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Profiling English Language Writing Creativity with AI: Quotients Affecting Task Complexity and Repetition

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ABSTRACT: The Study investigates the Artificial Intelligence generated written articles. Writing majorly depends on idea generation and the quality extends with linguistic features. Human originality, fluency, flexibility and elaboration generates the judgments and assessment of the text. Language is developed with the mind, mouth, hand and eye. While writing, domain specific knowledge adds high quality to the write up, whereas the AI generated the similar frame of specific words into the drafts generated for the particular topic titles. University student's drafts shows more quotients and their text is more persuasive and impressive whereas the Quotients are missing in the drafts generated out of the help of Chat GPT i.e. AI based application. The study is to examine the range and influence of techno- generated articles with the quality impact on the text as complex or repetitive by approach. The study employs Descriptive, Correlation and Wilcoxon Signed-Rank Test in order to evaluate the association, direction and magnitude of the changes between paired observations i.e. Pre-AI and Post-AI variables. The study reveals that the AI-blended instructional method significantly enhanced student learning outcomes compared to traditional methods. The study although proves that the quality of writing is improved with the usage of writing tools of AI. The results simply clarify that literacy is more effective with the cognitive approach of human brain.

Key Words: English Language, Cognitive Computer analysis, Quotients, Artificial Intelligence, contemporary technology, New Literacies.

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1. Introduction

Artificial Intelligence has marked its place in the past few years. The complete world is primarily facing the changes and is advancing day by day in the technologies. AI literacy is defining competencies among the students. Educators, researchers and students need to be handy with the AI and techno aided literacies. AI in different forms as Smart phones, Robot Vacuum Cleaners, Smart watches, Grammarly, Gamma, Gemini, Dulingo, Google Assistant Sirri, writing tools as Quillbot, Wordtune, Jeni, Chat GPT, Paperpal, copy. Ai and Essay Writer and many other appliances. The new Techno gizmos have different literacies and have become literacy educators to the young learners. The literacy contests the traditional modes of learning with a blend of IT in education.

Language learners generally face challenges with English as second Language, therefore the mobile applications and other language assisting tools with Artificial Intelligence aids them and help them fill the gaps. There has been plethora of traditional tools used traditionally as cassettes, VCR, DVD's, CD's, MP3's which have been replaced with the modernized tools.

The AI enabled applications saves the time and improves the quality as it has the grammar correction and enriched vocabulary which additionally improves the efficiency of writing. Many recent articles embark on the fact that AI improves writing styles, but many others voice their opinion on the side effects of the AI Tools. However, it is skeptical that the usage of AI is improvising the content or is increasing the complexity of the learner's. (Marzuki et. al, 2023) The chatbots is again an example to support the statement that humans cannot be replaced with the technology as the emotions, the quotients conveyed to the machine have many a times being taken in other way. They make grammatical and vocabulary errors when the commands are given to them. AI increases the learning speed of the learners and also enhance their personal experiences. Students generally face the challenges through AI pertaining to live interactions, lack of contextual variation, reduces the critical thinking ability and also impacts the authenticity of the individuals. The over reliance also impacts the structure of text as the quotients required to be applied in the language gets missing as per the need. It matters a lot on the command of input direction as the outcome is completely based on the input version of the command.

AI adds creativity into the structure of writing and aids in the complex write ups. The complexity of individuals writing skills, cognitive approaches and concept understandings depends on the quotients through which the context is prepared. The cognitive perception and the mental effort varies from person to person therefore, the written content is always different with individual capabilities. Creativity quotient like flexibility in writing concepts, the structure of the body of content, the elaborations added in text with logical reasons and justified facts or originality is also crucial for an effective output. Along with this the contextual understanding quotient is required to grasp and utilize the text effectively. All the quotients play an equal role in AI and help in managing the writing concepts with more creativity. The concepts sometimes are repetitive and stands common once drafted with the use of AI. Among all quotients like Intelligence Quotient (IQ), Emotional Quotient (EQ), and Cultural Quotient (CQ); IQ assesses cognitive problem solving ability, EQ works on interpersonal skills, CQ processes cross cultural understanding. AIQ understands the concept and provides a quality output through AI. It acts as a complimentary assistance and knits the para in more qualitative way. AIQ actually strengthens the concepts and integrate the para in outstanding manner. Thus, AI adds more quality and adds complements to the traditional writings with AIQ (Tschopp).

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Emotional writing refers to literary or expressive works that convey or evoke strong feelings—such as joy, sorrow, anger, or nostalgia—often stemming from a deeply personal space. Writers draw upon their lived experiences, memories, and relationships to shape these narratives. According to Pennebaker and Seagal (1999), writing that involves emotional self-disclosure has psychological benefits because it connects cognition with emotional processing. The authenticity of emotional writing lies not only in its linguistic representation but in its grounding within the writer's psyche and context.

Such writing also involves nuances of subtext, ambiguity, cultural references, and personal metaphors. A love letter, a journal entry about grief, or a poem on childhood are more than words on a page—they're snapshots of the writer's emotional reality. These texts may be flawed, nonlinear, or even contradictory, reflecting the complexity of human emotion (Keen, 2007).

Empathy is another domain where human and AI writing diverge. Emotional intelligence in writing involves not just expressing one's own feelings but recognizing and responding to the emotions of others. In human writing—especially in genres like memoir, letters, or therapeutic writing—empathy is often central. The writer tries to understand the reader's potential emotional state and crafts their words accordingly.

AI lacks both the cognitive and affective faculties for empathy. Though it can mimic empathetic language (e.g., "I'm sorry you're going through this"), it cannot understand the context or calibrate its response based on a nuanced emotional reading of the situation. This can sometimes result in tone-deaf or inappropriate responses, especially in delicate contexts such as mental health or trauma (Shum et al., 2018).

