

Revolutionizing English Learning with AI: Insights from ChatGPT and Google Gemini

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Abstract—This research describes the use of both Google Gemini and ChatGPT in English language learning. This research is descriptive qualitative. The analysis shows that both ChatGPT and Gemini provide valuable insights into AI's role in English language learning, though their approaches differ. ChatGPT focuses on practical applications like personalized feedback, chatbots, and analytics tools, emphasizing text generation and teacher workload reduction. Google Gemini, with its multimodal capabilities, highlights interactive learning systems, automation, and accessibility improvements in education. Both models stress personalization, interactivity, and teaching efficiency but with different emphases—ChatGPT on student analysis, Gemini on immersive experiences, and data-driven teaching. While both tools offer great potential, the choice between them depends on whether we prioritize text-based tasks (ChatGPT) or multimedia content (Google Gemini). Choosing between ChatGPT and Google Gemini depends on our specific needs. If we require text generation, such as creating articles or engaging in text-based conversations, ChatGPT is a better fit due to its focus on producing natural, relevant text. However, if you need to handle multiple types of data like text, images, audio, and video, Google Gemini's multimodal capabilities make it more versatile for multimedia tasks. While ChatGPT is ideal for text-based applications and integrates easily through APIs, Gemini is more suited for users within the Google ecosystem. ChatGPT is known for generating high-quality text, while Gemini provides good quality across various formats, but its effectiveness varies with context. Ultimately, the best choice depends on whether your focus is on text or multimedia tasks.

Keywords: *Artificial Intelligence (AI), ChatGPT, English language learning, Google Gemini*

I. INTRODUCTION

The term Artificial Intelligence (AI) was first introduced in the 1960s and has since advanced considerably. In the increasingly advanced digital era, artificial intelligence (AI) has become an integral part of various aspects of our lives. AI functions to process and analyze large amounts of data, and provide effective and efficient solutions. One branch of AI that is growing rapidly is Generative AI, which focuses on creating new content based on learned data. Generative AI tools can produce various forms of output such as text, images, audio, and video, with capabilities that are increasingly close to human creativity. Generative AI tools are a type of artificial intelligence that is capable of creating new content based on data it has learned. These tools can produce various types of results, such as text, images, audio, or video, by emulating patterns and information from existing data (Fitria, 2024a). Generative AI leverages techniques such as deep learning and language models to produce creative and relevant output, and can be applied in areas such as content creation, design, and data analysis.

The advancement in the field of artificial intelligence (AI) holds the potential to create new horizons for knowledge, learning, and creativity (Islam & Ahmed, 2024). There are some examples of Generative AI tools that demonstrate the capabilities of this technology in a variety of applications (Fitria,

2024c). An artificial intelligence model (AI model) is a system or computer program designed to imitate or simulate human thinking and learning abilities (Fitria, 2024b). These models use algorithms and data to perform tasks that typically require human intelligence, such as pattern recognition, learning, decision-making, and natural language processing. There are various types of AI models, including those used for image recognition, language processing, prediction, and more. Artificial intelligence models, such as ChatGPT or Google Gemini, are examples of the use of deep learning and Natural Language Processing (NLP) to process and generate natural human language, as well as perform other tasks based on the data provided.

ChatGPT is a language model from OpenAI that can generate text based on context, answer questions, and help with various writing tasks (Fitria, 2023; Fitria et al., 2023). Google Gemini, a multimodal generative tool from Google, is capable of processing and generating content from text, images, audio, and video. Gemini AI stands out for its ability to process various types of data, including text, images, audio, and video, to produce varied and innovative content. Over the years, many AI applications have been developed, with GPT-4 and Gemini being among the most prominent (Meral et al., 2024). Recent developments in artificial intelligence (AI), particularly with generative pre-trained

transformers like ChatGPT and Google's Gemini, have expanded the range of research across multiple fields (Rana & Katoch, 2024). GPT-4, GPT-4o, and advanced Gemini are notable large language models (LLMs) with the ability to process and understand visual data (Günay et al., 2024).

Google Gemini is a cutting-edge AI developed by Google, notable for its advanced capabilities that are comparable to those of ChatGPT (Lee et al., 2024). Google Gemini is a multimodal generative AI tool developed by Google. It is designed to process and generate content across various formats, including text, images, audio, and video. By integrating these different types of data, Gemini provides versatile and innovative solutions for various applications, including educational technology and content creation. Its advanced capabilities allow it to handle complex inputs and generate diverse outputs, making it a powerful tool for enhancing and transforming interactions in multiple domains. Gemini is a large language model developed by Google AI designed to provide informative responses to a wide range of questions, including those that are open-ended, challenging, or unusual (Ananda, 2024). Google's Gemini AI marks a major advancement in chatbot technology, highlighting its sophisticated capabilities and cutting-edge features (Masalkhi et al., 2024).

There are several previous studies related to the use of Gemini AI. Saeidnia (2023) explains that Gemini was created to improve user experiences by delivering personalized and context-specific information. Its goal is to simplify information access, enhance customer service, and provide customized content suggestions. The rivalry among companies in developing AI-driven chatbots is fueling swift progress and innovation within the industry. Joseph et al. (2024) explain that ChatGPT and Google Gemini were found to be equally effective in creating patient education materials for acute appendicitis, cholecystitis, and hydrocele. The analysis showed no significant differences in readability, word count, sentence length, or reliability between the two tools. Omar et al. (2024) evaluated and compared GPT-4 and Google Gemini in generating medical research introductions and showed that Gemini outperformed GPT-4 in reference accuracy, achieving higher correctness (77.2%) and accuracy (68.0%), though its introductions were shorter. GPT-4 provided more detailed content but had lower citation accuracy (54.0% correctness, 49.2% accuracy) and a higher incidence of fabricated references. Overall, Gemini demonstrated superior performance in producing credible and accurate references, highlighting its potential for effective collaboration in medical research. Shukla et al. (2024) explain that ChatGPT,

