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**ARTICLE**

# Implementation of a Digital Multimodal Workbook in EFL Academic Writing: Enhancing Students Engagement, Digital and Multimodal Literacies

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## ABSTRACT

Integrating digital technology into English as a Foreign Language (EFL) writing courses is essential for students' adaptation to the demands of contemporary communication. This study examines the implementation of digital multimodal workbooks (DMW) in academic writing courses for EFL students at a university in Indonesia. This study focuses on the implementation phase by employing a research and development methodology that uses the ADDIE (Analysis, Design, Development, Implementation, and Evaluation) model. Sixteen students completed five worksheets that were designed to guide them in creating multimodal academic writing projects. Data were collected through student reflections and interviews and subsequently analyzed thematically. The findings indicate that the structured implementation of DMW can engage students in the writing process, resulting in enhanced conceptual understanding and improved academic writing literacy. Students develop writing, critical thinking, confidence, communication, research, creativity, and collaboration skills while creating multimodal text using digital tools. Despite these positive outcomes, limitations were identified, including challenges in summarizing information and issues related to team collaboration. These findings demonstrate the value of structured support for addressing these challenges. This study aligns with contemporary language learning theories and better equips students with meeting the demands of digital communication. To maximize the benefits of DMW, educators should focus on providing targeted support for synthesizing information and collaborative work.

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Further research could explore adapting DMW to various educational contexts to refine its effectiveness and address these challenges.

***Keywords:*** English as a Foreign Language; Digital Technology Integration; Addie Model; Innovative Pedagogy; Multimodal Project

# 1. Introduction

The approach to teaching English as a Foreign Language (EFL) has evolved significantly with the advancement of digital technology. Traditional text-based methods are now considered insufficient to equip EFL learners with the skills needed to navigate the increasingly complex demands of modern digital communication [1–3]. A key limitation of these traditional approaches is their emphasis on native speaker norms, which may not reflect the realities of global communication. For instance, in Taiwan, English instruction is often modeled after native speakers, despite students' greater likelihood of interacting with non-native speakers internationally. Consequently, these methods do not adequately prepare students for effective communication in diverse multilingual contexts [4].

In addition to this linguistic gap, traditional methods often fail to incorporate technology to enhance the language learning experience. The integration of artificial intelligence (AI) and digital tools such as ChatGPT has emerged as a promising solution. These technologies offer real-time feedback and interactive support for skills such as speaking and writing [5]. AI-powered tools enable personalized learning experiences, allowing students to practice their conversational skills and to receive targeted feedback. They also assist with academic writing by providing grammar corrections, vocabulary suggestions, and structural guidance [6]. Consequently, curricula that do not leverage technology risk fil to prepare students for the challenges of global communication [7].

Traditional methods often overlook cultural dimensions, which are critical for developing intercultural communicative competence. In Hong Kong, teachers often recognize the need to integrate local and international cultures into EFL instruction, but they frequently lack clear strategies for implementing this integration. This suggests that conventional approaches are not sufficiently flexible to accommodate the diverse cultural contexts that are crucial for meaningful global interactions [8]. Furthermore, emotional barriers such as foreign language anxiety can hinder students' willingness to communicate in English. Traditional methods that prioritize grammar and vocabulary for test performance often neglect these emotional factors, resulting in less effective instruction [9]. Despite these limitations, it is important to recognize the merits of traditional approaches to certain aspects of language learning.

Many university students have indeed become effective academic writers through traditional text-based pedagogies. These methods have successfully developed foundational skills in grammar, vocabulary, and academic discourse, enabling students to produce well-structured essays and research papers that meet academic standards. However, while these traditional methods have proven successful in developing core writing skills, the evolving landscape of communication necessitates a reevaluation of our pedagogical approaches. Today, effective communication increasingly involves the integration of multiple modes, such as visual, audio, video, and interactive media [1]. Although traditional pedagogies have developed strong writers in the past, they are no longer sufficient on their own to prepare students for the complex and multimodal communication demands of the contemporary world. In response to these changing demands, educators are increasingly turning to multimodal pedagogies to bridge the gap between traditional writing skills and contemporary communication needs. The integration of multimodal pedagogy is not intended to replace but rather to complement and expand these fundamental skills, ensuring that students remain competitive and proficient in a rapidly changing global environment. This shift towards multimodal instruction is not merely a response to technological trends, but a recognition of the fundamental changes in how information is conveyed and consumed in modern society.

Multimodal competence has become increasingly vital in both general and academic communication s. Modern communication, whether in academic settings, professional environments, or daily interactions, often involves written

texts, images, diagrams, audio, video, and interactive elements. These studies highlight the importance of multimodal competence in communication [10,11]. Multimodal communication enables individuals to convey ideas, arguments, and information more effectively by combining various modes that support and enhance meaning [12]. For EFL learners, developing the ability to interpret and produce multimodal texts is essential for participating in global discourse, engaging with diverse audiences, and meeting the demands of digital literacy [13]. In an academic contexts, students are expected to create presentations, posters, video essays, and reports that integrate visual and textual information. In professional settings, they must navigate e-mails, social media, and collaborative platforms that require multimodal proficiency. Thus, fostering multimodal literacy ensures that learners are better equipped to succeed in today's interconnected, media-rich world. Recognizing the significance of multimodal literacy in contemporary communication, researchers and educators have turned their attention to technology-based approaches that can enhance EFL learning and address the shortcomings of the traditional methods.

Recent researches have highlighted the advantages of integrating digital and interactive technologies into EFL learning. Technology-based approaches offer more personalized and adaptive experiences through AI [14], greater willingness to communicate through digital activities [11], collaborative learning through platforms such as wiki-based writing projects [15], and expanded vocabulary through informal digital learning [16]. Despite these promising advancements, the integration of technology in EFL instruction is not without challenges. The challenges remain, including digital distractions [17], ethical considerations [18], and the need for comprehensive training [19]. There is also a notable lack of structured digital resources in the literature for teaching multimodal writing. Most current EFL writing curricula still focus on traditional, text-based composition and have yet to fully integrate multimodal communication methods.

EFL writing courses currently fail to address the need for multimodal communication for several reasons. First, a disconnect exists between the growing importance of multimodal literacy and the continued focus on functional literacy and exam-oriented practices. Although EFL writing and AR hold promise for enhancing motivation and cognition through context-based learning, their application in multimodal and contextualized EFL instruction remains limited and faces practical challenges [11,17,20]. Insufficient teacher training and a lack of understanding of how to utilize these tools further hinders progress in this regard. Additionally, there is a pressing need for empirical research on adapting AI models to meet the linguistic and multimodal needs of EFL learners [21]. Although tools such as Grammarly and automated assessment systems have improved writing quality, issues such as writing anxiety and the provision of meaningful feedback persist [22,23]. Despite the availability of new technologies and instructional methods, their adoption in EFL writing courses remains limited, resulting in inadequate preparation to meet the demands of modern multimodal communication.

