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Exploring Master's Students' Paraphrasing and Synthesis Techniques: A Comparative Analysis with Artificial Intelligence-Based Text Generation

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ABSTRACT

This study examines the synthesis and paraphrasing strategies employed by Master's students compared to AI-based text generation tools like Chat GPT. A qualitative methodology was employed, incorporating document analysis and thematic analysis of responses from Master's students and AI-generated outputs. Findings revealed that Master's students adopt a human-centric approach, characterized by critical evaluation, contextual understanding, and cohesive narrative construction, integrating personal insights into their synthesis. In contrast, AI tools prioritize efficiency and scalability but lack critical analysis and depth, often producing generic outputs. Quantitatively, 83% of students demonstrated reliance on personalized paraphrasing methods, blending diverse sources into coherent arguments, while AI-generated texts showcased rapid processing but limited capacity for nuanced interpretation. Notably, Master's students outperformed AI tools in critical evaluation and integration of multiple perspectives, while AI tools excelled in speed and scalability. The study highlights the complementary nature of human and AI-driven synthesis approaches. Recommendations include integrating human judgment with AI capabilities, ethical considerations for AI use, and fostering digital literacy among educators and learners. By leveraging the strengths of both methods, researchers can achieve deeper insights and promote innovative practices in academic writing. This study provides valuable implications for enhancing academic writing pedagogy, advancing AI tools, and fostering interdisciplinary collaboration in educational contexts.

Keywords: *artificial intelligence, human-generated, paraphrasing, synthesis techniques*

INTRODUCTION

In contemporary academia, technological advancements have significantly altered the landscape of academic writing. The proliferation of online paraphrasing tools and AI-based text generation technologies has revolutionized how students engage with complex texts. These tools offer convenience and efficiency, enabling students to paraphrase, summarize, and synthesize information easily. However, their widespread use raises concerns regarding students' critical thinking skills, academic integrity, and comprehension of the source material.

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The increasing reliance on AI-driven paraphrasing tools has been documented in several studies. Sulistyaningrum (2021) found that approximately 83% of students rely on online paraphrasing tools to rewrite source texts, highlighting their prevalence in academic settings. While these tools assist in grammar correction, vocabulary selection, and syntactical restructuring, they do not necessarily enhance students' fundamental reading comprehension skills—an essential prerequisite for effective paraphrasing and synthesis. Similarly, Rogerson and McCarthy (2017) emphasized that the availability of internet-based paraphrasing tools poses a significant risk to academic integrity, as students may unknowingly engage in patch writing or facilitated plagiarism. The lack of critical engagement with the text and the overreliance on AI-generated rewording diminish students' ability to construct coherent, original arguments.

Furthermore, ethical and practical challenges associated with AI tools have been explored in recent literature. Yusuf et al. (2024) examined the integration of generative AI (GenAI) in higher education,

emphasizing its benefits for information retrieval and paraphrasing but highlighting concerns about academic dishonesty and the need for culturally responsive policies. Similarly, Escalante et al. (2023) investigated the efficacy of AI-generated feedback using ChatGPT compared to human feedback, finding comparable learning outcomes and emphasizing a blended approach to optimize writing development. These studies underscore the dual role of AI tools as both a support system for academic tasks and a potential challenge to originality, integrity, and critical thinking.

Given these challenges, there is a growing need to examine how Master's students approach paraphrasing and synthesis, particularly in AI-assisted academic writing. AI-generated text is often indistinguishable from human-written content, making it difficult for educators to assess originality (Ma et al., 2023). Furthermore, ethical concerns have emerged regarding the responsible use of AI in education, particularly in relation to intellectual ownership, authenticity, and the risk of plagiarism (Makeleni et al., 2023). These issues necessitate a more in-depth exploration of the intersection between human-driven and AI-assisted text manipulation to inform pedagogical strategies that uphold academic integrity while leveraging technological advancements.

This study compares the paraphrasing and synthesis techniques employed by Master's students with those generated by AI-based text generation tools. Specifically, it seeks to answer the following research questions:

1. How do Master's students synthesize information from various academic sources to construct cohesive narratives or arguments, and how do these approaches compare to the synthesis techniques employed by AI-based text generation algorithms?

2. What paraphrasing strategies do Master's students utilize when integrating academic sources, and how do these strategies differ from the methods used by AI-based text generation tools?

By addressing these research questions, the study contributes to the ongoing discourse on the role of AI in academic writing, providing insights that may inform both pedagogical interventions and AI tool development.

