

# Investigating L2 Grammatical Accuracy in Digital Multimodal Writing

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## ABSTRACT

This study examines and compares L2 grammatical accuracy in digital multimodal writing (DMW) and monomodal text-based writing (TBW). Utilizing a mixed-methods design, the research incorporates a dataset comprising 180 written texts, a questionnaire, and text-based interviews. Sixty EFL learners were assigned to two groups (TBW and DMW) and completed three writing tasks on identical topics. The findings reveal that there are no significant differences in grammatical accuracy between TBW and DMW. Moreover, learners' perceptions indicate that the integration of multi-semiotic recourses has no detrimental effect on grammatical accuracy. Additionally, learners adopted a preferred recursive strategy, involving text writing followed by integrating nonlinguistic components to complete and revise their DMW compositions. Consequently, two factors emerge as crucial in elucidating the comparable level of grammatical accuracy in DMW and TBW: (1) active engagement in each linguistic and nonlinguistic component, and (2) an awareness of the essentiality of the text component, necessitating the prioritization of the linguistic resource or the deliberate separation of text writing from other components within the DMW process. This study concludes with pedagogical implications and suggestions for further research.

## KEYWORDS

Digital Multimodality, EFL Learner Perception, Grammatical Errors, Second Language Learning, Writing Task

## INTRODUCTION

The rapid and unprecedented advancements in communication technologies have necessitated a reevaluation of the traditional notion of literacy (Alrajhi, 2023a). One manifestation of digital literacy, specifically relevant to English instruction, is digital multimodal composition (DMC), which encompasses the integration of different semiotic modes, such as text, static images, audio, and audiovisual elements, into a single digital product (Hafner, 2019). Recently, there has been a surge of interest in exploring DMC within the context of second language (L2) learning (Kim & Belcher, 2020), particularly in relation to L2 writing. This interest in DMC stems from the ever-growing utilization of technology for meaning-making in L2 instructional settings (Hauck & Satar, 2018), as well as the call for attention to multimodality as an essential aspect of communication (Kress, 2003).

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However, some researchers (e.g., Manchón, 2017; Qu, 2017) have expressed concerns that DMC, as an alternative to text-based writing (TBW), may hinder learners' development of the target language, as the potential effects of DMC on L2 competence have not been adequately examined. Previous research has relied primarily on qualitative case studies (Zhang et al., 2021) to explore the potential of DMC in L2 learning. Furthermore, limited empirical investigations have specifically examined the impact of digital multimodal writing (DMW) on L2 writers' attention to the text component (i.e., linguistic mode) and its influence on grammatical accuracy. Consequently, research has yet to establish conclusive evidence regarding the potential effect of DMW on language use. To contribute to the expanding body of research on DMC, the present study aims to investigate the effect of integrating multiple semiotic resources on grammatical accuracy in DMW. By addressing this research gap, the study endeavors to provide insight into the relation between DMC and L2 writing, shedding light on the potential implications for language learning and instruction.

## LITERATURE REVIEW

### The Concepts of Multimodal Composition and Multimodality

In the field of composition, a conundrum is observed in relation to defining multimodality-based writing (Prior, 2017). Several definitions, however, elucidating the concepts of multimodality and multimodal composition (MC) have been proposed in the literature. One such definition, put forth by Bowen and Whithaus (2013), characterizes MC as “the conscious manipulation of the interaction among various sensory experiences—visual, textual, verbal, tactile, and aural—used in the processes of producing...texts” (p. 7). In terms of multimodality and modes, Kress and van Leeuwen (2001) define the former as the “use of several semiotic modes in the design of a semiotic product or event” and the latter as “ways of representing information or the semiotic channels we use to compose a text” (pp. 20–22). Thus, these modes can manifest in different forms, such as linguistic, visual, spatial, aural, and gestural.

### Theoretical Motivation

The use of innovative digital tools in L2 education can spark the interest of L2 learners (Alrajhi, 2020). For language teachers striving to enhance the educational experience of their students, incorporating digital multimodal resources is inevitable (Veliz & Hossein, 2020). However, the integration of multiple semiotic resources into a single composition product has sparked controversy regarding the role and impact of DMC on L2 learning and development. One concern is that DMC may shift the attention of L2 writers away from language itself toward other forms of meaning-making (Qu, 2017). This raises questions about the extent to which language is prioritized in DMC and whether it may hinder the development of linguistic proficiency. Additionally, Casanave (2017) highlighted a potential negative impact on learners' academic writing and language use in DMC, as multimodality may encourage more entertaining and informal tasks, potentially overshadowing traditional writing practices. Manchón (2017) argued that multimodality can offer opportunities for L2 learning when it promotes cognitive processing of language within DMC; however, the linguistic mode in the process of DMC may not be regarded as the essential mode but rather as one constituent of the multimodal product. Consequently, Manchón (2017) pointed out that the extent to which this digital form of composition effectively facilitates the achievement of L2 learning objectives and caters to learners' needs remains unclear. Furthermore, concerns have been raised regarding the quality of L2 writing within the context of DMC (Chun et al., 2016).

### Research on DMC and Writing Performance

Several studies have explored the relation between DMC and L2 writing development. For instance, Dzekoe (2017) investigated L2 acquisition and writing revision in multimodal projects, revealing that

learners exhibited increased text revisions, leading to enhanced writing quality. This study suggested that DMC may facilitate attention to the linguistic aspect of multimodal tasks. However, separate phases were allocated to text writing, design, and the integration of other semiotic modes. Thus, learners were able to focus their attention on each task. Consequently, it is not unexpected that intensive focus on multiple textual revisions would lead to an improvement in the quality of the written text.