Gemini, and Perplexity each have unique strengths. ChatGPT excels in understanding textual data, while Gemini and Perplexity handle both text and visual data effectively. ChatGPT and Gemini lack transparency as they do not cite sources, making verification difficult, whereas Perplexity ensures greater transparency by providing citations. All three platforms involve associated costs. Mihalache et al. (2024) explain Google Gemini and Bard demonstrated acceptable proficiency in ophthalmology with a 71% accuracy on 150 multiple-choice questions. Country-specific versions showed minor, statistically insignificant performance variations, with Gemini in Vietnam scoring highest (74%) and Bard in the Netherlands lowest (65%). Both chatbots often provided confident explanations even when incorrect. Rossetini et al. (2024) explain that ChatGPT-4, Microsoft Copilot, and Google Gemini effectively predicted answers on the CINECA healthcare entrance exam, with ChatGPT-4 and Microsoft Copilot outperforming Gemini. While their responses were logically coherent, candidates are advised to use these tools as supplementary aids rather than primary study resources. Hasanein et al. (2024) investigated university students' acceptance of the AI tool Gemini and found that behavioral intention (BI) to adopt it is strongly influenced by perceived ease of use (PE) and social influence (SI), though PE's impact on academic performance was not significant. Ease of access (EE) does not directly affect BI but encourages use due to accessibility. Facilitation conditions (FC) influence BI but not actual use, reflecting insufficient external support. BI mediates the relationships between EE, PE, SI, and Gemini's adoption, offering insights applicable to higher education globally. Karaca (2024) analyzed 120 Turkish stories created by ChatGPT-3.5, ChatGPT-4, and Gemini1.5 Pro revealed that ChatGPT-3.5 generally produced more readable stories according to the Ateşman formula, while Gemini performed better with the Bezirci-Yılmaz formula. ChatGPT-3.5's story readability increased with education level, with undergraduate stories being the most difficult and primary school stories the easiest. While all AI models generated stories appropriate for their intended education levels, the stories often exceeded the expected difficulty. Overall, ChatGPT-3.5 and Gemini were more effective in story creation, and the Bezirci-Yılmaz formula was more suitable for assessing readability. Ranjan et al. (2024) evaluated ChatGPT 3.5 and Gemini's performance on 200 microbiology questions showing similar accuracy, with correct response rates of 71% and 70.5%, respectively. Their performance varied by topic: Gemini performed better in General Microbiology and Immunology, while ChatGPT 3.5 excelled in Applied

Microbiology. The results suggest that both AI platforms have potential in microbiology and medical education, but further development and updates are needed to improve their performance. Rane et al. (2024b) examine ChatGPT and Gemini highlighting their strengths and weaknesses. Gemini benefits from integration with Google Search, improving its factual accuracy, while ChatGPT excels in conversational fluidity and creative expression. Both models face challenges with bias reduction and safety. Gemini focuses on multimodal functionality and integrates with Google's infrastructure, making it a powerful knowledge tool. ChatGPT, with its emphasis on natural language interactions and creative text generation, is ideal for conversational AI. While both models are strong in text comprehension and generation, ChatGPT stands out in natural language generation and code understanding, whereas Gemini's integration with external tools boosts its real-world problem-solving capabilities. Rane (2024) explores AI-enhanced tools like Gemini and ChatGPT offer significant benefits in education, such as simplifying content creation, personalizing assignments, and analyzing performance to identify learning challenges. However, they raise concerns about authenticity, quality, and the potential for plagiarism and academic integrity issues. Ananda (2024) explores students' perceptions of using Gemini as a supplementary tool in the English writing process. Nine out of thirty selected EFL students participated in semi-structured interviews. While many students were reluctant to adopt Gemini due to familiarity with other AI tools, they acknowledged its valuable features for writing. Despite current preferences for familiar tools, positive feedback indicates that Gemini could become a useful writing aid in the future. Carlà et al. (2024) evaluate ChatGPT-4 as effective performance in analyzing both standard and complex glaucoma cases and proposing accurate surgical plans. In contrast, Google Gemini showed significant limitations, with frequent instances of inaccurate or incomplete responses. Meral et al. (2024) compare the performance of GPT-4, Gemini, and emergency medicine specialists in using the Emergency Severity Index (ESI) for patient triage in emergency departments. Rane et al. (2024a) compare Gemini and ChatGPT in finance and accounting tasks highlighting the impact of model size, architecture, and resource allocation on efficiency. Gemini benefits from extensive datasets and computing power, excelling in complex financial analysis but with higher computational costs. In contrast, ChatGPT from OpenAI emphasizes speed and resource efficiency, making it ideal for tasks requiring quick text processing. While both models excel in data analysis, financial modeling, reporting, auditing, and customer

service, Gemini may have an edge in accuracy due to its resources, while ChatGPT shines in creativity and text generation. Ahmad et al. (2024) explain that ChatGPT-4o outperformed the others, demonstrating the potential of large language models as educational tools in periodontology. Lorenzi et al. (2024) assessed the effectiveness of OpenAI's ChatGPT 4 and Google's Gemini Advanced in offering treatment recommendations for head and neck oncology cases. Is & Menekseoglu (2024) explain that ChatGPT-4 significantly surpassed Google Gemini in answering rheumatology board-level questions, showcasing its effectiveness in handling complex and specialized knowledge related to rheumatological diseases. Gupta et al. (2024) describe ChatGPT 4.0 and Google Gemini, differ in diagnostic accuracy, with ChatGPT 4.0 leading at 64.89% overall. These tools show promise in enhancing diagnostics and medical education, their effectiveness varies depending on the area, with Google Gemini performing inconsistently across different categories. Phillips et al. (2024) finds that ChatGPT exceeds Google Gemini in readability, despite having similar metrics. This indicates that ChatGPT may be more effective in creating clearer and more comprehensible patient education materials. Sallam et al. (2024) demonstrate ChatGPT-4 and Gemini have better performance in English than in Arabic, with ChatGPT-4 consistently outperforming Gemini in terms of correctness and CLEAR scores. In English, ChatGPT-4 achieved 80% correctness, while Gemini scored 62.5%, compared to 65% vs. 55% in Arabic. Both AI models showed stronger performance in lower cognitive domains. Overall, both ChatGPT-4 and Gemini showed promise for educational applications.