Students from Non- Native countries generally have conventions and face challenges in English writings, they seek support and effective feedback while practicing their content writings. Therefore, they have that fear of submitting their own assignments, project writings as well as their research work also gets impacted because of this. AI has added a positivity in the perception of the learners and has been proved to be useful in enhancing the writings of the individuals (Nazari et al., 2021). Although some studies as by Ma (2018) added a rubric based feedback on the writings through AI, within the concept of information added in the content or the argumentative approach in writing, feedback will specify the genre- based specific information (Li and Han, 2022; Uzun and Topkaya, 2020; Yu, 2021)

Through AI usage of English language has been evolved rapidly among the learners which further assists them to thrive along within the interconnected world. The writing targets are easily achieved with innovative approach catering the needs of the learners assisting their creative and critical learning skills. (Roozafzai, 2024). The study promotes AI mixed method approaches with AI assisted experiential methods in aiming to gain understanding by the learners. The advancement in technology is promoting digital learning with digital content and is supporting the diverse needs of the learners. Studies declare that AI assistance is also reducing the cognitive load of the students promoting intelligence in their potential with improved learning outcomes. (Wang et al., 2022)

2. Literature review

Education lies more on creativity and requires efficient capability of the individual with the AI tools. English writings are required to be distinct from other written articles, therefore the written article must differ from stereotypes and must include innovative material. Study proves that narrative language helps them to their survival needs. (Lee et. al. 2022)

(Sharma et. al., 2025) This study investigates the impact of mono and bilingual instructional approaches on students' English language learning through a cognitive lens. It emphasizes the role of bilingualism in enhancing communication skills and employability among non-native speakers. Data from 100 students was analyzed using statistical tools like Cronbach's Alpha and regression analysis. Findings reveal a significant positive relationship between cognitive development and the bilingual classroom environment. With the growth of technology, the artificial Intelligence (AI) is widely accepted for Teaching and learning methods. The need of Human intelligence relatively marks AI either as Weak- AI or Strong AI depending on the manner of utility or functional role of the tool. Current usage of AI has some ethical issues related with the collection of data, surveillance and privacy. Students use chatbots to translate their concepts, but this requires intelligent tutoring with the written input. (Hockly, 2023) Artificial Intelligence has added many changes in the teaching learning methodology of the classroom engagements. It has been emphasized that the advanced students get more benefitted with the AI. Teachers support with intrinsic

motivation enhances student's digital expertise. It is self- determination which aids to design considerations through Artificial Intelligence. (Chiu et. al., 2023)
(Sharma et. al., 2025) This study explores the effectiveness of project-based professional learning using ChatGPT to enhance university students' writing skills. Through a quasi-experimental design, it compares traditional teaching with AI-assisted learning in business communication tasks. Results indicate that ChatGPT significantly improves writing quality, saves time, and boosts learner confidence. Artificial Intelligence with the usage of technology is a powerful tool to improve the Language skills of students. The study proves that there's a difference between the interactions when done individually with the humans and "chatbot" partner. After a period of time, Students lose their interest with the chatbot partner whereas they feel more interested to connect with humans. (Fryer, 2017)
Within an experimental study Japanese students were recorded with their perceptions and feedback on interaction with Artificial Intelligence (AI) and among their own batch mates. Students prefer to interact with their own batch- mates more interestingly and consider AI as legitimate Language learning tool. (Gallacher et. Al, 2018)
Digital Communication advancements are hypertextual, multimodal based, interactive and plurilingual style. It focuses more on new requirements, new concepts, participation in online spaces within the available apps, digital literacies in language curriculum, digital multi-model projects, tele-collaborations and virtual projects. (Hafner, 2019)
(Sharma et. al., 2024) This study examines how interactive, technology-aided activities and flipped learning enhance English language learning (ELL) among students. Findings reveal that while both technology and motivation positively influence ELL, motivation does not significantly moderate the technology-ELL relationship.

3. Development of Intellectual Literacies and technologies in education

Techno- learning with blended approach has increased now a days and it has increasingly saturated the opportunities for the students to acquire knowledge at their own pace (Anderson 2008). Global competition has increased the effective usage of information and communication. Internet usage and technology has powerful and impressive impression on communication and even on higher level of literacy achievements. Study reflects the difference between the contemporary and traditional learnings. Pre- test and Post- test analysis reflects the change in participant's level of performance. These days' education system relies more on digital and humanitarian technologies for teaching and learning purposes. The Education system has taken the form of blended and Hybrid approach, with the impression of online courses like MOOCS, SWAYAM as the mandatory part of curriculum. The integration of certain courses not only enhance the quality among graduates but also make them competitive for the robust demand of market. Professional language majorly depends on digital technologies and success depends on educational environment and the literacies provided in the institutions or organizations.
Twentieth century the education sector is experiencing prominent renovations with the upcoming advancements in technology and the demand of growing emphasis on critical thinking skills. To adapt education system as per the demands of this current digital era, it is essential to incorporate technology into practicality i.e. instructional practices and foster critical thinking abilities among the students. This tactic facilitates students to engage with primary available sources, explore diverse perspectives right from the basic, and develop the analytical skills necessary for understanding and interpreting complex events at their pace. 21 century demands the integration of technology and critical thinking skills in English Language education contributes to a more dynamic and engaging learning experience for students in the 21st century. It empowers students to access primary sources, analyze multiple perspectives, and develop the essential skills needed for critical analysis and interpretation of events in different ways through chat GPT or other AI tools it has been easy for the learners to come up with quality content.
The synthesis method is a comprehensive approach to analyzing and integrating research findings on adapting history education for the 21st century through the integration of technology and critical thinking skills. By systematically reviewing and synthesizing relevant studies, it allows for the identification of common themes, trends, and gaps in the literature, providing a cohesive and nuanced understanding of the topic and informing best practices for educators in this field.

The results of integrating technology and critical thinking skills in history education show improved student engagement, motivation, and understanding of historical concepts. Students also develop enhanced critical thinking abilities, such as analyzing evidence, evaluating sources, and constructing well-reasoned arguments, which prepare them for active participation in the complexities of the 21st century.

