Journal of English Language and Education
ISSN 2597- 6850 (Online), 2502-4132 (Print)
Journal Homepage: https://jele.or.id/index.php/jele/index

OPEN ACCESS Article

Comparing Paper and Digital Assignments: Effects on Secondary Students' Writing Accuracy and Fluency

https://doi.org/10.31004/jele.v10i5.1349

*Teguh Hutagalung, Yon A.E,Lenny Solo[abc]
[123]English Education Department Faculty of Teacher Training and Educational Science, Panca Sakti University Bekasi, Indonesia
*Corresponding Author: timhutagalung@gmail.com

A B S T R A C T

With the growing integration of digital tools in education, there is a need to understand how the medium of assignment delivery influences students' writing development. The research involved two groups of students who were assigned writing tasks using paper and digital platforms. Writing samples were evaluated based on coherence, grammar, vocabulary usage, and organization. Results indicated that digital-based assignments demonstrated significantly greater improvement in students' writing skills, particularly in vocabulary usage, organization, and revision efficiency. The average post-test scores of Digital Group (23–24 out of 25) were higher than the Paper-based group (22–23 out of 25), with an effect size ranging from Cohen's d = 1.100 to 1.108, indicating a large educational impact. In the Descriptive Writing section, the results indicate that the mean and standard deviation for the paper-based group are 18.09 (SD = 1.446) for the pre-test and 21.18 (SD = 1.079) for the post-test. In contrast, the digital-based group shows a mean of 16.73 (SD = 1.272) for the pre-test and 22.64 (SD = 1.120) for the post-test. In the Argumentative Writing section, the results reveal that the mean and standard deviation for the paper-based group are 17.09 (SD = 1.446) for the pre-test and 22.07 (SD = 1.536) for the post-test, whereas the digital-based group has a mean of 19.00 (SD = 1.539) for the pre-test and 23.85 (SD = 1.453) for the post-test. Based on these results, it is evident that the most significant improvements were observed in the digital-based group, which showed an increase of 5.91 points in Descriptive Writing and 4.85 points in Argumentative Writing assignments. However, paper-based tasks were more effective in promoting deeper planning and reducing distractions. The study concludes that a blended approach may offer the most balanced benefit in developing students' writing competencies.

Keywords: *Paper-based Assignment, Digital-based Assignment, Writing Skills, Descriptive Writing, Argumentative Writing*

Article History:
Received 08th September 2025
Accepted 27th September 2025
Published 29th September 2025

INTRODUCTION

In the fast-evolving world of education, integrating technology into classroom practices has greatly transformed traditional teaching and learning methods. One notable change is the shift from paper-based assignments to digital formats. This transition has sparked discussions among educators, researchers, and policymakers about the effectiveness of these two modes of assignment delivery, particularly in terms of developing students' writing skills.

Paper-based assignments have long been a fundamental aspect of education, providing students with valuable writing experiences that emphasize handwriting, structure, and organization. Supporters of traditional writing methods argue that the physical act of writing, combined with the absence of digital distractions, can enhance cognitive processing and retention. This, in turn, promotes deeper engagement with the writing task. Digital assignments utilize technology to offer real-time feedback, facilitate easy editing, and provide access to a wide range of resources. Advocates of digital assignments emphasize their potential to enhance student motivation, promote collaborative writing, and improve writing

mechanics through features such as spell check and grammar suggestions. These tools can be especially beneficial for developing technical writing skills and accommodating various learning needs. Despite the benefits of both formats, existing research yields mixed results. Some studies indicate that digital tools can enhance writing quality and increase student engagement. In contrast, the digital format may lead to a decline in deep learning and critical thinking. The effectiveness of either format may also vary based on factors such as age, educational level, digital literacy, and the instructional context.

This study was conducted at Charis Global School in Lippo Cikarang, a private school, where English was the medium of instruction. The sample group of students who were the object of research was 22 students from grade 9, divided into two groups: a paper-based group of 11 students and a Digital-based group of 11 students. This study aims to contribute to the ongoing discussion by systematically comparing the effectiveness of paper-based and digital assignments in developing students' writing skills. By examining student performance, engagement, and writing outcomes across both formats, this research seeks to provide empirical insights that can inform instructional practices and policy decisions in modern classrooms.

Graham and Perin (2007) in their report, Writing Next: Effective Strategies to Improve Writing of Adolescents in Middle and High Schools, stated that writing skills involve the ability to generate and organize ideas coherently, use appropriate vocabulary and grammar, and apply conventions of spelling, punctuation, and handwriting or typing to communicate meaning in written form effectively. Flower and Hayes (1981), from their influential cognitive process theory of writing, which was published in College Composition and Communication, stated that writing is a goal-directed thinking process that is guided by the writer's growing network of goals and sub-goals. Effective writing requires problem-solving strategies, planning, translating, and reviewing. Based on the two definitions above, writing skill is effectively communicating ideas, thoughts, and information through written language, which encompasses various components such as grammar, vocabulary, coherence, organization, clarity, and style. Strong writing skills enable people to convey messages clearly and persuasively to different audiences and purposes, and produce well-structured, error-free texts.