To address these gaps, Yana et al. [24] developed digital multimodal learning materials for EFL students at an Indonesian private university, to enhance their ability to understand and produce multimodal texts. This initiative includes a comprehensive needs assessment, integration of various modalities, and use of technology for language verification and citation management. However, despite their strong theoretical foundation, the practical implementation and evaluation of these materials face significant challenges. Therefore, this study aims to investigate the impact of implementing digital multimodal workbooks (DMW) on EFL students' academic writing. Specifically, it describes the implementation process, types of multimodal texts produced, technology used, challenges encountered, and impact on students' academic writing experiences in EFL contexts.

By investigating the implementation of digital multimodal workbooks (DMW) in academic writing classes, this study offers new empirical insights into effective practices for integrating technology into EFL instruction. It systematically examines the process, outcomes, and challenges of using multimodal materials and provide practical guidance for educators and curriculum designers. Ultimately, this study contributes to the advancement of EFL pedagogy by supporting the development of students' digital and multimodal communication skills, which are essential for academic and professional success in a globalized world.

Research question:

(1) What is the process of implementing a multimodal workbook in the context of an academic writing class?
(2) What types of multimodal texts are produced, what chal-

lenges are faced, and what impacts are experienced by EFL students after using the multimodal workbook in the academic writing classroom?

## 2. Literature Review

Digital transformation in education is revolutionizing teaching and learning practices by integrating digital technologies into the educational environment. This process aims to create more advanced and effective educational methods, particularly in higher education [25], which has become a priority. This shift towards digital integration is particularly evident in education, where institutions are actively seeking ways to leverage technology to improve learning outcomes. Institutions focus on establishing sustainable digital environments aligned with best practices to overcome challenges and deliver high-quality education. Education 4.0 has emerged as a key aim within this transformation, emphasizing the development of skills relevant to the Fourth Industrial Revolution [26]. Education 4.0 represents the culmination of these digital transformation efforts, which aim to align educational practices with the demands of an increasingly technology-driven world. While many institutions are still in the initial phases of digital transformation, focusing primarily on technological upgrades, there is growing recognition of the need for a comprehensive transformation model [27]. The COVID-19 pandemic accelerated this process, highlighting both challenges and opportunities to adapt to new digital modalities [28,29]. The global pandemic has served as a catalyst, accelerating the adoption of digital technologies in education and underscoring the importance of a holistic approach to digital transformation. As digital transformation progresses, educational institutions must address implementation challenges, adopt strategic approaches, and ensure the effective integration of technologies such as artificial intelligence, the Internet of Things, blockchain, virtual reality, and cloud computing to meet modern educational demands and prepare students for the evolving global landscape [30]. While digital transformation reshapes the educational landscape, it also influences specific areas of learning, such as academic writing in the English as a Foreign Language (EFL) contexts.

Academic writing in the English as a Foreign Language (EFL) contexts is crucial for multiple reasons, serving as a tool for enhancing language proficiency, articulating ideas, and fostering critical thinking. The integration of digital tools and technologies has further enhanced the effectiveness of academic writing instruction in EFL settings, offering new avenues for feedback and improvement. One study highlighted how electronic peer feedback significantly improves EFL students' writing competencies and stimulates reflective thinking [31]. This indicates that academic writing enhances language skills and fosters higher-order cognitive processes among students. Advanced tools such as AI and automated feedback systems have proven beneficial in developing EFL students' writing abilities, with research on ChatGPT revealing improvements in content organization, linguistic range, and vocabulary [32]. Beyond providing direct writing assistance, these technological advancements contribute to building students' confidence and self-efficacy in their writing abilities. Academic writing tasks also influence self-efficacy, as beliefs about linguistic knowledge, self-regulation, and information management predict EFL academic writing performance [33]. This underscores the significance of academic writing in fostering student confidence and self-reliance. Additionally, metacognitive strategies play a crucial role in improving writing performance, functioning as higher-order constructs encompassing planning, monitoring, evaluating, and managing information [34]. Thus, academic writing in an EFL context is a multifaceted instrument that enhances language proficiency, fosters critical thinking, and supports learners' personal growth. The integration of advanced technological tools and metacognitive strategies further elevates their impact, making them indispensable in modern EFL education. Building on these foundational aspects of academic writing, the integration of digital multimodal workbooks (DMW) offers an innovative approach to further enhance EFL writing instruction.

Integrating digital multimodal workbooks (DMW) in an English as a Foreign Language (EFL) writing courses offers several benefits, enhancing both teaching and learning experiences. One of the major rationales for this integration is the improvement of written self-regulation and self-efficacy among EFL students. Research indicates that collaborative digital multimodal composing (CDMC) can enhance self-regulated writing strategies and boost self-efficacy [35]. This improvement is crucial, as these skills are fundamental for developing autonomous learners who can confidently engage in writing tasks. Digital multimodal composing (DMC)

has shown significant improvements in various aspects of L2 writing. For instance, in a study involving Chinese EFL learners, those engaged in DMC displayed marked improvements in areas such as text length, content, and clarity compared with a control group completing traditional writing tasks [36]. These improvements suggest that DMW can help students produce more comprehensive and coherent written work. Another advantage is the development of digital and multimodal literacy skills. In the digital age, literacy involves the ability to communicate effectively using multiple modes, such as text, audio, and video. Integrating DMW into EFL courses helps students acquire these skills, making them better prepared for communication in diverse contexts [20]. This multimodal approach encourages creativity and expression through various digital platforms that can increase student engagement and motivation. Digital multimodal learning environments facilitate effective learning and motivation. Abdelhalim [35] documented positive student perceptions of a digital multimodal education atmosphere, particularly regarding motivation, enjoyment, and the opportunity to practice diverse writing strategies. Such environments offer a rich context for students to enhance their self-confidence and writing capabilities, although their perceptions of their effectiveness vary across students. Finally, digital multimodal workbooks supported the development of critical thinking skills. The integration of DMC in educational settings requires students to analyze and synthesize information from multiple sources and formats, thereby promoting deeper learning and cognitive engagement [21]. These skills are imperative for students as they navigate complex language tasks and prepare for advanced communication in their academic and professional lives. To fully understand the impact of digital multimodal workbooks in an EFL context, it is essential to explore their unique features and capabilities is essential.