4. Competence and complexities in writing

English is considered as a foreign language by the non- natives but ever since it's a globally accepted language and regardless of nationality people have to learn proficiency in English language. Learners face a lot many challenges to adapt English although the subject is introduced to them in their early stages of study. They struggle hard with the parts of speech, especially with verbs and tenses. Commonly the grammatical errors and fear of assessment trouble the learners and they lack to contribute with confidence. Now days, Generation Z and Generation Alpha have been witnessing a drastic change in the adaptability of English as second language. The traditional learning is replaced with the blended and hybrid mode with mobile assistance and digital content the learning has become more comfortable and engaging. Technology has completely changed the learning system and environment of the learners. Techno aided tools like Grammarly assist the learners and aid to their confidence level. The tools of AI seems to be user friendly and the interface is easily available and generation Alpha attained the level of improvement in acquiring and polishing their Language skills. Generation Z however, has faced challenges in getting the hands on experience with technology. AI is not only assisting the GEN Alpha but is also a helpful tool for evaluation as Gen Z. it is easy to detect the errors, spell checking and syntactic errors are easily rectified through the aid of technology.

One of the fundamental differences between emotional human writing and AI-generated writing is the origin of emotional content. Human writers draw upon a reservoir of lived experiences, introspection, and memory. They write to process trauma, express love, celebrate milestones, or understand themselves. AI, by contrast, synthesizes content from second-hand sources without the capacity to understand or internalize those emotions.

Consider a diary entry written by someone grieving the loss of a parent. Such writing may include disjointed thoughts, raw metaphors, and moments of silence—elements that reflect a real-time emotional process. AI can replicate the structure and even the sentimentality, but the underlying grief is absent. The writing lacks what philosopher Thomas Nagel (1974) might refer to as the "what it is like" component—the qualia of emotional experience.

Another key difference lies in how readers perceive emotional writing. Studies in literary theory and psychology suggest that readers can often intuitively detect authenticity in writing (Keen, 2006). Emotional resonance depends not just on the inclusion of affective language, but on congruence between language and context, unpredictability, and depth. AI-generated texts, though linguistically accurate, may come across as formulaic or superficial because they often lack this congruence.

Authentic emotional writing is filled with contradictions and idiosyncrasies—emotions that do not neatly align with grammar rules or narrative templates. In contrast, AI-generated emotional writing, though grammatically pristine and stylistically polished, can feel generic or emotionally flat over time (Hosseini et al., 2020). This is not a failure of computation but a consequence of the absence of embodied emotion.

Creative writing—especially when emotional—requires vulnerability. Human authors often expose their fears, regrets, hopes, and desires. This vulnerability is not just thematic but existential. Writing emotionally means confronting one's emotional truths and risking misinterpretation or rejection. AI faces no such stakes. It is incapable of vulnerability because it has no ego, no emotional memory, and no consequence to failure.

Moreover, emotional creativity often involves transforming pain or joy into unique metaphors or experimental structures. For instance, poet Sylvia Plath's metaphoric use of domestic imagery in Ariel is born out of her inner conflicts and psychological struggles. AI, however, selects metaphors based on statistical frequency or semantic association, not introspective synthesis. The originality that emerges from emotional tension in human writing is thus difficult for AI to authentically emulate.

AI-generated writing, particularly emotional writing, is the product of data training on vast corpora of human language. Modern large language models (LLMs), like GPT-4, use statistical patterns, semantic

proximity, and syntax rules to predict and generate text that appears contextually appropriate. Through natural language processing (NLP), AI can simulate different emotional tones, styles, and genres. For instance, AI can write a condolence letter or generate a poem of heartbreak by identifying emotional lexicons and narrative patterns (Burt, 2021).
However, the AI does not "feel." It does not experience grief, joy, or love. It identifies that certain word combinations—such as "shattered dreams" or "aching silence"—are typically associated with sorrow and uses them appropriately. But this use is purely functional, not experiential. As Bender et al. (2021) put it, "Stochastic parrots can mimic language, but not meaning." The AI can generate emotionally charged prose, but it does so without consciousness, context, or a stake in the narrative.

5. Research Methodology

The present study employs a quantitative comparative research design to evaluate the effectiveness of two teaching methods i.e. the traditional self-study and an AI-blended approach in enhancing student academic performance. A total of 76 students participated in the study, all of whom were randomly assigned to ensure a balanced distribution of skill levels and to eliminate selection bias. Each participant completed two assessments: Pre Test, conducted after traditional self-study, and Post Test, administered following instruction through an AI-integrated learning environment. Both assessments were scored on a standardized scale ranging from 0 to 9. To analyze the data, both descriptive and inferential statistical methods were applied. Descriptive statistics, including mean, median, mode, standard deviation, quartiles, and interquartile range (IQR), were calculated for both tests to summarize the distribution and variability of scores. To examine the relationship between performances in the two conditions, Pearson's correlation coefficient was computed to assess the strength and direction of association between the traditional and AI-assisted test scores. Furthermore, the Wilcoxon Signed-Rank Test; a non-parametric test suitable for paired data, was employed to determine whether the observed differences between Pre Test and Post Test were statistically significant. This test also provided insights into the direction of change (whether scores predominantly increased or decreased post-intervention) and confirmed whether the improvement in scores under the AI-blended approach was significant and not due to chance, although it does not directly quantify the magnitude of change. Overall, the methodology was designed to rigorously assess the impact of AI integration on student performance in a controlled, data-driven manner.