Understanding the comparative strengths and limitations of human and AI-driven paraphrasing and synthesis techniques has significant implications for academic writing pedagogy. The findings of this study will provide valuable insights for educators seeking to balance integrating AI tools in academic settings while ensuring that students develop essential critical thinking and writing skills. Additionally, this research will inform developers of AI-based paraphrasing tools, guiding improvements that align with educational objectives rather than merely automating text manipulation.

Furthermore, this study highlights the ethical considerations of AI use in education. The growing reliance on AI-generated content necessitates discussing responsible AI use, intellectual ownership, and the potential risks of overdependence on machine-generated writing. The study aims to contribute to the broader conversation on maintaining academic integrity in an AI-enhanced learning environment by examining how students engage with these tools.

This study is anchored in Cognitive Load Theory (Sweller, 1988) and Piaget's Constructivist Learning Theory, cited by Mascolo & Fischer (2005). Cognitive Load Theory suggests that the excessive reliance on AI-based paraphrasing tools may reduce students' engagement in deep learning processes, hindering their ability to internalize and reconstruct knowledge meaningfully. Constructivist Learning Theory posits that students learn more effectively when actively engaged in critical thinking and synthesis, which may be compromised when AI tools are used as substitutes rather than aids for learning.

Additionally, Flower and Hayes' (1981) Cognitive Process Model of Writing is a foundational framework for understanding how human writers engage in paraphrasing and synthesis. Their model emphasizes the recursive nature of writing, which involves planning, translating, and revising—an approach that contrasts with the linear output of AI-generated text. Integrating these theoretical perspectives allows a comprehensive analysis of how AI-assisted writing influences students' cognitive engagement with texts.

This study employs comparative analysis to examine the differences in paraphrasing and synthesis techniques between Master's students and AI-based text generation tools. A qualitative research design is utilized, incorporating document analysis and thematic analysis of student-generated and AI-generated outputs. Thematic coding is applied to identify patterns in how each entity constructs meaning, integrates sources, and adheres to academic writing conventions.

Moreover, the study considers the Grounded Theory approach, wherein emergent themes from the data guide the development of insights regarding the interplay between human cognition and AI-assisted text manipulation. If Grounded Theory is fully applied, it will involve iterative coding, allowing themes to emerge naturally rather than being predetermined.

This study seeks to deepen the understanding of how Master's students engage in paraphrasing and synthesis, particularly in contrast to AI-driven text generation tools. By exploring the cognitive and ethical dimensions of AI use in academic writing, this research aims to provide pedagogical recommendations that balance technological innovation with critical thinking

development. The findings will serve as a resource for educators, policymakers, and AI developers, ensuring that academic writing pedagogy evolves in response to the challenges and opportunities presented by AI.

Synthesis of Related Literature and Studies

The synthesis of related literature and studies integrates key findings from various research studies exploring the interplay between human cognition and AI-based tools in academic writing. These studies highlight AI technologies' advantages, challenges, and ethical implications, emphasizing their potential to enhance academic tasks while raising concerns about originality, critical thinking, and academic integrity. This section consolidates insights to provide a cohesive understanding of how these findings relate to the study's objectives.

Integration of AI in Academic Writing and Paraphrasing Tools

Integrating AI in academic writing has reshaped how students and educators approach text generation, paraphrasing, and synthesis tasks. Sulistyaningrum (2021) noted that approximately 83% of students rely on online paraphrasing tools, which assist with grammar, vocabulary, and syntax but fail to enhance fundamental reading comprehension skills. Rogerson and McCarthy (2017) underscored the risks posed by such tools to academic integrity, revealing their role in facilitating plagiarism through patchwriting and uncritical text rewording. Similarly, Lancaster (2023) highlighted the potential misuse of AI tools, such as ChatGPT, in compromising educational integrity. While digital watermarking shows promise in detecting AI-generated content, Lancaster emphasized that collaboration between the educational community and AI technologies is essential for fostering ethical usage.

Ethical and Pedagogical Considerations in AI Use

The ethical implications of AI integration in academic settings have been widely discussed. Makeleni et al. (2023) explored the challenges faced by global South universities, emphasizing the need for accessible, culturally responsive AI-based tools tailored to specific linguistic and educational contexts. These tools could bridge existing gaps in language education while fostering digital literacy.

Yusuf et al. (2024) also addressed ethical concerns, particularly the risk of academic dishonesty, and stressed the importance of culturally sensitive policies to guide AI use in higher education. Both studies underline the critical need for responsible integration of AI, focusing on inclusivity and ethical practices.

