

Measuring Student Engagement and Multimodal Literacy through Interactive Digital Graphic Novels in Secondary Classrooms

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Abstract: This study investigates the impact of digital interactive graphic novels on student engagement and multimodal literacy in the secondary classroom. Many digital tools are available, but traditional English classrooms are still using text-heavy approaches and may be missing out on engaging digital learners and developing their multimodal interpretive skills. Therefore, this study aims to fill the gap in engagement and literacy outcomes through interactive graphic novels. The study used a mixed-methods quasi-experimental design over six weeks with 60 secondary students. Quantitative data were collected from pre- and post-intervention surveys and assessments, while qualitative data were collected through unobtrusive classroom observations and semi-structured interviews. Statistical analysis showed that student engagement scores increased significantly, with a mean rise of 2.8 to 4.1 on a 5-point Likert scale ($p < 0.01$). In a multimodal literacy assessment, the pre-test mean of 56% and post-test mean of 78% showed a 22% improvement. Additionally, 85% of participants reported being more motivated and interested in learning with interactive digital texts. The qualitative data reflected these results, with increased student engagement, enhanced analysis of visual-textual components, and greater interactivity in learning tools. The research shows that interactive digital graphic novels are a way to improve engagement and develop multimodal literacy. The study showed that the curriculum needs improvement, and digital, multimodal texts should be incorporated into instructional practices to create learning opportunities that are more accommodating of varying learning needs. The study also suggests that more research should be conducted on a larger scale, with a particular focus on a more diverse student population.

Key Words: student engagement, multimodal literacy, interactive digital graphic novels, secondary education, digital learning, visual literacy, english language teaching

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Introduction

The growing adoption of new digital technologies of all types has brought notable changes to secondary education teaching and learning, especially English teaching and learning. English language learners today deal with new complex texts. Today's texts comprise digital and visual components as well as written components, and teaching of English must adjust to teaching with these new complex texts. Recent scholarship underscores a heightened focus on using multiple resources to improve literacy development, especially for adolescents who are constantly connected to digital media (Linder & Falk-Ross, 2024). Digital media not only provide multiple ways to communicate but also require students to redefine how they think, which makes traditional text-based media instruction deficient for developing literacy (Higgs & Kim, 2022). When students participate in learning tasks, they mentally and emotionally invest, which makes their involvement in learning extremely important for academic achievement. Involvement in academic tasks extends from participation and remaining on-task to interest and motivation, and ultimately to investment in learning a given content deeply. Studies have shown that interactive

learning environments and multiple modes of instruction support students' digital interest and experience, which makes them more involved in their academic tasks (Bodén et al., 2023). Multimodal literacy is also a vital skill in today's education, which is defined as thinking and reasoning across and through visual, digital, and textual modes (Smith et al., 2021). Multimodal literacy goes beyond the traditional literacy of reading print text. Multimodal literacy engagement requires learners to think critically, which is reflected in analyzing visuals, symbols, interactive digital elements, and narratives (Lewis III & Lewis, 2021).