Digital multimodal workbooks are innovative educational tools that combine various modes of communication to enhance learning experiences. Unlike traditional single-mode textbooks, these digital resources leverage technology to present information through multiple semiotic modes, including text, images, audio, videos, and interactive features. Digital multimodal workbooks are specifically designed to be interactive, incorporating multimedia elements such as videos, animations, graphics, and sound to cater to diverse learning preferences and increase student engagement [37]. A key advantage of these workbooks is their ability to be customized and personalized to individual learner needs, enabling students to progress at their pace and select learning paths that suit their styles [38,39]. Overall, Digital Multimodal Workbooks exemplify a sophisticated approach to language learning, fostering interaction, creativity, and comprehensive skill development through structured and feature-rich design.

In conclusion, digital transformation in education, particularly in higher education and EFL contexts, reshape teaching and learning practices. The integration of digital technologies, accelerated by the COVID-19 pandemic has led to the emergence of Education 4.0, aligning educational practices with the demands of the Fourth Industrial Revolution. This transformation extends to academic writing in EFL contexts, where digital tools and technologies enhance instruction, feedback, and student outcomes. The introduction of digital multimodal workbooks (DMW) represents a significant advancement in this area, offering benefits such as improved writing self-regulation, enhanced self-efficacy, and the development of digital and multimodal literacy skills. As educational institutions continue to adapt to these changes, they must address implementation challenges and ensure effective integration of technologies to meet modern educational demands and prepare students for an evolving global landscape.

# 3. Materials and Methods

This study is part of a Research and Development (R&D) project that use the ADDIE model, which includes Analysis, Design, Development, Implementation, and Evaluation (**Figure 1**). The ADDIE model was chosen for its systematic approach to instructional design, which supported a structured and iterative research process. This process allows for a comprehensive needs analysis, efficient solution design, effective implementation strategies, and rigorous evaluation [40]. This study focuses on the implementation phase, as the analysis, design, and development phases have been previously documented and published [41–43]. The implementation phase involved applying the developed DMW to a real-world educational context.

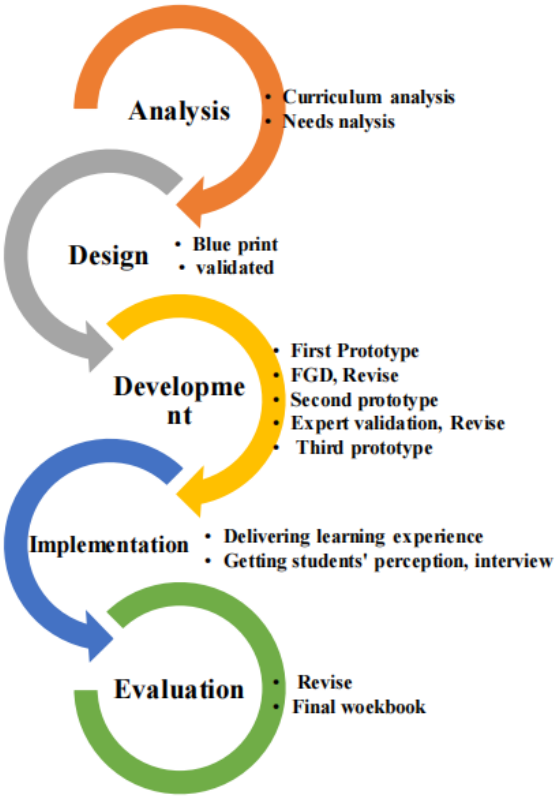


**Figure 1.** Modified ADDIE Framework used in this study.

## 3.1. Participants and Context

This research was conducted in an EFL academic writing course during the fourth semester of 2024 in the English Language Education Study Program, Faculty of Teacher Training and Education, at a private university in Indonesia. The sample size for this study was 16 students. These students were selected because they were EFL teacher candidates who completed paragraph writing in the first semester, essay writing in the second semester, and creative writing in the third semester. Their writing experience was considered to be sufficient for a more complex academic writing course. The course aims to further develop students' academic writing skills, including writing research papers and argumentative essays. This course builds on the basic writing skills acquired in the previous semester and challenges students to engage in more advanced forms of academic discourse. Additionally, this course serves as preparation for thesis writing in subsequent semesters, equipping students with the necessary tools and techniques to conduct and present research in their fields of study. The course structure and content were tailored to meet the specific needs of future EFL teachers, emphasizing the importance of clear, coherent, and well-supported academic writing in their professional development.

## 3.2. Instruments, Data Collection, and Analysis

This study was conducted through the implementation of a Digital Multimodal Workbook (DMW), which was designed and developed in stages [41–43]. The workbook consists of five units structured according to the learning objectives and follows the project-based learning syntax [24], as shown in **Table 1**. After the validation and piloting stages, the workbook was implemented with 16 students in an academic writing class. Semi-structured interviews were conducted with selected student representatives to evaluate the effectiveness of the DMW. Before the interviews began, the researchers explained the purpose of the study, maintained data confidentiality, and requested the participants' consent for audio recording for transcription purposes. The interviews (**Appendix A**) focused on students' experiences while using the module and the types and variety of multimodal products created, such as infographics, videos, or blogs, as

well as the process of creating these works from planning to completion, including the applications or digital tools used. In addition, the interviews explored the challenges faced by students, their efforts to overcome these obstacles, and the support they received from their lecturers or peers. The discussion also centered on the module's impact on improving academic writing skills, changes in self-confidence and learning motivation, and the acquisition of new skills such as digital literacy, collaboration, and critical thinking. Students were then asked to provide suggestions and recommendations for future workbook development. The interview data were qualitatively analyzed using thematic analysis. All interview recordings were transcribed verbatim and read thoroughly to understand the context and identify initial patterns. Coding was performed manually by labeling relevant sections of the data, after which the codes were grouped into main categories and themes. This analysis identified several dominant themes, including perceptions of the workbook's effectiveness in improving academic writing abilities, variety of multimodal products produced, challenges encountered, and impact of the workbook's use on the development of EFL students' writing skills. Triangulation was conducted by comparing the interview data with the observations results. All analysis results are presented thematically and reinforced with direct quotations from participants, thus providing a comprehensive and in-depth overview of the implementation and impact of DMW in academic writing class.

# 4. Results

## 4.1. The Process of Implementing a Multimodal Workbook in the Context of an Academic Writing Class

### 4.1.1. The Implementation of Worksheet 1

In the first and second weeks, the lecturer acted as a facilitator to initiate the learning project by presenting examples of multimodal texts to the students. The lecturer used these texts to introduce the learning objectives and topics for discussion. Subsequently, students work on Worksheet 1, which focused on the contextual orientation and understanding of the project objectives. In this unit, students explore and map concepts that support their learning to achieve the project goals. Once the students completed Worksheet 1, they conducted an evaluation using a self-reflection rubric to assess their engagement and achievements based on their perceptions. The results of the reflection (**Table 2**) show that, in general, the students had an adequate understanding of key concepts such as multimodality, the writing process, and research skills. None of the students completely failed to understand (score 1), although a small portion had a low level of understanding (score 2). Understanding multimodal elements was the weakest compared to the other components, indicating the need for more explicit examples and activities in early units.