This research aims to explore the use of both Google Gemini and ChatGPT in English language learning. Although several studies have evaluated Gemini's effectiveness across different fields, including healthcare, content creation, and education, there is a notable gap in research specifically focused on its role in English language acquisition. For instance, Saeidnia (2023) highlighted Gemini's ability to deliver personalized and context-specific information, improving user experiences and customer service. However, research comparing Gemini's effectiveness in language learning, particularly in terms of fluency, grammar, and vocabulary acquisition, is limited. Previous studies, such as those by Joseph et al. (2024) and Omar et al. (2024), have compared Gemini with other tools like ChatGPT in various domains, showing their comparable strengths in generating accurate and reliable information. However, these studies did not investigate their impact on English language learning. Furthermore, studies

like Ananda (2024) have explored students' perceptions of Gemini as a supplementary tool for English writing, but there is insufficient research on its potential to enhance other language skills, such as speaking and listening. While both Gemini and ChatGPT excel in generating text, as seen in research by Shukla et al. (2024) and Rane et al. (2024), the implications of their multimodal capabilities—especially in integrating text and visual data—have not been thoroughly explored for language learning purposes. This research aims to fill this gap by comparing Gemini and ChatGPT's effectiveness in improving English fluency, writing skills, and grammar. Additionally, it will address concerns about the authenticity and ethical use of AI in language learning, a topic discussed by Rane (2024).

The novelty of this research lies in its focus on Gemini's specific potential in English language learning, comparing it with ChatGPT's established strengths. By assessing how Gemini supports vocabulary building, reading comprehension, and overall fluency, this study will provide new insights into its role in the educational process. The research also examines students' acceptance of Gemini, exploring how its multimodal features can be leveraged for improved language learning experiences. This study not only contributes to the understanding of Gemini in the context of English language learning but also offers a comparative analysis that has not been deeply explored in previous studies.

II. METHOD

This research uses descriptive qualitative research. Descriptive research describes and analyzes in detail how these two tools function in English language learning, as well as their advantages and disadvantages. This research can describe the various features offered by ChatGPT and Google Gemini, such as multimodal capabilities in Gemini and text focus in ChatGPT, as well as how these features are applied in the context of English education. Additionally, the researcher can compare the advantages of each tool in aspects such as personalization, interactivity, teaching efficiency, and accessibility that were discussed earlier. Descriptive research allows us to explore how each tool is used by educators and students in English language learning, as well as in the context of real applications such as classroom use, self-paced learning tools, or reduced teaching load. With a descriptive approach, the researcher can explore and describe in detail the comparison between ChatGPT and Google Gemini in the context of use in English education, providing a clear picture of the advantages, limitations, and more

appropriate options depending on the purpose and context of use.

For this research, data are collected using documents in the form of the official websites of ChatGPT and Google Gemini. This documentation will include a description of the features, capabilities, and use of each tool in an English language education context. Data collection will be carried out by studying the information available on the official OpenAI website for ChatGPT and the official Google platform for Gemini. In addition, additional data can be obtained through forums, related articles, or case studies that discuss the application of these two tools in the world of education. The data collected are analyzed by explaining the findings in the form of tables or pictures narratively. This analysis aims to compare the various features and uses of ChatGPT and Google Gemini in English language learning. Each finding will be presented in the form of a table showing a comparison of the two tools' main features, such as the multimodal capabilities of Gemini and the text focus of ChatGPT, as well as the advantages and disadvantages of each in the context of educational applications. After that, a narrative explanation will be provided to describe the findings in detail, explain the differences in how the two tools support English language learning, and provide insight into which is more suitable for use in various educational contexts.

III. FINDINGS AND DISCUSSION

Findings

1. ChatGPT

Using ChatGPT involves several simple steps, depending on how you plan to access and use the tool. To access ChatGPT, you can visit the official OpenAI website, such as chat.openai.com, or use the official app available for mobile devices. You may need to create an account or log in if you don't already have one. Alternatively, developers can access ChatGPT via the OpenAI API by registering and obtaining the required API key. Once you have access, enter your prompt in the ChatGPT user interface, such as asking a question or giving a specific instruction. You can also provide more context or detailed instructions for more relevant responses. After sending the prompt, wait a moment for ChatGPT to process and generate the answer or content. Once the response is received, review the result to ensure it meets your needs and make any necessary edits. If needed, we can provide feedback or ask follow-up questions. For developers using the API, follow OpenAI's documentation to make API calls, and use our preferred programming language to

integrate and customize the results. It is important to use ChatGPT ethically and responsibly, avoiding harmful activities or spreading incorrect information. By following these steps, you can

leverage ChatGPT for a variety of applications, from answering questions to generating creative and informative text-based content.

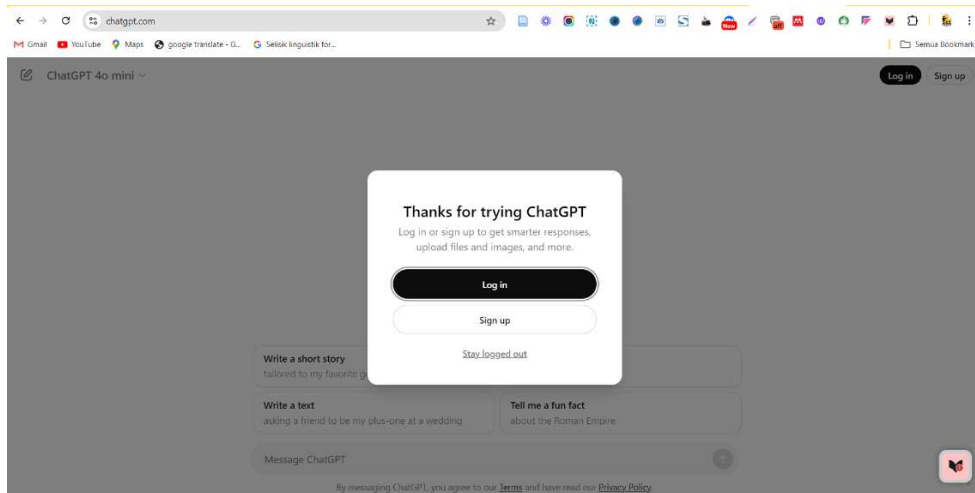


Figure 1. The View of ChatGPT

In general, ChatGPT requires a login to access much of its functionality, especially for the latest versions and premium features. However, in some cases, users may be able to access the basic version of ChatGPT without logging in for a limited trial. This allows using basic features or older versions of the ChatGPT model without having to create an account. However, loginless access usually has limitations, such as not saving conversation history or user preferences. If we select "Stay logged out," you may only be able to