In another study, Vandommele et al. (2017) employed a pre- and post-test design, involving narrative and persuasive writing tasks, to examine the potential of DMC in fostering L2 development. The researchers found that DMC enhanced learners' confidence and willingness to engage in L2 writing. Moreover, DMC contributed to improvements in linguistic complexity and fluency, although there was no evidence of accuracy development. These findings, however, may be influenced by the novelty effect (i.e., DMC is engaging because it is a new experience), as the intervention involved a brief two-week period of DMC tasks. Additionally, the tests focused on text-only writing, suggesting that learners directed their attention solely to the linguistic mode. It remains unclear whether the inclusion of multiple semiotic modes in the post-test would have yielded similar linguistic gains, as other modes could potentially distract L2 writers from deliberate attention to the text.

Kim and Kang (2020) probed into L2 writing quality in collaborative DMC tasks, finding that learners paid sufficient attention to all modes, including language, while engaged in DMC. Nonetheless, the researchers acknowledged the possible influence of the novelty effect due to the limited number of tasks. Furthermore, the collaboration factor might have encouraged learners to attend to language in the multimodal products. It is important to note that this study focused solely on the argumentative genre in DMC tasks, providing no evidence of potential similar findings in other genres. More importantly, the analysis considered traditional texts in the pre- and post-tests, disregarding the actual writing in DMC products. Consequently, the direct impact of multiple semiotic resources within the writing tasks was not measured.

Another study conducted by Kim and Belcher (2020) examined accuracy and syntactic complexity in DMC and text-only essays. The findings indicated that text-only essays exhibited higher syntactic complexity levels, while accuracy levels were similar to those of DMC. However, the participants wrote about different self-selected topics, with only one traditional writing task and one DMC task guided by a pre-selected scenario (i.e., only two writing tasks on the same topic). Another limitation of this study is the small sample size, limiting the generalizability of the findings to other English as a foreign language (EFL) students in different contexts.

In a more recent study, Cho and Kim (2021) investigated EFL learners' writing quality in text-only essays and DMC. They compared DMC to traditional writing by utilizing a single academic reading-writing task. The findings indicated no significant differences in learners' writing performance between the traditional writing and DMC.

Another recent study by Xu (2021) investigated the impact of DMC on writing performance in an EFL setting. The study revealed that DMC had positive effects on certain linguistic features, such as fluency and overall complexity, but did not lead to accuracy development. This study employed a pre- and post-test design with two argumentative writing tasks, and learners focused their attention on the linguistic mode in the post-test since it was the only required mode. However, it remains unclear whether integrating other semiotic modes into the writing tasks would have yielded similar findings.

## The Present Study

The motivation for this study stems from the ongoing discussion surrounding the merits and role of DMC in L2 literacy development (Belcher, 2017). However, this discussion has largely relied on self-reported data and theoretical assumptions (Xu, 2021). Qu (2017) emphasized the need for research to investigate L2 learners' attention to the linguistic component within DMC in order to thoroughly scrutinize the potential of DMC in fostering L2 literacy. To date, the existing literature indicates a dearth of research on the impact of multimodal tasks on L2 writing quality and development (Xu, 2021). While some previous studies have explored L2 writing within DMC, there remains a notable

gap in examining the textual component of multimodal products, including linguistic accuracy (Zhang et al., 2021). Empirical research has yet to investigate this aspect across multiple DMC products. Put another way, while some studies have found positive effects of DMC, when utilized as a mediating phase, on the development of linguistic aspects of writing (e.g., Vandommele et al., 2017), these studies employed pre- and post-test designs focusing on text-only writing. Thus, it remains unknown whether the integration of multiple semiotic modes influences attention to the linguistic mode during the DMC design process. Furthermore, there is a scarcity of research examining the linguistic aspect of multimodal essays. By comparing TBW with DMW, valuable insights can be gained into the textual component of each task type (Oskoz & Elola, 2016). Despite some studies reporting positive gains in terms of writing complexity and fluency, little is known about grammatical accuracy in DMC, and the evidence regarding the positive, negative, or neutral effects of DMC on this linguistic aspect remains inconclusive.

Therefore, this study aims to bridge this gap and address language accuracy in DMW. To achieve this, it systematically compares TBW and DMW products from three writing tasks to investigate the quality of grammatical accuracy in both sets, as advocated for in DMC research (Kim & Belcher, 2020). Additionally, in alignment with Xu's (2021) recommendations, this study probes into learners' perceptions and awareness of L2 grammatical accuracy in DMW, an area that has received limited attention. Thus, two research questions guide this study:

1. Are there differences in L2 learners' grammatical error quantity, density, and probability between TBW and DMW tasks?
2. What are learners' perceptions of the impact of DMW on L2 grammatical accuracy?

## METHODS

### Participants

The study recruited a cohort of 60 sophomore-level Arabic-speaking English majors at a public university in Saudi Arabia. The participants' ages ranged from 20 to 26 years ( $M = 21.47$  years,  $SD = 1.780$ ). Prior to their enrollment in the English undergraduate program, the participants had an average of eight years of English-learning experience. In addition, they had successfully completed a mandatory four-month intensive English program as a prerequisite for official matriculation. Their English proficiency level corresponded to B1 on the Common European Framework of Reference (CEFR) scale. They attended a class (two groups), taught by the author in a language lab, that met once a week for three hours. One group was assigned to TBW tasks, the other to DMW tasks ( $n = 30$  for each group). Prior to their involvement in the study, all participants provided informed consent, indicating their voluntary participation.