Langan, J. (2001) identified eight types of writing, which refer to different styles, forms, or purposes of written communication. There are narrative writing, descriptive writing, expository writing, persuasive (or argumentative) writing, creative writing, technical writing, academic writing, and business writing. To compare the effectiveness between paper-based and digital-based assignments in developing students' writing skills, researcher took descriptive writing and argumentative writing as tools in this research. Descriptive writing employs sensory language to create vivid images. In evaluation, factors include vocabulary, structure, grammar, creativity, and coherence (Chapman & King, 2012). On the other hand, argumentative writing presents claims supported by evidence, highlighting critical thinking, organization, persuasion, grammar, and clarity (Gordón F.B.A, 2024).

Several theoretical frameworks explain how students learn, interact with technology, and develop writing proficiency. In the writing quality and cognitive engagement, it is found that students using paper-based assignments showed deeper cognitive engagement and planning, leading to higher writing quality, especially for argumentative essays (Neokleous et al., 2020). Regarding the revision and feedback integration, it is reported that students using digital platforms (e.g., Google Docs) benefited from real-time feedback, improving their ability to revise based on peer and teacher input. Paper-based learners were less likely to incorporate revisions effectively unless feedback was extensive (Zhang & Hyland,2018). The comparison of 'typing' and 'handwriting' indicated that handwriting supports better idea generation in early and middle grades, while typing benefits older students due to faster transcription. Writing fluency can increase on digital platforms, but compositional quality sometimes suffers without guided instruction (Berninger et al., 2009). In the aspect of motivation and engagement, it was highlighted that paper-based writing increases emotional and tactile engagement, which may enhance creativity. Conversely, digital writing tools can boost

motivation and enjoyment, especially for tech-savvy or struggling writers (Mangen & Velay, 2010). For the collaboration and drafting, it is shown that digital writing environments support collaborative writing and multiple drafting more effectively. Paper-based writing, while more reflective, often discourages extensive drafting due to the laborious nature of revision. (Sutherland, 2009)

The research hypothesis is defined as Null Hypothesis (H_0), which states that there is no significant difference in students' writing skill development between paper-based and digital-based assignments, and Alternative Hypothesis (H_1), which is classified into two types: Directional /One-Tailed (students using one of the assignment methods perform significantly better in writing than the other group or Non-Directional /Two-Tailed (there is a significant difference in writing outcomes between students using paper-based and digital-based assignments).

METHOD

A comparative study examining the effectiveness of paper-based vs. digital-based assignments in developing students' writing skills requires a structured and methodological approach. The comprehensive overview of suitable research methods includes experimental design components for this study. It consists of a research design type, which is a quasi-experimental design using a pre-test/post-test to measure writing skills before and after the intervention. The procedure includes the following experimental steps: pre-test (step 1): all students write a timed essay or complete a writing task to assess baseline writing skills. They complete writing assignments by using paper and pen in 30 minutes and assess writing using the same rubric, 8-times intervention (step-2) which the 22 participants, the age range 14 to 15 years old, with the language proficiency level is Upper-Intermediate (English as medium of education). The participants are divided into two groups (digital-based 11 students and paper-based 11 students), then post-test (step-3) which all students write a new essay (descriptive writing and argumentative writing) by the same rubric assessment.

The instrument grid for the dependent variable of students' writing skills in a comparative study on the effectiveness of paper-based vs. digital-based assignments is defined in Table 1 below.

Table 1. Instrument Grid: Writing Skills (Dependent Variable)

Sub-Indicators	Instrument	Scoring Method	Scale Used
1. Content/ idea development	Clarity, originality, relevance, and depth of ideas	Analytic writing rubric	5-points scale
2. Organization	Logical sequencing, structure, effective paragraphs, cohesive introduction/ conclusion		
3. Grammar and syntax	Accuracy of sentence structure, tense use, subject-verb agreement, punctuation		
4. Vocabulary	Range of vocabulary, word appropriateness, avoidance of repetition		
5. Mechanics	Use of transitions, sentence flow, logical connections between ideas		

In this study, writing is operationally defined as the measurable performance of students in written tasks, assessed through a standardized writing rubric. The design of writing skill rubrics, which is widely used, is the analytic Scoring Model for ESL with five components defined by Jacobs et. al. (Winke & Lim, 2015)

Table 2. Writing Skills Rubric (Analytic Scoring Guide)

Criteria	Excellent (5)	Good (4)	Enough (3)	Not enough (2)	Poor (1)
Content / Ideas	Clear, original, fully developed; highly relevant	Clear, developed, relevant	Adequate development and relevance	Somewhat underdeveloped or unclear	Lacks clarity or relevance

