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Influence of AI-Powered Writing Tools on the Research Writing Quality and Productivity among Postgraduate Students in Federal Universities in South-South Nigeria

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Abstract **Original Research Article**

This study examines the extent of influence of AI software on the research writing quality and productivity among postgraduate students in Federal Universities in South-South Nigeria. A descriptive survey design was used for the study. Stratified random sampling procedures permitted selection of 381 postgraduate students from a total population of 8, 01 5 at six institutions for the 2024/2025 academic session. A research instrument, consisting of 20 items titled "Artificial Intelligence Software and the Research Writing Quality and Productivity among Postgraduate Students Questionnaires" (AISRWQPPSQ), was developed and validated by experts, achieving a high reliability coefficient of 0.89. The result showed that QuillBot and Writefull were perceived to be highly valuable and strongly influential on patterns of research writing for both masters and doctoral students. The findings revealed a statistically significant difference in research writing quality and productivity between Master's and PhD postgraduate students who utilized AI-powered writing tools. PhD students demonstrated higher mean scores in both writing quality and productivity compared to their Master's counterparts. The observed differences were associated with the use of QuillBot, which enhanced textual quality and Writefull, which improved writing efficiency and grammatical accuracy. The null hypotheses were rejected at the 0.05 level of significance, indicating that academic level significantly influences the effectiveness of AI-powered writing tools on research writing outcomes. The study concluded that the use of AI-powered writing tools such as QuillBot and Writefull has a statistically significant positive influence on both research writing quality and productivity among postgraduate students is to a great extent. Therefore, the integration of these tools into academic writing practices can substantially improve research outcomes. It was recommended that universities incorporate AI writing tools into research training while establishing clear ethical guidelines for their appropriate use.

Keywords: Artificial Intelligence, AI-powered writing tools, Research Writing Quality, Research Productivity.

Introduction

AI-powered writing tools have become indispensable for education, healthcare, business and scientific research (Russell and Norvig, 2021). Examples such as QuillBot and Writefull illustrate the extent to which machine learning and natural language processing have revolutionized human interactions with

technology (Biber, 2020). For graduate students and researchers, these applications provide measurable increases in efficiency, accuracy and accessibility of research writing. In addition, they promote collaboration and critical thinking to transform practices of research and to reshape the overall culture of writing (Kasneci *et al.*, 2023). AI represents computer systems capable of performing tasks that require human intelligence, including learning and understanding of language. Beginning with simple rule-based systems, developments in AI have led to highly sophisticated applications based on deep learning and natural language processing, and have established AI as a major component of the Fourth Industrial Revolution (Dwivedi *et al.*, 2021). These systems rapidly and accurately analyze large data sets to facilitate both decision making and management of knowledge. Finally, errors associated with complex tasks are substantially reduced because of the adaptability and scalability of AI (Haenlein and Kaplan, 2019), further exemplifying the magnitude of technological transformation achieved in multiple domains (See also, Thomas, 2020).

The effects of artificial intelligence software on research writing practices among postgraduate students merit careful consideration in view of continuing changes in modes of academic work. With respect to language development, idea generation and technical support, these tools provide widely varying functions that substantially alter patterns of student engagement with scholarly work (Biber, 2020). Use of software for reference management, detection of plagiarism and assistance with writing represents a broader transformation that has influenced patterns of research conduct and organization of academic work. Postgraduate education is fundamentally based on research writing that requires development of critical thinking, familiarity with the literature, experience with data analysis and skill in the organization of scholarly arguments (Hyland, 2019). Differences in institutional expectations, availability of resources and degree of technological sophistication contribute to the development of research writing practices among postgraduate students (Hyland, 2019). Although technological applications improve efficiency and accuracy of writing, they also raise concerns about loss of originality and excessive reliance on automated modes of operation in place of conventional practices of scholarly work (Perkins, 2023). In addition, we continue to experience major difficulties with development of proficiency in academic language, adaptation to conventions of scholarly work and production of well-developed arguments (Swales and Feak, 2021). Consequently, full understanding of changing patterns of research writing among postgraduate students will require detailed consideration of the effects of artificial intelligence software on research writing practices. This represents an additional demonstration of the extent to which technological development and expectations of academic performance interact to produce major changes in modes of postgraduate research writing.