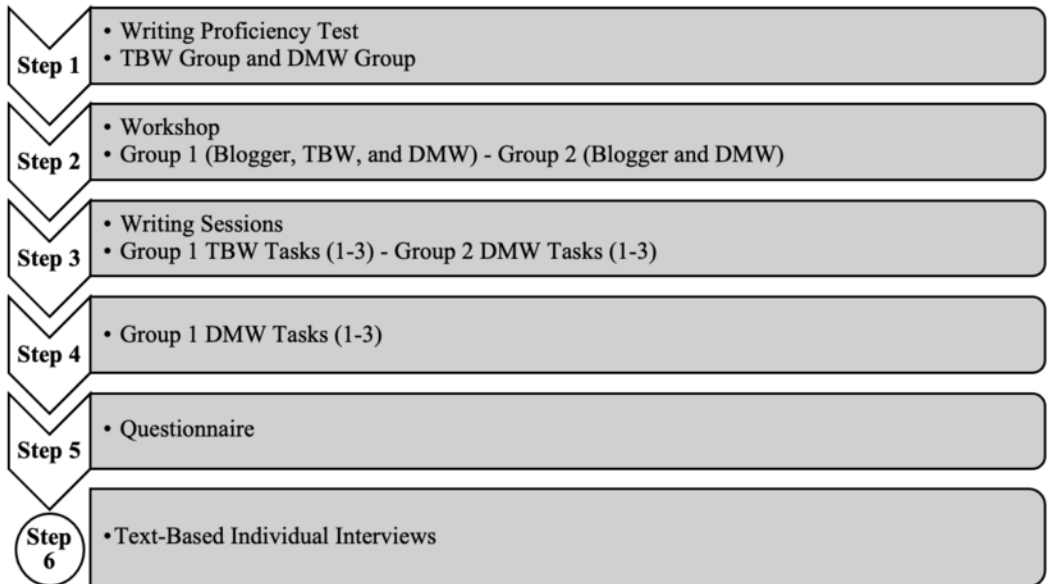
### Procedures and Analysis

Employing a mixed-methods approach for data collection (see Fig. 1) and analysis, the study spanned eight weeks (regular class sessions). The procedures encompassed five main phases: a writing-proficiency test, one workshop, three sessions dedicated to digital TBW and three dedicated to DMW, a questionnaire survey, and text-based individual interviews. To enhance the credibility and reliability of the findings, triangulation of multiple data sources was utilized (Creswell, 2009).

### Writing Proficiency

The initial phase of the study involved administering an online writing test to the students using a validated website ([writeandimprove.com](https://writeandimprove.com)), designed by Cambridge English. This test aimed to assess and confirm the participants' homogeneity in terms of L2 writing proficiency. In the language lab, equipped with computers and internet access, the students were presented with the following task:

Figure 1. Data collection



describe your reasons for learning English and explain why it is important to you. The test duration ranged from 35 to 40 minutes, and individual results were promptly displayed on the website.

The website provided an automated assessment of writing proficiency, utilizing the CEFR six-point scale (A1 = beginner level, A2, B1, B2, C1, and C2 = mastery level). To facilitate analysis, the displayed proficiency levels (ranging from A1 to C1) were converted into numerical scores (Chung & Ahn, 2022) as follows: A1 = 1, A2 = 2.5, B1 = 4.5, B2 = 5.5, and C1 = 6.5. To ensure the homogeneity assumption of writing proficiency between the two groups, the test scores were assessed for normal distribution using the Shapiro-Wilk test. However, the analysis revealed a violation of normality ( $p < .05$ ). Consequently, the Mann-Whitney U test, a nonparametric test, was employed. The results indicated no significant differences between the two groups ( $U = 364.00$ ,  $z = -1.454$ ,  $p = .146$ ), thus affirming their similar L2 writing proficiency, with mean values corresponding to the B1 level.

### *Blogger Workshop*

Following the proficiency test, all participant groups engaged in a 60-minute workshop focusing on the use of Blogger ([www.blogger.com](http://www.blogger.com)). This online platform is an accessible and user-friendly tool that can be utilized for TBW (Group 1), while also enabling the integration of other semiotic resources into the writing process (Groups 1 and 2). To illustrate the practical application of multimodal integration, a series of online designs exemplifying different integration modes were displayed to the students, using a large interactive whiteboard in the lab. Because of the tangible examples, the students could be cognizant of how different resources can be effectively integrated into a written product. Furthermore, the workshop aimed to elucidate the underlying purposes of incorporating different semiotic resources, as employing these resources can enhance the communicative effectiveness of written products.

Toward the conclusion of the workshop, the author distributed personalized invitations via email to each student in the two groups, granting them access to specific pages on Blogger. By accepting these invitations and following the provided instructions, the students were able to create new posts for each writing task assigned. Due to practical constraints such as limited class time and the number of tasks involved, the students in the DMW group were exempt from designing visual

and audiovisual materials. Instead, they were instructed to utilize internet resources to search for nonlinguistic components.

### *TBW and DMW Tasks*

In the language lab, as the third phase of the study, the students utilized Blogger during three in-class online-mediated L2 writing sessions. These sessions encompassed three TBW tasks for Group 1 and three DMW tasks for Group 2, with durations of approximately 40–45 and 55–60 minutes, respectively. To mitigate the potential effects of task type and genre (Alrajhi, 2023b) on grammatical accuracy, both TBW and DMW tasks were carried out on identical topics. Each writing session commenced with the students creating a new post on Blogger, where the assigned tasks were presented. For the DMW sessions, the students received specific instructions to integrate text, images, and audiovisual materials as semiotic resources. Upon completion of all monomodal writing tasks, the TBW group was directed to undertake three additional DMW tasks on the same topics as in the TBW phase. The inclusion of these additional DMW tasks aimed to elicit the Group-1 students' perceptions regarding the impact of DMW on grammatical accuracy. By eliciting further responses, the study sought to validate the findings obtained from the questionnaire.