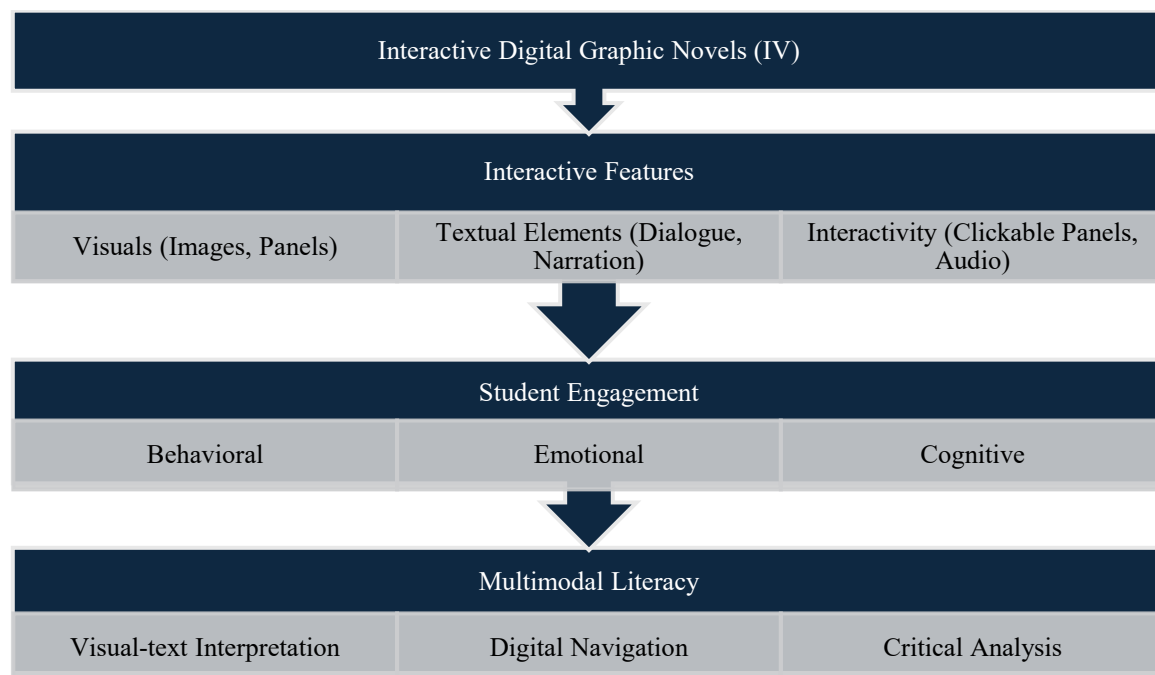


Figure 1: Conceptual Framework of Interactive Digital Graphic Novels, Student Engagement, and Multimodal Literacy

Figure 1 presents the study's conceptual framework, where interactive digital graphic novels are the independent variable impacting learning outcomes. The model emphasizes that the interactive features visuals, text, and interactivity are determinants of the learning experience and engagement. These features are determinants of any combination of the three dimensions of student engagement: behavioral, emotional and cognitive engagement. Increased engagement, in turn, fosters higher levels of multimodal literacy, specifically, visual-text literacy, digital literacy, and critical literacy. The arrows represent the order of digital content, engagement, and literacy outcomes.

Interactive digital graphic novels offer a new way of teaching that combines narrative with other forms of media and interactivity. These can be used to allow students to take an active role in telling a story, and to make use of other features to adjust the narrative, and in doing so affect meaning. Studies indicate that graphic novels positively affect comprehension, motivation, and inclusive learning, especially for diverse learners (Bemiss & Keel, 2021). Additionally, the interaction feature of digital comics also improves creativity and interpretation by allowing students to engage with the material in a more meaningful way (Axelrod & Kahn, 2024). Though use of digital fiction to teach literature has been recognized to improve learning outcomes, use of it in the classroom is still inconsistent (Aliagas et al., 2024). Despite progress made in using graphic novels and comics to teach literature, most secondary level English classrooms still rely on traditional, text-based approaches to teaching literature. This has two main problems: it does not engage the current generation of learners who are digital natives, and it does not teach them to integrate

different forms of communication to create a single, coherent product. Most of the previous research has looked at either student engagement with a digital learning tool, or at the student's ability to use multiple forms of communication. Little attempt has been made to analyze the two together, especially in the context of interactive digital graphic novels (Wünsch-Nagy & Fodor, 2025). Technologies that modern classrooms are using like digital storytelling or augmented reality still offer more potential. These tools can help develop new approaches to teaching, but have not been thoroughly considered (Nurjain et al., 2025). This research focuses on interactive digital graphic novels and aims to determine their influence on student engagement and ability to use multiple forms of communication. A main concern of this research is to develop a measure to gauge the influence interactive digital graphic novels on literacy outcomes.

This study aims to assist educators in developing innovative strategies in secondary English instruction by examining how digital and multimodal tools impact student engagement and literacy growth. This paper builds upon previous research by presenting a cohesive study of student engagement and multimodal literacy in conjunction within one teaching framework and offering actionable classroom strategies.