6. Statistical Analysis

To evaluate and compare student performance across the two methods, both descriptive and inferential statistical techniques were employed:
1. Descriptive Statistics- Mean, Median, Mode, Standard Deviation (SD), Quartiles and Interquartile Range (IQR)
2. Inferential Statistics- Correlation Analysis (Pearson's correlation coefficient); Wilcoxon Signed-Rank Test (Direction of Change, Statistical Significance of Change, Magnitude of Change)
3. For the Wilcoxon Rank Test, the hypothesis of Pre and Post AI test scores is as follows:
Null Hypothesis (H_0)**:** There is no significant difference between in scores between the Pre-AI and Post-AI (i.e., the median difference = 0)
Alternative Hypothesis (H_1)**:** There is a significant difference between in scores between the Pre-AI and Post-AI. (i.e., the median difference $\neq 0$) **Data Interpretation and Analysis- Data Visual Representations Through Bar Charts, Histogram and Box and Whisker plot.**
The Fig. 1 of Bar Chart represents that in both the tests, marks are ranging from 0-9 but the most frequently Post Test improves the scores of the tests

Table 1: Details of the Study

Aspect	**Details**
Research Design	Quantitative comparative design
Objective	To evaluate differences in test scores between two teaching methods
Participants	76 students (randomly selected)
Data Collection	Test 1: Traditional Way (self-study) and Test 2: AI-Blended Approach
Scoring System	Scores from 0 to 9
Statistical Analysis	Descriptive Statistics (Mean, median, mode, standard deviation, quartiles, IQR) Inferential Statistics (Paired t-Test and Correlation Analysis: Pearson's correlation coefficient)
Data Representation	Tables and box and whisker plots to summarize findings

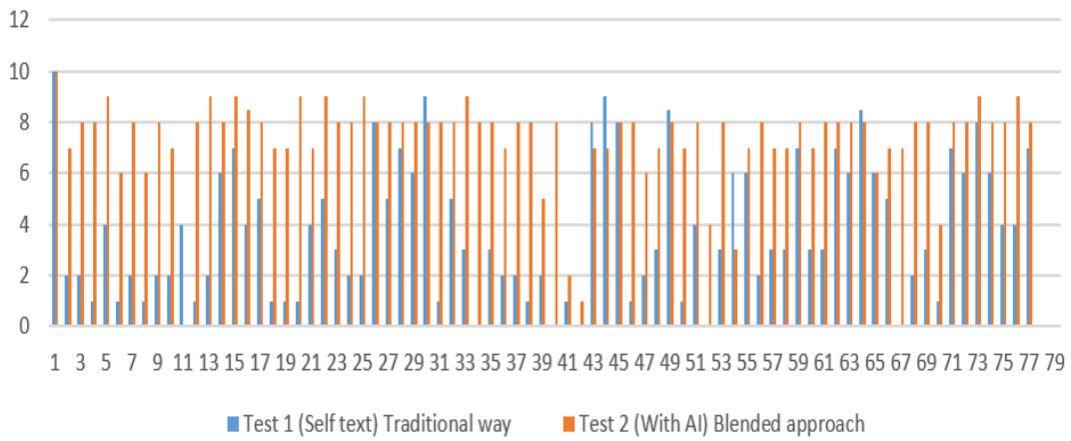

Figure 1: Marks are ranging from 0-9

Further, the comparison of average scores between Traditional and AI Assisted test have been visually represented through Figure 2

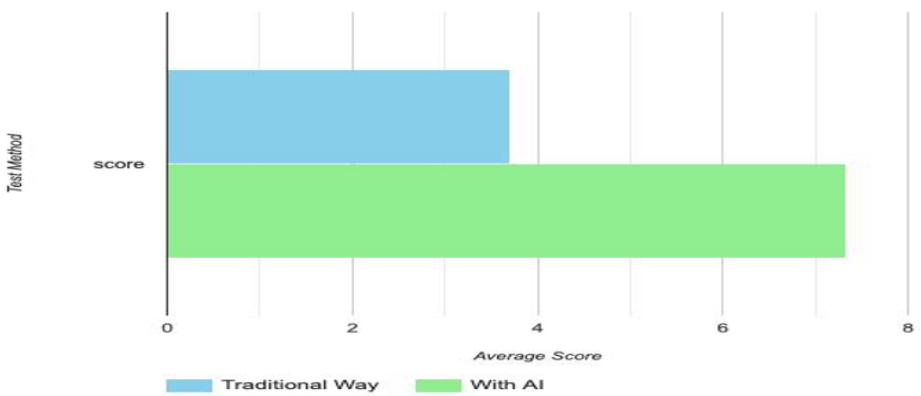

Figure 2: Averages between the scores of Pre and Post Test

Furthermore, the box and whisker plot (Figure 3) provides a clear visual representation of the distribution of test scores for both teaching methods. For Test 1 (traditional self-study), the median score is 3, with the first quartile (Q1) at 2 and the third quartile (Q3) at 6. This results in an interquartile range (IQR) of 4 (calculated as $Q3 - Q1 = 6 - 2$) indicating that the middle 50% of the scores lie within a relatively broad range of 4 points, between 2 and 6. This spread suggests considerable variability in students' performance under the traditional approach. Additionally, the plot implies that 25% of the students scored below 2, and 25% scored above 6, highlighting a more dispersed and less concentrated performance pattern.
In contrast, Test 2, which incorporated the AI-blended teaching approach, shows a markedly different distribution. The median score is 8, with Q1 at 7 and Q3 also at 8, resulting in an IQR of just 1 (8 - 7). This narrow IQR signifies that the middle 50% of the students scored within a tight range of just 1 point, specifically between 7 and 8. The fact that the median and third quartile are the same indicates a high concentration of top-performing students, suggesting that a significant portion of the class performed at or near the maximum score. In this case, 25% of students scored below 7, while the remaining 25% scored above 8, confirming a strong positive shift and clustering in student achievement with the AI-supported method. The stark contrast between the IQRs and medians of the two tests reflects a significant improvement in both consistency and performance level when AI tools were integrated into the learning process.