The topics for these tasks were as follows: (1) your favorite sports/video game; (2) importance of, advantages, and disadvantages of social media; and (3) different ways in which students can improve English outside the classroom. These topics were carefully selected to minimize the influence of task difficulty on writing accuracy and fluency. Three criteria guided the selection of the topics to control for the effect of topic familiarity on the quality of written products (Yoon, 2017). First, the topics were relevant to the students' daily lives. Second, they represented three different genres commonly encountered by English majors during their university education, thus ensuring ecological validity. These genres included descriptive (Task 1), argumentative (Task 2), and expository (Task 3) compositions. Third, the topics were deliberately broad in scope, providing the students with ample opportunities to find and incorporate suitable semiotic resources within their DMW.

The students were not informed that their texts would undergo analysis for grammatical errors. Both the TBW and DMW sets of texts were examined for accuracy. The analysis entailed identifying various types of grammatical errors, which were categorized as either morphological, syntactical, or lexical (Wigglesworth & Storch, 2009), encompassing errors such as those related to articles, subject–verb agreement, word order, missing words, and commonly confused words. Moreover, the analysis included error density, which refers to the rounded percentage of grammatical errors per text, and error probability, operationalized as the number of grammatical errors divided by the total number of words in a text (Larsen-Freeman, 2006). The total number of words in each text was also considered.

Subsequently, a web-based grammar checker, Virtual Writing Tutor (VWT), available at <https://virtualwritingtutor.com>, was used as a computational assessment tool. The utilization of automated evaluation for writing analysis is a valid quantitative approach, as it enhances assessment objectivity and consistency while minimizing the likelihood of assessment inaccuracies (Godwin-Jones, 2018). The VWT provided a comprehensive count of grammatical errors, error density, and overall word count for each text.

To compare the grammatical accuracy of TBW and DMW across different tasks, SPSS Statistics 24 was employed. The differences in the aforementioned writing parameters were examined using a between-group text comparison design. The data were first checked for the assumptions of normality using the Shapiro-Wilk test. However, the analysis revealed a violation of the normality assumption ( $p < .05$ ) for scores related to certain accuracy parameters in different tasks. Therefore, both the independent sample t-test (for normally distributed data) and the Mann-Whitney U test (for non-normally distributed data) were conducted, and estimated effect sizes were calculated for significant differences.

### *Questionnaire Survey*

The Google Forms platform was utilized to develop and administer an online questionnaire. The questionnaire was constructed following an extensive literature review and was organized around two blocks. The first block comprised items relevant to demographic information, while the second block consisted of seven items designed to explore learners' perceptions of the effect of DMW on L2 grammatical accuracy. The students provided their responses using a five-point Likert scale ranging from strongly disagree = 1 to strongly agree = 5.

The analysis of the scale responses was based on the following: mean values between 1.00 and 2.60 indicated negative perceptions, mean values between 2.61 and 3.40 indicated neutral perceptions, and mean values between 3.41 and 5 indicated positive perceptions. The validity of the questionnaire items was examined by two expert researchers, and a pilot test was conducted to assess the internal consistency reliability of the questionnaire. The results confirmed that the items had suitable internal consistency (Cronbach's  $\alpha = .82$ ). The reliability of the items and the subsequent analysis of the questionnaire to obtain descriptive statistics were performed using SPSS Statistics 24. Upon completing the DMW tasks, both groups filled out the questionnaire, with the process spanning approximately five to six minutes.

### *Text-Based Individual Interviews*

In order to gain a deeper understanding of the findings obtained from the DMW analysis and to elucidate the responses obtained from the questionnaire, data collection included audio-recorded text-based individual interviews ( $n = 7$ , 12% of the total participants). These forms of interviews are "related to stimulated recall in that they use a stimulus (i.e., a text) as the focal point for the interview; however, they differ from stimulated recall in that they do not necessarily aim to study the writer's cognitive processes" (Polio & Friedman, 2016, p. 155). Each interview lasted approximately 11–18 minutes, during which the interviewees willingly engaged and provided informed consent for audio recording. The interviewees were presented with their own DMW products and were asked open-ended questions, such as, "How did you approach the DMW tasks?" and "What are your thoughts regarding attention to language and the integration of other resources in DMW?"

The interviews were meticulously transcribed and prepared for thematic analysis (Braun & Clarke, 2006). To ensure the reliability of the coding process, both the author and an expert researcher independently carried out the coding. Subsequently, an inter-coder reliability analysis was conducted, revealing a high level of agreement between the coders (Cohen's kappa = 0.83). Any discrepancies in coding were resolved through discussions. Through extensive and intensive exploration of the codes, subcategories emerged and were integrated and key themes, such as interest, attention, grammatical errors, strategies for DMW, nonlinguistic components, text quality, text writing, and accuracy, were identified based on the frequency and significance of the codes.

## **FINDINGS**

### **Grammatical Accuracy in Overall TBW and DMW Tasks**

Descriptive statistics (Table 1) reveal that the mean values of accuracy parameters pertaining to grammatical errors, error density, error probability, and overall word count in the combined TBW tasks and DMW tasks are relatively comparable. However, the analysis of grammatical errors, error density, and overall word count indicates a departure from normal distribution, as determined through the Shapiro-Wilk test ( $p < .05$ ). The results of the Mann-Whitney U test (Table 2) indicate no statistically significant differences between the two sets of texts in terms of grammatical errors ( $U = 3833.00$ ,  $z = -.624$ ,  $p = .533$ ), error density ( $U = 3970.50$ ,  $z = -.233$ ,  $p = .816$ ), and word count ( $U = 3806.50$ ,  $z = -.697$ ,  $p = .486$ ). These findings suggest that accuracy, as measured by grammatical errors, error density, and overall word count, is similar across both writing modes.