### 4.1.2. The Implementation of Worksheet 2

In the third week, the meeting was conducted online using the Zoom application. The students completed worksheet 2. This activity included forming groups, selecting genres and topics, planning the text content, and drafting the project plan. The lecturer guided group discussions, provided suggestions regarding the relevance of the topics, and ensured that the planning aligned with the project objectives as well as the multimodal characteristics of the text.

In this unit, the students were instructed to form collaborative groups consisting of three to five members. As part of the facilitation process, the lecturer utilizes the polling feature in the WhatsApp Group (WAG), where students are asked to choose one from several available options such as "Search Engine," "Mendeley," "Quillbot," "Grammarly," and "Turnitin." These labels do not serve as project themes; instead, they serve as identifiers for each group. Students were free to choose the group name they wanted and join according to their preferences. This method helps speed up the group formation process, encourages student independence, and ensures an organized distribution of group members. The use of digital platforms such as WhatsApp reflects a multimodal and flexible learning environment promoted through the integration of multimodal environments and project-based approaches. At the end of the second worksheet, students engaged in another reflection. The results of this reflection (**Table 3**) show that all respondents stated that they were actively involved in the project planning process, including determining genre, topic, and implementation strategies. Involvement in determining the project topic and planning was categorized as very high and consistent (100%), whereas contributions to choosing the genre were slightly

more varied, with one student feeling less involved. These findings indicate that the determination and planning unit successfully encouraged a sense of obligation and collaboration among the group members.

**Table 1.** The design of multimodal workbook.

| **Unit/Worksheets** | **Objectives** | **Materials Inputs (Text Form, Academic Writing Skills)** | **Technology Tools (Alternatives Software, App, AI Platforms)** | **Activities and Setting** | **Assessment Tools (Provided via Google Form Link or QR-code)** |
|---|---|---|---|---|---|
| 1. How is multimodal text in the academic context? | Student understand the context and concept of the project | – What is multimodal project in academic writing?<br>– How to write well in academic context? | To work individually and in Group:<br>– Microsoft office<br>– WhatsApp<br>– E-mail<br>– Google workspace for education (GWE)<br>– Zoom<br>– etc.<br>To manage reference:<br>– Mendeley<br>– Zotero<br>– Endnote | – Get into the prompt and driving questions<br>– Explores the materials, and take notes the concepts<br>– Map or summary the concepts<br>– Share the concept to the class<br>– Do a self-checklist<br>– Use technology tips to obtain the appropriate technology support. | A rubric of self-checklist |
| 2. How to do? | Students choose and plan the project | – Model of academic writing genres<br>– Model of multimodal essay<br>– Model of a project plan | To research information:<br>– Publish or Perish<br>– Google Scholar<br>– Research Gate<br>– Semantic Scholar<br>– etc.<br>To plan a project:<br>– Trello<br>– Monday.com<br>– etc. | – Form a Group of three to five<br>– Explore the model of the academic writing genre<br>– Explore the model of multimodal essay<br>– Select one of the academic genre and a topic<br>– Decide a specific target and plan the project<br>– Use technology tips to obtain the appropriate technology support. | A rubric of self-reflection |
| 3. Creating multimodal text | Student create the product | – Writing process | To support the writing process:<br>– ChatGPT<br>– ProWritingAid<br>– Grammarly<br>– Quillbot<br>– Turnitin<br>– etc.<br>To convert mono text to multimodal/digital multimodal text:<br>– Canva<br>– Prezi<br>– iMovie<br>– etc. | – Brainstorming the topics<br>– Searching the topics information<br>– Outlining<br>– Drafting<br>– Use technology tips to obtain the appropriate technology support. | A rubric of self-reflection<br>A peer-rubric of writing process |
| 4. Checking the content and product | Student analyze dan revise the product | – Academic writing elements | To share a project result:<br>– Podcast<br>– YouTube<br>– Instagram<br>– TikTok<br>– etc. | – Reviewing<br>– Revising<br>– Proofreading<br>– Editing<br>– Use technology tips to obtain the appropriate technology support. | A rubric of self-reflection<br>A peer-rubric of proofreading |
| 5. Sharing the final product | Student publish their final product | – Multimodal element and Principles<br>– Multimodal presentation | | – Converting or completing the final draft with relevant multimodal elements<br>– Presenting the final draft or products<br>– Use technology tips to obtain the appropriate technology support. | A peer-rubric of final product A peer-rubric of multimodal presentation |

**Table 2.** Self-reflection on the worksheet (unit 1).

| Statements | Self-reflection Rating Score (%), n = 12 | | | |
|---|---|---|---|---|
| | 1 | 2 | 3 | 4 |
| My understanding of the multimodal concept. | 0 | 8.3 | 75 | 16.7 |
| My understanding of multimodal elements | 0 | 33.3 | 66.7 | 0 |
| My understanding of the writing process | 0 | 8.3 | 75 | 16.7 |
| My understanding of writing skills | 0 | 16.7 | 58.3 | 25 |
| My understanding of research skills | 0 | 16.8 | 75 | 8.3 |

**Note**: 1 = I do not understand; 1 = I do not understand; 2 = A bit of an understanding; 3 = Understood; 4 = Well understood.

**Table 3.** Self-reflection on the worksheet (unit 2).

| Statements | Self-reflection Rating Score (%), n = 13 | | | |
|---|---|---|---|---|
| | 1 | 2 | 3 | 4 |
| I contributed to group discussions to determine the project's genre. | 0 | 7.7 | 46. 2 | 46. 2 |
| I contribute to group discussions to determine project topics. | 0 | 0 | 69. 2 | 30.8 |
| I contribute to group discussions to establish project plans. | 0 | 0 | 53.8 | 46. 2 |

**Note**: 1 = No contribution; 2 = contributed somewhat; 3 = contributed; 4 = highly contributed.

### 4.1.3. The Implementation of Worksheet 3

In the fourth and fifth weeks, students worked together to complete Worksheet 3, which included activities such as research, summarizing, paraphrasing, citing, listing references, creating an outline, and drafting the initial version of their writing. The students developed ideas based on the sources of information. On this worksheet, each group actively engaged in various academic writing processes, including searching for relevant information from digital sources, analyzing content, taking notes, paraphrasing specific sections, and preparing proper citations. At the end of the worksheet, students reflected on their involvement in the core processes of the project, such as formulating questions, searching for and organizing information, and analyzing data relevant to the project objectives.