QuillBot is an AI-based tool that enhances academic and professional writing by paraphrasing sentences without compromising meaning (Patil and Patil, 2020). The application of machine learning and natural language processing enables users to reorganize sentences, correct grammar and improve vocabulary, thereby providing a valuable digital assistant for many writing tasks (Dwivedi *et al.*, 2021). The ability to generate multiple versions of text improves clarity and reduces redundancy, and has contributed to widespread acceptance by students, faculty and researchers. In addition, use of AI-based tools such as QuillBot increases learner autonomy through immediate feedback and development of both writing competence and critical thinking skills (Ezza, 2022). Finally, these tools provide extensive support for original writing and help prevent plagiarism by promoting appropriate citation practices that are essential to academic integrity (Azzam *et al.*, 2022). QuillBot and other AI-based writing tools represent an important example of the growing integration of technology into instruction, and they provide important opportunities to examine future directions for the teaching and learning of academic writing.

Writefull is an AI-based tool that provides real-time feedback on grammar, vocabulary, style and sentence structure. It

differs from conventional grammar checkers in its focus on scholarly communication (van der Loo *et al.*, 2019) and its reliance on algorithms trained on millions of published articles to provide individualized suggestions that increase clarity and adherence to standards of scholarly writing. Individuals with difficulties adapting to conventions of discipline-specific writing benefit most from these capabilities (Johnson, 2023; Swales and Feak, 2021). Application of deep learning and methods of natural language processing provide the technological basis for assistance with increased fluency and accuracy for students, researchers and professionals (Azzam *et al.*, 2022). Use of a large corpus of scientific texts enables the system to generate suggestions for discipline-appropriate expressions and patterns of language that are consistent with requirements of particular fields of scholarly communication. Writefull has achieved high levels of acceptance in settings of higher education, where graduate students routinely use it for purposes of paraphrasing, evaluating overall coherence and generating citations (Pérez-Paredes and Bueno-Alastuey, 2021). In addition, students receive concurrent feedback that conforms to standards of academic writing, and thereby obtain additional confirmation of the value of this comprehensive system of support for adaptation to the complex requirements of academic communication.

Rooted in the work of Jean Piaget (1951), constructivist learning theory provides a central theoretical framework for the present study and reflects the view that knowledge is actively constructed through interaction with the environment. As students integrate new experiences and knowledge with prior experience, learning occurs within the framework of constructivist principles. Active engagement and development of critical thinking skills are important components of this process, and reflect the experience of students who learn to write effectively with the aid of these technologies. Application of the present constructivist framework illustrates the ways in which AI-based writing tools are perceived and used by graduate students during the process of writing their theses. Rather than serving simply as aids to the writing process, these technologies provide a richer experience of learning within a constructivist context. As a result, students receive immediate feedback on the effectiveness of their language and learn to modify their writing skills to achieve a higher level of academic performance. This experience is supported further by the views of several authors regarding the effects of AI software on the process of writing research theses.

Use of the writing suggestions provided by Writefull enabled users to achieve a substantially higher degree of conformity with conventions of their respective disciplines (Van den Bosch and Daelemans, 2020). In addition, students who received training in the use of Writefull's discipline-specific phrase bank achieved substantially greater abilities to organize and express ideas in their academic writing, and developed greater confidence and efficiency in using appropriate academic language (Garcia, 2019). Finally, use of the grammar checking and summarization functions of QuillBot resulted in substantially greater accuracy of language use, reduction of redundancy and increased clarity of expression of ideas in the academic writing of students (Smith, 2020). In addition, concerns about excessive reliance on these technologies and potential impairment of development of critical writing skills were accompanied by the benefits of substantial reductions in the time required to complete the writing of theses (Siti *et al*., 2024).

Statement of the Problem

Research writing is a critical component of postgraduate education and provides evidence of students' capacity to produce and communicate scholarly knowledge effectively. However, postgraduate students at Federal Universities in southern Nigeria experience numerous difficulties related to inadequate writing skills, errors in grammar and citation, concerns with plagiarism and limited access to advanced tools for research writing. These limitations impair the quality of theses and dissertations produced by postgraduate students.