**Table 1. Descriptive statistics of accuracy parameters for combined TBW and DMW tasks\***

| Tasks | Grammatical Errors |       | Error Density (%) |       | Error Probability |      | Number of Words |        |
|-------|--------------------|-------|-------------------|-------|-------------------|------|-----------------|--------|
|       | Mean               | SD    | Mean              | SD    | Mean              | SD   | Mean            | SD     |
| TBW   | 6.06               | 3.156 | 3.23              | 1.469 | .026              | .014 | 222.03          | 31.619 |
| DMW   | 6.36               | 3.439 | 3.28              | 1.499 | .028              | .014 | 219.69          | 33.402 |

\**n* = 90 per mode.

Regarding error probability, the Shapiro-Wilk test ( $p > .05$ ) confirms that the data followed a normal distribution. Subsequently, the results of the independent sample t-test reveal no statistically significant differences between the two sets of texts;  $t(178) = -.539$ , ( $p = .590$ ), indicating that error probability is similar across both writing modes.

### Grammatical Accuracy in Individual TBW and DMW Tasks

The analysis of grammatical errors, error density, and overall word count of the first TBW and DMW tasks (Table 3) shows that the data violated the assumption of normal distribution, as indicated by the Shapiro-Wilk test ( $p < .05$ ). However, subsequent examination using the Mann-Whitney U test (Table 4) reveals no statistically significant differences between TBW and DMW in terms of grammatical errors ( $U = 448.50$ ,  $z = -.022$ ,  $p = .982$ ), error density ( $U = 398.00$ ,  $z = -.791$ ,  $p = .429$ ), and word count ( $U = 437.00$ ,  $z = -.192$ ,  $p = .848$ ). These findings demonstrate that accuracy performance in both writing modes, specifically regarding grammatical errors, error density, and overall word count, is similar in the first TBW and DMW tasks. Regarding error probability, the data followed a normal distribution based on the Shapiro-Wilk test ( $p > .05$ ). Furthermore, the independent sample t-test reveals no statistically significant differences between TBW and DMW;  $t(58) = .711$ , ( $p = .480$ ). This suggests that both groups have a similar level of error probability in both writing modes.

The analysis of the second TBW and DMW tasks (Table 3) indicates that the data are normally distributed for grammatical errors and error probability, as determined by the Shapiro-Wilk test ( $p > .05$ ). However, the data deviate from normal distribution for error density and word count, as indicated by the Shapiro-Wilk test ( $p < .05$ ). Furthermore, the independent sample t-test reveals no statistically significant differences between TBW and DMW in terms of grammatical errors;  $t(58) = -1.418$ , ( $p = .162$ ) and error probability;  $t(58) = -1.145$ , ( $p = .257$ ). These results show that the two groups exhibit a similar level of grammatical errors and error probability in both writing modes. Moreover, the findings from the Mann-Whitney U test (Table 4) indicate no statistically significant differences between TBW and DMW in terms of error density ( $U = 382.50$ ,  $z = -1.029$ ,  $p = .304$ ) and overall

**Table 2. Ranks of accuracy parameters for combined TBW and DMW tasks\***

| Writing Mode | Parameter          | Mean Rank | Sum of Ranks |
|--------------|--------------------|-----------|--------------|
| TBW          | Grammatical errors | 88.09     | 7,928.00     |
|              | Error density      | 89.62     | 8,065.50     |
|              | Word count         | 93.21     | 8,388.50     |
| DMW          | Grammatical errors | 92.91     | 8,362.00     |
|              | Error density      | 91.38     | 8,224.50     |
|              | Word count         | 87.79     | 7,901.50     |

\**n* = 90 per mode.

**Table 3. Descriptive statistics of accuracy parameters for individual TBW and DMW tasks\***

| Writing Mode       | TBW 1              | DMW 1              | TBW 2              | DMW 2              | TBW 3              | DMW 3              |
|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|
| Parameter          | Mean<br>(SD)       | Mean<br>(SD)       | Mean<br>(SD)       | Mean<br>(SD)       | Mean<br>(SD)       | Mean<br>(SD)       |
| Grammatical errors | 7<br>(3.414)       | 6.60<br>(2.860)    | 5.70<br>(2.654)    | 6.90<br>(3.800)    | 5.47<br>(3.235)    | 5.57<br>(3.559)    |
| Error density (%)  | 3.60<br>(1.567)    | 3.23<br>(1.194)    | 3.20<br>(1.157)    | 3.53<br>(1.570)    | 2.90<br>(1.605)    | 3.07<br>(1.701)    |
| Error probability  | .030<br>(.015)     | .027<br>(.011)     | .026<br>(.012)     | .030<br>(.015)     | .024<br>(.015)     | .026<br>(.016)     |
| Number of words    | 231.40<br>(34.162) | 234.63<br>(42.522) | 215.30<br>(35.155) | 217.60<br>(21.796) | 219.40<br>(22.812) | 206.83<br>(27.099) |

\* $n = 30$  per task.