Most of the students showed high levels of engagement (**Table 4**). A total of 72.7% of the students agreed and 18.2% strongly agreed that they contributed to group discussions when formulating the project questions. Only one student (9.1%) felt less involved with the unit. This indicates that the process of formulating questions was successful in encouraging collective participation within groups. Regarding data collection for answering the project questions, 45.5% of the students felt very active, 36.4% felt quite active, and only 9.1% showed low involvement. These findings suggest that most students understand the importance of the research process as a foundation for developing their projects. Engagement in organizing information was also quite high, with 54.5% of students strongly agreeing that they were active in managing information relevant to the project's goals, and 36.4% agreeing. Only one student contributed to this study. Similarly, in the analysis and conclusion, 91% of the students reported being active (with scores of 3 or 4), whereas only one student reported being less involved. This shows that most students demonstrated strong critical thinking skills in processing and drawing conclusions from the project data. Overall, these reflections demonstrate students' strong engagement in all the core processes of the project. However, the presence of a small number of less active students indicates that guidance and division of roles within the group still need to be strengthened. Therefore, strategies such as explicitly assigning collaborative roles, using analytical tools such as information charts or thinking frameworks, and tracking individual contributions can be implemented to encourage more equitable participation and enhance accountability in teamwork.

### 4.1.4. The Implementation of Worksheet 4

After the initial draft was prepared, the students completed Worksheet 4 in week six. This unit involves receiving feedback from lecturers and peers, revising content, and proofreading to correct grammatical errors, spelling, and coherence. The lecturer acts as an evaluator and editor, providing constructive comments, while the students develop a reflective attitude and the ability to independently revise their writing. At the end of Worksheet 4, they reflected on their own learning. The results of the reflection (**Table 5**) show that regarding participation in group discussions to provide feedback on drafts from other groups, 40% of respondents rated themselves as having contributed somewhat,

while 60% felt they had contributed significantly. Regarding the conversion of the revised drafts into final products, 20% reported contributing somewhat, 20% contributed, and 60% contributed highly. Regarding assistance with proofreading and editing project drafts, 10% of the respondents indicated that they contributed somewhat, 40% contributed, and 50% contributed significantly. These ratings suggest that most participants felt that they made significant contributions to various aspects of group project work, particularly in finalizing drafts and providing feedback to their peers. This means that students were quite active in the revision and finalization processes of the project. However, cross-group collaboration in the form of feedback remains an area that requires improvement.

**Table 4.** Self-reflection on the worksheet (unit 3).

| Statements | Self-reflection Rating Score (%), n = 13 | | | |
|---|---|---|---|---|
| | 1 | 2 | 3 | 4 |
| I contributed to group discussions to formulate questions. | 0 | 9.1 | 18.2 | 72.7 |
| I have assisted in the search for pertinent data. | 0 | 9.1 | 36.4 | 54.5 |
| I contribute to organizing information relevant to the purpose and focus of the project. | 0 | 9.1 | 36.4 | 54.5 |
| I contribute to analysing and concluding information relevant to the purpose and focus of the project. | 0 | 9.1 | 45.5 | 45.5 |

**Note**: 1 = Highly inactive; 2 = Marginally active; 3 = active; 4 = Highly active.

**Table 5.** Self-reflection on the worksheet (unit 4).

| Statements | Self-reflection Rating Score (%), n = 10 | | | |
|---|---|---|---|---|
| | 1 | 2 | 3 | 4 |
| I participated in group discussions to provide feedback on drafts from other groups. | 0 | 40 | 40 | 20 |
| I contribute to converting the revised draft into the final product. | 0 | 20 | 20 | 60 |
| I have assisted in proofreading and editing the draft of projects | 0 | 10 | 40 | 50 |

**Note**: 1 = No contribution; 2 = contributed somewhat; 3 = contributed; 4 = highly contributed.

### 4.1.5. The Implementation of Worksheet 5

In the eighth week, students completed Worksheet 5. In the final unit, students transform their writing drafts into multimodal texts, present them in front of the class, either online or offline, and share the final products with the intended audience (e.g., through social media, blogs, or community forums). At the end of the worksheet, the students reflected on the project process and results. The reflection results (**Table 6**) show that students had a high level of engagement when presenting their projects in class (almost 90% with scores of 3 and 4), indicating confidence and willingness to contribute. The revision process based on feedback still faces challenges in terms of perceptions and equal participation among group members. Students are beginning to understand the activity of publishing projects outside the classroom, but they need further facilitation to maximize their impact. Overall, the implementation of a multimodal workbook in academic writing classes has shown positive results in enhancing student engagement and understanding. Through a series of structured worksheets, students can develop their academic writing, critical thinking, and collaboration skills. This project-based, multimodal learning process enables students to explore various aspects of writing, from planning to publication. Although there are some challenges, such as varying levels of participation in certain units and the need to enhance cross-group collaboration, this multimodal workbook successfully encouraged active learning and the development of relevant skills. To improve the effectiveness of future implementations, it is necessary to strengthen the aspects of peer feedback, provide more explicit collaborative strategies, and offer further support in the process of publishing students' work.

**Table 6.** Self-reflection on the worksheet (unit 5).

| Statements | Self-reflection Rating Score (%), n = 11 | | | |
|---|---|---|---|---|
| | 1 | 2 | 3 | 4 |
| I helped present the project's final product to the class. | 0 | 9.1 | 18.2 | 72.7 |
| I helped edit the final product based on feedback from other groups or lecturers. | 0 | 36.4 | 18.1 | 45.5 |
| I contributed to the publication the final product to a wider audience. | 0 | 0 | 72.7 | 27.3 |

**Note**: 1 = No contribution; 2 = contributed somewhat; 3 = contributed; 4 = highly contributed.

## 4.2. The Types of Multimodal Texts Produced, the Challenges Faced, and the Impact Experienced by EFL Students after Using the Multimodal Workbook in Academic Writing Classroom

The data presented in **Table 7** indicate a pronounced preference among respondents for infographics as the predominant format of multimodal texts. There are several reasons for this choice including novelty, accessibility, and clarity. Novelty and exploration were emerged the significant factors. As R-2 explained, "*I chose that infographic because, honestly, I had never made anything like an infographic or a poster before… I want to explore a project that hasn't been explored yet*." This response demonstrates students' willingness among to venture beyond their comfort zones and explore new digital forms. Accessibility and reach are also key considerations in favoring infographics. R-2 emphasized, "*YouTube is only digital, and PPT requires a presenter, so it seems like this infographic can have a wider reach*." The respondents also noted the use of QR codes to bridge print and digital access, further enhancing the format's accessibility. Clarity and simplicity were appreciated aspects of the infographics. The respondents valued the ability of this format to simplify complex information. R-2 stated, "*Every piece of information… can be understood, even by laypeople*," demonstrating a focus on audience comprehension and effective communication. An example of this shift towards multimodal literacy was provided by R-1, who consolidated written essays into infographics and merged traditional academic skills with digital literacy. As expressed: "*The essay is put into infographic form*." The choice of infographics demonstrates both a practical and pedagogical shift towards multimodal literacy. Students' value formats that enhance communication, engagement, and dissemination of information, reflect the evolving approach to academic and professional communication in the digital age.