The development of artificial intelligence tools such as Quillbot and Writefull provides an opportunity to improve research writing and facilitate correction of grammar, restructuring of

sentences, selection of vocabulary and mitigation of concerns with plagiarism. However, there is a paucity of data on the effectiveness of these tools for improving research writing by postgraduate students in Nigeria. This reflects continued uncertainty regarding whether use of artificial intelligence tools is promoting originality, development of critical thinking and increases in productivity or is resulting in excessive reliance and reduced capacity for independent writing. Without additional studies of these influence, it will remain difficult to examine the extent of influence of artificial intelligence tools on the quality and productivity of research writing by postgraduate students. Consequently, the present study examine the effects of artificial intelligence tools on quality and productivity of research writing by postgraduate students at Federal Universities in southern Nigeria.

Purpose of the Study

The main purpose of the study was to examine artificial intelligence-powered writing tools on the research writing culture of postgraduate Students in Federal Universities in South-South, Nigeria. Specifically, the study seeks to determine:

1. The extent of influence of Quillbot on the research writing culture of Masters and PhD Students in Federal Universities in South-South, Nigeria.
2. The extent of influence of Writefull on the research writing culture of Masters and PhD Students in Federal Universities in South-South, Nigeria.

Research Questions

The following research questions were raised to guide the study:

1. What is the extent of influence of Quillbot on the research writing culture of Masters and PhD Students in Federal Universities in South-South, Nigeria?
2. What is the extent of influence of Writefull on the research writing culture of Masters and PhD Students in Federal Universities in South-South, Nigeria?

Research Hypotheses

The following research hypotheses were formulated to guide the study:

$H_{O1:}$ There is no significant difference in the mean responses of Masters and PhD Postgraduate Students on the extent of Quillbot influence on the research writing culture in Federal Universities in South-South, Nigeria.

$H_{O2:}$ There is no significant difference in the mean responses of Masters and PhD Postgraduate Students on the extent of Writefull influence on the research writing culture in Federal Universities in South-South, Nigeria.

Research Methods

A descriptive survey design was adopted for this study. The study was conducted in selected Federal Universities in South-South Nigeria. The population for this study comprised 8015 Postgraduate Students in six Federal University in South-South, Nigeria for 2024/2025 session. A sample of 381 postgraduate students was selected using stratified random sampling to ensure representation across disciplines. The researcher developed twenty (20) items research instrument titled: “Artificial Intelligence-Powered Writing Tools and the Research Writing Culture of Postgraduate Students Questionnaires” (AIPRTRWCPSQ) for data collection for this study. The instrument was face validated by three experts in educational technology and measurement, while reliability testing using Cronbach’s alpha yielded a coefficient of 0.89, indicating high internal consistency. The questionnaire was administered to the respondents by the researcher together with one research assistant. Mean was used to answer the two research questions while the independent sample t-Test was used to test null hypotheses at 0.5 level of significance. Real limit was used as a decision rule for the research questions as indicated in the following order: Very Low

Extent = 1; Low Extent =2; Moderate Extent = 3, Great Extent = 4 and Very Great Extent = 5. In order to test the null hypotheses, if the p-value was less or equal to 0.05 ($p \leq 0.05$), the null hypothesis was rejected. Notwithstanding, where p-value was greater than 0.05 ($p > 0.05$), then the null hypothesis was retained.

Results and Discussion

Research Question 1: What is the extent of influence of Quillbot on the research writing culture of Masters and PhD Students in Federal Universities in South-South, Nigeria?

Table 1 Mean Responses of Students on the extent of influence of Quillbot on the research writing culture of Masters and PhD Students. (n = 375)