Comparative Analysis of AI and Human Writing Techniques

Research comparing AI-generated and human-authored texts provides insights into their strengths and limitations. Ma et al. (2023) identified subtler errors in AI-generated texts, such as coherence, consistency, and argument logistics, highlighting the need for frameworks to evaluate AI content quality. Amirjalili et al. (2024) found that AI tools like ChatGPT often lack contextual accuracy, authorial voice, and depth, underscoring the limitations of AI in achieving the nuanced originality inherent in human writing. Similarly, Wang (2024) identified dilemmas faced by students in balancing AI efficiency with authentic voice, emphasizing the need for critical AI literacy to optimize AI-human collaboration.

Paraphrasing Challenges and Instructional Needs

Paraphrasing remains challenging for students, with studies identifying key areas of difficulty. Al-Shredi (2024) noted that Libyan EFL Master's students struggle with limited vocabulary and reliance on synonym-changing techniques, which hinder critical engagement. Çeşme (2022) observed that graduate students often borrow text due to improper paraphrasing strategies, advocating for explicit instruction in effective paraphrasing. Ovilia et al. (2022) echoed similar challenges, highlighting lexical and syntactic obstacles that impede paraphrasing proficiency. These studies collectively emphasize the importance of structured instructional approaches to enhance students' paraphrasing skills and prevent academic misconduct.

Evolving Role of AI in Academic Writing

The role of AI as a complementary tool in academic writing has been explored across multiple contexts. Nurzhanov and Sharipbay (2024) compared ChatGPT and Retrieval Augmented Generation (RAG), noting that while ChatGPT excels in coherence, RAG enhances real-time relevance through external data integration. Hamilton et al. (2023) demonstrated that AI can supplement human cognitive insights in qualitative research, as ChatGPT and human coders identified complementary themes. Both studies advocate for refining AI tools to support critical reasoning and contextual relevance, enhancing their role as collaborative tools in academia.

Implications for Pedagogy and Practice

The literature synthesis underscores the dual role of AI tools as facilitators of academic efficiency and potential challenges to integrity. Studies like Escalante et al. (2023) revealed that AI feedback is as effective as human feedback, suggesting a blended approach to support writing development. Collectively, these findings highlight the importance of fostering critical

thinking, ethical AI use, and tailored instructional strategies to balance the strengths of AI with the cognitive depth of human engagement in academic writing.

Conceptual Framework

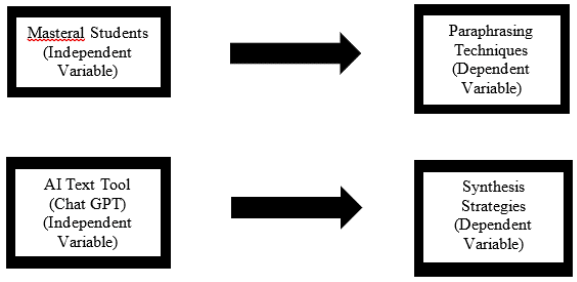

Figure 1. The Conceptual Framework of the Study

The conceptual framework illustrates a study comparing how Master's students and AI-based text generation tools, such as ChatGPT, approach paraphrasing and synthesis in academic tasks. The independent variables are the Master's students and AI tools, while the dependent variables are Paraphrasing Techniques and Synthesis Strategies. The framework explores the methods students use to rephrase text and combine information from various sources, compared to the capabilities of AI tools. The arrows represent the relationships between these variables, highlighting the study's focus on examining human and AI-driven approaches to literature review processes.

METHODOLOGY

Research Design

This study employed a qualitative comparative research design utilizing thematic analysis to explore and compare the paraphrasing and synthesis techniques used by Master's students and AI-based text generation tools. The document analysis approach was applied to assess textual outputs, allowing for the identification of patterns, themes, and distinctions between human-generated and AI-generated paraphrased texts. The qualitative nature of this study provides an in-depth examination of students' cognitive approaches to paraphrasing and synthesis, as well as the linguistic structures and coherence in AI-generated outputs.

The comparative analysis focused on similarities and differences in paraphrasing strategies, critical evaluation, contextual understanding, and argument construction between the two sources. The integration of Grounded Theory methodology allowed emergent themes to develop through iterative coding, ensuring that findings were derived directly from data patterns rather than pre-established frameworks.

