de la exposición a Comics Digitales. Participaron 33 estudiantes del grado 8° del Colegio María Angélica Idrobo, el estudio fue cuantitativo pre-experimental, con un solo grupo. El estudio se desarrolló durante cuatro horas clase de inglés continuas, en donde la intervención consistió en la exposición a Comics Digitales. Se realizó un pre-test y un post-test con cuatro sub-grupos (ideas principales y detalles, vocabulario en contexto, secuenciación e inferencia), y un cuestionario de actitud tipo Likert para conocer cómo valoraban los estudiantes los Comics Digitales como herramienta lectora. Se demostró una gran mejoría en la comprensión lectora, donde los aciertos pasaron de 54.04% a 71.21% (antes y después de la experimentación). La prueba t para muestras emparejadas refleja que dicha diferencia es estadísticamente significativa, $t(32) = 6.39$, $p < .001$. Las respuestas al cuestionario evidenciaron que los estudiantes tienen una posición relativamente positiva hacia los Comics Digitales, aún más en aspectos relacionados con la facilidad de comprensión y pertinencia para su utilización en las clases de inglés. De esta manera, los Comics Digitales pueden ser una herramienta multimodal para trabajar en apoyo a la lectura comprensiva en inglés como lengua extranjera. Los resultados, se deben interpretar con precaución, dado la ausencia de un grupo control.

Palabras clave: cómics digitales; comprensión lectora; inglés como lengua extranjera, aprendizaje multimodal.

Introduction

Coordination of linguistic knowledge and cognitive strategies may pose difficulty for secondary school students, especially when the target language is not used outside the classroom. Reading comprehension is a major competence within foreign-language learning, as it allows learners to make sense of written texts, associate new information with previously acquired knowledge, and use the language for academic purposes. Reading in an EFL context goes beyond decoding words and translating sentence after sentence. It is essential that learners comprehend relevant information, organize ideas, infer meanings, and understand vocabulary in context. Furthermore, in these times when technology has been growing at a rapid pace, the use of traditional texts is becoming less effective (Afandi and Degeng, 2025).

Within this context, digital comics have been explored increasingly due to the combination of verbal text, sequential art, characters, speech bubbles, and story structure into one reading experience. Maity (2022), stated that the development of digital technology has changed language teaching material, while the relationship linking readers with digital text continues to evolve, as students encounter written text through screen, graphics, links, video, and interactive media. Teachers, faced with this shift, have started exploring resources closer to students' digital habits while still meeting formal learning objectives. What stands out is that this combination of image and text can make reading input more contextualized, narrowing the distance between the learner and the text, especially when vocabulary is limited or exposure to English remains scarce.

Previous research suggests that learners may strengthen reading comprehension by working with digital comics; however, significant limitations remain. In fact, there is little evidence from

studies conducted in classrooms at public educational institutions in Ecuador. Most studies have been conducted in international educational settings, and few have investigated specific reading comprehension skills in depth. For this reason, the present study seeks to respond to these shortcomings by examining the use of digital comics in English language instruction within the educational context of Ecuador. With this in mind, three main contributions guided the present study.

First, it explores the growth in reading comprehension EFL students experience when working with digital comics as a reading tool, focusing on the learning of eighth graders in Ecuador. Second, reading comprehension is divided into four parts: main ideas and details, vocabulary in context, sequencing, and inference. This provides a more detailed picture of the nature of the improvement. Third, the pretest-posttest comparison of reading comprehension scores is complemented with an examination of students' perceptions, which were viewed as providing a backdrop to the learning experience rather than evidence of effectiveness.

This study aimed mainly to evaluate shifts in reading comprehension following the use of digital comics among eighth-grade students at María Angélica Idrobo High School by analyzing performance on a traditional text-based assessment versus performance on a comic-based assessment after instruction. For this purpose, two research questions guided the investigation:

- How are changes in reading comprehension skills observed after the use of digital comics?
- How do students perceive digital comics as reading material in the EFL classroom?