**Table 4. Ranks of accuracy parameters for individual TBW and DMW tasks\***

| Writing Task | Accuracy Parameters | Mean Rank | Sum of Ranks |
|--------------|---------------------|-----------|--------------|
| TBW 1        | Grammatical errors  | 30.45     | 913.50       |
|              | Error density       | 32.23     | 967.00       |
|              | Word count          | 30.07     | 902.00       |
| DMW 1        | Grammatical errors  | 30.55     | 916.50       |
|              | Error density       | 28.77     | 863.00       |
|              | Word count          | 30.93     | 928.00       |
| TBW 2        | Error density       | 28.25     | 847.50       |
|              | Word count          | 28.67     | 860.00       |
| DMW 2        | Error density       | 32.75     | 982.50       |
|              | Word count          | 32.33     | 970.00       |
| TBW 3        | Word count          | 35.73**   | 1,072.00     |
| DMW 3        | Word count          | 25.27     | 758.00       |

\* $n = 30$  per task.

\*\*Significant difference ( $p < .05$ ).

words ( $U = 395.00$ ,  $z = -.814$ ,  $p = .416$ ). These results reveal that error density and overall word count are comparable across both writing modes.

In the context of the third TBW and DMW tasks (Table 3), the analysis indicates that the data follow a normal distribution for grammatical errors, error density, and error probability, as determined by the Shapiro-Wilk test ( $p > .05$ ). However, the data deviate from normal distribution for word count, as revealed by the Shapiro-Wilk test ( $p < .05$ ). Furthermore, the results of the independent sample t-test show no statistically significant differences between TBW and DMW in terms of grammatical errors;  $t(58) = -.114$ , ( $p = .910$ ), error density;  $t(58) = -.390$ , ( $p = .698$ ), and error probability;  $t(58) = -.456$ , ( $p = .650$ ). These findings suggest a similar level of grammatical errors, error density, and error probability in the two writing modes. However, when considering overall word count, the Mann-Whitney U test (Table 4) reveals a statistically significant difference between the TBW and DMW groups ( $U = 293.00$ ,  $z = -2.324$ ,  $p = .020$ ), with a moderate effect size ( $r = -0.30$ ). This indicates that the TBW group has a significantly higher word count than the DMW group.

## Learners' Perceptions of the Effect of DMW on L2 Grammatical Accuracy

The analysis (Table 5) reveals noteworthy findings regarding learners' perceptions. Notably, the mean value of the majority of the items do not fall within the positive range. While Items 1, 4, and 7 are within the negative range, Items 2, 5, and 6 fall within the neutral range. However, Item 3 stands out with a mean score of 3.47, indicating a perception that falls within the positive range. Overall, the mean value for all items is within the neutral range ( $M = 2.87$ ). These findings suggest that the learners do not perceive DMW as hindering their attention to text grammatical accuracy. Particularly, the item with the highest disagreement among the learners is Item 7 ( $M = 2.25$ ), indicating that the learners did not encounter difficulties concentrating on text grammatical accuracy while integrating visuals and audiovisuals in DMW. On the other hand, the learners, to some extent, perceive DMW as beneficial in reducing the amount of text writing, ultimately resulting in a decrease in grammatical errors.

### Text-Based Individual Interviews

Given that DMW was a novel experience for the majority of the interviewees, their reflections highlight its intriguing nature and ability to engender a sense of satisfaction in writers. The students recognized that DMW effectively conveys meaning to readers. Notably, three sources of satisfaction emerged, encompassing aspects such as writing quality, the integration of visuals, or the combination of both elements:

*For readers, an essay with visuals is more effective than just text. From this experience I felt like a designer. I felt I had achieved something important with it [DMW]. After I revised, I felt they delivered information better. (Student 5)*

*I guess I did well in the tasks. I revised my text to correct mistakes in grammar. For images I chose them carefully, so I think I did successful writing with visuals. Maybe visuals helped me much to do it successfully because they are fun. (Student 2)*

*I was fully satisfied with all elements in my last essays; the images and text, and I was focusing on a specific thing...I am satisfied with everything. (Student 1)*

**Table 5. Learners' perceptions of the effect of DMW on L2 grammatical accuracy (n = 60)**

| Item                                                                                                                                              | M    | SD    |
|---------------------------------------------------------------------------------------------------------------------------------------------------|------|-------|
| 1. DMW distracts me from focusing on text grammatical accuracy.                                                                                   | 2.55 | 1.064 |
| 2. In DMW, I do not need to ensure text grammatical accuracy because images and audiovisuals can help to convey meaning.                          | 2.73 | 1.118 |
| 3. Integrating images and audiovisuals in DMW can help me to avoid much writing that can cause grammatical errors.                                | 3.47 | 1.321 |
| 4. When I revise my DMW, I pay more attention to images and audiovisuals and less to text grammatical accuracy.                                   | 2.57 | 1.212 |
| 5. In DMW, I worry about readers' impression of images and audiovisuals more than my text grammatical accuracy.                                   | 3.20 | 1.299 |
| 6. Text grammatical accuracy should be treated as less important than the relevance and integration of images and audiovisuals in DMW assessment. | 3.35 | 1.191 |
| 7. It is difficult to focus on text grammatical accuracy and the integration of images and audiovisuals in DMW.                                   | 2.25 | 1.216 |
| Total Mean                                                                                                                                        | 2.87 |       |

While the students exhibited an interest in DMW, it is noteworthy that over half of them noted its potential impact on attention to language. Despite this perception, the students remained attentive to grammatical accuracy across all DMW tasks, and the majority of them reported that they did not prioritize images and audiovisuals over the textual component:

*Because I write parts of text first, I focus on grammar and the manner of writing in general first, then I insert visuals. I was basically focusing on grammar before I add images. In this task, I consider writing like just text. I write like usual, then I think about the visuals to insert. (Student 6)*