use basic features without full access to premium functionality or conversation history. To get a more complete experience and take advantage of all the features offered, creating an account and logging in is usually required. Some platforms may offer limited access without logging in as part of a marketing strategy or to provide an initial overview of the service, but for more comprehensive use, logging in and creating an account is still recommended.

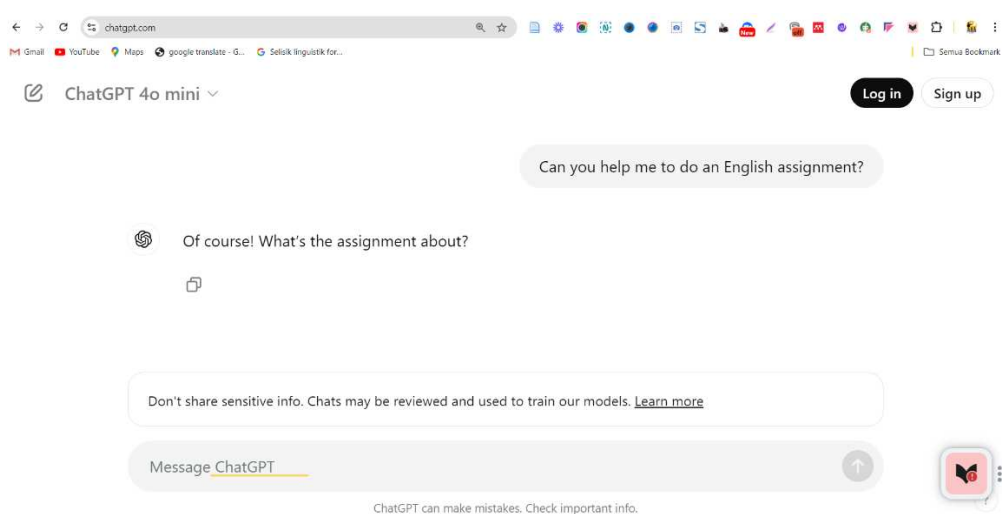


Figure 2. The Prompt in ChatGPT

To write prompts in ChatGPT effectively, first clearly define your goals, such as whether you need an answer to a question, generation of text, or explanation of a specific topic. After that,

provide a little context about the topic or task you want to cover so ChatGPT can better understand your request. Next, provide specific instructions, such as the desired length of the text, whether

there is a particular format that must be followed, or whether certain examples need to be included. Finally, make your question or request clear and targeted, so that ChatGPT can provide answers that are relevant to your needs. For example, you could write, "Can you help me with my English assignment? I need to write three paragraphs of

descriptive text about artificial intelligence in English language teaching. Please include examples of AI applications like language learning apps, chatbots, and virtual tutors, and explain how they benefit students and educators." By following these steps, you will get appropriate and more effective answers from ChatGPT.

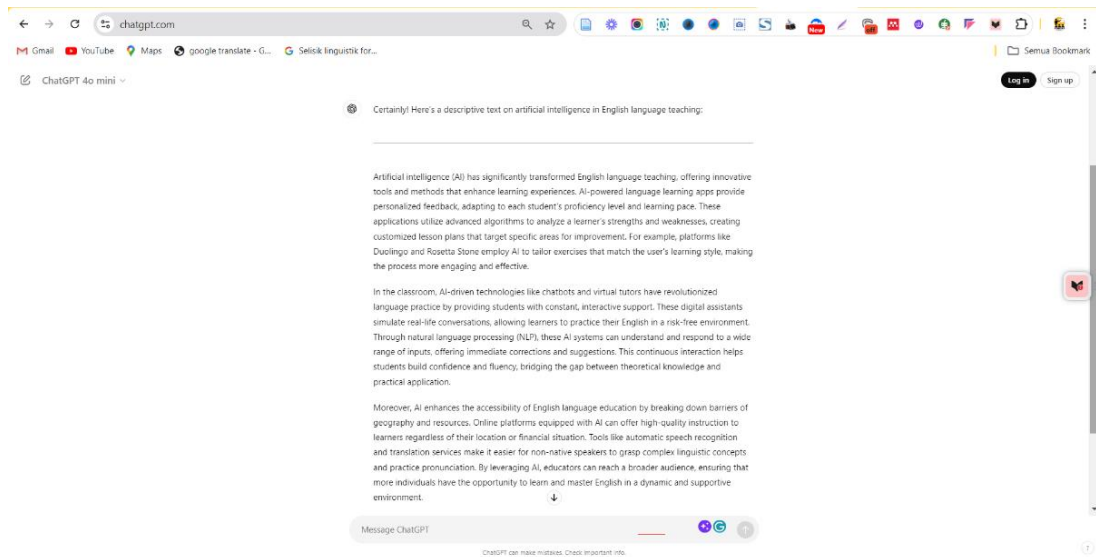


Figure 3. The Answer from ChatGPT

The content of the text is clear, comprehensive, and highly relevant to the topic of AI in English language teaching. It highlights the key contributions of AI, such as personalized feedback through learning apps, interactive language practice with chatbots, and increased accessibility to education. Specific examples like Duolingo and Rosetta Stone strengthen the argument by showing how AI is applied in real-world platforms. Additionally, the mention of natural language processing (NLP) and other tools like automatic speech recognition and translation services provides depth to the discussion, focusing on both educational benefits and the broader impact of AI on accessibility and inclusivity. The grammar in the text is solid, with well-structured sentences that flow logically. The use of verbs is consistent, and tenses are correctly applied. Sentences like "AI-powered language learning apps provide personalized feedback" are grammatically sound, and the writing maintains a professional tone throughout. There are no glaring grammatical errors, and the text stays clear and easy to follow. Punctuation is used effectively, with commas, periods, and other punctuation marks helping to structure the text and aid readability. For example, in the sentence "For example, platforms like Duolingo and Rosetta