Theoretical framework

This study is guided by two theoretical perspectives: Dual Coding Theory by Paivio (1991) and the Cognitive Theory of Multimedia Learning by Mayer (2002). According to Paivio (1991), cognition involves two channels, verbal and visual, and learning is enhanced when these two channels establish referential connections. Mayer (2002), posited that meaningful learning takes place when verbal and visual information is selected, organized, and integrated by the learner. Both of these theories have implications for reading in an EFL context, where readers often lack the requisite linkage between the English word and the concept, action, and relationship that the text conveys.

Together, both theories explain how digital comics can be adapted to the four reading-comprehension dimensions examined in this study. Images can provide useful references for characters, actions, settings, and objects, and written language provides labels and propositional information. The learner needs to select, organize, and link sources to prior knowledge. Such referential and integrative processes may help readers to identify main ideas and supporting details because central events are represented verbally and visually; interpret vocabulary contextually because images provide semantic clues; follow sequence because panels show events in an orderly

spatial arrangement; and make inferences through linking textual information with facial expressions, actions, and background information (Mayer, 2002; Paivio, 1991; Sadoski & Paivio, 2001).

The verbal exchanges and descriptive text that appear in captions demand that the reader comprehend written text, while the images that accompany these cues provide contextual support for meaning. Therefore, digital comics may have particular relevance for EFL classrooms, as they engage in both linguistic and graphic processing. Clark and Mayer (2011), and Mayer (2002), argued that this simultaneous activation can reduce cognitive load and help students build mental representations of the text. Facial expressions, objects, settings, and panel order, within a comic sequence, allow students to infer information that the written text alone might not be immediately clear.

The multimodal-literacy perspective adds to this explanation. According to Mills and Unsworth (2017), meaning emerges from the combined operation of two or more semiotic resources, not through written language alone. Digital comics represent multimodal texts in which written language, images, panel layout, spatial arrangement and sequencing work together. Comprehension is not only based on decoding words or viewing images separately, but also on understanding the connections between the modes. This intermodal support can be used in an EFL classroom to make information easier to obtain, but students may still need explicit guidance about visual conventions and how to connect visual cues with the text.

Sadoski and Paivio (2001), argued that combining words and images creates referential links that strengthen both reading and writing processes. Digital comics, accordingly, offer a theoretically grounded instructional resource, presenting language through multimodal input. In reviewing this framework, the study found it useful for analyzing whether digital comics contribute to reading comprehension and whether students perceive them as accessible, motivating, and appropriate materials for learning English.

Literature review

Comprehending written English in an EFL setting is a complex cognitive process shaped by learners' linguistic knowledge, cognitive strategies, instructional approaches, and the characteristics of the texts they read. As teaching materials have shifted from traditional print toward multimodal digital resources, researchers have increasingly examined how verbal and visual information can be combined to facilitate comprehension. Digital comics represent one such resource because they integrate written language with sequential images that may support vocabulary development, inference, identification of key ideas, and understanding of textual organization. To establish the basis for the present study, this literature review examines theoretical perspectives and empirical evidence supporting digital comic applications within EFL instruction.

Afandi and Degeng (2025), found that learners often struggle to distinguish central ideas from supporting information and derive meaning from contextual clues, given that English is not

their native language. Reading comprehension remains a common challenge across EFL contexts. Digital comics, in this scenario, offer a potential solution by combining written text with visual support. Unfamiliar vocabulary can thus be related to concrete images, while the order of events in a story becomes easier to follow.

Nispa et al. (2023), found significant gains in reading comprehension by having students use comic strips. In a similar vein, Guarín Serrano (2022), found virtual learning tools utilized in a purposeful pedagogy enhanced reading comprehension in English. Taken together, the research in multimodal language learning provides some support for using digital comics. Taken together, these studies suggest that comics can function as visual scaffolds that support comprehension of ideas, events, and vocabulary.

Nispa et al. (2023), for instance, worked with printed comic strips rather than digital formats, which limits the conclusions that can be drawn about technology-mediated reading materials. Previous research, though, is not without limitations that justify further study. Gutiérrez-Huanca-yo (2025), Tekin and İlhan (2025), and Vassilikopoulou et al. (2011), examined university students and productive skills such as writing and creativity, or language production through digital comic creation, rather than the comprehension of written texts by secondary EFL students. Kembaren et al. (2026), added that studies on digital comics in language teaching frequently rely on small samples, specific institutional contexts, or designs that make generalization to other educational settings difficult.