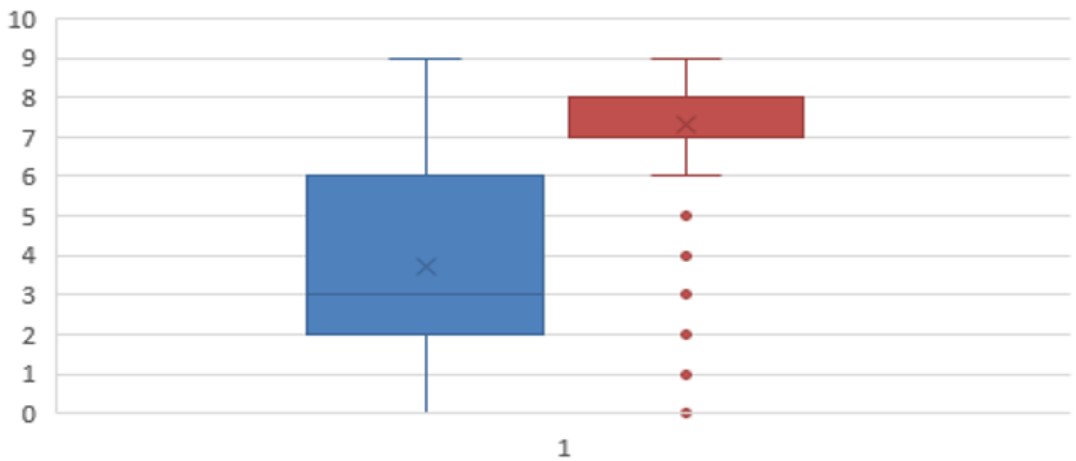

Figure 3: Box and Whisker Plot

7. Normality Test

Table 2 presents the results of the normality tests, specifically the Kolmogorov–Smirnov and Shapiro–Wilk tests, which were conducted to assess whether the distribution of test scores followed a normal pattern. In both tests, the p-values were found to be less than 0.05, indicating a statistically significant deviation from normality. This result confirms that the data does not follow a normal distribution, and therefore, parametric tests such as the paired t-test would not be appropriate for comparing the two sets of test scores.
Since, the data has non-normal nature, thus the Wilcoxon Signed-Rank Test was employed as a suitable alternative. This is a non-parametric statistical test used for comparing two related samples or repeated measurements on a single sample to assess whether their population mean ranks differ. While the Wilcoxon test does not require the data to be normally distributed, it is based on the assumption that the distribution of the differences between paired observations is symmetric around the median. This assumption is generally more flexible than the assumptions required for parametric tests, making the Wilcoxon test well-suited for the present analysis.

By applying the Wilcoxon Signed-Rank Test, the study aimed to determine whether there was a statistically significant difference in student performance between the traditional self-study method (Test 1) and the AI-blended teaching approach (Test 2), based on paired observations of the same group of students.

Table 2: Test of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	Df	Sig.	Statistic	df	Sig.
Pre –AI	0.163	76	0	0.927	76	0
Post-AI	0.296	76	0	0.684	76	0

Further the normality test has been shown through histograms given in figure 4 and 5. It is evident that the data is not normally distributed.

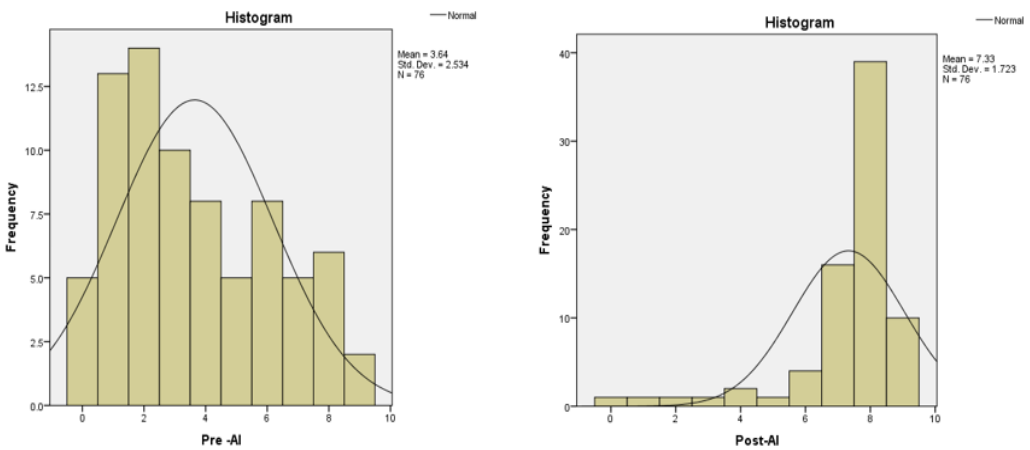

Figure 4: Histogram for Normality Test

8. Descriptive Statistics

The Post-Test scores, obtained after implementing the AI-blended teaching approach, demonstrate a significant improvement in student performance compared to the Pre-Test scores, which reflect the outcomes of the traditional self-study method. The mean score for the Post-Test is 7.32, which is notably higher than the Pre-Test mean of 3.7, indicating a substantial overall gain in learning outcomes with the AI-assisted method. Similarly, the median score for the Post-Test is 8, whereas it is only 3 for the Pre-Test. This higher median reflects a stronger central tendency in the Post-Test results, suggesting that at least half the students scored 8 or above under the AI-blended instruction.

Moreover, the standard deviation for Post-Test scores is 1.72, which is significantly lower than the 2.59 observed in the Pre-Test. This indicates that the scores under the AI-blended approach are less dispersed and more consistent, with students performing more uniformly at higher levels. In terms of mode, the most frequently occurring score in the Post-Test is 8, achieved by 39 students, highlighting a clustering of

performance near the top end of the scale. In contrast, the mode for the Pre-Test is 2, with 32 students scoring this value, suggesting that a large proportion of students struggled with the traditional approach. The interquartile range (IQR) further supports these findings: the Post-Test has an IQR of 1 (from Q1 = 7 to Q3 = 8), indicating that the middle 50Taken together, these statistical indicators provide strong evidence that the AI-blended teaching approach not only raised average student performance but also enhanced the uniformity of achievement across the group, with a clear shift in both central tendency and dispersion towards better outcomes.