Stone employ AI to tailor exercises," the comma usage helps introduce the example without disrupting the flow of the sentence. However, there are minor areas where punctuation could improve the flow: in the sentence "Moreover, AI enhances the accessibility of English language education by breaking down barriers of geography and resources," a comma after "geography" would improve clarity by separating the two distinct ideas within the sentence. Another possible improvement could be the addition of a comma in "Through natural language processing (NLP), these AI systems can understand," making the transition smoother between the introductory phrase and the main sentence. Overall, the text is well-written and clear, with solid grammar, appropriate punctuation, and content that is both informative and relevant to the topic. It highlights how AI is shaping English language teaching and offers insightful examples of its application. A few minor punctuation adjustments could enhance the flow, but overall, the text is effective in conveying its message.

2. Google Gemini

Using Google Gemini, like other generative AI tools, involves several basic steps to maximize its

ability to generate content. First, access the Google Gemini website or the platform providing access and register if you don't already have a Google account. Then, select the appropriate features or modes based on your needs, such as text generation, image creation, or data analysis. Next, input the relevant data, whether it's a description or topic for text generation or a description or reference image for image generation. Adjust settings as needed, such as determining writing style or level of detail, and choose a specific model or algorithm for more tailored results. Once everything is set, initiate the generative process, and Google Gemini

will process your input and generate content. Review the output to ensure it meets your standards, making any necessary adjustments or edits. After finalizing the content, save or export it in the desired format, and if needed, integrate it with other applications. Finally, evaluate the results and provide feedback for future improvements. Keep in mind that different versions or implementations of Google Gemini may have variations in their features and interfaces, so refer to the user guide or official documentation for more detailed instructions.

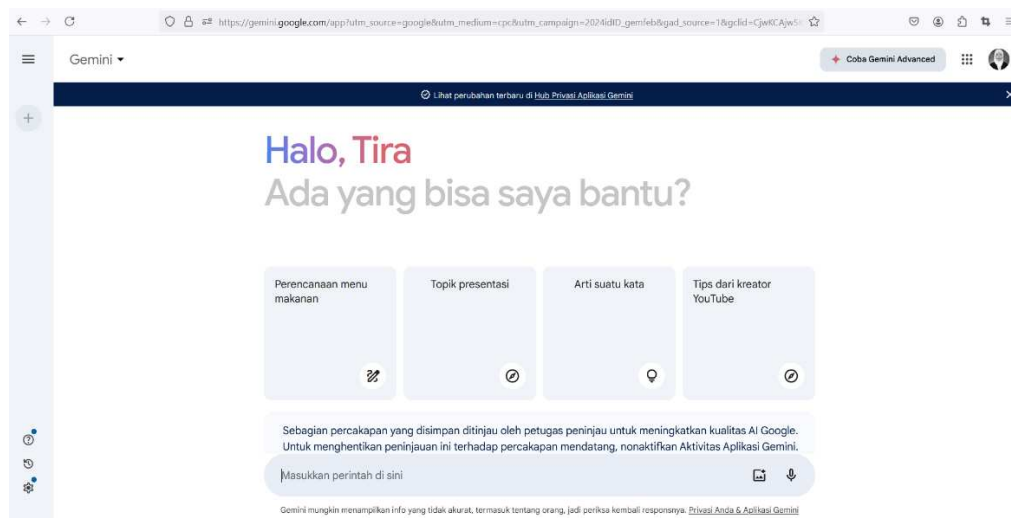


Figure 4. The View of Gemini

To use Google Gemini, it is usually necessary to log in with a Google account. Google Gemini, as part of the Google ecosystem, requires an account to access its full features, including integration with other Google products and services such as Google Drive and Google Workspace. Logging in with a Google account allows users to take advantage of various features, such as data storage, personalization, and

personal settings, as well as ensuring data security through Google account security features, such as two-factor authentication. While some basic features may be accessible without logging in, for the full experience and access to all the functionality Google Gemini has to offer, logging in with a Google account is the recommended and often necessary step.

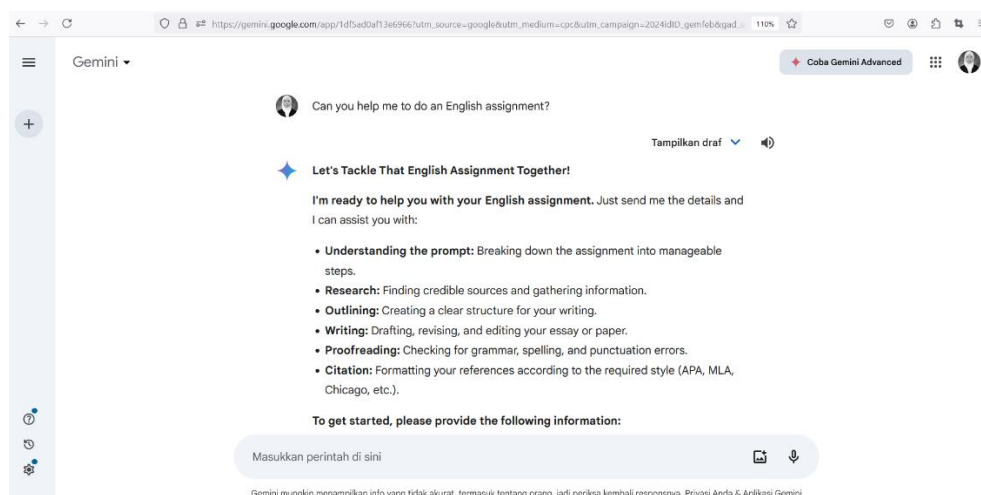


Figure 5. The Prompt in Gemini

To write a prompt in Google Gemini AI, you can follow steps similar to writing a prompt in ChatGPT, but with some adjustments for the Gemini platform which has multimodal capabilities. First, define your goals clearly, for example explaining what you need from the AI. If you need help with an English assignment, specify the type of assignment. For example, you could write, "Can you help me with my English assignment?" This way, you provide a clear picture of what you expect from AI, allowing Gemini to provide responses that are relevant and tailored to your needs.

