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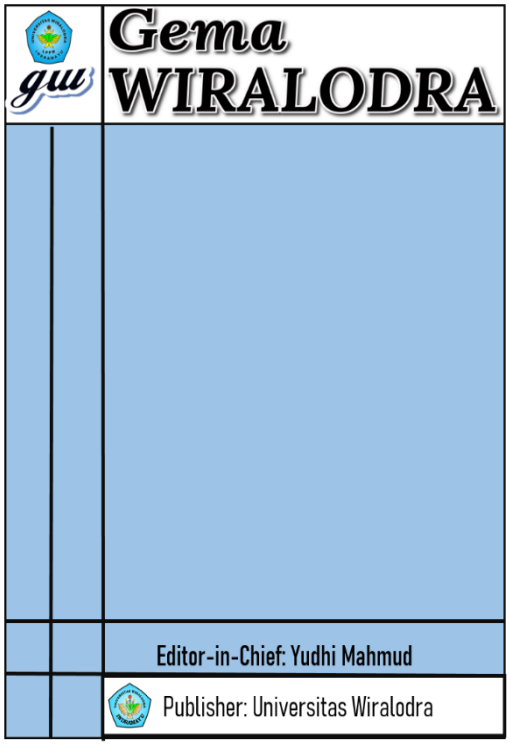

Exploring the Potential of AI Tools in Education: A Thematic Analysis of Gemini.ai

Edi Supriyadi[a*], Samsul Pahmi[b]
[a*]Universitas Teknologi Bandung, Bandung, Indonesia, edipmatematika@gmail.com
[b]Nusa Putra University, Sukabumi, Indonesia, samsul.pahmi@nusaputra.ac.id

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[a*]Universitas Teknologi Bandung, Bandung, Indonesia, edipmatematika@gmail.com
[b]Nusa Putra University, Sukabumi, Indonesia, samsul.pahmi@nusaputra.ac.id

Correspondence: edipmatematika@gmail.com

Abstract
Artificial intelligence (AI) technologies, such as Gemini.ai, are revolutionizing higher education by enhancing data analysis and interpretation. This study aimed to investigate how Gemini.ai can enhance clarity in analytical results, provide contextually adaptive responses, and excel in advanced data modeling. We collected data through interviews with industrial engineering students and conducted thematic analysis using a qualitative research approach. In qualitative research, thematic analysis entails carefully reviewing interview transcripts to uncover, analyze, and report recurrent patterns and relevant themes that provide a deep, nuanced understanding of participants' experiences and viewpoints. The study conducted interviews with industrial engineering students to evaluate the performance of Gemini.ai and discovered three significant findings. Students repeatedly lauded Gemini's ability to explain graph axes, context, and actionable recommendations to simplify difficult data. The research found that Gemini's adaptive communication abilities allow instructions without a profession to generate more extensive explanations. Students also praised the app's data analysis and modeling, especially its ability to combine Google Search data for more advanced analytical insights. Gemini.ai's intuitive, user-friendly data analysis platform may be a useful AI tool for technical undergraduates. The application has enormous potential, but the research suggests adding customization choices and advanced modeling tools. Future research should explore interdisciplinary applications and the ethical implications of integrating AI in education to enhance its efficacy and accessibility.
Keywords: Artificial Intelligence, Data Analysis, Gemini.ai, Thematic Analysis.

1. Introduction

Artificial intelligence (AI) platforms such as Gemini.ai are utilized in higher education to enhance undergraduate learning. Artificial intelligence technologies are employed in education to enhance learning, ranging from personalization to administrative efficiency. Personalization constitutes one of Gemini's major advantages in higher education. AI systems can analyze extensive data sets to tailor educational content for individual students, enhancing engagement and understanding. AI applications can facilitate intelligent tutoring systems (ITS) that adjust to students' learning styles and speeds, enhancing educational outcomes (Ahmad et al., 2021; Adhitya & Supriyadi, 2024). This versatility accommodates the diverse learning demands of undergraduate students, enabling them to advance at their own pace and obtain prompt feedback (Magrill, 2024).