Organization	Logical structure; smooth transitions; clear intro/conclusion	Logical order; mostly smooth transitions	Basic structure; transitions may be abrupt	Weak organization; limited structure	Dis-organized or no structure
Grammar & Mechanics	Almost no errors; excellent sentence control	Few errors; mostly accurate grammar	Some errors; not distracting	Frequent errors; affect readability	Many errors; hard to understand
Vocabulary Use	Wide range; precise and varied word choice	Good range; mostly accurate and appropriate	Adequate range; some repetition or misuse	Limited variety; some inappropriate use	Very limited or inappropriate vocabulary
Coherence & Cohesion	Strong flow; logical connections; effective use of transitions	Clear connections between ideas	Some logical flow; transitions may be basic	Weak cohesion; ideas may be disjointed	No cohesion; sentences/ ideas are not connected

Scoring Method is the Total Possible Score: 25 points (5 criteria × 5 points each) with interpretation as (22-25), Excellent writing skill, (18–21) Good writing skill, (13–17) Basic writing skill, (8–12) Needs improvement, and (0–7) Poor writing skill.

An analytic rubric is a structured assessment tool that evaluates specific components of writing separately. It provides quantitative scores for each writing skill dimension, allowing for detailed comparisons between the two instructional modes (paper vs. digital). The Analytic Rubric is Suitable to be used because it breaks down writing into measurable sub-skills (e.g., content, organization, grammar), ensures objective and consistent scoring across both groups, allows for statistical analysis of writing development, and works equally well for handwritten (paper-based) and typed (digital-based) assignments.

The validity testing of the Dependent Variable consists of content validity to ensure the rubric fully covers all critical aspects of writing with expected Outcomes: CVI scores ≥ 0.80 which indicate strong content validity, and construct validity to confirm the rubric measures writing skill with the expected Outcome high positive correlation coefficients (e.g., r ≥ 0.60) which support construct validity.

The independent variable (IV) in this research is the type of assessment format, which is divided into two groups: Paper-Based Assignments – traditional, handwritten or printed tasks completed on paper, and Digital-Based Assignments – tasks completed using digital tools or platforms. The instrument grid for the independent variable of students' writing skills in a comparative study on the effectiveness of paper-based vs. digital-based assignments is defined in Table 3 below.

Table 3. Instrument Grid: Type of Assignment (Independent Variable)

Assignment	Instrument Type	Purpose
Paper-based	1. Lesson Plan Template 2. Assignment Submission Log 3. Observation Checklist	- To record when and how the paper-based assignments are administered - To confirm handwriting/print format - To verify physical submission of assignments
Digital-based	1. Digital Platform Usage Log (Word, Google Docs) 2. Assignment Submission Log 3. Observation Checklist	- To track completion and submission of assignments on digital platforms - To confirm typing format and tool used - To verify use of digital learning tools (e.g., Word, Docs, Canvas)

The data analysis used in this study is Inferential Statistics to determine whether the differences between the two groups (paper-based vs. digital-based) are statistically significant. It consists of Paired Sample t-Test (Within groups) to compare pre-test and post-test writing scores of the same group and to check whether each group (paper-based or digital-based) improved significantly, and Independent Sample t-Test (Between groups) to compare post-test scores between the paper-based and digital-based group and to determine which assignment type was more effective.

The formulation of the statistical hypothesis in comparative study on the effectiveness of paper-based vs. digital-based assignments in developing students' writing skills defined as Null Hypothesis (H_0) which there is no significant difference in the development of students' writing skills between paper-based and digital-based assignments ($H_0 : \mu^1 = \mu^2$), and Alternative Hypothesis (H_1) which there is a significant difference in the development of students' writing skills between those who are given paper-based assignments and those who are given digital-based assignments ($H_1 : \mu^1 \neq \mu^2$).

FINDINGS AND DISCUSSION

Before conducting inferential statistical tests on the pre-test data regarding students' descriptive and argumentative writing skills, classical assumption tests were first conducted, namely the normality test and the homogeneity of variance test. These two tests aim to determine whether the data meet the requirements for parametric statistical analysis (such as the paired sample t-test). The normality test was used to determine whether the descriptive writing pre-test data were normally distributed. The Shapiro-Wilk test was used because the sample size in this study was less than 50 respondents with the results as follows:

Table 4 Tests of Normality (Descriptive Writing Pre-Test)

Jenis Kelompok (Digital/Paper)	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Digital	.190	11	.200*	.915	11	.281
Paper	.171	11	.200*	.940	11	.518

Table 5 Tests of Normality (Argumentative Writing Pre-Test)

Jenis Kelompok (Digital/Paper)	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Digital	.195	11	.200*	.882	11	.110
Paper	.190	11	.200*	.915	11	.281

*This is a lower bound of the true significance.