While Laura-De la Cruz et al. (2024), studied digital comics with English vocabulary with secondary students, Chaves-Yuste and De-La-Peña (2025), focused on writing skills with their multimodal focus, meanwhile Jiménez De León and Carrillo Rada (2025), further highlighted that digital comics encourage active student participation, increase interest in reading in English, and facilitate content learning through visual and interactive presentation. These pieces of evidence are important and add value, but they answer specific language outcomes more so than the larger picture. These findings do not answer how digital comics might impact a reading comprehension skill such as identifying the main idea and details, understanding vocabulary in context, understanding the order of events, or drawing an inference based on text evidence. More classroom-based evidence is needed to show if there is a relationship between digital-comic instruction and gains in these specific comprehension skills.

There is also encouraging evidence on the positive effects on using digital comics on reading comprehension with younger learners, such as the study of Utami et al. (2025) in elementary schools, though not directly in the secondary EFL classroom. With the experimental and review studies in mind, digital comics appear to be a promising technology to explore and apply in reading comprehension instruction, but the available evidence for one context or the other may be slim or lacking. For example, Kembaren et al. (2026), in their synthesis of studies and experiments regarding digital comics and reading comprehension, indicated that many studies focus on particular school levels, specific populations, and foreign cultural contexts. Thus, local secondary schools with different perceived causes of reading comprehension challenges, inadequate

vocabulary knowledge, limited contact with English outside of school, and reading tasks utilizing traditional methods, warrant particular attention. Especially in Ecuador, the application of digital comics in public or semi-public secondary school English classrooms seems to be an infrequently reported area and, thus, an area lacking sufficient evidence for teachers in the same context.

Some studies focus on vocabulary or writing, while others prioritize motivation or technology integration (Laura-De la Cruz et al., 2024; Ontenient Lledó, 2025). Although evidence exists regarding digital comics and English learning, previous studies differ considerably in their target skills and instructional contexts. In this review, the study identified that examining reading comprehension outcomes together with student perception, within a single study, offers a more complete view of the educational value these digital-comic resources may hold.

A visual-literacy perspective also cautions against assuming that images are self-explanatory. Visual scaffolding was also supported by Cohn (2020), who suggested that sequential image understanding relies on learned visual-narrative conventions, and by Golding and Verrier (2021), who reported that instruction in comics literacy led to improvements in understanding and making inferences from comics. Both of these findings suggest that the improvements may rely on prior experience and instruction, rather than understanding the comics' format alone. Their primary-school and intervention-specific designs differ from the present secondary EFL setting, which limits direct comparison. Taken together, literature does not establish that the comic format alone produces learning gains; rather, outcomes appear to depend on instructional guidance, learners' visual-literacy experience, sample characteristics, and the specific language skill assessed.

Methodology

Study design

A pretest-posttest structure allows researchers to compare performance at two different moments and to estimate both the size of an observed difference and whether it reaches statistical significance (Creswell and Creswell, 2018). The research followed a quantitative, one-group pre-experimental pretest-posttest design to assess shifts in students' reading-comprehension scores after digital comics were introduced as a reading resource; no control group was included. Therefore, the results can be used as evidence of improvement related to the intervention. The one-group design was selected because the intervention occurred in an intact class under regular school conditions, in which random assignment and formation of a comparison group were not feasible within institutional and pedagogical constraints. It therefore provides preliminary evidence of change, but weaker causal evidence than randomized or quasi-experimental designs.

Participants

Working with a natural classroom group fit the educational context well, since the intervention took place during regular English instruction. The study originally started with 35 students

Upon obtaining institutional and parental informed consent, the final sample comprised 33 participants enrolled in the eighth-grade class B at María Angélica Idrobo High School, aged between 12 and 13 years old, 13 males and 20 females. The sample included students who had parental consent, were regularly enrolled in the class, present for the instructional intervention, and present for both the pre- and post-assessments. From 35 students, 2 of them did not complete the instructional intervention and assessments, so they were omitted from the final analysis; therefore, adhering to the predefined inclusion and exclusion criteria. Student identities were omitted from the analytical database, and all information was used solely for academic purposes and handled confidentially.