S/N	Items	Groups	Mean1 (PhD) Mean2 (Masters)	Remarks
1	I use Quillbot in simplifying complex academic texts.	PhD	4.49	GE
		Masters	3.92	GE
2	I use Quillbot in enhancing the efficiency of the research writing process.	PhD	3.55	GE
		Masters	3.13	ME
3	I use Quillbot paraphrasing text to avoid plagiarism in research writing.	PhD	3.53	GE
		Masters	3.11	ME
4	Quillbot helps me to retain the original meaning of technical content during paraphrasing.	PhD	4.53	VGE
		Masters	4.57	VGE
5	I use Quillbot's grammar checker to enhance the quality of research manuscripts.	PhD	4.18	GE
		Masters	3.57	GE
6	I use Quillbot to improve sentence structure,	PhD	4.52	VGE
		Masters	3.86	GE
7	I use Quillbotto summarize large volumes of research material.	PhD	4.70	VGE
		Masters	4.44	GE
8	I use Quillbot to condense lengthy research findings into concise abstracts.	PhD	4.52	VGE
		Masters	3.86	GE
9	Quillbot asssit me to ensure originality while rewriting content.	PhD	3.40	ME
		Masters	3.52	GE
10	Quillbot assist me in supporting non-native English speakers in research writing	PhD	4.51	VGE
		Masters	3.71	GE
	Cluster Mean	**PhD**	**4.19**	**GE**
		Masters	**3.77**	**GE**

Source: Field Survey (2025).

The results in Table 1 indicate that QuillBot significantly influences the research writing culture of postgraduate students in Federal Universities in South-South Nigeria. For PhD students, 5 out of 10 items had mean values between 4.51 and 4.70, reflecting a very high influence. Additionally, 4 items showed a mean range of 3.53 to 4.46, indicating a great extent of influence, while one item had a mean value of 3.40, signifying a moderate influence. For Master's students, 7 out of 10 items had mean values from 3.52 to 4.44, indicating a great extent of influence. One item scored 4.57, showing a very great influence, while two items had mean values of 3.11 and 3.13, reflecting a moderate influence. Overall, the cluster summary yielded mean values of 4.19 for PhD and 3.77 for Master's students, suggesting that

QuillBot positively affects research writing culture, with PhD students reporting a greater influence.

Research Question 2: What is the extent of influence of Writefull on the research writing culture of Masters and PhD Students in Federal Universities in South-South, Nigeria?

Table 1 Mean Responses of Students on the extent of influence of Writeful on the research writing culture of Masters and PhD Students. (n = 375)

S/N	Items	Groups	Mean1 (PhD) Mean2 (Masters)	Remarks
1	I use Writefull to improve the overall quality of the research writing.	PhD Masters	4.70 4.44	VGE GE
2	Writefull helps me in ensuring the accuracy of language in research writing.	PhD Masters	4.78 4.46	VGE GE
3	Writefull helps me to correct common writing errors in research writing.	PhD Masters	4.70 4.44	VGE GE
4	I use Writefull to identify grammatical errors in research writing.	PhD Masters	3.30 3.12	ME ME
5	Writefull assist me to improve charity in research papers.	PhD Masters	3.40 3.28	ME ME
6	Writefull helps me with proper citation formatting.	PhD Masters	4.46 3.77	GE GE
7	Writefull assist me checking the consistency of reference lists.	PhD Masters	3.53 3.14	GE ME
8	Writefull helps researcher to produce more polished proffessional research papers.	PhD Masters	4.45 3.77	GE GE
9	Writefull helps me to avoid unintentional plagiarism.	PhD Masters	3.55 3.13	GE ME
10	I use Writefull to integrate with others writing platform.	PhD Masters	4.69 3.70	VGE GE
	Cluster Mean	**PhD** **Masters**	**4.16** **3.73**	**GE** **GE**

Source: Field Survey (2025).

The results in Table 2 reveal that Writefull significantly influences the research writing culture of postgraduate students in Federal Universities in South-South Nigeria. Among PhD students, 4 out of 10 items had mean values ranging from 4.69 to 4.78, indicating a very high influence. Additionally, 4 items had mean values between 3.53 and 4.46, suggesting a great extent of influence, while 2 items scored between 3.30 and 3.40, reflecting a moderate influence. For Master's students, 6 out of 10 items had mean values from 3.70 to 4.46, indicating a great extent of influence, while 4 remaining items scored between 3.12 and 3.28, suggesting a moderate influence. Overall, the cluster summary shows mean values of 4.16 for PhD students and 3.73 for Master's students, indicating that Writefull positively impacts research writing culture, with PhD students reporting a greater level of influence.