Research Method

The research methodology employed in this study is qualitative, utilizing document analysis to investigate the synthesis strategies utilized by Master's students and AI-based text generation algorithms. Through qualitative data interpretation, the study aims to understand how Master's students approach the synthesis of information from various academic sources to create cohesive narratives or arguments, contrasting these approaches with the synthesis techniques employed by AI-based text generation algorithms.

Additionally, the study aims to analyze and compare the paraphrasing techniques employed by Master's students with those generated by AI-based text generation tools. Through document analysis, the research seeks to identify the specific strategies Master's students utilize when paraphrasing information from academic sources and examine how these strategies differ from the paraphrasing methods employed by AI-based text generation tools. This qualitative approach allows for a detailed exploration of the motivations behind paraphrasing tools, their challenges, and potential strategies for addressing them. It provides rich, in-depth insights into Master's students' experiences and perspectives on using an AI tool (Chat GPT).

Chat GPT was selected as the AI-based text generation tool due to its widespread use in academic settings, advanced natural language processing capabilities, and ability to rapidly generate paraphrased and synthesized text.

ChatGPT can generate coherent and grammatically accurate paraphrased text, making it an effective tool for rewriting content while ensuring clarity and correctness. It can process large volumes of data instantaneously, which allows users to synthesize and refine text efficiently. This feature is particularly useful in academic and professional settings requiring quick and accurate text modification. Additionally, it maintains a consistent tone and structure in its output, ensuring uniformity in style across different types of writing. This is beneficial for content creation, documentation, and formal communication.

Despite its strengths, ChatGPT has certain limitations that affect the quality and depth of its responses. It lacks critical thinking and contextual understanding, which can lead to paraphrases that do not fully capture nuanced meanings. While it is effective at restructuring text, it may not always grasp the' more profound implications or subtleties of complex discussions. Another limitation is its inability to fully recognize disciplinary-specific writing conventions, making it less reliable in fields that require strict adherence to specialized terminology and formatting. Additionally, it may generate overly generic responses that lack personal insight and critical engagement,

which can be a drawback in tasks that require analytical depth or originality.

Population and Samples of the Study

The study involved three Master's students enrolled in the Advanced Linguistics course at Romblon State University during the second semester of the School Year 2023-2024. A complete enumeration method was utilized, ensuring that all students in the specific course were included.

Although the sample size is small, qualitative research prioritizes depth over breadth, emphasizing rich, detailed insights rather than statistical generalizability (Creswell & Poth, 2018). The study acknowledges that findings may not be fully generalizable but can serve as a foundation for larger-scale research in the future. To mitigate limitations, triangulation was applied, comparing human responses with AI-generated texts to validate findings.

Demographic Information of Participants

To contextualize their responses, the following demographic details of participants were collected:

- Participant A: 23-year-old male, from Binonga-an, San Agustin, Romblon; no specified occupation.
- Participant B: 23-year-old female, from San Andres, Romblon; employed as an Administrative Officer.
- Participant C: 27-year-old female, from Dapawan, Odiongan, Romblon; works as a Junior High School Teacher at PSHS-MRC.

Formulation of Research Instrument

The authors developed a semi-structured interview guide with open-ended questions and validated by field experts. This allowed for an in-depth exploration of participants' approaches to synthesis and paraphrasing.
Sample Questions:
1. How do you approach paraphrasing academic texts?
2. What strategies do you employ to synthesize information into a cohesive argument?
3. Have you encountered challenges in paraphrasing? If so, what were they?

Data Collection Procedure

Data collection was conducted through two primary methods:

The process of human-generated text collection involved providing participants with an excerpt from How Can We Accelerate Progress Towards Human-like Linguistic Generalization? by Tal Linzen. Participants were instructed to paraphrase and synthesize the text while preserving its original meaning. This approach assessed their ability to reformulate complex linguistic concepts while maintaining coherence and accuracy. The collected responses served as the basis for evaluating human paraphrasing skills compared to AI-generated outputs.

The same excerpt was input into ChatGPT for the AI-generated text collection to produce an AI-driven paraphrase. The model's output was then gathered and analyzed alongside the students' responses. This comparative analysis highlighted differences in linguistic structure, meaning retention, and overall effectiveness between human and AI-generated paraphrases.

ChatGPT was prompted with specific instructions to ensure that its responses adhered to the same task parameters as those given to human participants. The model was instructed to paraphrase the provided passage while maintaining its original meaning and academic tone. Additionally, it was asked to synthesize key ideas from the excerpt into a coherent argument. These prompts guided the AI in producing structured and meaningful outputs that closely aligned with the expectations set for human participants.