Instruments

Two instruments were applied throughout the study. First, a reading comprehension test was used in a pretest and posttest scenario, organized into four dimensions, namely, main ideas and details, vocabulary in context, sequencing, and inference. The principal distinction between both assessments concerned the reading format, with a paper text for the pretest and a comic-based digital text for the posttest, employing similar content elements. The tests assessed the same four dimensions, had the same number of items, used the same scoring system, and employed similar content elements in terms of vocabulary, grammar, cognitive level, and text length. There were three questions for each of the four dimensions; each dimension had a possible score of three correct answers, with the total score ranging between 0 and 12. For statistical analysis, correct responses were coded as 1 and incorrect responses as 0; thus, possible overall scores could take values from 0 to 12. (See Annex 1). Second, a student perception questionnaire was administered following the intervention to elicit responses from the students. Their perceptions were queried across 14 Likert-type-scale questions in three dimensions: interest and motivation, comprehensibility of texts, and the appropriateness of using digital comics in EFL classrooms (See Annex 2).

Instrument validation

The reading-comprehension tests were validated for content and format by three English teachers and 28 eighth-grade students who were not part of the final sample. Prior to administration of the instrument, they reviewed the format of the test, instructions, and grammar, as well as the test items. Suggestions by the students at this pilot-testing stage indicated the redundancy of directions in each section of the exam might serve to distract or confuse students taking the test. Prior to instrument administration, additional and clearer directions were added at the beginning of the test. The major goal of this pilot testing was to enhance clarity and content validity of the instrument prior to its use in pre-experimental study.

The three teachers suggested seven small changes and grammatical errors on the tests, and the necessary changes were made. Keeping their recommendations in mind, the wording of some items was revised, a word-level check was conducted, and the internal organization of the items

was reviewed to keep the test coherent in addressing the four reading constructs. This validation step for the instrument was part of the methodology to ensure the adequacy of the instrument prior to using it to draw conclusions about pretest and posttest results.

The internal consistency of the perception questionnaire instrument was assessed based on the data obtained from the questionnaire administration to check clarity, wording, alignment of the 14 items with the three proposed dimensions and appropriateness of the five-point response scale. The final questionnaire contained five items for interest and motivation, five items to make the texts easier to understand, and four items to make the texts more suitable in classrooms. The perception questionnaire's internal consistency was analyzed by performing a Cronbach alpha test yielding results of 0.269 for interest and motivation, 0.806 for ease of understanding texts and 0.42 for suitability of digital comics for EFL classroom use, with an overall value of $\alpha = 0.788$ for the perception questionnaire; therefore, dimension-level results should be interpreted cautiously.

Procedure

The implementation of the instruction and practice lasted 160 minutes across four class periods, each lasting in 40 minutes. The instructional and practice components included introducing comic conventions and main ideas, introducing vocabulary in context, sequencing, and making inferences in conjunction with comprehension practice. Family-based digital comics were used on the screen for instruction and practice. The digital comic used in the posttest, Kelly's Family, is presented in Annex 1. During these sessions, students worked with digital comics, looking at the images, identifying the characters, matching the speech balloons with the picture clues, following the sequence of panels, and answering comprehension questions about the story. The teacher provided guidance in all four of these reading aspects as they were assessed on the tests. This took place after obtaining permission from the school and the students' parents, as well as after administering a pretest to measure the students' initial performance in reading comprehension. After the intervention, a posttest measured students' gains in comprehension, and a perception questionnaire measured the students' perceptions of utilizing digital comics in the English class. All of the data collected was for the purposes of this study and was kept confidential.

Data analysis

A dependent sample t-test compared scores obtained before and after the intervention; a choice justified by the fact that the same students were evaluated at both moments. Next, the magnitude of the effect was quantified through Cohen's d_z to provide an estimate of the magnitude of the effect. In addition to the hypothesis test, data were also analyzed using summary measures including frequencies, proportions, averages, standard deviations, and observed score ranges. Questionnaire responses, for their part, were summarized using Likert means alongside percentages of favorable, neutral, and unfavorable answers. The database was organized in Microsoft

Excel, which was also used to calculate the descriptive statistics, paired-samples t-test, confidence interval, and Cohen's *dz*.