When the researcher writes a prompt, Gemini describes "If you're looking for help with an English assignment, I'm here to assist! Simply provide the details, and I can guide you through the entire process. We'll start by understanding the assignment prompt and breaking it down into manageable steps. I can also

help with research, finding credible sources, and gathering the necessary information. From there, we'll outline your assignment to create a clear structure, followed by drafting, revising, and editing your work. Additionally, I'll help with proofreading to check for grammar, spelling, and punctuation errors, and ensure that citations are formatted correctly according to the required style (APA, MLA, Chicago, etc.). To begin, please share the assignment prompt, the topic or subject, length requirements, citation style, deadline, and any specific guidelines or requirements. Feel free to ask any questions or share any concerns – I'm here to support you throughout the process! Let's get started!"

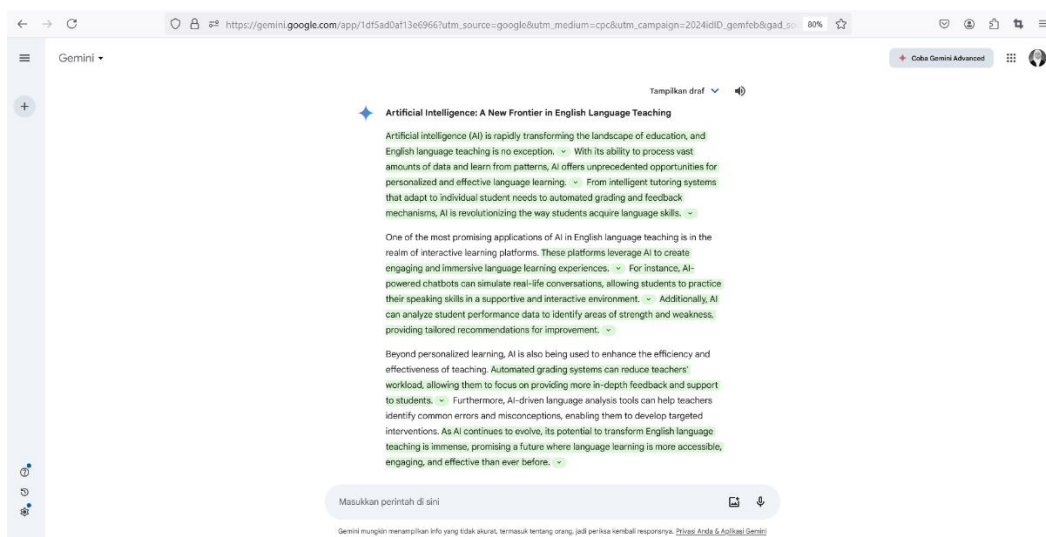


Figure 6. The Answer from Gemini

Answer results from Google Gemini are not always taken directly from Google sources or certain sources. As a generative AI model, Gemini uses machine-learning techniques to generate text based on patterns and information that have been learned from various training data. Google Gemini is trained using large amounts of data from various sources, such as books, articles, and websites, to form the knowledge used to provide answers. This model does not automatically retrieve information from specific sources or search real-time data from Google when answering questions. As a generative model, Gemini creates text that is relevant to the context of the question without including direct quotes or specific references, except in certain formats or applications that require it. Because answers are generated based on learned patterns and knowledge, it is important to verify the information provided by Gemini through

credible sources, especially for data that requires high accuracy. While Google Gemini may feature integration with various information sources depending on the platform, the basic functionality of its generative AI does not include searching directly from sources when providing answers. Therefore, it is important to check the reliability of the information provided by Gemini through trusted sources.

The content of the paragraphs is thorough and relevant, covering several key aspects of how AI is impacting English language teaching, such as personalized learning, interactive platforms, automated grading, and enhanced teaching efficiency. Specific examples, such as AI-powered chatbots and automated grading systems, are used to illustrate the points made, adding clarity and depth to the discussion. Grammar and spelling are correct throughout the text, with well-structured sentences and no noticeable errors or typos. Punctuation is used

appropriately, with commas, periods, and other punctuation marks helping to separate clauses and enhance readability. However, there are a few instances where punctuation could improve clarity. For example, in the phrase “English language teaching is no exception. With its ability to process,” adding a comma after “exception” would improve the transition between sentences. Additionally, in the list “From intelligent tutoring systems that adapt to individual student needs to automated grading and feedback mechanisms,” it might be helpful to add a comma before “and feedback mechanisms” for consistency.

3. Similarities ChatGPT vs Google Gemini

ChatGPT and Google Gemini are two generative AI tools that share several important similarities. Both tools are widely used in education, business, and content creation, with applications such as writing, learning materials, and multimedia creation. In terms of multimodal capabilities, ChatGPT primarily focuses on text generation, while Google Gemini offers more flexibility by handling text, images, audio, and video.

Both tools use advanced AI technology, with ChatGPT relying on language models and deep learning for text generation, while Gemini employs advanced AI models for text, image, and multimedia content. In user experience, ChatGPT focuses on providing a fast, efficient, and intuitive text-based interface, whereas Google Gemini aims for a seamless experience by enabling efficient interaction and multimedia content creation. Regarding customization, ChatGPT allows for customization of text-based content based on user input, while Google Gemini offers customization for both text and multimedia outputs through various methods. Despite these differences, both tools aim to provide innovative AI solutions for content creation and user interaction, differing mainly in the types of data they process and the range of output they produce. Both tools share the goal of providing innovative AI solutions for content creation and user interaction, with some differences in the types of data they process and the output they produce.