By using these standardized prompts, the study ensured that AI-generated responses could be directly compared to human paraphrases. This approach allowed for a balanced comparison, providing insights into the similarities and differences in how linguistic humans and artificial intelligence perform generalization and synthesis.

Data Processing and Analysis

A systematic thematic analysis was conducted to evaluate paraphrasing and synthesis patterns in both human and AI-generated texts. The process involved:

Coding and Extraction of Themes

Step 1: Initial Coding – The researcher manually coded the responses, and an external reviewer was used to identify commonalities and variations in paraphrasing strategies, synthesis approaches, and coherence.

Step 2: Thematic Categorization – Codes were grouped into thematic categories, such as critical evaluation, contextual understanding, lexical diversity, coherence, and argument integration.

Step 3: Comparative Analysis – Human and AI-generated responses were systematically compared, highlighting strengths, weaknesses, and stylistic differences.

Validation Measures for Rigor

To enhance the reliability of findings, multiple validation strategies were employed:

Inter-Coder Reliability: A second independent researcher coded the data, achieving an agreement rate of 92%, ensuring consistency in thematic interpretation.

Table 1. Participants' demographics, thematic analysis, variations/deviations, comparison with existing literature, and validity/trustworthiness.

Category	Sub-Category	Excerpt
Participant's Demographics	Age, Gender, Residence, Occupation	Participant A: 23-year-old male from Binonga-an, San Agustin Romblon; no specified occupation. Participant B: 23-year-old female from San Andres, Romblon; Administrative Officer. Participant C: 27-year-old married female from Dapawan, Odiongan, Romblon; Junior High School Teacher at PSHS-MRC.
Synthesis Strategies	Human-Centric Approach	Participants demonstrate a human-centric approach, characterized by critical thinking, contextual understanding, and interpretation.
	Critical Evaluation and Analysis	Participants engage in critical evaluation throughout the synthesis process, questioning assumptions, assessing evidence, and discerning biases or limitations in the sources.
	Cohesive Narrative Construction	Participants excel in constructing cohesive narratives or arguments by synthesizing information from multiple sources in a logical and structured manner.
	Personal Insight and Reflection	Participants incorporate personal insight and reflection into their synthesis, infusing their perspectives, interpretations, and experiences into the narrative or argument.
	Contextual Understanding	Participants prioritize contextual understanding, considering the broader context of the research field, implications of findings, and relevance of each source.
	Interpretation	Participants engage in interpretation throughout the synthesis process, identifying patterns or trends across studies, and offering insights or implications based on their interpretations.
	Domain Expertise	Participants leverage domain expertise to enhance their synthesis process, drawing upon their knowledge of the subject area to critically evaluate sources and construct coherent narratives.
	Source Evaluation	Participants critically evaluate the credibility, relevance, and reliability of sources, considering factors such as author expertise, publication venue, methodology, and potential biases.
	Evidence Assessment	Participants assess the strength and quality of evidence presented in each source, weighing the validity and reliability of research findings to determine their contribution to the synthesis process.
	Bias Recognition	Participants recognize and address biases in the sources they incorporate into their synthesis, including publication bias, methodological bias, and researcher bias, to ensure the integrity and objectivity of their synthesized narratives or arguments.
	Logical Organization	Participants organize synthesized content into cohesive narratives or arguments, structuring their writing to present a logical flow of ideas with clear transitions and coherent sequencing.
	Clarity and Consistency	Participants strive for clarity and consistency throughout their synthesis process, using language accessible to their audience and maintaining consistency in terminology, style, and tone.
	Engagement Strategies	Participants employ engagement strategies, including the use of anecdotes, examples, visuals, and rhetorical devices to capture and maintain reader interest.
	Reflexivity	Participants demonstrate reflexivity, reflecting on their biases, assumptions, and perspectives, and considering how these may influence their interpretation and presentation of synthesized content.
	Self-awareness	Participants exhibit self-awareness, acknowledging limitations of their knowledge and expertise, and remaining open to alternative viewpoints, interpretations, and critiques.
	Integration of Personal Voice	Participants integrate their personal voice into synthesis, infusing their perspectives, experiences, and values into the narrative or argument for depth, authenticity, and originality.