Gemini.ai additionally offers administrative assistance in addition to personalized learning. Artificial intelligence can enhance communication between students and instructors, streamline enrollment processes, and optimize data management (Hannan, 2021; Supriyadi, 2024). Efficient operations reduce administrative expenses, allowing educators and mentors to concentrate on instruction and guidance. Utilizing AI technologies such as Gemini can enhance student support services, which are essential for an effective learning environment (Hannan, 2021; Perera, 2023). In enhancing educational and administrative functions, Gemini.ai also facilitates the development of critical thinking and problem-solving abilities in students.

AI platforms can produce content and offer information; nevertheless, they may encounter difficulties with complex cognitive tasks requiring advanced critical thinking (Sallam, 2024). This constraint underscores the necessity of utilizing AI as an adjunct to

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conventional pedagogy. Educators must judiciously incorporate AI tools into their curricula to enhance learning while preserving skill development (Alnasib, 2024; Magrill, 2024). The integration of AI in education has ethical considerations. As AI technologies proliferate, it is imperative to confront issues of academic integrity and the dependability of AI-generated content (Fowler, 2023). To guarantee the responsible and ethical utilization of AI tools in education, institutions must establish clear standards and protocols (Fowler, 2023; Perera, 2023).

Students may encounter difficulties utilizing AI technology such as Gemini.ai in academic endeavors, potentially impacting their learning and academic integrity. The challenges encompass reliance on AI, ethical considerations, and proficiency in AI literacy. Excessive dependence on AI tools may diminish students' critical thinking and creativity. As students increasingly utilize AI for assignment completion, they may neglect their analytical and creative abilities. Research indicates that AI can assist pupils; nonetheless, it should not supplant their profound engagement with subjects (Chan & Hu, 2023). Students might be inclined to present AI-generated writing as their own without appropriate attribution, heightening concerns over plagiarism and authenticity (Tindle, 2023).

The utilization of AI in academia presents ethical dilemmas. Students may not fully comprehend the ramifications of AI techniques, particularly for academic integrity and content ethics. Ambiguity in AI tool usage restrictions might lead to confusion and inadvertent breaches of academic policy (Chan & Hu, 2023). AI systems function as "black boxes," rendering students potentially unaware of their operational mechanisms or the reliability of the information provided (Fujimori et al., 2022). A deficiency in openness can hinder students' ability to critically evaluate AI-generated content, which is essential for academic integrity. AI literacy among pupils constitutes an additional concern. Students must understand the advantages and disadvantages of AI tools as they become increasingly prevalent (Chan & Hu, 2023). Students may encounter difficulties in utilizing AI responsibly and efficiently without this competence, resulting in dissatisfaction and suboptimal learning outcomes. Schools must prioritize instruction on AI, encompassing its ethical implications and practical applications, to assist students in navigating the complexities of its use in academic work.

Recent advancements in AI-driven educational tools in higher education illustrate the transformative potential of artificial intelligence in the academic sphere. Among these advancements are personalized learning, enhanced pedagogical techniques, and artificial intelligence ethics. The personalization of learning with artificial intelligence is a significant development. Singh (2024) emphasizes that AI participates in higher education to revolutionize teaching and learning. Tran (2024) revealed that AI-powered tools enhance students' academic writing abilities, confirming that AI positively influences educational outcomes. Zhou (2024) examines the various applications of AI, such as improved efficiency, personalized learning, academic integrity, and the overreliance on AI tools.

Artificial intelligence in higher education facilitates innovative educational approaches. Crompton and Burke in the last five years, AI technologies in higher education have expanded significantly, reflecting an increase in resources for educators (Crompton & Burke, 2023). Slimi (2023) conducted a rigorous evaluation that demonstrated the significant influence of AI on educational quality, learning processes, and assessment procedures. Additional discoveries by Kamalov et al. (2023) assert that AI's exceptional performance on standardized tests has sparked widespread discourse over its implications for alterations in educational paradigms. The ethical implications of AI in education are also under consideration. Vinuesa et al. (2020) caution that while AI can enhance productivity, it may also exacerbate inequality if not properly regulated.

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We must acknowledge the importance of AI in providing students with essential skills. This research stands out from previous studies because it incorporates industrial engineering students who are likely to pursue careers in the creative industry. This study aims to explore and analyze the potential of Gemini.ai as an advanced tool for data analysis and interpretation, focusing on its ability to enhance clarity in analytical results, adapt contextually to user commands, and excel in data modeling. The study aims to synthesize user feedback to identify strengths, limitations, and areas for improvement, thereby contributing to the understanding of AI systems' role in facilitating intuitive, user-friendly, and sophisticated analytical experiences for undergraduate students in technical disciplines.