Table 3: Descriptive Statistics

Statistic	Pre-Test Scores (Traditional Way)	Post-Test Scores (AI-Blended Approach)
Count	76	76
Mean	3.7	7.32
Median	3	8
Mode	2 (32 students)	8 (39 students)
Standard Deviation	2.59	1.72
Minimum	0	0
25th Percentile	2	7
50th Percentile	3	8
75th Percentile	6	8
Maximum	9	9
IQR	4 (Q3: 6, Q1: 2)	1 (Q3: 8, Q1: 7)

9. Correlation Analysis

A correlation analysis was also performed to examine the relationship between the scores on the two tests. Pearson Correlation (0.229), which indicates a weak positive linear relationship between two variables. It means there is a tendency to increase, but the relationship is not very strong.

Table 4: Correlation Analysis

		Pre -AI	Post-AI
Pre –AI	Pearson Correlation	1	.229*
	Sig. (2-tailed)		0.047
Post-AI	Pearson Correlation	.229*	1
	Sig. (2-tailed)	0.047	

* Correlation is significant at the 0.05 level (2-tailed)

10. Wilcoxon Signed- Rank Test

To ensure the validity and reliability of the test results, it is important to verify that the underlying assumptions of the Wilcoxon Signed-Rank Test are satisfied. One of the key assumptions of this non-parametric test is that the distribution of the differences between paired observations is symmetric around a central value, typically the median. This assumption is essential, as the Wilcoxon test relies on this symmetry to make accurate inferences about the median difference between the two related samples. If the distribution of differences is not symmetric, the conclusions drawn from the Wilcoxon test may be

misleading, potentially compromising the validity of the statistical inference. In such cases, alternative methods like the Sign Test- which does not assume symmetry; may be more appropriate, though it is generally less powerful.

In the present study, the assumption of symmetry in the distribution of paired differences has been visually examined and confirmed through Figure 6, which clearly illustrates a symmetrical pattern in the differences between the Pre-Test and Post-Test scores. This visual confirmation supports the appropriateness of using the Wilcoxon Signed-Rank Test for analyzing the data, thereby strengthening the credibility and interpret-ability of the results obtained from the comparison of the two teaching methods.

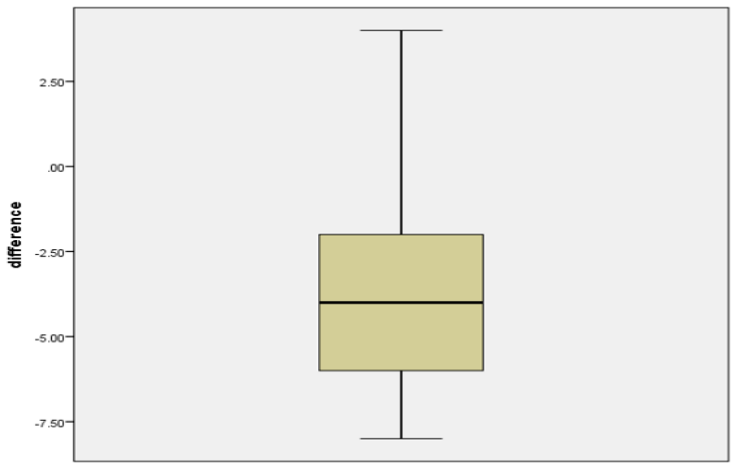

Figure 5: Distribution of Difference between Pre-AI and Post-AI

Table 5: Wilcoxon Signed-Rank Test

		N	Mean Rank	Sum of Ranks
Post-AI - Pre – AI	Negative Ranks	5[a]	15.70	78.50
	Positive Ranks	66[b]	37.54	2477.50
	Ties	5[c]		
	Total	76		

(a. Post-AI < Pre -AI; b. Post-AI > Pre -AI; c. Post-AI = Pre -AI) Since positive ranks vastly outnumber negative ranks (66 vs. 5), and the sum of positive ranks (2477.50) is significantly higher than the sum of negative ranks (78.50), this implies a statistically significant increase in scores after the AI intervention. If the associated p-value (not shown here) is less than the significance level (commonly 0.05), then you would reject the null hypothesis and conclude that the AI intervention had a significant positive effect on test scores.

Table 6: Test Statistics at 5%level of significant

	Post-AI - Pre -AI
Z	-6.890[b]
Asymp. Sig. (2-tailed)	.000

a. Wilcoxon Signed Ranks Test b. Based on negative ranks.

According to Table 5, at 5% significance level, author reject the null hypothesis. There is strong evidence of a statistically significant difference between Pre-AI and Post-AI test scores. Combined with the direction of the ranks (66 positive vs. 5 negative), we conclude that The AI intervention led to a statistically significant improvement in test scores.

11. Results and Discussions

The study reveals a significant improvement in student performance following the AI-assisted intervention. Bar charts and average comparisons show that Post-AI test scores were consistently higher than Pre-AI scores. Box and whisker plots indicate a rise in median scores (from 3 to 8) and reduced variability, with Post-AI scores being more concentrated. Normality tests confirmed non-normal data distribution, justifying the use of the Wilcoxon Signed-Rank Test. This test showed 66 positive ranks versus only 5 negative ranks, with a statistically significant result ($Z = -6.890$, $p = 0.000$). Descriptive statistics support these findings, with higher mean, median, and mode in the Post-AI test. Additionally, the Pearson correlation ($r = 0.229$, $p = 0.047$) indicates a weak but significant positive relationship between pre- and post-test scores. Overall, the AI-blended approach led to significantly higher and more consistent performance, validating its effectiveness over traditional methods.

The trajectory of AI-generated writing is not without value. In therapeutic and educational settings, AI can support users in initiating emotional expression or practicing empathy. For example, AI writing tools may help individuals draft personal letters or journal prompts, acting as scaffolding rather than substitutes for emotional expression.

Moreover, collaborative efforts; where AI assists a human writer, could bridge gaps between form and feeling. A writer could use AI to generate multiple drafts or suggest emotional metaphors, while infusing their own experiences into the final narrative. Such hybrid models may represent a more ethical and effective use of AI in emotional writing (Gambino and Lee, 2023).