Results

Results are organized into three parts. The first part summarizes students' reading comprehension performance across dimensions in both the pretest and posttest. The second reports the hypothesis test comparing the two measurements, and the third part addresses students' perceptions of digital comics as reading material in the EFL classroom.

Table 1. Descriptive comparison of pretest and posttest results by reading comprehension dimension

Dimension	Students (n)	Items per student	Pretest M (SD); correct n/N (%)	Posttest M (SD); correct n/N (%)	Change in correct answers, n (percentage points)
Main ideas and details	33	3	2.36 (0.60) 78/99 (78.79%)	2.52 (0.62) 83/99 (83.84%)	+5 (+5.05)
Vocabulary in context	33	3	(0.79) 33/99 (33.33%)	1.52 (0.76) 50/99 (50.51%)	+17 (+17.17)
Sequencing	33	3	1.45 (0.90) 48/99 (48.48%)	2.18 (0.64) 72/99 (72.73%)	+24 (+24.24)
Inference	33	3	1.67 (0.92) 55/99 (55.56%)	2.33 (0.69) 77/99 (77.78%)	+22 (+22.22)
Total score	33	12	6.48 (1.64) 214/396 (54.04%)	8.55 (1.66) 282/396 (71.21%)	+68 (+17.17)

]Source: own elaboration based on the pretest and posttest database (n = 33).

Note. There are three items in each of the reading-comprehension dimensions, answered by 33 students, for a total of 99 possible responses for each of the dimensions. There are 12 items in the total score, for a total of 396 possible responses. Percentages were computed as the ratio of items answered correctly to the full count of possible responses available. Percentage-point differences may not match exactly due to rounding.

An overall increase in students' performance in reading comprehension is illustrated in Table 1. There were three questions in each of the four dimensions, and the number of participating students was 33. Therefore, the number of responses per dimension was 99, and the overall count of responses for the entire test was 396. The pretest produced 214 correct responses out of 396 (54.04%), whereas the posttest produced 282 out of 396 (71.21%), showing an increase of 68 correct responses with a percentage gain of 17.17. The total test score rose from $M = 6.48$ ($SD = 1.64$) to $M = 8.55$ ($SD = 1.66$). Twenty-five students earned higher scores on the posttest than on the pretest, six students had no change in their scores, and two students' scores decreased.

All four of the dimensions had higher posttest scores. The dimension of main ideas and details had the highest scores with 78 out of 99 correct responses (78.79%) for the pretest and 83 out of 99 correct responses (83.84%) for the posttest. This dimension showed the least amount of gain

with an increase of 5.05 percentage points. The dimension of vocabulary in context had the lowest scores with 33 out of 99 correct responses (33.33%) for the pretest and 50 out of 99 correct responses (50.51%) for the posttest. This result indicates that vocabulary is the area in which students need the most reinforcement.

Sequencing showed the largest descriptive gain from 48/99 (48.48%) to 72/99 (72.73%) with a lowered standard deviation from 0.90 to 0.64, and inference increased from 55/99 (55.56%) to 77/99 (77.78%) with a lowered standard deviation from 0.92 to 0.69 with a pretest to posttest comparison. Though not tested for significance, gain appeared to be greater among some dimensions than among others as shown in the prior table.

A t-test for dependent observations was then applied to the total reading comprehension scores to determine whether this improvement carried statistical weight. It is worth mentioning that, before conducting this paired t-test, the distribution of the within-student difference values was examined for approximate normality. This analysis was guided by two hypotheses. H0 stated that no meaningful statistical difference existed between scores from the two assessment occasions. H1, in contrast, proposed that posttest scores would be significantly higher than those obtained at pretest.