Table 1. Similarities ChatGPT vs Google Gemini

Aspect	ChatGPT	Google Gemini
Multimodal Capabilities	Focuses on text generation.	Handles text, images, audio, and video, offering more flexibility.
Content Generation	Generates text such as articles, dialogues, and descriptions.	Produces various types of multimedia output.
Advanced AI Technology	Uses language models and deep learning to generate text.	Uses advanced AI models for text, image, and multimedia content.
Applications in Education and Business	Used in education, business, and content creation, such as writing and creating learning materials.	Also used in education, business, and content creation, including marketing and multimedia creation.
User Experience	Focuses on providing a fast, efficient, and intuitive text-based interface.	Aims for a seamless experience with multimedia content creation and efficient interaction.
Customization	Allows customization of text-based content based on user input.	Offers customization for both text and multimedia output, with varying methods.

4. Differences ChatGPT vs Google Gemini

ChatGPT and Google Gemini are two generative AI tools that have some basic differences. ChatGPT primarily focuses on generating text, such as articles, question answers, and conversations, while Google Gemini can process and generate a broader range of content, including text, images, audio, and video, allowing for more diverse content creation. In terms of multimodal capabilities, ChatGPT is limited to text processing, whereas Google Gemini handles multiple data formats, offering more flexibility. The platforms and integrations also differ: ChatGPT, developed by OpenAI, is integrated through APIs for various text-based applications, while Google Gemini, developed

by Google, is integrated into the Google ecosystem and leverages Google tools for broader solutions. Regarding usage focus, ChatGPT is ideal for text-based applications like chatbots, automated writing, and virtual assistants, whereas Google Gemini is better suited for applications that require multimedia content creation and complex data analysis. While ChatGPT is known for generating natural and relevant text in text-only contexts, Google Gemini is expected to produce high-quality content across multiple formats, with varying accuracy depending on the data type. Finally, ChatGPT is accessible through OpenAI APIs and platforms, while Google Gemini is integrated within the Google ecosystem, potentially offering broader use

across various multimodal applications. This table illustrates that the key difference lies in the multimodal capabilities of Google Gemini, which allows it to handle various types of data, while ChatGPT remains focused on text generation.

Table 2. Differences ChatGPT vs Google Gemini

Aspect	ChatGPT	Google Gemini
Types of Content Produced	Primarily focuses on text generation, such as articles, question answers, and conversations.	Can process and generate text, images, audio, and video, offering more diverse content creation.
Multimodal Capabilities	Primarily handles text, not images, audio, or video.	Handles multiple data formats, including text, images, audio, and video.
Platforms and Integrations	Developed by OpenAI and integrated through APIs for various text-based applications.	Developed by Google and integrated into the Google ecosystem, leveraging Google tools for broader solutions.
Usage Focus	Ideal for text-based applications like chatbots, automated writing, and virtual assistants.	Suitable for applications requiring multimedia content creation and complex data analysis.
Output Quality and Accuracy	Known for generating natural and relevant text, but limited to text-only contexts.	Expected to generate high-quality content across multiple data formats, with accuracy varying depending on the data type.
Usage and Access	Accessible through OpenAI APIs and platforms for a wide range of users and developers.	Integrated within the Google ecosystem, potentially offering broader use across various multimodal applications.

Furthermore, the appearance of ChatGPT and Google Gemini differs based on the user interface design and functionality of each tool. ChatGPT and Google Gemini differ significantly in their user interfaces and functionalities. ChatGPT features a simple and minimalist design, focusing on text input and output areas, where users type their questions or instructions in the input box at the bottom of the screen, and the results are displayed above in speech bubbles or plain text. The main feature of ChatGPT is the display of chat history, which can be deleted or adjusted through settings. It is available on both desktop and mobile platforms with a consistent design tailored to each device, primarily focusing on text-based interactions accessed via OpenAI’s platform.

In contrast, Google Gemini has a more complex and multimodal interface, designed to process and display a variety of data formats,

including text, images, audio, and video. Users can enter text or upload files, with additional options to set multimodal parameters. Results are displayed in different formats, depending on the input, providing a more diverse content presentation. Google Gemini offers customization options for different data formats and is integrated within the Google ecosystem, with platform-specific functionality that reflects Google’s design approach, making it part of a broader suite of services. In general, ChatGPT offers an interface that focuses more on text and conversational interactions, while Google Gemini presents a more multimodal and complex view, befitting its ability to process different types of data. The design and features of each tool are designed to meet their specific purpose and context of use. Here’s an overview of what both platforms look like:

Table 3. Appearance of ChatGPT vs Google Gemini

Aspect	ChatGPT	Google Gemini
User Interface	Simple and minimalist, with a focus on text input and output areas.	Multimodal and complex, designed to process and display text, images, audio, and video.
Text Input Box	Users type their questions or instructions in the box at the bottom of the screen.	Users can enter text or upload files, with options to set multimodal parameters.
Output Area	Displays results above the input box, often as speech bubbles or plain text.	Displays results in various formats (text, images, video) depending on input.
Main Feature	Chat history displayed for previous	Multimodal content display with

	conversations; additional options to delete history or access settings.	customization options for different data formats.
App Version	Available on desktop and mobile with a consistent design tailored to each device.	Integrated within the Google ecosystem, with platform-specific functionality.
Platform Integration	Focused on text-based interactions, mainly accessed via OpenAI’s platform.	Integrates with other Google products and services, reflecting Google’s ecosystem design.

IV. DISCUSSION

The emergence of Large Language Models (LLMs) like ChatGPT and Gemini has introduced new challenges for academia (Pudasaini et al., 2024). These models enable students to easily complete assignments and exams, while educators face difficulties in identifying AI-generated content. This has led to a rise in academic dishonesty, with students presenting work created by LLMs as their own, bypassing the learning process. As AI tools evolve and produce increasingly human-like text, detecting such content becomes more difficult. This shift has notably affected the academic field, leaving many educators struggling to adjust their assessment methods to address these issues.