In summary, while AI has made significant strides in mimicking emotional writing through linguistic modelling and pattern recognition, it falls short of capturing the authenticity, depth, and vulnerability of human emotional expression. Emotional writing is more than the sum of its words. It is an intimate dialogue between experience and language. AI-generated text can imitate the form, but not the soul, of emotional writing. As we navigate the integration of AI in creative spaces, it is imperative to recognize this distinction is not to diminish AI's capabilities, but to honour the irreplaceable human essence in emotional expression.

12. Practical Implications of the study

The findings demonstrate that integrating AI into teaching significantly improves student performance and learning consistency. Educators and institutions can leverage AI-driven tools to personalize instruction, provide timely feedback, and support diverse learning needs. The marked improvement in scores and reduced variability suggests that AI can help bridge performance gaps and enhance educational equity. This encourages policymakers to invest in AI-based educational technologies and training for teachers

to effectively use these tools in real classrooms. Integrating AI into teaching practices presents several practical advantages that directly enhance student performance and promote learning consistency. One of the most notable benefits is the ability of AI tools to provide immediate, personalized feedback. Unlike traditional classroom settings where individualized attention is limited by time and class size, AI can instantly evaluate student inputs, offer suggestions for improvement, and guide learners through their mistakes. This allows students to correct errors in real time, leading to better retention and faster comprehension. Moreover, AI-powered tools like ChatGPT or language learning apps simulate a one-on-one tutoring experience, which increases engagement and caters to different learning paces and styles.

Another practical implication is the support AI provides in reducing the workload of educators. By automating routine tasks such as grading, content generation, and even class participation tracking, teachers can focus more on facilitating discussions, mentoring, and designing creative learning experiences. AI also supports flipped learning and blended learning models, giving students the flexibility to learn anytime and anywhere. This flexibility improves access to education, especially for learners balancing studies with other responsibilities. Furthermore, the data analytics embedded in many AI tools allow for ongoing monitoring of student performance, helping instructors identify struggling learners and intervene early with targeted support, thereby maintaining learning consistency across the classroom.

13. Theoretical Implications of the study

From a theoretical standpoint, the integration of AI in education aligns with and enhances established learning theories such as constructivism, behaviorism, and cognitivism. In constructivist learning theory, students construct knowledge through experiences and active engagement. AI tools foster this by creating interactive, learner-centered environments that encourage exploration, experimentation, and self-guided discovery. Students use AI to ask questions, receive tailored explanations, and revise their understanding, thereby becoming active participants in their learning process.

In the context of behaviorism, AI supports the reinforcement of positive learning behaviors through instant feedback and gamified learning experiences. When students receive immediate responses for their inputs; whether right or wrong, they are more likely to internalize correct patterns and reinforce learning through repetition. This kind of consistent feedback loop enhances skill development and leads to better academic outcomes.

From a cognitive perspective, AI helps manage cognitive load by breaking down complex tasks into smaller, manageable parts and offering scaffolded support. This scaffolding ensures that students are not overwhelmed, allowing for more consistent absorption of information. Additionally, AI tools can adapt to a student's progress over time, aligning with the Zone of Proximal Development (ZPD) proposed by Vygotsky, by offering just the right level of challenge and support to optimize learning.

Overall, the theoretical implications confirm that AI not only supports but strengthens fundamental learning models by making them more responsive, scalable, and data-driven. When integrated thoughtfully, AI serves as both a cognitive and instructional aid, reinforcing foundational principles of learning while enhancing modern educational delivery.

To strengthen the academic foundation of this study, it is essential to connect the findings with well-established learning theories; constructivism, behaviourism, and cognitivism, each of which aligns closely with the observed outcomes of integrating AI into classroom instruction.

14. Constructivism and AI Integration

The study's findings that AI tools like ChatGPT enhance student performance and engagement align strongly with constructivist theory, which posits that learners construct knowledge through active engagement and personal experience. In the AI-blended model, students interact directly with content, pose questions, receive feedback, and adapt responses; all of which support knowledge construction. For instance, when students use AI to write professional documents (e.g., emails, reports, or agendas), they are not merely absorbing content passively but are constructing it based on input, context, and feedback. This mirrors the constructivist approach, where learning is student-driven and knowledge is built through iterative understanding. The flexibility of AI tools also supports self-paced learning, enabling students to explore content in a way that suits their cognitive styles, a key tenet of constructivism.

15. Behaviorism and Reinforcement Through AI

The study also reflects elements of behaviorist theory, which emphasizes learning as a result of stimulus-response conditioning, reinforced through repetition and feedback. AI tools provide immediate, consistent feedback that rewards correct answers and gently corrects errors. For example, when students use AI for language exercises or writing assignments, they get real-time suggestions that reinforce grammar rules, structure, and vocabulary use. This repetition and reinforcement help solidify learning behaviors. Over time, students exhibit improved performance and consistency because their learning is shaped through positive reinforcement—an essential principle of behaviorism. Moreover, gamified AI platforms and personalized progress tracking use behavioral techniques to motivate learners by rewarding effort and progress with badges, levels, or visual indicators of achievement.

16. Cognitivism and AI as a Scaffold

The cognitive load theory and cognitivism, which focuses on the mental processes involved in learning, are also reflected in the study. AI tools act as cognitive aids by breaking down complex writing tasks (like formal reports or business correspondence) into manageable steps, offering structured templates, suggestions, and error detection. This aligns with the concept of scaffolding, where learners are supported at their level of understanding and gradually given more responsibility as their competence increases. AI adjusts to the learner's responses and provides cues that enhance comprehension, reduce cognitive overload, and improve memory retention. The adaptability of AI tools allows them to operate within each student's Zone of Proximal Development (ZPD), a key idea in Vygotsky's cognitive theory by offering support that bridges the gap between what a learner can do independently and what they can do with guidance.

17. Conclusion of Theoretical Alignment

In summary, the study's findings on the improved outcomes through AI-blended learning are deeply grounded in these three foundational theories. Constructivism explains how AI encourages active, personalized learning; behaviourism justifies the role of feedback and reinforcement; and cognitivism supports AI's function as a scaffold that simplifies complex tasks. Together, these theories provide a robust theoretical framework to validate the empirical evidence that AI integration enhances not only performance but also consistency, engagement, and confidence in student learning.