**Table 7.** Multimodal texts produced and the reasons.

| Theme (Codings) | Excerpt of the Interview |
|---|---|
| (Theme 1)<br>(R-1) [0:40] - [0:45] | the multi-model text generated is an infographic from the essay, yes, so the essay is put into infographic form |
| (Theme 2)<br>(R-2) [1:02] - [1:46] | I chose that infographic because, honestly, I had never made anything like an infographic or a poster before if YouTube and PPT have already been done before, so I want to explore a project that hasn't been explored yet. Then, for this infographic, we tried using features like QR codes and links. So, if it's printed and placed in public areas, people can read it and scan the QR code. YouTube is only digital, and PPT requires a presenter, so it seems like this infographic can have a wider reach. |
| (Theme 1)<br>(R-1) [0:38] -[0:43] | The text created is in the form of essays, presented in infographics. |
| (Theme 1)<br>(R-2) [3:39] | infographics and video-graphics |
| (Theme 2)<br>(R-2) [3:46] - [4:06] | The first reason for choosing infographic products is because every piece of information, which is included there can be understood, even by laypeople, therefore, The appearance is simple yet attractive, so we made the product as appealing as possible so that the audience can understand the context we convey in the infographic. |

**Table 8** illustrates that the creation of multimodal texts predominantly utilized a range of digital tools, with Canva, Adobe Premiere, Photoshop, and CapCut being the most frequently cited. Students employed a collaborative workflow, as described by R-1: "*From the essay to making the outline, there was a team dedicated to it, who summarized the essay. Then I put it from the outline into the multimodal infographic*." Students encountered a learning curve with new technologies but found process reward. R-1 shared, "*As for touching links and hyperlinks… I just learned that too, but it turns out it's not that difficult, so I enjoy making it*." This experience highlights the need to develop new technical skills through hands-on learning. Creative integration is a key aspect of the production process. R-2 discussed layering creativity through the use of emojis and the unique writing styles, facilitated by Photoshop. This approach demonstrates how students leveraged technology to enhance the visual and stylistic elements of their projects. The choice of tools is often aligned with the specific requirements of each multimodal project. For instance, R-3 described the use of CapCut for video editing and BandyCam for screen recording, illustrating how students tailored

their technological approach to meet project needs. The data suggest that the integration of technology not only fostered technical skills but also prompted collaborative and creative problem-solving among students. As they navigated unfamiliar software and developed new competencies, the students engaged in a process of discovery and innovation, enhancing their digital literacy and multimodal communication skills.

**Table 8.** Technologies used.

| Theme (Codings) | Excerpt of the Interview |
|---|---|
| (Theme 3)<br>(R-1) [2:30] - [4:02] | If make the infographic, it's from Canva, the software application Canva.**(3)**<br>It just so happened that I made it myself. In the past, I only made posters, so the ideas were developed only a little, not as long as making text. Now, if the essay is converted into an infographic, we need the outline. The team was very helpful in that project because from the essay to making the outline, there was a team dedicated to it, who summarized the essay. Then I put it from the outline into the multimodal infographic. As for touching links and hyperlinks so that people can click on them, I just learned that too, but it turns out it's not that difficult, so I enjoy making it. |
| (Theme 3)<br>(R-2) [4:27] - [5:07] | for AI itself, our group uses Adobe Premiere, Adobe Premiere and for the application itself for the infographic creator, we use Canvas…editing the design part, after that, there's Photoshop, to create the writing, including all elements, as much as possible, like emojis, or like, writings that cannot be reached, edited without, so we use Photoshop. |
| (Theme 3)<br>(R-3) [7:06] - [7:25] | for the video itself, it was made using CapCut, CapCup for screen recording, using a capture card for screen recording, using the BandyCam application, and one more for inserting and editing the video, which was done using a video editor. |

Students reported a range of challenges during their projects (**Table 9**). One major issue involves team dynamics and participation, particularly group member disengagement. R-1 described a situation where "*there is one group member who… went silent… so we have to redo the plan from scratch*." This highlights the difficulties that can arise in collaborative work when not all the team members are fully engaged. Summarizing and paraphrasing complex essays into concise infographics is another significant challenge. R-2 expressed this difficulty, stating, "*Summarizing it into one important point is quite difficult; the difficulty lies in paraphrasing it.*" This reflects the cognitive demands for distilling extensive information into a more compact, visual format. To overcome these challenges, students employed iterative refinement strategies. This involved multiple reviews and revisions to their work. R-3 described their approach: "*Review it again, read it again, after getting the points, paraphrase it again… Choose again to include a few points that are really important in the infographic*." When faced with difficulties in summarizing and paraphrasing, students "*reviewed and paraphrased again*" until they successfully distilled the essence of the information. These findings demonstrate the value of adaptability, persistence, and iterative learning in multimodal composition process. The challenges encountered tested the students' teamwork and communication skills, requiring them to develop strategies for both content management and collaboration. This experience likely contributed to the development of valuable skills in information synthesis, teamwork, and problem-solving.