Table 2. Paired-samples hypothesis test for total reading comprehension score

N	Pretest M (SD)	Posttest M (SD)	Mean difference	t(df)	p	95% CI	Cohen's dz
33	6.48 (1.64)	8.55 (1.66)	2.06	6.39 (32)	< .001	[1.40, 2.72]	1.11

Source: own elaboration based on the pretest and posttest database (n = 33).

As seen in Table 2, a significant effect emerged from this analysis. Cohen's $d_z = 1.11$ was calculated, indicating a large, standardized change within the group studied. The paired-samples t-test, in fact, revealed that students' total reading comprehension scores rose significantly following the intervention, $t(32) = 6.39$, $p < .001$. The evidence therefore led to rejection of the null hypothesis based on the observed statistically significant difference.

Although this represented a small change in raw scores, an increase of 2.06 points in a scale with 12 points possibly indicated a meaningful change when considering the range of the scale.

Table 3. Student perception results by questionnaire item

Item	Statement	M	Favorable %	Neutral %	Unfavorable %
1	Reading digital comics is more interesting than using traditional materials.	4.76	96.97%	0.00%	3.03%
2	My enthusiasm for reading has grown since I started reading digital comics.	3.52	54.55%	33.33%	12.12%
3	I'd like to read more digital comics.	4.09	72.73%	27.27%	0.00%
4	I enjoy reading more when I use digital comics rather than traditional texts.	3.76	54.55%	39.39%	6.06%

Item	Statement	M	Favorable %	Neutral %	Unfavorable %
5	Digital comics hold my attention longer than traditional texts.	4.18	75.76%	15.15%	9.09%
6	Reading digital comics helps me understand the story easily.	4.48	90.91%	9.09%	0.00%
7	I find it easier to retain information by using digital comics.	4.06	81.82%	15.15%	3.03%
8	The images in digital comics help me understand the text.	4.42	90.91%	9.09%	0.00%
9	I find it easier to follow the story's sequence in digital comics.	4.39	87.88%	12.12%	0.00%
10	Digital comics make it easier to engage in reading activities.	4.42	90.91%	9.09%	0.00%
11	Digital comics make it easier to achieve the goals of reading classes.	4.30	84.85%	12.12%	3.03%
12	Teachers should incorporate digital comics into their English classes.	4.61	93.94%	6.06%	0.00%
13	Digital comics are a suitable resource for students learning English as a foreign language.	4.58	93.94%	6.06%	0.00%
14	Digital comics should be used as a supplement to traditional texts.	4.39	87.88%	9.09%	3.03%

Source: own elaboration based on the student perception questionnaire database (n = 33).

Table 3 presents the results for all 14 questionnaire items. The highest mean was $M = 4.76$ for item 1, with 96.97% favorable responses, 0.00% neutral, and 3.03% unfavorable responses. Item 2 had $M = 3.52$, with 54.55% favorable, 33.33% neutral, and 12.12% unfavorable responses. Item 3 reached $M = 4.09$, with 72.73% favorable and 27.27% neutral responses; and Item 4 reached $M = 3.76$, with 54.55% favorable, 39.39% neutral and 6.06% unfavorable responses. Item 5 reached $M = 4.18$ with 75.76% favorable, 15.15% neutral, and 9.09% unfavorable responses. Item 6 got $M = 4.48$, with 90.91% favorable and 9.09% neutral responses; Item 7 got $M = 4.06$, with 81.82% favorable, 15.15% neutral, and 3.03% unfavorable responses; Items 8 and 10 were scored at 90.91% favorable, $M = 4.42$, with 9.09% neutral and no unfavorable responses; Item 9 had $M = 4.39$, with 87.88% favorable and 12.12% neutral responses. Item 11 obtained $M = 4.30$ with 84.85% favorable, 12.12% neutral, and 3.03% unfavorable responses within the classroom suitability score. Items 12 and 13 had 93.94% favorable, 6.06% neutral responses, with means of 4.61 and 4.58, respectively. Finally, Item 14 received $M = 4.39$ with 87.88% favorable, 9.09% neutral and 3.03% unfavorable responses.