This paper is structured to present ideas in a logical sequential order. In Section I, the background, main ideas, and the objectives of the paper are introduced. In Section II, literature on the relevant concepts of student engagement, multimodal literacy and digital graphic novels are examined. In Section III, the methodology is presented with the research design, participants, tools, and processes. In Section IV, results are presented through both the quantitative and qualitative findings. In Section V, findings are discussed in relation to the research questions and other relevant studies. Section VI wraps up the paper with a description of the major findings, the educational significance, the limitations, and the recommendations for future studies.

Literature Review

Significant engagement research demonstrates the value of investing resources to improve engagement across the board in secondary classrooms in particular. From a constructivist perspective, engagement should focus attention at the intersection of learning, collaboration, and reflection. Engagement theory describes three components that anticipate and inform each other: behavioral engagement (participation and completion of tasks), emotional engagement (interest, motivation, and affect), and cognitive engagement (critical thinking and effort sustained over a period of time). Recent English language education research highlights the potential of multimodal and digitally mediated learning environments to strengthen each of these components through integrating classroom tasks and the lived digital experiences of students (Karjagdi Çolak, 2024). Digital storytelling in education research documents a positive impact on multidimensional engagement, particularly in writing and language tasks (Ajabshir, 2024). Measurements of these studies focus on the metric end of the spectrum (i.e. Likert-scale surveys, observational rubrics related to specific engagement metrics, and assessments that combine aspects of participation and learning). Being multimodal literate means being able to both construct and deconstruct meaning through semiotics. These can include words, pictures, sound, video, and interactive modalities. In 21st-century learning, literacy is no longer limited to the printing press but must also encompass the understanding and use of the digital, visual, and media. Synthesizing meaning across the different modalities is a learning process critical for creativity (Shen et al., 2025). When teaching literacy practices across the digital divide, focusing on equity and justice, specifically in diverse inclusive classrooms, the need to analyze, tactically and critically, multimodal texts is even more critical (Piotrowski & Garcia, 2024). Similarly, higher-order thinking and interpretative skills are fostered through digital

storytelling and transmedia (Djonov et al., 2021). In English classrooms, digital graphic novels are being used as teaching tools because of the integration of visual narratives and text and because of the growing inclusivity to diverse literacy levels in classrooms (Aziz & Aziz, 2023). Previous research also demonstrated the potential of graphic narratives to enhance comprehension through guided architecture of visual sequencing and narrative cues (Falk-Ross & Linder, 2024). However, research has remained limited on the fostering multimodal literacy, particularly within the context of reading comprehension and appreciation (Mariam et al., 2025). LiteraTech has Interactive Learning Technologies that promote literacy instruction and learning through an active engagement pedagogy and design that includes responsive digital content such as clickable panels, embedded audio, animated features, and branching narratives. These attributes promote active meaning-making and sustained engagement. Within the context of pedagogical design, VR-based multimodal learning, and digital storytelling frameworks, the emphasis on interactivity facilitates deeper understanding, enhanced creative expression, and improved presentation competencies (Lai, 2024; Kim et al., 2024). These tools promote learner independence, as students can exercise agency and control the pace at which they move through narratives.

The reviewed literature suggests that multimodal and interactive digital tools enhance motivation, comprehension, and critical literacy competencies. However, to date, the positive effects of interactive digital graphic novels on student engagement and multimodal literacy have not been sufficiently studied; thus, this research gap can be addressed.

Methodology

Research Design

The impact of interactive digital graphic novels on students' engagement and multimodal literacy was evaluated in this study. The method involved the use of quantitative data and qualitative data. A combination of pre-tests and post-tests was applied under the same classroom setting because random assignment was not possible. The quantitative data determined the engagement and literacy levels, and the qualitative data provided information on students' experiences and responses to the changes in the classroom.

Participants

The participants in this study were 60 students from Grade 9 of a secondary school. Participants were purposely sampled to include students from different academic and digital skill levels. The students were split into two groups: an experimental group and a control group, each containing 30 students. The experimental group was introduced to interactive digital graphic novels, while the control group was given instruction in the traditional, text-based method. All the students had some basic digital skills that enabled them to use the digital materials.

Instruments

Reliability in data collection was achieved by using different instruments. A study on engagement used a structured questionnaire that utilized a five-point Likert scale that evaluated the behavioral, emotional, and cognitive aspects of engagement. The rubric on multimodal literacy was a measure of the participants' skills to analyze the visual-textual configurations and digital components. Observations on the involvement and engagement of participants were supplemented by semi-structured interviews that provided additional data related to the students' learning experiences.