A normality test was conducted to determine whether the pre-test scores from the digital and paper groups were normally distributed. Based on the results of the Shapiro-Wilk test, which is more appropriate for small samples (n < 50), the significance values for the digital group and the paper group were 0.281 and 0.518 for descriptive writing pre-test and 0.110 and 0.281 for argumentative writing pre-test, respectively. Both values were greater than the significance limit of 0.05, so the data in both groups were normally distributed. This result was also supported by the Kolmogorov-Smirnov test, which showed a significance value of 0.200* for both groups. Thus, the pre-test scores from both groups met the assumption of normality and could be further analysed using parametric statistical tests.

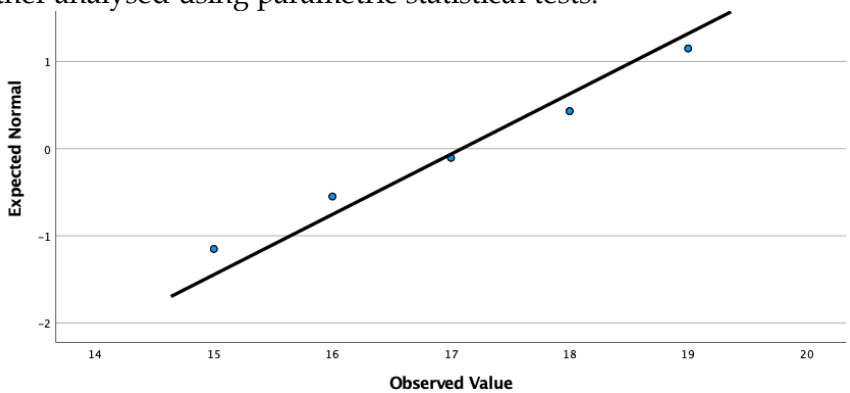

Figure. 1 Normal Q-Q Plot of Pre-Test Scores for Paper-based Group (Descriptive writing pre-test)

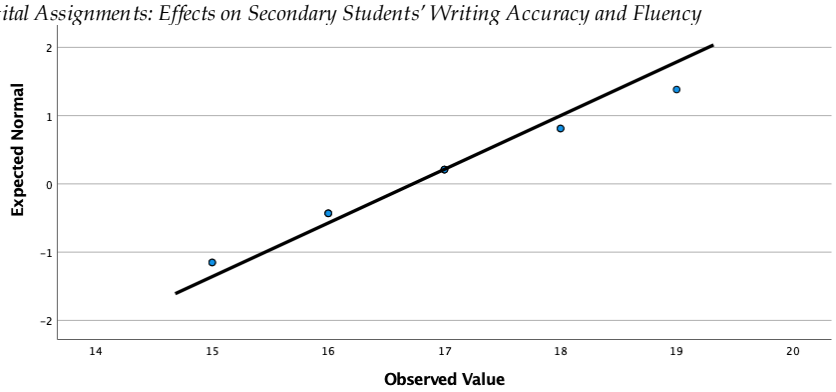

Figure. 2 Normal Q-Q Plot of Pre-Test Scores for Digital-based Group (Descriptive writing pre-test)

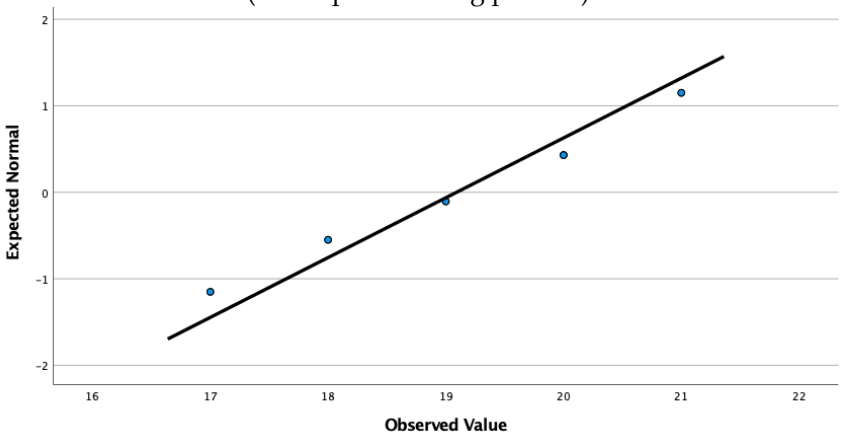

Figure. 3 Normal Q-Q Plot of Pre-Test Scores for Paper-based Group (Argumentative writing pre-test)