Table 4. Student perception of digital comics by questionnaire dimension

Questionnaire dimension	Items	Mean	Favorable responses	Neutral responses	Unfavorable responses
Interest and motivation	5	4.06	70.91%	23.03%	6.06%
Ease of understanding texts	5	4.36	88.48%	10.91%	0.61%
Suitability in EFL classrooms	4	4.47	90.15%	8.33%	1.52%

Questionnaire dimension	Items	Mean	Favorable responses	Neutral responses	Unfavorable responses
Overall perception	14	4.28	82.68%	14.50%	2.81%

Source: own elaboration based on the student perception questionnaire (n = 33).

Table 4 summarizes the item-level findings by questionnaire dimension. Responses were interpreted on a five-point Likert scale, with agree and strongly agree classified as favorable, neutral retained as a separate category, and disagree and strongly disagree classified as unfavorable. Suitability in EFL classrooms obtained the highest mean of 4.47, with 90.15% favorable, 8.33% neutral and 1.52% unfavorable responses. Ease of understanding texts followed with $M = 4.36$, 88.48% favorable, 10.91% neutral and 0.61% unfavorable responses. Interest and motivation obtained $M = 4.06$, with 70.91% favorable, 23.03% neutral, and 6.06% unfavorable responses. Overall perception across the 14 items was positive ($M = 4.28$) with 82.68% favorable, 14.50% neutral, and 2.81% unfavorable responses.

Discussion

This study examined the changes in reading comprehension of eighth-grade EFL learners after the use of digital comics as a supplementary teaching material. Reading comprehension test scores, including pretest and posttest, showed significant differences between pretest and posttest scores with a large effect size within the group. There were improvements in all four areas of the test: main ideas and details, vocabulary in context, sequencing, and inference. The biggest gains were in sequencing and inference. These findings indicate that the use of digital comics was associated with improved reading test scores and that the multimodal and sequential features of digital comics may help support different reading comprehension tasks.

Regarding the first research question, “How are changes in reading comprehension skills observed after the use of digital comics?”, the increase in overall reading-comprehension scores was statistically significant and also associated with a large within-group effect size. All four dimensions improved, the biggest descriptive improvements were in sequencing and inference. This pattern is especially pertinent as these dimensions could be closer to the sequential and multimodal properties of comics.

The greatest increases were observed in sequencing and inference skills. Paivio (1991), as well as Sadoski and Paivio (2001), posited that when utilized in conjunction with Dual Coding Theory, images and words stimulate two different and complementary cognitive processing channels, enabling the student to associate meaning with text and visual signals. This theoretical grounding matches the findings of this study. Visual information in sequential panels of digital comics can help readers follow events. Facial expressions, actions, and background details can offer additional clues for interpreting information not explicitly stated in the text. The current study did not directly examine these cognitive processes, but the pattern of results obtained is consistent with these theoretical possibilities.

Vocabulary in context also improved, though it remained, notably, the weakest-performing area overall. Freire and Perea (2024) along with Suhaila et al. (2025) identified limited vocabulary as a recurring obstacle in EFL reading comprehension, and this study's findings align with that view. Such findings suggest that images assist vocabulary comprehension without resolving every lexical difficulty on their own. Explicit instruction, repeated exposure, and guided reading strategies remain necessary if word meaning is to be properly consolidated.

Kembaren et al. (2026) reported that digital comics may strengthen reading performance in EFL settings, a finding echoed by Nispa et al. (2023), who observed improvement in comprehension after students used comic strips. The current study extends this research by exploring reading achievement on four separate dimensions of reading rather than relying only on a composite comprehension score. The dimension level analysis shows that the observed pattern of change was inconsistent; sequencing and inference showed more descriptive improvement than main ideas and details. This distinction could be useful for future research examining whether particular features of comics are more closely associated with particular aspects of reading comprehension. It is also worth noting the relatively modest descriptive gain in main ideas and details. The identification of central information may depend on reading processes not equally supported by visual information as are sequencing or inference. Another explanation could be that the smaller gain is related to the nature of the assessment, the difficulty of the items or the previous proficiency that students had in this dimension. The present study was not designed to isolate these possibilities and this pattern should be explored in future research.