Research Hypothesis 1**:** There is no significant difference in the mean responses of Masters and PhD Students on the extent of Quillbot influence on the research writing culture in Federal Universities in South-South, Nigeria.

Table 3 t-test analysis of the mean responses of Masters and PhD Students on the extent of Quillbot influence on the research writing culture (n= 375)

S/N	Items	Groups	Mean	t-Values	p-Values	Decision
1	I use Quillbot in simplifying complex academic texts.	PhD	4.49	5.16	.000	S
		Masters	3.92	7.36	.000	S
2	I use Quillbot in enhancing the efficiency of the research writing process.	PhD	3.55	3.22	.001	S
		Masters	3.13	3.69	.000	S
3	I use Quillbot paraphrasing text to avoid plagiarism in research writing.	PhD	3.53	3.15	.002	S
		Masters	3.11	3.61	.000	S
4	Quillbot helps me to retain the original meaning of technical content during paraphrasing.	PhD	4.53	-.56	.576	NS
		Masters	4.57	-.56	.575	NS
5	I use Quillbot's grammar checker to enhance the quality of research manuscripts.	PhD	4.18	4.27	.000	S
		Masters	3.57	5.71	.000	S
6	I use Quillbot to improve sentence structure,	PhD	4.52	5.27	.000	S
		Masters	3.86	7.56	.000	S
7	I use Quillbot to summarize large volumes of research material.	PhD	4.70	5.70	.000	S
		Masters	4.44	8.59	.000	S
8	I use Quillbot to condense lengthy research findings into concise abstracts.	PhD	4.52	5.23	.000	S
		Masters	3.86	7.42	.000	S
9	Quillbot asssit me to ensure originality while rewriting content.	PhD	3.40	-1.10	.273	NS
		Masters	3.52	-1.06	.289	NS
10	Quillbot assist me in supporting non-native English speakers in research writing	PhD	4.51	5.27	.000	S
		Masters	3.71	7.58	.000	S

S = Significant at 0.05 level of Significance, NS = Not Significant at 0.05 level of Significance, df = 373

Source: Field Survey 2025.

The t-Test analysis in Table 3 indicates that eight out of ten items demonstrated significant differences in mean responses between Master's and PhD students regarding the influence of QuillBot on research writing culture in Federal Universities in South-South Nigeria. These eight items had t-values between 3.15 and 8.59 and p-values from 0.00 to 0.002, which are below the 0.05 significance level, leading to the rejection of the null hypothesis for these items. In contrast, the remaining two items, specifically items 4 and 9, showed t-values ranging from -1.10 to -0.56 and p-values between 0.273 and 0.576, indicating no significant difference in

mean responses. Consequently, the null hypothesis was retained for items 4 and 9, suggesting that QuillBot's influence was not perceived differently by Master's and PhD students for these specific items.

Research Hypothesis 2**:** There is no significant difference in the mean responses of Masters and PhD Students on the extent of Writefull influence on the research writing culture in Federal Universities in South-South, Nigeria.

Table 4: t-test analysis of the mean responses of Masters and PhD Students on the extent of Writeful influence on the research writing culture. (n= 375)

S/N	Items	Groups	Mean	t-Values	p-Values	Decision
1	I use Writefull to improve the overall quality of the research writing.	PhD Masters	4.70 4.44	5.88 9.02	.000 .000	S S
2	Writefull helps me in ensuring the accuracy of language in research writing.	PhD Masters	4.78 4.46	5.97 9.43	.000 .000	S S
3	Writefull helps me to correct common writing errors in research writing.	PhD Masters	4.70 4.44	5.88 9.02	.000 .000	S S
4	I use Writefull to identify grammatical errors in research writing.	PhD Masters	3.30 3.12	1.40 1.69	.161 .093	NS NS
5	Writefull assist me to improve charity in research papers.	PhD Masters	3.40 3.28	.93 1.01	.356 .314	NS NS
6	Writefull helps me with proper citation formatting.	PhD Masters	4.46 3.77	4.93 6.88	.000 .000	S S
7	Writefull assist me checking the consistency of reference lists.	PhD Masters	3.53 3.14	3.02 3.43	.003 .001	S S
8	Writefull helps researcher to produce more polished professional research papers.	PhD Masters	4.45 3.77	4.85 6.76	.000 .000	S S
9	Writefull helps me to avoid unintentional plagiarism.	PhD Masters	3.55 3.13	3.20 3.66	.001 .000	S S
10	I use Writefull to integrate with others writing platform.	PhD Masters	4.69 3.70	6.60 9.94	.000 .000	S S

S = Significant at 0.05 level of Significance, NS = Not Significant at 0.05 level of Significance, df = 373.
Source: Field Survey 2025.