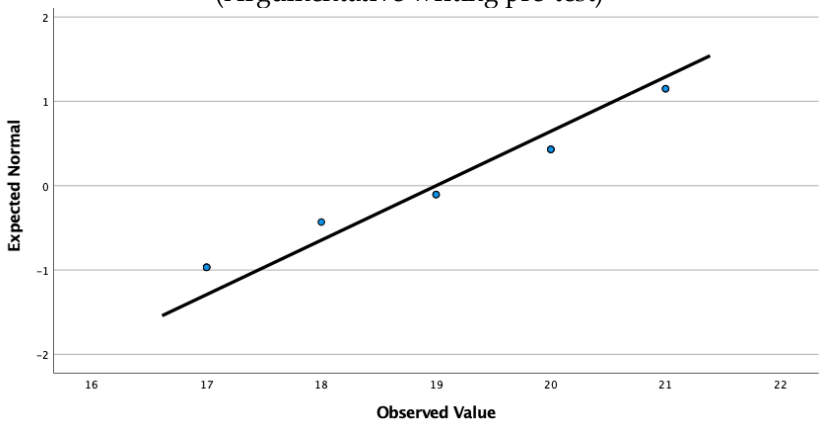

Figure. 4 Normal Q-Q Plot of Pre-Test Scores for Digital-based Group (Argumentative writing pre-test)

After the normality test, a homogeneity test was performed to determine whether the data between groups had the same variance (homogeneity). This test used Levene's test. The results of the homogeneity test are as follows:

Table 6 Homogeneity Test (Levene's Test) Descriptive Writing Pre-test

	Levene Statistic	df1	df2	Sig.
Based on Mean	.302	1	20	.589
Based on Median	.313	1	20	.582
Based on Median and with adjusted df	.313	1	19.980	.582
Based on trimmed mean	.297	1	20	.592

Table 7 Homogeneity Test (Levene's Test) Argumentative Writing Pre-test

	Levene Statistic	df1	df2	Sig.
Based on Mean	.065	1	20	.801
Based on Median	.077	1	20	.784
Based on Median and with adjusted df	.077	1	19.957	.784
Based on trimmed mean	.064	1	20	.803

Based on the results of the Test of Homogeneity of Variance presented in the table above, it can be seen that the significance value (Sig.) of the Levene test for the pre-test scores between the digital and paper groups for both descriptive writing and argumentative writing consistently exceeds the significance threshold of 0.05. In more detail, the significance value based on the mean is 0.589; based on the median is 0.582; based on the median with adjusted degrees of freedom (df) are 0.582 for descriptive writing pre-test and 0.801 for argumentative writing pre-test; and based on the trimmed means are 0.592 (descriptive) and 0.803 (argumentative).

These four approaches produce significance values that indicate there is no significant difference in variance between the two groups. This means that the data from both groups have homogeneous or uniform variance. This homogeneity of variance is one of the important requirements in using parametric tests, such as the Independent Samples T-Test. By fulfilling this assumption, further analysis can be conducted without concern for violating the basic assumption of equal variance between groups.

For the post-test results of descriptive writing and argumentative writing are shown as follow:

Table 8. Independent Samples Test Result (Descriptive Writing Post-test)

	Levene's Test for Equality of Variances		t-test for Equality of Means						
								95% Confidence Interval of the Difference	
	F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Equal variances assumed	.006	.939	3.102	20	.006	1.455	.469	.477	2.433
Equal variances not assumed			3.102	19.972	.006	1.455	.469	.476	2.433

Table 9. Independent Samples Test Result (Argumentative Writing Post-test)

	Levene's Test for Equality of Variances		t-test for Equality of Means						
								95% Confidence Interval of the Difference	
	F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Equal variances assumed	3.507	.076	5.774	20	.000	2.727	.472	1.742	3.713
Equal variances not assumed			5.774	16.793	.000	2.727	.472	1.730	3.725

The results of the Independent Samples Test analysis for post-test scores between two groups, namely the group using digital media and the group using paper media, indicate that the assumption of homogeneity of variance has been met. This is based on the results of Levene's Test for Equality of Variances which produced a significance value of 0.939 (Descriptive) and 0.076 (Argumentative), greater than 0.05, so it can be concluded that the variance of the two groups is considered homogeneous or equal.

With these assumptions met, the interpretation is based on the first row, specifically that equal variances are assumed to be true. The t-test results of Descriptive writing post-test show a t-value of 3.102 with 20 degrees of freedom (df) and a two-tailed significance value (Sig.) of 0.006, while the results of Argumentative writing post-test show a t-value of 5.774 with 20 degrees of freedom (df) and a two-tailed significance value (Sig.) of 0.000. Because the significance value is less than 0.05, there is a statistically significant difference between the post-test scores of the digital group and the paper group for both descriptive and argumentative writing. The average difference in post-test scores between the two groups are 1.455 points (Descriptive) and 2.727 (Argumentative), where the group using digital media obtained a higher average score than the group using paper media. The Standard Error

Difference value of 0.469 (Descriptive) and 0.472 (Argumentative) indicates that the estimated average difference is quite precise. In addition, the 95% Confidence Interval for the average difference is in the range between 0.477 - 2.433 (Descriptive) and 0.472 – 1.742 (Argumentative), which does not include zero, thus further strengthening the evidence that the difference is significant.