2. Method

This study employed a qualitative research method to investigate the experiences of industrial engineering students utilizing AI gadgets in teaching. This strategy can yield comprehensive insights into students' perceptions, interactions, and influences about AI technologies inside their educational context. This study employed qualitative research methodologies, including interviews and thematic analysis, corroborated by existing literature on the topic. These interviews seek to uncover intricate viewpoints regarding the ways that AI devices enhance or impede learning. The significance of comprehending students' perceptions of AI gadgets, revealing both advantages and disadvantages in their educational experiences (Zhou, 2024). Namjoo examines the relationship between interaction with AI devices and self-directed learning, emphasizing the necessity for qualitative insights into students' individual experiences and difficulties (Namjoo, 2023).

This method can identify the AI devices that industrial engineering students perceive as most advantageous or troublesome; hence, it guides educators in the tailored integration of AI into the curriculum. We use thematic analysis, a significant qualitative tool, to examine data gathered from interviews. This methodology enables researchers to discern prevalent themes and patterns in students' interactions with AI equipment. Students exhibit significant enhancements in academic achievement attributable to AI, although they encounter difficulties with digital competence (Quinde, 2024). The thematic analysis employed a systematic approach to data collection, meticulous coding, and theme development to examine the impact of AI devices on student lectures. We initiated the process by reviewing the collected data and identifying the initial codes that encapsulated the primary experiences and observations associated with Gemini AI. The influence of AI on organizational competitiveness; however, it does not explicitly consider educational outcomes (Iwuanyanwu, 2021). So, while thematic analysis might help explain how AI technologies can improve personalized learning and adaptive instruction, more research specifically focused on educational settings is needed to back up this claim. This study chose students from the industrial engineering department at a university in Bandung as its subjects, with the aim of examining the application of Gemini AI in data analysis. The researcher undertook an investigation into the application of Gemini AI in lectures. We gathered data via interviews and subsequently evaluated it thematically.

3. Results and Discussion

We validated the semi-structured interview instrument through expert review to enhance the rigor of this study. Two independent experts in industrial engineering and information technology education critically evaluated the interview protocol. These experts evaluated the interview questions for clarity, relevance, completeness, and potential bias. We subsequently incorporated their comprehensive feedback to enhance the instrument's reliability and validity. We systematically designed the interview questions to gain meaningful insights into students'

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experiences with the Gemini.ai application, thereby enhancing the credibility of the research methodology through expert validation.

We conducted interviews with four industrial engineering students who utilized the Gemini.ai application. The exploration of Gemini's capabilities highlights its potential as a tool for data analysis and interpretation. By synthesizing feedback across different interactions, key themes emerge that shed light on its strengths and areas for improvement. These themes provide insight into how effectively Gemini delivers analytical clarity, responds contextually to user commands, and excels in data analysis and modeling. Table 1 below presents a detailed summary of these findings, capturing user perspectives from four distinct interactions (M1–M4).

We generated Table 1 by applying a systematic thematic analysis methodology to the interview data. We collected and meticulously transcribed verbatim interviews with four industrial engineering students to initiate this process. We implemented open coding by meticulously reviewing the transcripts and identifying the initial themes. Our primary objective was to extract key quotations that embodied significant insights. We created a coding framework based on three primary themes: Excellence in Data Analysis and Modeling, Prompted Contextual Response, and Clarity of Analysis Results. The themes were mutually exclusive, and we comprehensively documented the participant's experiences by grouping similar codes and quotes through rigorous comparative analysis.

Table 1
Thematic Analysis from Interview

Theme	M1	M2	M3	M4
Clarity of Analytical Results	"Gemini provides highly detailed and clear answers. Its explanations are easy for many people to understand."	"The analysis provided is very easy to understand. Gemini simplifies data interpretation."	"Gemini explains graphs by analyzing the data peaks and providing context, making it easy to understand."	"Gemini's explanations are very specific, such as detailing the graph axes, data context, and next steps."
Contextual Response Based on Commands	Not mentioned.	Not mentioned.	Not mentioned.	"Commands without a profession provide more detailed explanations, while commands with a profession only provide the results."
Excellence in Data Analysis and Modeling	Not mentioned.	Not mentioned.	Not mentioned.	"Gemini excels in data analysis and modeling and has access to information from Google Search."