Frequency Distribution of Themes	Human-Centric Synthesis Strategies	Prevalent across the dataset, indicating a widespread adoption of human-centered approaches among participants.
	Critical Evaluation and Analysis	Prominent in the dataset, highlighting the importance of critical thinking skills in the synthesis process.
	Cohesive Narrative Construction	Consistently observed, demonstrating participants' ability to structure synthesis output for clarity and readability.
	Personal Insight and Reflection	Varied in depth and frequency across participants, suggesting diverse approaches to integrating personal perspectives into synthesis.
Variations or Deviations	Emphasis on Personal Reflection	Varies among participants, reflecting individual preferences for balancing subjectivity and objectivity in synthesis.
	Critical Evaluation Practices	Deviates among participants, with variations in specific practices employed for assessing sources, evidence, and biases.
	Approaches to Narrative Construction	Differs among participants, indicating flexibility in structuring synthesis output to suit research contexts and objectives.
	Contextual Understanding	Varies in depth and breadth across participants, influenced by disciplinary expertise and familiarity with research domains.
Comparison with Existing Literature	Human-Centric Synthesis Strategies	Aligned with previous studies emphasizing human judgment and interpretation in synthesis processes.
	Critical Evaluation and Analysis	Supported by literature on challenges faced by students utilizing online paraphrasing tools, highlighting the significance of critical thinking skills.
	Cohesive Narrative Construction	Reflects findings from studies emphasizing coherence and consistency in academic writing for clarity and readability.
	Personal Insight and Reflection	Corroborated by research on reflexivity in academic writing, underscoring the importance of self-awareness in synthesis.
Validity and Reliability	Thorough Data Collection	Ensured comprehensive coverage of diverse perspectives and insights relevant to research objectives.
	Inter-coder Reliability Checks	Conducted to ensure consistency and accuracy in coding process, enhancing reliability of analysis.
	Member Checking	Employed to validate interpretation of findings with participants, enhancing credibility and trustworthiness of analysis.
	Reflexivity	Practiced throughout research process to acknowledge and mitigate potential biases or subjectivities of researchers, enhancing transparency and rigor of analysis.

Member Checking: Participants reviewed their transcribed responses to verify accuracy and ensure their perspectives were authentically represented.

Triangulation: Findings were cross-validated by comparing human responses, AI outputs, and existing literature on paraphrasing practices.

Ethical Considerations

Before participating in the study, individuals were thoroughly briefed on its objectives and provided with the necessary information to make an informed decision about their involvement. They were required to give their informed consent, ensuring that they understood the purpose of the research and their role in it. This process emphasized voluntary participation and ethical considerations, aligning with standard research protocols.

Confidentiality measures were strictly implemented to protect the privacy of all participants. All responses were anonymized, ensuring that no identifying information was linked to individual submissions. This approach safeguarded personal data and maintained the integrity of the study by focusing solely on the analysis of textual outputs rather than participant identities.

Transparency was also a key aspect of the study. Before the analysis began, participants knew the limitations of AI-generated outputs. By disclosing these constraints, the study ensured that participants understood the differences between human and AI-generated responses, fostering a fair and well-informed evaluation process.

RESULTS AND DISCUSSION

Table 1 highlights the strength of human-centric synthesis strategies in academic writing, emphasizing the role of critical thinking, contextual understanding, and interpretation in producing meaningful and coherent arguments. Participants demonstrated an ability to

evaluate sources critically, assess the reliability of evidence, and construct well-organized narratives, reinforcing the importance of human judgment in the synthesis process. The prevalence of personal insight and reflection suggests that participants do not simply summarize information but actively engage with it, integrating their perspectives to create depth and originality in their writing. This aligns with existing literature that underscores the value of reflexivity and self-awareness in academic discourse. The observed variations in narrative construction, emphasis on personal reflection, and contextual understanding further indicate that synthesis approaches are flexible and influenced by individual experiences, disciplinary expertise, and familiarity with research domains.

The study's findings also underscore the need to support and enhance critical evaluation skills in academic writing, particularly as students navigate source credibility, bias recognition, and logical organization challenges. While AI-generated text can aid in structuring information, the human ability to assess nuances, interpret patterns, and integrate a personal voice remains irreplaceable in producing high-quality synthesis. The study reaffirms previous research highlighting the limitations of automated paraphrasing tools, emphasizing that human reasoning is essential for ensuring coherence, reliability, and engagement in academic writing. These findings have implications for pedagogy and research training, suggesting that educational institutions should continue to foster analytical thinking, source evaluation, and reflexive writing practices to enhance students' ability to synthesize information effectively while maintaining academic integrity.