**Table 9.** Challenges and overcome strategies.

| Theme (Codings) | Excerpt of the Interview |
|---|---|
| (Theme 4)<br>(R-1) [1:09] - [1:35] | the obstacles faced by the team at that time there are several members in the group but there is one group member who Suddenly, in the middle of the process, that person went silent, so from the beginning, we had already divided the tasks like in this meeting, for example, this person was supposed to do the outline, but that person is missing, so we have to redo the plan from scratch. That's really the obstacle. |
| (Theme 4)<br>(R-2) [5:37] - [6:21] | Its own difficulty, perhaps from how to summarize all the information in the essay to make it easier to understand and more concise., because in our project, we have many sources that we gathered, and we included all of them in one essay, so summarizing it into one important point is quite difficult, the difficulty lies in paraphrasing it, in summarizing it to the main point, and for that, maybe that's it, the rest is just about inserting the text, adding the image elements, there's no challenge in that, On its own. |
| (Theme 4)<br>(R-3) [6:26] - [6:54] | how to address it, review it again, read it again, after getting the points, paraphrase it again, after getting the gist, paraphrase it again after getting the gist, the essence of the text, it's not direct, I put it in, the infographic, but I, choose again to Include a few points that are really important in the infographic, the rest being points like rational explanations. |

**Table 10** illustrates that the process of engaging in multimodal projects had significant positive impacts across various skill domains. Writing skills showed notable improvement, with participants reporting increased confidence and competence in structuring and producing academic texts. For instance, R-1 noted, "*since that project and the program… I feel like I can take it more seriously*." The project also enhances collaboration and communication skills. The project facilitated improved teamwork and enhanced interpersonal interactions among participants. As R-1 stated, "*in terms of interacting with people, it has also increased a lot… we know what we need to do.*" This improvement in communication was further emphasized by R-3, who observed, "*at first there were difficulties, like miscommunication… but after a while it got better. It means there is an improvement in the communication process.*" Critical thinking and creativity were significantly bolstered. R-2 highlighted this improvement, saying, "*From how we want to write… how I could weave the writing into a scientific work, so it really improved*." This suggests that the participants developed a more nuanced appreciation for academic writing and its integration with scientific work. Time management and process awareness also exhibited positive changes. R-1 described a shift from unstructured to structured writing: "*After learning this, there are steps to follow… So, in this paragraph, it talks about this…*" This indicates a more organized approach to writing tasks and improved awareness of the writing process. Engagement in multimodal projects not only enhanced academic writing and digital literacy but also fostered higher-order skills. The iterative nature of the process promotes reflective practice and self-directed learning, contributing to overall personal and professional development.

**Table 10.** Creating proceed: impacts.

| Theme (Codings) | Excerpt of the Interview |
|---|---|
| (Theme 5)<br>(R-1) [5:44]- [6:12] | In my opinion, it has improved, Ma'am, because in terms of writing skills, I also happen to want to create multimodal texts again. So, if in the past I wanted to do it but was still hesitant about what the structure was or how to make it, since that project and the program (the steps in DW) came along, I feel like I can take it more seriously, … |
| (Theme 5)<br>(R-1) [6:16] - [6:34] | well, if it's about the team, in terms of interacting with people, it has also increased a lot because before we didn't know, I mean to communicate with those people, how to do it effectively so that the information gets across. But because of this project, we know what we need to do. So it's not always individual work. |
| (Theme 5)<br>(R-1) [6:57] - [7:25] | in my opinion, the impact actually increases. Because previously, when we were looking for sources, I wasn't really aware. what should I include. But here I have to look at it multiple times, then we need to delve deeper into the sources if we're looking for sources, and for creativity, it has also improved from earlier when we created multimodal texts, I want to upgrade and convert multimodal text into another form. |
| (Theme 5)<br>(R-1) [2:08] [2:41] | There was a time, ma'am, because, in the past, if I was given a writing assignment, I wouldn't write an outline or anything like that. So, whatever comes to my mind, I write it down. But, after learning this, there are steps to follow. So, I know how to write in a structured way. So, in this paragraph, it talks about this, in this paragraph, it talks about that. So, in the project, there are instructions to write the steps. |
| (Theme 5)<br>(R-2) [0:57] -[1:44] | If we think critically, of course, Ma'am, because with step-by-step processes, from how we want to write, we have to start from the beginning, I don't know where to start, or for example, after I read, but to combine those materials, ..... after I gathered the materials, after I read from several sources, how I could weave the writing into a scientific work, so it really improved how I could write something |
| (Theme 5)<br>(R-3) [8:05] - [8:22] | at first there were difficulties, like miscommunication and perhaps some opinions didn't quite align, but after a while it got better. It means there is an improvement in the communication process. |

# 5. Discussion

The integration of multimodal workbooks into English as a Foreign Language (EFL) academic writing courses has proven to be effective in enhancing student engagement and comprehension. Through the use of structured worksheets, students cultivate academic writing skills, critical thinking, and collaboration and engage in project-based and multimodal learning processes. Students create multimodal texts, such as infographics and video-graphics, which are selected for their effectiveness in conveying information, broad accessibility, and potential for exploring new media. These findings are consistent with the existing literature on digital transformation in education, particularly within the framework of Education 4.0, which emphasizes skills pertinent to the Fourth Industrial Revolution [22,23].

The presence of multimodal workbooks has enhanced student engagement, collaboration, and critical thinking, ex-

emplifying the practical implementation of digital transformation in classrooms. Prior research has corroborated the positive impact of digital and multimodal tools on EFL learning outcomes. For instance, Abdelhalim [35] and Xu [36] elaborated that digital multimodal composing (DMC) not only improves writing quality but also boosts students' motivation and self-confidence. This benefit is evident in the increased confidence and more structured writing processes of students who utilize multimodal workbooks.

The development of digital and multimodal literacy is further evidenced by students' ability to produce infographics and video graphics, supporting the notion that multimodal workbooks prepare learners for contemporary communication contexts and enhance creativity and technological competence [17,34]. Nonetheless, significant challenges persist, such as difficulties in summarizing information and unequal team collaboration, which are addressed through material review, paraphrasing, and task division reorganization. Challenges related to unequal participation reveal that technology alone is insufficient to overcome group dynamics or individual motivation, as affirmed by Giang et al. [27] who asserted that digital transformation necessitates comprehensive pedagogical and institutional changes and not merely technological integration.Theoretically, this approach reflects the principles of constructivist [44,45], and project-based learning (PjBL) [46–50], which emphasizes hands-on experience [51], as well as Kolb's experiential learning theory, practiced in four stages: concrete experience, reflective observation, abstract conceptualization, and active experimentation [52]. Additionally, the multimodal approach enriches the learning experience by using various communication modes such as linguistic, visual, aural, gestural, and spatial [2], as well as technological integration, which aligns with current trends in language learning [53–55].

Nevertheless, the efficacy of this approach is contingent on the students' digital preparedness. Identified challenges, such as deficiencies in digital literacy, limited access to devices, and inadequate internet connectivity, may exacerbate educational disparities. Additionally, we must address the integration of ethical principles and cultural relevance in technology use, as well as the potential for algorithmic bias in AI to ensure equity in language learning [56]. Therefore, we should balance the deployment of technology by considering socio-technical and the ethical challenges to avoid amplifying the existing inequities.

The design of this multimodal workbook aligns with the principles of Intercultural Communicative Language Teaching (ICLT) and Task-Based Language Teaching (TBLT), which advocates curriculum negotiation and heightened student engagement. This study corroborates the significance of collaborative activities in enhancing motivation, academic development, and access to supplementary materials [29]. However, there remains a need for additional support and scaffolding, particularly for students with limited digital skills or low participation levels. The present investigation highlights the discrepancy between the theoretical potential of digital multimodal resources and their practical impact in diverse classroom settings.