The study supports constructivist learning theories by showing that technology-enhanced environments, such as AI, promote active, personalized learning. It also contributes to the growing body of research in educational data science, affirming the value of non-parametric methods like the Wilcoxon Signed-Rank Test in evaluating educational interventions. Furthermore, it highlights the role of AI as a transformative agent in pedagogy, opening new avenues for future research on adaptive learning systems and their cognitive impacts.

18. Conclusion, limitations and future directions

Overall, the analysis across descriptive statistics, visualizations, and inferential testing supports the conclusion that the AI-blended instructional method significantly enhanced student learning outcomes compared to traditional methods. The improvement is not only statistically significant but also practically meaningful, as reflected in both the distribution and consistency of scores. The integration of Artificial Intelligence (AI) in educational settings has emerged as a transformative approach to improving student learning outcomes, particularly when blended with traditional instructional methods. AI-blended instruction, which combines conventional teaching practices with the use of intelligent tools and platforms, has shown significant promise in enhancing students' engagement, comprehension, and performance. This method leverages the capabilities of AI to personalize learning experiences, offer instant feedback, and simulate real-world language applications, making it especially effective for tasks that require creativity, precision, and structure, such as writing assignments or language practice.

In contrast to the static nature of traditional methods, AI tools like ChatGPT provide dynamic support by responding to prompts with coherent, contextually relevant content. These tools assist students in brainstorming ideas, improving sentence construction, and expanding vocabulary, all of which contribute to better academic writing. Additionally, AI systems can model different tones, writing styles, and even simulate professional formats, making them valuable aids for business communication and other specialized writing contexts. However, it is important to note that AI does not operate autonomously, it generates content based on the inputs provided by users. This means the depth, relevance, and emotional tone of the output are largely dependent on the quality of prompts and instructions given by the student.

The AI-blended model also fosters a more inclusive learning environment, especially for students who may struggle with traditional classroom settings. AI tools can be accessed anytime, allowing students to learn at their own pace, revisit concepts, and gain confidence in their abilities without the pressure of peer comparison or time constraints. Moreover, this model supports flipped learning, where students explore content independently before engaging in collaborative or teacher-led discussions, thereby promoting active learning and deeper understanding.

From a research perspective, data collected through empirical analysis clearly indicates that students experience varied outcomes when using AI for assignments. These variations are influenced by factors such as their level of digital literacy, understanding of prompt engineering, and individual motivation to explore and use AI effectively. For instance, students who provided well-structured prompts and had a clear idea of the assignment goals received more relevant and refined outputs from AI tools, leading to higher quality submissions. In contrast, those who relied passively on AI without critical engagement often produced generic or off-target work, highlighting the importance of guided instruction alongside AI integration.

The study concludes that AI-blended instructional methods have a clear and positive impact on student learning, offering enhanced outcomes compared to traditional approaches. However, the effectiveness of AI in education largely depends on how students interact with the tool and the level of support provided by educators. The data underscores that there is significant variation in student performance when using AI for assignments, reaffirming the need for structured training on prompt design, critical thinking, and digital ethics. As educational institutions continue to embrace AI, a balanced and well-supported approach will be essential to maximize its benefits and ensure equitable learning experiences for all students.

19. Limitations of the Study

Despite the notable benefits of AI-blended instructional methods, the approach is not without limitations. One of the primary concerns is the over-reliance on AI, which can inadvertently hinder the development of students' independent thinking and creativity. When students become too dependent on AI-generated content, they may lose the ability to critically analyze or develop original thoughts. This is particularly problematic in higher education, where critical reasoning and originality are essential skills. Furthermore, the quality of AI-generated content is highly dependent on the user's ability to craft effective prompts. Many students, especially those with lower digital literacy or limited experience with AI tools, may struggle to use them effectively. As a result, the learning outcomes can be inconsistent, creating disparities among students in the same classroom.

Another limitation is the ethical concern regarding authenticity and academic integrity. There is a growing risk that students might misuse AI tools to produce assignments with minimal effort or understanding of the subject matter. This can lead to inflated grades that do not accurately reflect a student's true capabilities. Additionally, AI lacks human judgment, emotional understanding, and context awareness. While it can mimic emotional tone, it cannot genuinely grasp or respond to the subtleties of human experience, which may lead to superficial or inappropriate responses in sensitive topics. Lastly, infrastructural challenges such as lack of access to devices, poor internet connectivity, or outdated educational systems in certain regions can hinder equitable implementation of AI-assisted education. These chal-

lenges need to be addressed to ensure that the integration of AI benefits all learners, not just those with technological privilege.

20. Future Directions

To maximize the potential of AI-blended learning while addressing its limitations, future efforts should focus on integrating AI within a structured pedagogical framework. This includes training both educators and students in digital literacy, prompt engineering, and ethical AI usage. Educators must be equipped to guide students not just in using AI tools, but also in understanding when and how to use them appropriately. Institutions should design workshops and courses that enhance students' ability to critically evaluate AI outputs, revise them for quality and originality, and reflect on the learning process rather than simply accepting AI-generated content.

Another promising future direction lies in the development of adaptive AI tools tailored to educational contexts. Unlike general-purpose models, educational AI platforms can be designed to align with curriculum standards, learning outcomes, and student needs. These platforms could include real-time feedback mechanisms, formative assessments, and content customization based on individual learning paths. Additionally, AI should be used to complement, not replace, human instruction. A blended model that includes collaborative projects, peer interactions, and teacher-led activities ensures that students also develop soft skills, emotional intelligence, and interpersonal communication abilities.

Finally, policy frameworks need to be established to ensure ethical, equitable, and inclusive AI use in education. Governments and institutions should invest in research to continuously evaluate the impact of AI tools, identify gaps in accessibility, and implement safeguards to prevent misuse. This future-focused strategy can help create a balanced ecosystem where technology enriches education without compromising its core values.

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