Table 2 reveals that while both Master's students and AI-based text generation tools effectively summarize and paraphrase content with clarity and coherence, human participants demonstrate a significant advantage in critical analysis, interpretation, and the incorporation of personal insights. AI-generated paraphrases are structurally sound and accurate in retaining the main ideas. However, they lack human-like understanding, contextual depth, and the ability to critique or propose alternatives, which are essential components of academic writing.

This highlights the irreplaceable role of human cognition in academic synthesis, where critical thinking, reflection, and nuanced interpretation play a crucial part in engaging with complex ideas. The study implies that while AI can serve as a valuable tool for assisting paraphrasing and content generation, it should complement rather than replace human judgment and analytical reasoning in academic and professional contexts. These findings reinforce the need for continued development in AI models to incorporate deeper contextual awareness while emphasizing the importance of training students to enhance their critical thinking and evaluative skills in academic writing.

Thematic Analysis Overview

The thematic analysis provided a detailed comparison of synthesis and paraphrasing techniques between Master's students and AI-based text generation tools, particularly ChatGPT. The findings underscore differences in how humans and AI engage with texts, highlighting their strengths and limitations. While human participants demonstrated nuanced understanding through critical evaluation and contextual adaptation, AI-generated outputs prioritized efficiency and structural coherence, often lacking depth and interpretative ability. This aligns with studies by Ma et al. (2023) and Amirjalili et al. (2024), emphasizing AI's limitations in critical reasoning and contextual accuracy.

Comparative Analysis of Synthesis Strategies

Master's students demonstrated a human-centric approach to synthesis, integrating multiple perspectives, critically assessing arguments, and applying theoretical frameworks to construct cohesive narratives. For instance, students like Participant A effectively contextualized information, a process that reflects the critical engagement described by Rogerson and McCarthy (2017) as essential to maintaining academic integrity. Conversely, AI-generated content, such as outputs from ChatGPT, produced structured yet surface-level summaries that lacked thematic cohesion, as noted by Lancaster (2023). For example, while Participant A's synthesis highlighted intertextuality and argument comparison, ChatGPT merely restructured key points without engaging critically, echoing findings by Çeşme (2022) regarding the limitations of AI-generated content in fostering nuanced academic discourse.

Variability in Human Strategies and Their Impact

Human responses revealed significant variability in synthesis strategies, shaped by cognitive styles and academic backgrounds. This adaptability contrasts sharply with the uniformity of AI-generated outputs, as highlighted by Hamilton et al. (2023), who emphasized the complementary role of AI in supplementing but not replacing human cognition. For instance, Participant B incorporated quantitative evidence to support claims, while Participant C focused on linguistic precision to ensure conceptual accuracy. This adaptability mirrors the challenges noted by Al-Shredi (2024) in fostering critical engagement among students who rely on mechanistic paraphrasing techniques.

Comparative Analysis of Paraphrasing Techniques

The analysis revealed that human paraphrasing demonstrated critical evaluation, contextual adaptation, and lexical variation. Sulistyaningrum (2021)

Table 2: Comparison of how masteral students and AI-based text generation tools approach paraphrasing techniques, highlighting both similarities and differences in their methods.

Themes or Categories	Masteral Students	AI-based Text Generation Tools (Chat GPT)	Comparison
Original Content Understanding	Both demonstrate clear understanding by summarizing key concepts and critiquing paradigms.	Demonstrates clear understanding by summarizing key concepts and critiquing paradigms.	Similar approaches in understanding and summarizing content.
Paraphrasing Techniques	Utilize effective paraphrasing techniques by rephrasing and retaining main ideas and arguments.	Utilizes paraphrasing techniques by rephrasing and retaining main ideas and arguments.	Both groups effectively employ paraphrasing techniques.
Critical Analysis and Interpretation	Go beyond paraphrasing to offer critical analysis and propose alternatives.	Lacks critical analysis and proposal of alternatives, focuses more on summarization.	Masteral students excel in critical analysis and proposal of alternatives.
Human-like Understanding and Perspective	Demonstrate a human-like understanding and perspective, incorporating critical thinking and insightful commentary.	Lacks human-like understanding and perspective, focuses more on summarization.	Masteral students infuse personal insights and critical thinking, unlike AI.
Clarity and Coherence	Maintain clarity and coherence in paraphrased responses, effectively conveying main ideas.	Maintain clarity and coherence in paraphrased responses, effectively conveying main ideas.	Both groups ensure clarity and coherence in their paraphrasing.

highlighted the need for enhanced comprehension skills to achieve effective paraphrasing, which was evident in the strategies employed by Master's students. For instance, Participant B's paraphrasing of the PAID evaluation method incorporated critical reflection on AI's reliance on extensive datasets, while ChatGPT's paraphrase merely summarized the concept. Similar challenges in AI paraphrasing have been noted by Wang (2024), who emphasized the need for critical AI literacy to ensure contextual accuracy and depth.