The thematic analysis identifies three primary themes from interviews with Industrial Engineering students concerning their experiences with Gemini.ai. The primary theme, Clarity of Analytical Results, emphasizes Gemini's capacity to provide comprehensive and lucid

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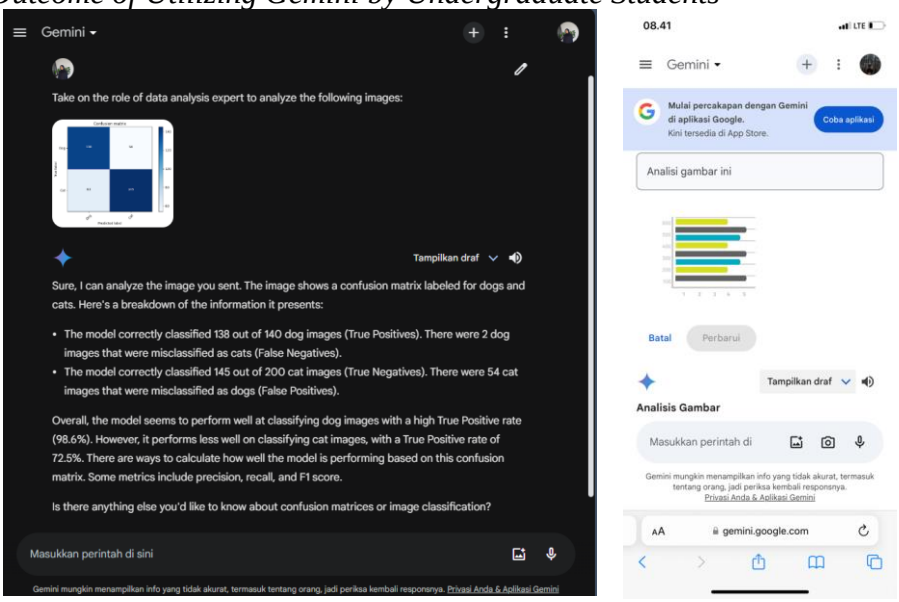
explanations. Students observed that the application elucidates intricate data, facilitating user comprehension of context and insights. All four participants underscored that Gemini's meticulous methodology, including the delineation of graph axes, provision of data context, and presentation of actionable recommendations, augments understanding.

The second theme, Contextual Response Based on Commands, arose from observations regarding the variability of Gemini's replies contingent upon the nature of the command issued. One participant (M4) saw those orders devoid of a specified profession elicited more comprehensive explanations, whereas those that mentioned a profession yielded more simplistic outcomes. This demonstrates Gemini's adaptability in responding to user inputs and customizing its replies accordingly. The third theme, Excellence in Data Analysis and Modeling, emphasizes Gemini's robust proficiency in data processing and analysis. A student (M4) emphasized the app's capability to incorporate supplementary information from Google Search, enhancing its analytical results and offering a considerable benefit to user's dependent on sophisticated modeling and in-depth insights.

In examining the feedback from these interactions, it becomes evident that Gemini.ai is highly regarded for its user-friendly interface and intuitive design. Users consistently praised the platform for its ease of use and accessibility, noting that they were able to navigate the application with minimal training. Additionally, many users appreciated the robust data analysis capabilities of Gemini, noting that the platform allowed them to quickly and accurately interpret complex datasets. However, some users also identified areas for improvement, such as the need for additional customization options and more advanced modeling features. The feedback from these interactions suggests that Gemini has the potential to be a valuable tool for data analysis and interpretation, with room for further development and refinement.

Figure 1
Outcome of Utilizing Gemini by Undergraduate Students



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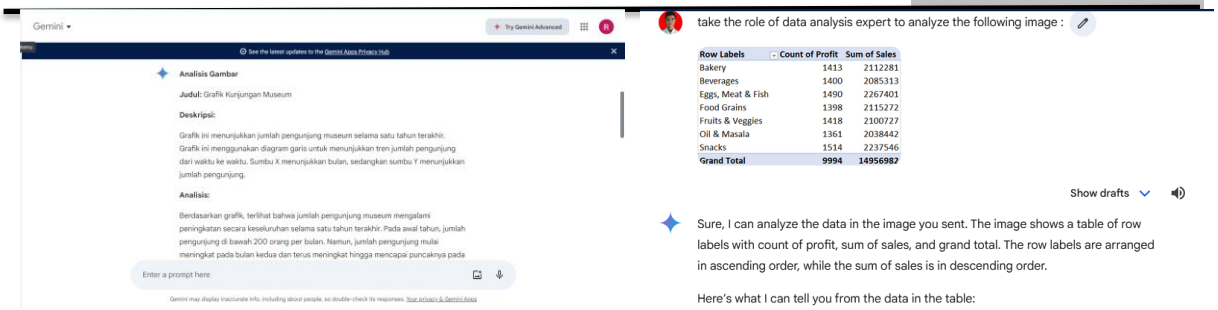