In relation to the second research question, "How do students perceive digital comics as reading material in the EFL classroom?", the results show a positive perception with a high percentage of favorable responses. The aspects with the strongest perceptions were suitability in EFL classrooms and ease of understanding texts, while interest and motivation also had a positive evaluation. Overall, Students generally had a positive attitude toward digital comics, particularly in relation to their suitability for the EFL classroom and their perceived potential to facilitate text comprehension. Interest and motivation were also rated positively, but these ratings were relatively less positive.

These quantitative results are supported by the students' survey responses when describing their perceptions during the intervention which provided contextual insight into how students experienced the materials. The areas the students mentioned as important in digital comics were comprehension, following the sequence of a story, and the fit of the digital comics for an English classroom. From a pedagogical perspective, a student's attitude towards the medium is a factor in the viability of integrating digital comics into classroom practice as a sustained instructional tool. The positive perceptions of digital comics lend support for adopting digital graphic narratives as a useful tool during instruction, but not necessarily evidence of its effectiveness.

Nevertheless, caution is needed when interpreting these findings. The study used a one-group pre-experimental approach without a control condition which limits the ability to attribute the observed improvements specifically to the digital-comic-based intervention. Because

the pre-intervention assessment and posttest differed in the format of presentation, the observed score differences may reflect both development in reading comprehension and the influence of the assessment modality. Therefore, the results were interpreted as an indication of improvement after intervention, not as definitive evidence that digital comics alone caused the gains observed. Moreover, the sample consisted of 33 students from only one school; it was also a convenience sample, so the results cannot be generalized. The reader must keep in mind that the findings from this investigation only show that there was an increase in posttest scores after the intervention. Future studies with larger sample sizes, with homogenous splitting, and with prolonged exposure to the intervention are needed to explore if similar results can be found.

Overall, the findings imply that digital comics could be a potential supplement for EFL reading instruction, particularly for assignments in which students need to integrate verbal information with visual and sequential cues. The results also indicate that improvement may not be equal across all aspects of reading comprehension, suggesting the need to examine specific skills rather than a total comprehension score. The study does not demonstrate a causal effect, but it provides context-specific evidence from a secondary-school classroom in Ecuador, and paves the way for further research with more rigorous comparative designs.

Conclusions

The reading comprehension of the students from María Angélica Idrobo High School, at the eighth-grade level, improved in a significant way after having reading activities based on digital comics. The students showed gains in all the dimensions of reading comprehension in the descriptive analysis. The dimensions of sequencing and inference showed the highest gains, indicating that the visual support provided by the comics helps the students to order events in a story, while the inference dimension suggests that the students were able to draw conclusions concerning implicit meaning. The dimension of vocabulary in context showed gains as well, though more work will be necessary in order to reinforce this area.

The analysis showed a statistically significant difference between the two assessment occasions, supporting the alternative hypothesis and confirming an increase in students' reading-comprehension scores after the intervention. This improvement had a substantial effect magnitude, suggesting that the enhancement was meaningful for the sample of the study. Hence, in light of these results, digital comics can be considered a multimodal tool that may be utilized to complement the traditional materials used in EFL classes.

The findings were complemented by students' positive perceptions of digital comics. The majority considered the digital comics as appropriate for an English class, and as helpful for understanding a story, following the sequence of events, and maintaining interest while working on a reading-related task. These perceptions add to the potential value of digital comics as having the potential to increase not only reading outcomes, but also classroom access and motivation.

Therefore, implications of the findings for pedagogy include the potential use of digital comics as an additional reading resource for practice with sequencing, inference, and contextual vocabulary, provided there is guidance from the classroom teacher. This is consistent with the stated multimodal theoretical framework for the study, where verbal and visual information can work together to enhance understanding. Implications for curriculum include the use of digital comics as supplemental materials addressing the reading goals, rather than substituting for traditional texts. In consideration of the above, digital comics can be used as a supplementing medium provided that the comics are carefully selected, explanations are guided by the teacher, and the use is in line with the reading objectives. Instructionally, it is advisable to make use of digital comics to teach reading in the EFL context with the above considerations. Suggestions for further studies can be made by comparing the use of other instructional materials, adding other control groups, and investigating the long-term effect of vocabulary learning and reading comprehension.

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