Different strategies were utilized by the students in DMW, including initially composing the complete textual content, followed by the subsequent insertion of relevant visuals and audiovisuals. However, the majority of the students expressed a preference for a recursive strategy, characterized by the iterative process of composing a segment of text and then incorporating a pertinent image and audiovisual component:

*I write a paragraph, then I search for a picture suitable for the paragraph, then the second paragraph, then I search for a video suitable for this paragraph, a step by step in all tasks...Focusing on organizing visuals makes text quality better because I have to organize. When I am done with this idea then it is time for an image or video, so I organize them this way, idea by idea, all linked with each other. (Student 4)*

During the revision process of DMW products, two distinct approaches were utilized by the students. Text-oriented students demonstrated a strong emphasis on ensuring grammatical accuracy in text. Multimodality-oriented students directed their attention more toward images and audiovisuals or the relation between the nonlinguistic components and the accompanying text. Almost all students noted that the presence of visuals and audiovisuals within DMW did not distract them from remaining attentive to text grammatical accuracy. They mentioned that text writing constituted a distinct phase within the process of DMW:

*When I revise my essays, I focus on grammar, the most important thing for me, I correct grammar mistakes, then I view images and videos. When I am done writing even with mistakes, I insert images and videos, they are right regardless of mistakes. (Student 2)*

*I quickly check my work and I focus on the link between texts and visuals. For grammar, because I totally focused on it when I was writing the text, so I do not revise my text...Images and videos do not distract me from grammar. I focused completely on what I was doing in a specific moment. I tried my best to do all the parts of the tasks correctly. If there were mistakes, it does not mean I did not care, but because I had no idea they were mistakes. (Student 5)*

A divergence in perspectives emerged regarding the perceived impact of task topics on the quality of text and content. Specifically, some students expressed the viewpoint that the assigned topics in the DMW tasks were of a general nature:

*I think one of the best things in the activity was the topics, because they were more general. I think topics can strongly influence my focus on the quality of the text. (Student 1)*

*I felt that the topics we had were general, they were easy to find videos and pictures for. I think the topics were balanced for attention to text and pictures. (Student 6)*

While the majority of the students acknowledged that DMW can result in a reduced amount of text, thereby helping to avoid more grammatical errors or mistakes, it is noteworthy that this perspective did not actively manifest during their engagement in DMW:

*I keep writing, sometimes more than enough, until I completely express my idea. I can use visuals to shorten text. Writing less can help to reduce mistakes in grammar. But I did not think about it. Other people maybe do that by adding visuals, and writing is going to be easier with less mistakes. (Student 2)*

The majority of the students reported that when readers view their DMW products, they would focus on text grammatical accuracy or both the images and audiovisuals and grammatical accuracy. Notably, some students mentioned that their texts were already grammatically accurate, prompting them to shift their attention toward other semiotic resources:

*Readers' impressions can be on the whole thing, because text adds to images and images add to text. Readers are going to focus on images and text. (Student 7)*

*I would think about images and videos, because I did not make mistakes in texts. Readers may wonder if visuals are suitable with the text...I would worry about text and visuals, but visuals more. (Student 3)*

Among the students, a divergence of opinions surfaced concerning the assessment of grammatical errors in DMW. Some students thought that accuracy should be more leniently evaluated, noting the ability of visuals and audiovisuals to mitigate grammatical incorrectness that could impede effective communication. Conversely, the majority maintained that text and grammatical accuracy should not be marginalized, given the uncertainty about the communicative efficacy of nonlinguistic components:

*I think ideas must be expressed clearly, if there are some mistakes or not...Correctness of grammar should be less important than ideas expression. I think visuals can reveal everything, you might add a video that can say it all. We should to some extent be O.K. with grammar mistakes. (Student 1)*  
*Grammar should be focused on when checking this type of essays, because you cannot guarantee that meaning is going to be expressed to readers by visuals. (Student 7)*

## DISCUSSION

This study, unlike the bulk of previous research, investigated the grammatical accuracy performance of EFL learners in multiple DMW products. The empirical evidence presented in the findings reveals a similarity in grammatical accuracy between TBW and DMW, which aligns with previous research by Cho and Kim (2021), Kim and Belcher (2020), and Kim and Kang (2020). Concerns have been raised in the literature regarding L2 writing quality within DMC (Chun et al., 2016). Qu (2017) posited that DMW could potentially distract from language and have detrimental effects on attention to the linguistic aspect within this writing mode. However, the present study reveals no negative impact of multimodality on text grammaticality in DMW. Thus, this finding contributes to the mitigation of such concerns.

Comparing individual TBW and DMW tasks, it is evident that grammatical errors in DMW are comparable to those in TBW. One assumption is that the novelty effect in the first DMW task may lead to lower accuracy, as learners enthusiastically engaged in the blog and integrated other resources into their products. However, this assumption is refuted by the fact that the learners' accuracy was similar from the first to the final task. Despite the fact that L2 learners might perceive DMW as a less formal writing type (Casanave, 2017), potentially diverting attention from text quality, the

study found similar levels of grammatical accuracy in both TBW and DMW. Moreover, despite the differences in writing genres across the tasks and varying degrees of learners' familiarity with each genre, the comparable performance suggests a neutral effect of genre on grammatical accuracy within DMW. Concerning the time-on-task factor, DMW apparently requires more time due to the integration of multiple semiotic resources. However, each group of learners had sufficient time for their specific writing tasks, eliminating time pressure and allowing for attention to text quality and accuracy through writing and revision.