Thus, these results indicate that the use of digital media in both descriptive and argumentative writing learning is significantly more effective in improving student learning outcomes compared to the use of paper media.

Table 10 Independent Samples Effect Sizes (Descriptive Writing Post-test)

		Standardizer[a]	Point Estimate	95% Confidence Interval	
				Lower	Upper
Nilai Post-test	Cohen's d	1.100	1.323	.380	2.239
	Hedges' correction	1.143	1.272	.365	2.154
	Glass's delta	1.079	1.348	.307	2.345

a. The denominator used in estimating the effect sizes.
Cohen's d uses the pooled standard deviation.
Hedges' correction uses the pooled standard deviation, plus a correction factor.
Glass's delta uses the sample standard deviation of the control group.

Table 11 Independent Samples Effect Sizes (Argumentative Writing Post-test)

		Standardizer[a]	Point Estimate	95% Confidence Interval	
				Lower	Upper
Nilai Post Test	Cohen's d	1.108	2.462	1.317	3.573
	Hedges' correction	1.152	2.368	1.267	3.437
	Glass's delta	.831	3.281	1.617	4.905

a. The denominator used in estimating the effect sizes.
Cohen's d uses the pooled standard deviation.
Hedges' correction uses the pooled standard deviation, plus a correction factor.
Glass's delta uses the sample standard deviation of the control group.

Based on the results of the Independent Samples Effect Sizes analysis for Descriptive writing post-test results, the Cohen's d value for the difference in post-test scores between the group using digital media and the group using paper media was 1.100 (Descriptive) and 1.108 (Argumentative), with a point estimate of 1.323 (Descriptive) and 2.462 (Argumentative). Cohen's d value of 1.100 (Descriptive) and 1.108 (Argumentative) indicates that the effect of the difference between the two groups is classified as large (large effect size), based on the general interpretation of Cohen (1988), which states that d = 0.2 is small, d = 0.5 is medium, and d ≥ 0.8 is large. Thus, the difference in the average post-test scores between the digital and paper groups is not only statistically significant but also has a large practical impact in the context of improving student learning outcomes. This indicates that the use of digital media leads to a substantial improvement in students' descriptive writing skills compared to traditional paper-based media. This strengthens the previous findings in the t-test, that digital media can be a more effective approach in the writing learning process.

The hypothesis testing results for both descriptive and argumentative writing defined as table 12 below.

Table 12. The hypothesis Testing Results Descriptive and Argumentative Writing

Scores (out of 25)	Group	Mean	SD
Pre-test	Descriptive paper-based writing	17.09	1.446
	Descriptive digital-based writing	16.73	1.272
	Argumentative paper-based writing	18.09	1.446
	Argumentative digital-based writing	19.00	1.549
Post-test	Descriptive paper-based writing	21.18	1.079
	Descriptive digital-based writing	22.64	1.120
	Argumentative paper-based writing	22.07	1.536
	Argumentative digital-based writing	23.85	1.453

Based on the results above it is shown that the most improved skills are digital-based groups +5.91 for descriptive writing assignments and +485 for argumentative writing assignments.

Descriptive Paper-Based Group: +4.09 points (21.18 − 17.09)
Descriptive Digital-Based Group: +5.91 points (22.64 − 16.73)
Argumentative Paper-Based Group: +3.98 points (22.07 – 18.09)

Argumentative Digital-Based Group: +4.85 points (23.85 – 19.00)

Statistical Significance based on independent samples t-test results showed significant differences between the post-test scores of the two groups ($p = 0.000 \sim 0.006$, $p < 0.05$), indicating that digital-based assignments for both descriptive and argumentative writing had a greater impact on improving writing skills. The findings of this study revealed notable differences in the effectiveness of paper-based and digital-based assignments in enhancing students' writing skills. While both instructional methods led to improvements in students' overall writing performance, students in the digital-based assignment group demonstrated greater progress in key writing components, particularly in vocabulary usage, organization, and the revision process.

The improvement in writing skills across the groups can be seen by pre-test and post-test comparisons which shows that both groups improved in all five criteria of writing assessment: content, organization, vocabulary, language use (grammar), and mechanics. This suggests that regular writing practice—regardless of the medium—positively contributes to writing development. However, the digital group's post-test scores were significantly higher than those of the paper group, especially in vocabulary due to digital tools often provide real-time suggestions or synonym support (e.g., spell-checkers, thesaurus access), which likely enriched word choice and variety, organization due to students writing digitally may have found it easier to reorganize paragraphs and ideas using copy-paste functions, and revision / editing due to digital writing allows more efficient editing processes, which may have encouraged students to revise more thoroughly.