The t-Test analysis in Table 4 indicates that eight out of ten items exhibited significant differences in mean responses between Master's and PhD students concerning the influence of Writefull on the research writing culture in Federal Universities in South-South Nigeria.

These eight items had t-values ranging from 3.02 to 9.94 and p-values from 0.00 to 0.003, which are below the 0.05 significance level, leading to the rejection of the null hypothesis for these items. Conversely, the remaining two items, specifically items 4 and 5, yielded t-values between 0.93 and 1.69 and p-values ranging from 0.093 to 0.356, indicating no significant difference in responses. Therefore, the null hypothesis was retained for items 4 and 5, suggesting that the influence of Writefull was similarly perceived by both Master's and PhD students for these specific items.

Discussion of Findings

The findings of the study showed that QuillBot significantly influences the research writing culture of postgraduate students in Federal Universities in South-South Nigeria, with PhD students experiencing a higher level of influence compared to Master's students. Furthermore, the t-Test analysis revealed that there are significant differences in the mean responses regarding the influence of QuillBot on research writing culture between Master's and PhD students in Federal Universities in South-South Nigeria. These findings is in consonance with the findings of Siti *et al.* (2024) who found that QuillBot significantly enhances writing quality and efficiency by detecting errors, paraphrasing and expanding vocabulary and that while users value its time-saving features, concerns regarding overreliance and potentially hindering critical skills development exist. In the same vein, Smith (2020) affirmed that QuillBot's grammar checking and summarization features significantly enhanced students' academic writing by improving syntactic correctness, reducing redundancy and facilitating clearer expression of ideas.

The findings of the study indicated that Writefull significantly influences the research writing culture of postgraduate students in Federal Universities in South-South Nigeria. Additionally, the t-Test analysis revealed that there are significant differences in the mean responses regarding the influence of Writefull on the research writing culture between Master's and PhD students in Federal Universities in South-South Nigeria. These findings is in assertion with the findings of Garcia (2019) who assert that Writefull's discipline-specific phrasebank significantly improved students' ability to structure and articulate their ideas in academic writing. Students reported increased confidence and efficiency in using academically appropriate language. The findings is also in support of Van den Bosch and Daelemans (2020) findings who found that Writefull's ability to provide writing suggestions tailored to specific academic fields significantly helped users conform to the expected conventions of their disciplines.

Conclusion

Based on the findings of the study, it was concluded there is a great extent of influence of artificial intelligence-powered writing tools on the research writing quality and productivity among postgraduate students in Federal Universities in South-South Nigeria. It was further concluded that there was a significant influence of QuillBot and Writefull, on the research writingquality and productivity among postgraduate students in Federal Universities in South-South Nigeria. Notably, PhD students show a greater reliance on these tools compared to Master's students, indicating differing levels of influence. The use of these technologies enhances writing efficiency and quality, suggesting a shift in academic writing practices. It was recommended that universities incorporate AI writing tools into research training while establishing clear ethical guidelines for their appropriate use.

Recommendations

Based on the findings of the study, the following recommendations are made:

1. Universities Management should incorporate the use of AI-powered writing tools like QuillBot and Writefull into the postgraduate curriculum, including mandatory training sessions to help students understand their benefits and applications in academic writing.
2. Universities Management should develop specialized workshops aimed at

Master's students to equip them with the necessary skills to effectively utilize these AI tools, ensuring they can maximize their writing potential.

3. The Head of Department should establish mentorship programs where PhD students can guide Master's students in the effective use of AI writing tools, fostering collaboration and improving overall writing skills across different academic levels.
4. Encourage ongoing research into the impact of AI writing tools on academic integrity and writing proficiency, complemented by periodic assessments of their effectiveness in shaping the research writing culture among postgraduate students.

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