Materials

For this research, interactive digital graphic novels with a multimodal approach were used. include a combination of audio, text, videos, images, and interactive elements, such as non-linear navigation and click-able panels. These graphic novels were hosted on an online platform accessible on classroom devices. The selected graphic novels were designed to be compatible with the English curriculum.

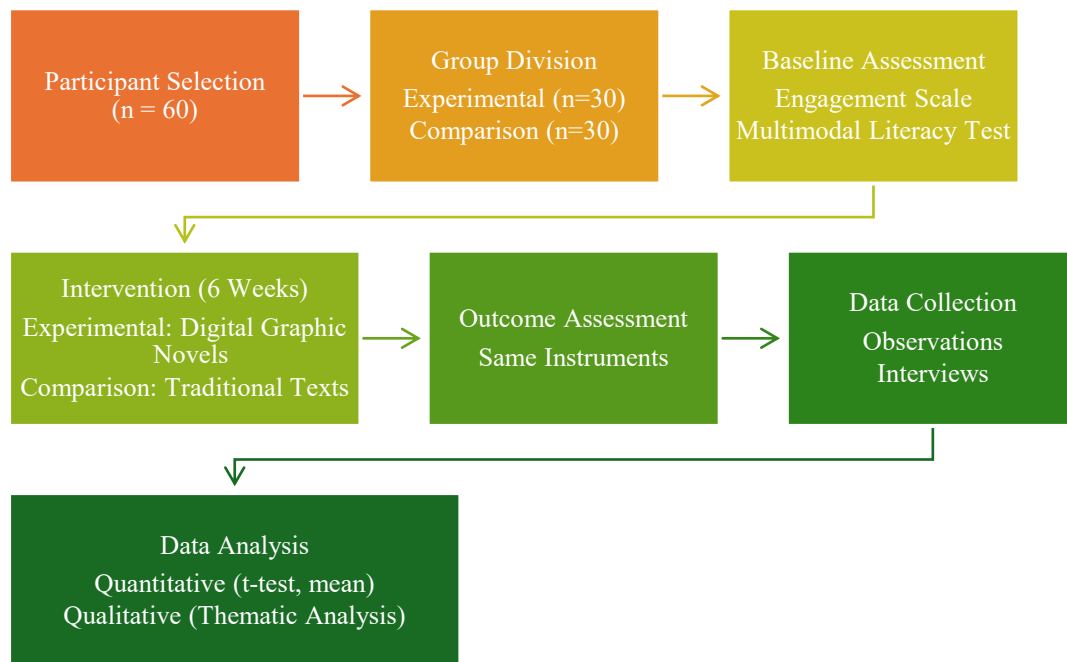


Figure 2: Research Procedure for Measuring Student Engagement and Multimodal Literacy

Figure 2 outlines the procedure for the study beginning with the selection of participants and the splitting of participants into experimental and comparison groups. It follows with baseline assessment of measures of engagement and multimodal literacy, a six-week intervention where the experimental group read digital graphic novels and the comparison group read traditional texts, followed by outcome assessment using the same measures, supplemented by data from observations and interviews. It ends with data analysis, integrating the quantitative approaches of t-tests and mean scores with qualitative thematic analysis to ascertain the impact of the intervention.

Procedure

The duration of the study was six weeks. To begin with, both groups were administered pre-tests to gather baseline data. For the duration of the study, the experimental group was provided digital graphic novels, and the comparison group was provided traditional texts. After the study, testing was administered to evaluate what, if anything, had changed as a result of the study. Observations were conducted throughout the study and post study interviews were conducted.

Data Analysis

The quantitative data was analyzed using descriptive statistics, and to identify the significant difference, if any, between pre-tests and post-tests, a paired sample t-test was conducted. The qualitative data, primarily interviews and observation notes, were analyzed using thematic analysis, to identify patterns especially, engagement and multifaceted learning.

Results

Participation of Students

Comparing the periods before and after the intervention, engagement scores certainly indicated the desired change. Using the results of the average scores and standard deviations, variation in the level of student engagement was identified. Table 1 below summarizes the results.