The findings related to the second research question further reinforce the evidence obtained from the aforementioned results. The text analysis results align with learners' perceptions of the impact of DMW on grammatical accuracy, as the learners did not view DMW as distracting from language. Additionally, the learners value text accuracy as a crucial aspect of DMW and a major criterion for product assessment, with their grammatical accuracy in the textual component aligning with these views. The questionnaire results indicate negative mean values for distraction, lack of attention, and difficulty in focusing on accuracy in DMW. Despite engaging in multiple phases, such as text writing, searching for nonlinguistic constituents, inserting, organizing, and editing, learners' attention to text as an important component of the final product was not hindered, nor did they face difficulty in attending to the accuracy of the linguistic mode. The predominance of negative and neutral scores in the questionnaire items further supports the results obtained from the text analysis.

The qualitative findings highlight learners' engagement and satisfaction with DMW, given its effective communication of meaning (Alrajhi, 2023a). As an enhanced educational experience (Veliz & Hossein, 2020) contributing to effective communication, the learners were intrigued by the utilization of multi-semiotic resources. Multimodality-based composition tasks were found to heighten learners' awareness of meaning communication by enabling novel ways of conveying meaning through different semiotic tools, leading to increased engagement (Nash, 2018). Even when topics were not self-selected, learners' choice in deciding which mode to utilize resulted in noticeable increased engagement (Nash, 2018). Hence, despite dividing learners' attention between the nonlinguistic elements and their roles in DMW products on one hand and the language component on the other, grammatical accuracy levels remained similar to those for TBW. This similarity underscores learners' cognizance of the pivotal and communicative role of text, regardless of the writing mode. Previous research has indicated positive attitudes among L2 students toward DMC in terms of interest, meaning-making, communication, and writing development (Alrajhi, 2023a). Such positive views further suggest learners' engagement in this form of composition, which encompasses both nonlinguistic components and textual aspects, including linguistic accuracy. L2 learners' engagement in DMC is associated with their appreciation of the benefits for L2 development (Kim & Belcher, 2020), leading them to approach the writing aspect of this form of communication deliberately.

The learners employed a preferred strategy in DMW that involved a recursive process of writing and integrating visuals and audiovisuals, indicating continuous consideration of different semiotic resources throughout each phase. Reminiscent of text-only processes, DMW comprises phases akin to traditional writing, including brainstorming, composing, organizing, and revising (Bruce, 2009), particularly when text writing is completed as a first step, followed by attending to other resources. When learners direct their focus toward a specific mode in DMW, the process of text writing can be conceived of as analogous to TBW. This entails channeling their attention toward producing grammatically accurate text, resulting in a comparable level of accuracy observed in both TBW and DMW. While some researchers have expressed concerns about extensive engagement in appealing online visuals and multitasking hindering essential academic learning (Van Leeuwen, 2015), this study suggests that the integration of semiotic resources based on visuals and audiovisuals does not impede attention to grammatical accuracy.

## CONCLUSION

The present study investigates the differences in L2 learners' grammatical error quantity, density, and probability between TBW and DMW tasks, as well as explores learners' perceptions of the impact of DMW on L2 grammatical accuracy. The results indicate no significant differences between the two writing types in terms of these parameters. Furthermore, the learners' perceptions reveal that despite the integration of multimodal resources in the DMW process, their attention to text grammatical accuracy was not impaired. Both the text analysis results and learners' perceptions suggest a neutral effect of DMW on the linguistic aspect of text grammatical accuracy. The study also concludes that two key factors contribute to maintaining attention to grammatical accuracy in multimodal essays: (1) learners' engagement in each individual constituent of DMW and (2) their awareness of the importance of text, which encourages prioritizing or treating text writing as a distinct phase in the DMW process.

These findings have important pedagogical implications. Some researchers argue that DMW is particularly suitable for writers who are developing their L2 (e.g., Belcher, 2017). As evident in this study, which involved learners at the B1 proficiency level, DMW does not undermine or have detrimental effects on L2 text grammatical accuracy. However, when incorporating DMW in writing classes, careful consideration is needed to determine its intended purpose(s) (Xu, 2021). Put differently, it is necessary to clearly define the instructional focus in relation to DMW, such as digital literacy, L2 writing, or both. Overall, when the aim is to engage L2 learners in writing practice, DMW can be a suitable approach. In this study, the learners did not invest significant effort in nonlinguistic components, as they were instructed to use ready-made materials, allowing them ample time to attend to text writing. Therefore, L2 teachers should consider the availability of nonlinguistic resources (Alrajhi, 2023a).

On the other hand, when L2 learners engage in designing their own nonlinguistic materials as a form of extensive involvement in digital literacy in writing curricula, it becomes crucial for L2 teachers to direct learners' attention to the linguistic mode. The process of designing materials can be time-consuming and challenging (Kim & Belcher, 2020) for L2 writers, potentially yielding different effects on the centrality of text in the DMW process. Furthermore, incorporating different composition phases that emphasize each constituent of DMW may serve as an effective instructional strategy. As evidenced in this study, when the learners treated text writing as a distinct phase within DMW, they directed their attention to grammatical accuracy.

Finally, it is important to note a few limitations of this study and recommendations for further research. First, the sample consisted of English majors with B1 proficiency, limiting the generalizability of the findings to learners with different competency levels. Second, the findings are specific to DMW and may not be applicable to other forms of DMC. Further research is warranted to explore the effects of self-designed nonlinguistic resources on attention to the textual component of DMW, as learners in this study utilized ready-made materials for their multimodal essays. Furthermore, a future line of research may be investigating grammatical accuracy in DMW when employed within collaborative writing, which might yield different findings.

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## CONFLICT OF INTEREST

The author declares that there is no conflict of interest.

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