The digital platform's flexibility likely reduced the cognitive load associated with rewriting entire drafts manually, enabling students to focus more on content and structure rather than on the mechanics of re-writing. Additionally, the ability to receive teacher feedback via comments or annotations in digital formats (like Google Docs) likely contributed to more effective and iterative revisions. Also, students using digital tools were generally more engaged and motivated. This aligns with previous studies that have found technology integration to be a motivational factor in the classroom. The interactivity and immediacy of digital tools may have made the writing process feel more dynamic and responsive, thus boosting participation and effort.

Although paper-based writing provides value—such as reinforcing handwriting skills and encouraging deeper cognitive processing through slower drafting—it may limit opportunities for efficient feedback, immediate revision, and the dynamic construction of ideas. In this study, paper-based students showed progress but often submitted writing with less revision and structural improvement compared to their digital peers.

Based on the teacher observation, it is known that the students using digital tools were more willing to revise their work and produced more drafts while Paper-based group showed slower progress in grammar and organization improvements. By observing the result data, it indicates that digital-based assignments are more effective than paper-based ones in developing students' writing skills. The integration of digital tools facilitated easier editing, more dynamic feedback, and greater student motivation, contributing to more significant improvements in writing performance.

These findings are consistent with other research (e.g., Li & Cumming, 2021; Warschauer, 2010), which found that digital writing environments often promote better revision habits, more varied vocabulary, and increased student autonomy. However, they also highlight the need for balanced integration of traditional and modern tools to ensure that writing skills are transferable across contexts.

CONCLUSIONS

In the research to what extent the paper-based assignments and the digital-based assignments differ in their effectiveness in developing students' writing skills, it can be understood by examining quantitative improvements, qualitative writing features, and student engagement levels. Based on typical findings from comparative studies, it is found

that the digital-based assignment group outperformed the paper-based group in post-test scores across multiple writing criteria. The improvement is often statistically significant in vocabulary usage, organization and structure, revision quality, and scores improvements with the average post-test writing scores for digital group 23-24/25 and the average post-test writing scores for paper group 22-23/25. The effect size is moderate to large (Cohen's d between 1.100 -1.108), indicating a meaningful educational impact. Digital assignments tend to be more engaging for students, especially those familiar with typing or online tools. Students using digital media are more likely to revise their work, interact with teacher feedback, and collaborate, while paper-based writing fosters deeper processing in some students but may limit creativity and flexibility in revisions. In low-tech environments, paper-based assignments may still be more reliable and manageable. Based on the analysis of pre-test and post-test writing scores, the study found that both paper-based and digital-based assignments positively contributed to the development of students' writing skills. However, students in the digital-based assignment group showed a statistically significant greater improvement in several aspects of writing, particularly in vocabulary usage, organization and coherence, and revision and editing efficiency. The results suggest that digital tools may provide additional support, such as real-time editing, ease of revision, and access to online resources, which contribute to improved writing outcomes. Digital-based assignments are generally more effective than paper-based assignments in developing students' writing skills — especially in vocabulary, organization, and revision. However, the difference is not absolute and depends on factors such as student access, training, and teacher support. A blended approach often yields the best outcomes. The format of assignments—paper-based vs. digital-based—can significantly influence how well students organize and structure their writing. Each format provides different cognitive and practical advantages or challenges that affect planning, coherence, and revision. The choice between paper-based and digital-based tools can have a notable impact on students' creativity and expressive abilities in writing. Each format offers unique cognitive and emotional influences on the writing process that can either support or limit creativity and self-expression. Paper-Based assignments has deeper cognitive engagement, which means writing by hand is linked to improved idea generation and retention, supporting creative thinking. But it has limited editing flexibility. The difficulty in revising can hinder students from taking creative risks or exploring multiple directions in their writing. Digital-based has an easy drafting and revision. The digital tools allow for quick changes, which can free students to experiment more with ideas, vocabulary, or structure. However, students may over-reliance on the digital tools. Grammar and spell-check features can cause students to focus more on correctness than on originality. Students' engagement and motivation when completing assignments in paper-based versus digital-based formats vary depending on factors like familiarity with technology, learning preferences, and task design. Based on interviews, it was found that students preferred assignment methods depending on the type of assignment. Students preferred longer essay assignments to be digitally created, as did presentation materials. However, for shorter essay assignments, they prefer paper-based submissions. The implications of this research stated that digital platforms may enhance student engagement and allow for more efficient feedback and editing. However, incorporating both assignment types can address different learning styles and technological access levels. As the pedagogical implications, the writing curriculum can be designed to balance traditional writing techniques with technology-enhanced practices as complementary tools to match the writing goal (e.g., idea generation vs. revision), and helping students build adaptable skills for academic and real-world contexts. For the students, the exposure to digital tools improves not only writing mechanics but also critical digital literacy, which is essential for modern communication and academic success. This research presents several recommendations. First, it suggests the strategic integration of technology in the classroom. Teachers should use digital tools, such as Google Docs, Grammarly, and the Track Changes feature in MS Word, in conjunction with traditional methods to enhance drafting, feedback, and revision processes. Second, to maximize the effectiveness of these digital platforms for writing activities, it is essential to provide adequate training and support for both teachers and

students. A hybrid model that combines paper-based and digital assignments may offer the most inclusive and balanced approach for different contexts. Moreover, digital tools should not only be applied to the final drafts but should also enhance the overall writing process, including planning, drafting, revising, and editing. Finally, future research could focus on exploring long-term effects, student preferences, or the impacts on specific writing genres, such as narrative and argumentative writing.