Table 1: Student Engagement Scores Following the Intervention

Group	Mean Score	Standard Deviation
Experimental (n=30)	4.2	0.48
Comparison (n=30)	3.2	0.47

Table 1 shows the engagement level of students after instruction. The experimental group had a higher mean engagement score, in comparison to the other group, suggesting the former showed greater behavioral, emotional, and cognitive engagement, while learning. The standard deviations were similar, indicating uniformity in responses for both groups. The experimental group demonstrated a greater level of positive average engagement score as compared to that of the comparison group.

Outcomes of Multimodal Literacy

Temporarily, the guidelines for assessing multimodal literacy performance were based on the critical assessment of visual-textual and digital components. The results are given in Table 2.

Table 2: Multimodal Literacy Scores Following the Intervention

Group	Mean Score (%)	Standard Deviation
Experimental (n=30)	78	6.2
Comparison (n=30)	62	5.8

Table 2 summarizes the students' performances in multimodal literacy and, in particular, their performance in the analysis and interpretation of visual and textual elements. The experimental group had a higher average score in positive percentages than the comparison group exhibited, which means that the experimental group had a greater achievement level in the tasks of multimodal literacy. The disparity within groups is moderate, as the standard deviations indicate. Higher multimodal literacy scores were achieved by the experimental group in comparison to the control group.

Qualitative Data

The qualitative data in the form of field notes and interviews indicated that patterns were similar across the board. Improved engagement, better visual-textual reading, and enriching positive learning experiences were the three major themes. These themes are summarized in Table 3.

Table 3: Qualitative Themes Overview

Theme	Description
Increased Participation	Students showed active involvement during learning tasks
Visual-Textual Understanding	Students effectively connected images with written content
Positive Learning Experience	Students expressed interest and motivation towards digital materials

Table 3 provides an overview of the main qualitative themes arising from classroom observations and student interviews. The findings express active participation, a deeper comprehension of multimodal

components, and an overall favorable response to the incorporation of interactive digital graphic novels into classroom activities.

Data from observations pointed to an increased classroom engagement for students who had access to interactive digital graphic novels. Student interview responses stressed that the interactive components were beneficial for students to comprehend the story and retain their attention.

Discussion

This study assessed the level of student engagement improvement through the use of interactive digital graphic novels. It found improved engagement scores; suggesting students were more behaviorally, cognitively, and emotionally invested; more active; and more involved. This study's improvements in engagement corroborates prior findings of enhanced motivation and engagement due to the use of digital and multimodal. The study also attributed improved multimodal instruction outcome due to students developing integrated visual and verbal communication skills while supporting the pre-existing hypotheses of improved critical thinking and comprehension due to instruction. This study cites improved engagement and literacy coping findings in digital storytelling and graphic narratives. The digital graphic novels' interactive features; particularly, visual sequencing and clickable panels, were attributed to sustained active meaning-making. It also appears students were more deeply engaged in the content because the design aligned with the students' digital lifestyle. This study found, as the students' familiarity with the interactive features increased, their engagement level increased. A few students struggled to navigate the interactive features, and the mobility was limited initially, but improved as time progressed. The findings conclude interactivity and multimodal design significantly improved student motivation and visual-text integration in secondary classroom.

Conclusion

This research focused on interactive digital graphic novels and how impact student engagement and multimodal literacy in secondary classrooms. The research showed improvement in both categories. The experimental group had an engagement mean of 4.2 compared to 3.2 in the comparison group. The experimental group also had better results in the multimodal literacy assessment with 78% compared to 62%. These results demonstrate that combining visual, textual and interactive elements promote more effective comprehension while also maintaining student interest and engagement. conclude that interactive digital narratives may promote learning that is more relevant to the student's everyday life. Teachers have digital tools that can help improve engagement. It also supports the needs of students with differing skill sets. Multimodal text should be included in the curriculum to help build the skills of modern literacy. The study had some limitations. The sample size was 60 students with a short time frame which may have impacted the results in the study's long-term effects. The study, also, may be limited in how the tools are used in an educational setting. Larger sample size, long term research and study of specific features may provide insight into the use of digital multimodal tools in the classroom.

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