Regarding sustainability and transferability, while some studies link digital writing tasks with sustained improvements in metacognitive skills and self-regulation [33,34], this study questions the longevity of these positive impacts without sufficient ongoing support. Therefore, future initiatives to enhance effectiveness should concentrate on improving peer feedback, clarifying collaboration strategies, and providing additional support for the publication of student work to enhance students' motivation and engagement. Overall, the implementation of a multimodal workbook in EFL academic writing classes exemplifies the effective integration of various contemporary language learning approaches and theories, fostering a rich learning environment that supports active knowledge construction by students. However, to ensure more equitable and sustainable benefits, targeted pedagogical interventions, clarified collaboration strategies, and longitudinal research are necessary to ensure the sustainability and inclusivity of the multimodal digital approach in the future.

The implementation of a multimodal workbook in learning has significant pedagogical implications, particularly in transitioning the learning paradigm from a traditional to a more participatory and student-centered approach. Educators serve as facilitators who create authentic learning experiences, while students are afforded the opportunity to actively explore, collaborate, and construct knowledge through real-life experiences, consistent with constructivist and project-based learning principles. Furthermore, the use of five modes of communication—linguistic, visual, aural, gestural, and spatial, enables students with diverse learning styles to more

effectively express ideas and comprehend material, while also enhancing digital and multimodal literacy, which are essential in today's digital era. Consequently, students learn not only to write academically but also to develop crucial 21st-century skills such as critical thinking, problem-solving, digital communication, cross-cultural collaboration, and creativity, all of which are highly pertinent to the demands of Education 4.0 and the future workforce.

From the perspective of social and educational equity, multimodal workbook has the potential to either mitigate or exacerbate the digital divide. On the one hand, this approach can empower students to enhance their digital literacy; on the other hand, without sufficient infrastructure and support, students from disadvantaged backgrounds may risk falling further behind. Educational institutions must prioritize challenges related to device access, internet connectivity, and digital literacy. Additionally, educational institutions must anticipate ethical and inclusivity considerations, including the risks of algorithmic bias and lack of cultural sensitivity in technology use. Therefore, the design of a multimodal workbook should consider students' sociocultural backgrounds and ensure privacy protection and equitable access for all learners.

Practically, the use of a multimodal workbook promotes collaboration, however, variations in student motivation and participation levels remain a challenge. This necessitates more explicit scaffolding and collaboration strategies, as well as equitable formative assessments to ensure that all team members are actively engaged. Moreover, strengthening peer feedback is important for developing reflective skills, improving writing quality, and enhancing the learning community, although its effectiveness depends greatly on training on how to give and receive constructive feedback. Regarding sustainability and skill transferability, although writing skills and self-confidence were shown to improve, further research is needed on how these multimodal skills can be transferred beyond the classroom and maintained over the long term. Institutional support, opportunities for ongoing practice, and consistent curriculum integration are crucial to sustainability.

To support more effective implementation, educational institutions need to expand technical support, provide digital literacy training, and ensure adequate resources for both students and teachers to minimize the digital divide and enhance inclusivity. Curriculum development should also be adaptive to students' actual needs, dynamic in adopting new technologies, and consistent with instilling ethical values and local cultures. Furthermore, longitudinal research is crucial to evaluate the sustainability of skills acquired through multimodal workbook and to identify factors influencing their transferability and effectiveness in various learning contexts. Overall, these findings underscore the significant potential of the multimodal workbook as a pedagogical innovation relevant to 21st-century demands, while also highlighting substantial challenges in its implementation. The most important implication is the necessity of ensuring sustainability, equity, and diversity in access to learning experiences so that digital transformation can genuinely benefit all students equally.

# 6. Conclusions

This study offers valuable observations on the implementation and impact of digital multimodal workbooks (DMW) in EFL academic writing contexts. A structured approach using multimodal worksheets and project-based learning effectively engaged students and developed their academic writing, critical-thinking, and collaboration skills. Students successfully produced multimodal texts such as infographics and video graphics, demonstrating enhanced digital literacy and creativity. However, challenges such as summarizing information, unequal team participation, and technical difficulties, indicate that some students require targeted support and scaffolding. The positive impacts included improvements in writing skills, confidence, collaboration, critical thinking, and research abilities, with a structured approach to writing being particularly beneficial. The DMW approach aligns well with constructivist, project-based, and multimodal learning theories, thus supporting active knowledge construction. While DMW has the potential to enhance digital literacy, it may exacerbate existing inequalities if not implemented with adequate infrastructure and support for all students. Areas of improvement include strengthening peer feedback processes, clarifying collaboration strategies, and providing additional support for the publication of student work. Future research should focus on longitudinal studies to assess long-term skill retention and transfer, develop targeted interventions to support students with lower digital

literacy, explore ways to ensure more equitable participation and outcomes, and investigate how to integrate ethical considerations and cultural relevance better. Overall, this study demonstrates the significant potential of digital multimodal workbooks for enhancing EFL academic writing education.

## Author Contributions

Conceptualization, D.Y., Y.R., and H.H.; methodology, D.Y.; software, D.Y.; validation, D.Y., Y.R., and H.H.; formal analysis, D.Y.; investigation, D.Y.; resources, D.Y.; data curation, D.Y.; writing—original draft preparation, D.Y.; writing—review and editing, D.Y., Y.R., H.H.; visualization, D.Y.; supervision, Y.R. and H.H.; project administration, D.Y.; funding acquisition, Y.R., H.H. and D.Y. All authors have read and agreed to the published version of the manuscript.

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## Institutional Review Board Statement

Not applicable.

## Informed Consent Statement

Informed consent was obtained from all subjects involved in the study.

## Data Availability Statement

The data used in this study is available from the corresponding author upon reasonable request and is incorporated in the manuscript.

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## Conflicts of Interest

The authors declare no conflict of interest.

## Appendix A

**Table A1.** The core questions of the interview.

| |
|---|
| 1 (a) What type of digital text did you produce? (b) why choose that type? |
| 2 (a).How did you make it? |
| (b) What technology did you use? (c) what were the challenges, and (d) how did you overcome them? |
| 3 (a) What impact have you felt after taking the academic writing course using DW? Is there an improvement, for example, in: (b) writing skills, |
| (c) collaboration (d) communication, (e) critical thinking, (f) creativity, (g) Time management, (g) And so on. |
| 4 (a). Can this project (DW) be continued or reused? Or (b). Is there anything that needs to be fixed? |

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