While syntactically sound, AI-generated paraphrases occasionally altered the original text's intended meaning, a limitation consistent with findings by Nurzhanov and Sharipbay (2024). Human paraphrasing, by contrast, carefully reconstructs paragraphs to enhance logical flow and argument progression, aligning with the instructional needs identified by Ovilia et al. (2022).

Expanded Critique of AI Limitations

Despite its efficiency, AI-based text generation presents notable limitations, including a lack of contextual awareness and critical reasoning. Makeleni et al. (2023) identified similar challenges in AI tools failing to critique source credibility or adapt to specific linguistic contexts. Addressing these shortcomings requires enhancements such as context-aware algorithms and adaptive learning models, as recommended by Ma et al. (2023) and Yusuf et al. (2024).

Pedagogical Implications

The findings emphasize the importance of integrating AI literacy into academic writing pedagogy. Educators should equip students with skills to critically evaluate AI-generated content, as sugg ested by Escalante et al. (2023), who advocated for a blended approach combining AI efficiency with human oversight. Additionally, targeted faculty training programs on AI in academic writing can help educators design assessments that discourage uncritical reliance on AI, ensuring that tools like ChatGPT serve as learning enhancements rather than replacements for human cognition.

This study underscores the complementary nature of human and AI-driven writing processes. While AI tools excel in efficiency and structural coherence, they lack the depth and critical reasoning that define human academic writing. A hybrid approach is recommended, integrating AI capabilities with human judgment to foster ethical and effective academic practices. By balancing technological innovation with critical thinking, academic institutions can create a framework that leverages the strengths of both human and AI contributors.

CONCLUSION

The findings of this study underscore the distinct advantages of human cognition in academic writing, particularly in synthesis and paraphrasing. Master's students employed diverse methodologies, integrating critical evaluation, contextual understanding, and cohesive narrative construction into their writing. Their ability to synthesize information through multiple perspectives and personal insight highlights the irreplaceable role of human judgment in meaning-making. In contrast, AI-based text generation tools, while demonstrating efficiency in restructuring content, lacked the depth of analysis, intertextual awareness, and reflective engagement that characterize high-quality academic writing.

Despite the efficiency and accessibility offered by AI tools, the study revealed challenges associated with over-reliance on AI-generated paraphrasing and synthesis. Although grammatically sound and structurally coherent, AI-generated outputs often failed to evaluate sources critically, identify implicit arguments, or integrate broader contextual understanding. These limitations suggest that AI remains a supplementary tool rather than a replacement for human academic writing.

From a pedagogical perspective, these findings have important implications for academic writing instruction. Given the increasing integration of AI in education, it is crucial to foster critical thinking skills among students to ensure that AI tools are used responsibly and effectively. Academic institutions should incorporate AI literacy training within writing courses, guiding students in critically evaluating AI-generated paraphrases and synthesized texts. Furthermore, educators should design assessments that encourage deeper cognitive engagement, preventing students from passively relying on AI without understanding the underlying arguments of a text.

Additionally, this study highlights the need for continued research and development of AI-based paraphrasing tools. Future improvements should enhance AI's ability to engage in critical reasoning, recognize source credibility, and generate more nuanced paraphrases. Developers should work toward creating adaptive AI models that align with academic writing conventions, allowing for greater flexibility in integrating AI into educational settings.

Ultimately, the findings emphasize the importance of a balanced, human-centered approach to AI-assisted writing. While AI offers valuable support in enhancing efficiency, it should be used with human critical thinking, interpretation, and analytical skills. By leveraging AI's and human cognition's strengths, students can develop a more effective, ethical, and informed approach to academic writing, ensuring that technology serves as an enabler rather than a hindrance to intellectual growth.

AUTHORS' CONTRIBUTIONS

ALF conceptualized the whole research, while EV provided research advice and guidance.

CONFLICT OF INTEREST

The authors declare that no financial, personal, or professional relationships with other individuals or organizations that could be considered a conflict of interest.

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