The theme of Clarity of Analytical Results in Gemini's Functions highlights its effectiveness in clarifying complex data for enhanced user comprehension. O'Sullivan and Jefferson assert that articulating qualitative research findings clearly and comprehensively is crucial. They advocate for a balance between detail and readability to prevent overwhelming the reader (O'Sullivan & Jefferson, 2020). The necessity for transparency and clarity in methodologies, along with Gemini's approach of delineating data context and providing actionable insights, hence reducing ambiguity in analytical outcomes (Ara & Wailoo, 2012). Although it is essential to communicate material clearly and understandably, overemphasizing simplification may lead to the oversimplification of intricate information, thus misleading the reader. It is essential to achieve a balance between detail and readability to ensure precision and comprehensive knowledge.

The Contextual Response Based on Commands theme within Gemini's functionalities showcases its capacity to customize responses based on the specificity of user inquiries. The value of personalizing automated responses to improve user experience and satisfaction, highlighting the necessity for adaptability in artificial intelligence systems (Doorn et al., 2016). The fact that commands without a specific profession get more detailed answers fits with what Nguyen et al., (2021) found, which is that AI systems allow for more complex interactions in environments with fewer restrictions. The balance between complexity and user comprehension in AI interactions (Brynjolfsson et al., 2017). When they asked about a profession, the number of responses went down, which showed that people were being more deliberate in how they talked to AI. This dynamic adaptability underscores Gemini's design as a user-centric tool that can modify its output to meet various informational needs, enhancing overall user engagement and effectiveness. Although AI systems facilitate more intricate connections, it is crucial to acknowledge the possible limitations and biases inherent in the algorithms that regulate these relationships. The AI system's adaptability and the information's quality and accuracy should affect user engagement and efficacy.

Gemini's functionality, with its Excellence in Data Analysis and Modeling theme, highlights its advanced data processing capabilities, especially by integrating external information sources like Google Search. This characteristic enhances the analytical complexity and breadth of its results, which is crucial in fields requiring advanced modeling. The integration of big data with advanced analytical techniques can significantly enhance accuracy in medical environments. The authors propose that a comparable methodology may be beneficial in numerous additional data analysis contexts (Leopold et al., 2020). The importance of clarity in data analytics, contending that well-defined roles and expectations can foster innovative behaviors in data-driven environments (Kundu et al., 2019). This concept aligns with the findings of Lepistö et al. regarding the flexibility and adaptability of data analytics. These traits significantly enhance performance, thereby reinforcing Gemini's strategy for incorporating contextual data (Lepistö et al., 2021). The theme analysis highlights the user-friendly design of Gemini.ai, which makes it easier to support intuitive interaction and

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simplifies the interpretation of technical datasets. Students acknowledged its strengths and pinpointed areas for improvement, including the incorporation of more intricate modeling tools and a wider range of customization parameters.

4. Conclusion

This study used thematic analysis of industrial engineering student user input to assess Gemini.ai's data analysis and interpretation skills. The findings show that Gemini.ai excels in analytical clarity, contextual adaptability, and advanced data modeling, making it useful for complicated datasets. The software can simplify complex data, give contextually responsive results, and incorporate external information sources, making it a user-centric analytical platform. These findings highlight the relevance of intuitive interfaces and customizable functions for improving user comprehension and engagement with AI-driven data analysis tools. The study suggests that Gemini.ai could improve by delivering more customization and advanced modeling features to meet varied user needs. This work lays the groundwork for more advanced AI data analytics tools for education, research, and industry. We could implement these tools in transdisciplinary situations and study their long-term effects on user efficiency and decision-making. Adding dynamic customization and cross-domain data synthesis will improve the tool's utility and adaptability.

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