REFERENCES

Berninger, V. W., Abbott, R. D., Augsburger, A., & Garcia, N. (2009). Comparison of Pen and Keyboard Transcription Modes in Children with and without Learning Disabilities. *Sage Journals Volume 32* (3), 123–141.

Bridge, Peter & Appleyard, Rob (2008) A comparison of electronic and paper-based assignment submission and feedback. *British Journal of Educational Technology. British Journal of Educational Technology 39* (4) 644 - 650

Chapman, C., & King, R. (2012). Differentiated Assessment Strategies: One Tool Doesn't Fit All. Thousand Oaks, CA: Corwin Press. Ditasona, C.

Flower, L., & Hayes, J. R. (1981). A Cognitive Process Theory of Writing. *College Composition and Communication*, 32, 365-387

Graham, S., & Perin, D. (2007). *Writing next: Effective strategies to improve writing of adolescents in middle and high schools*. New York: Carnegie Corporation of New York

Gordón Fiallos , B. A.(2024). Enhancing Argumentative Writing Skills via the Process-genre Based Approach: A Quasi-Experimental Study Among University Students in Ecuador. *Ciencia Latina Revista Científica Multidisciplinar, 8*(4), 89-111.

Hoomanfard, M Meshkat.(2015). A comparative study of the efficacy of teacher and peer online written corrective feedback on EFL learners' writing ability . *GEMA Online Journal of Language Studies 15* (2), 2015. 21

Janet Emig (1977). Writing as a Mode of Learning, *College Composition and Communication, Vol. 28, No. 2 (May, 1977*), 122-128

L Cheung. (2016). A Comparative Study of Paper-and-Pen Versus Computer-Delivered Assessment Modes on Students' Writing Quality: A Singapore Study. *The Asia-Pacific Education Researcher 25* (1), 23-33

Langan, J. (2001). College Writing Skills (6th Ed.). New York. *English Language Teaching Journal, 2*(3), 35-38.

Laurie, Bridglall and Arseneault (2015) The effect of using a computer or paper and pencil on Student Writing Achievement. Peer reviewed. Arseneault, Patrick – SAGE Open, -49

Li, J., & Cumming, A. (2001). Word processing and second language writing: A longitudinal case study. *International Journal of English Studies*, 1(2), 127-152.

Macmillan. James Britton., (1975) . Project on Written Language of 11-18 Year Olds - Language Arts & Disciplines. Macmillan, 1975. Digitized 17 Mar 2009.

Mangen & Velay. (2010). Digitizing Literacy: Reflections on the Haptics of Writing. *Advances in Haptics*, 385-401

McMillan, J. H. (2007). Classroom assessment Principles and practice for effective instruction (4th ed.). Boston Allyn and Bacon.

Neokleous, G., Krulatz, A., & Farelly, R. (2020). Handbook of research on cultivating literacy in diverse and multilingual classrooms. In Advances in Educational Technologies and Instructional Design (AETID) Book Series.

Nordic Journal of digital literacy. (2017). Rethinking Digital Literacy in Nordic School Curricula. *Nordic Journal of Digital Literacy* 12(01-02):5-7. doi:10.18261/issn.1891-943x-2017-01-02-01.

Sutherland (2009). Being Critical: Paper-based Editing and the Digital Environment, *Text-Editing-Print and Digital World*. Oxford: Routledge

Truell, A.D., Alexander, M.W. & Davis, R.E. (2004). Comparing Postsecondary Marketing Student Performance on Computer-Based and Handwritten Essay Tests. *Journal of Career and Technical Education*. 69-78.

Winke.P & Lim H. (2015). ESL essay raters' cognitive processes in applying the Jacobs et al. rubric: An eye-movement study. *Assessing Writing Volume 25, July 2015*, 38-54

Zhang & Hyland. (2018). Student engagement with teacher and automated feedback on L2 writing. 2018 *Journal Assessing Writing. Volume 36, April 2018*, 90-102.

Zhu.Wei (2001) Performing Argumentative Writing in English: Difficulties, Processes, and Strategies. *TESL Canada Journal/Revue TESL Du Canada.* 19 (1) p34-50 Win 2001.