Gemini AI is an artificial intelligence system developed by Google DeepMind, combining the capabilities of generative language models such as ChatGPT with advanced problem-solving capabilities, including data processing, analysis, and integration of AI-based tools. This project is designed to create more sophisticated and flexible AI models to assist humans in a variety of complex tasks. Some of Gemini's key features include multimodality capabilities to understand and process multiple types of input such as text and images simultaneously, as well as a focus on practical problem solving such as data analysis, coding, or content creation. Additionally, Gemini can integrate AI with existing tools or systems to improve work efficiency and understand context in depth, enabling more natural and relevant interactions. As a further development of technologies such as Bard AI, Gemini aims to provide a richer and more rewarding experience for users. Google AI developed Gemini, a large language model previously known as Bard. Gemini, integrated into various Google Workspace products like Docs, Sheets, and Gmail, is designed to help users with a range of tasks, including generating both text and visual data. It features enterprise-level security and privacy measures to protect user data. Trained on a vast dataset of code and text, Gemini can produce text and respond to queries in a manner that mimics human behavior (Shukla et al., 2024).

The incorporation of Generative AI (GenAI) in education offers great potential to transform learning experiences and empower both students and

educators. However, realizing this potential demands collaborative efforts and thoughtful decision-making to guarantee the responsible and effective application of AI technologies (Perera, 2023a). The integration of Generative AI (GenAI) in education holds great promise for transforming learning experiences and empowering both students and educators (Perera, 2023b). To fully realize this potential, it is essential to take collective action and make responsible decisions to ensure that AI technologies are used effectively and ethically (Fitria, 2021). As chatbots like ChatGPT and Google Gemini become more prevalent in educational settings, there is a rising interest in examining how students perceive and utilize Gemini as a distinctive and effective tool in their learning activities (Hasanein et al., 2024).

In an educational context, Google Gemini offers great potential to enhance the learning experience by providing tools that can produce dynamic and interactive learning materials. Baytak (2024) explores the use of ChatGPT and Google Gemini in creating 7th-grade lesson plans for subjects like mathematics, science, literature, and social studies. The results show that both chatbots produced lesson plans resembling human-written educational content, including sentence structures, activities, and assessments. While the lesson plans positioned teachers as facilitators and provided partially constructive activities, the technology-integrated activities were limited. The study highlights the potential of chatbots for teachers and emphasizes the need for careful consideration when integrating these tools into education.

Gemini shines out because of having the ability to give precise, accurate, and up-to-the-minute answers to our queries or questions. Unlike the other generative AI tools, which depend on the data they contain, Gemini employs Google Search to discover the newest and the most up-to-date information in real time. This makes sure that the responses you get are built on the latest knowledge, making it a very beneficial tool for staying updated. Moreover, Gemini focuses on factual correctness by rating the information it gets according to the quality. In a world where staying with the correct information becomes the biggest challenge, Gemini can be very useful to

overcome this challenge as it provides accurate, precise, latest, trustworthy, and relevant information. Beyond that, Gemini has a wonderful ability to comprehend context and logical thinking. It does not merely drop data at anyone, it understands the subtleties of the problem that you have asked and uses its reasoning skill to deliver comprehensive and accurate answers in response. Gemini is easy to access as it has a user-friendly interface, permitting individuals who have different technical abilities to effortlessly ask inquiries and receive properly organized outcomes. Furthermore, Gemini employs various kinds of machine learning algorithms that will help the model to continue to develop, learn, improve, and expand so that it can process more data and engage with more users, its ability to comprehend sophisticated queries, and provide correct and accurate responses continues to get better.

According to Imran & Almusharraf (2024), Google Gemini offers significant value to educational technologies, but its algorithms must undergo thorough testing and oversight to prevent biases that could disadvantage certain learner groups and create fairness issues. As with other AI tools, Gemini must ensure data privacy and security by protecting user information and adhering to ethical data collection practices, which are critical for responsible AI use in education. Gemini stands as a transformative force in the educational technology landscape, with its multimodal abilities, reasoning, and content generation capabilities providing new possibilities for personalized learning, engaging instruction, and dynamic assessment. Nevertheless, addressing ethical concerns, ensuring responsible development, and maintaining transparency are crucial for realizing the full potential of this generative AI technology. By focusing on human-centered design, mitigating biases, and upholding ethical standards, Google Gemini has the potential to revolutionize personalized learning experiences for all. This report on emerging technology explores Google Gemini as a multimodal generative AI tool, highlighting its groundbreaking potential for the future of educational technology (Imran & Almusharraf, 2024). It details Gemini's capabilities, including its ability to handle and generate content from various data types such as text, images, audio, and video.

To use Google Gemini effectively, start by accessing the official website or platform offering Google Gemini. We may need to create a Google account or register to gain access. Once logged in, choose from the various features or modes available based on your needs, such as text generation, image creation, or data analysis. Input the relevant data into the system; for text, provide a description or topic, and

for images, upload a description or reference image. Customize the settings according to our preferences, such as selecting the style of writing or detail level. Initiate the generative process, during which Google Gemini will process the input and generate content according to your specifications. After receiving the generated content, review it to ensure it meets your quality and relevance standards, making any necessary edits. Once satisfied, save or export the content in the desired format. Lastly, evaluate your experience with Gemini and provide feedback to help improve the tool for future use. For specific instructions or features, consult the official user guide or documentation provided.

Google Gemini offers several advantages, including its ability to process and generate various types of data, such as text, images, audio, and video, making it a very flexible tool for a variety of applications. With these multimodal capabilities, Gemini can produce creative and diverse content, support innovation in the creation of multimedia materials, and improve user experience in the context of education, design, and data analysis. Additionally, Gemini can automate the time-consuming content creation process, so users can produce material quickly and efficiently. Integration with the Google platform also makes it easier for users to join the wider ecosystem. However, there are several drawbacks to note. The quality of content produced by Gemini can vary and may not always be consistent, requiring additional monitoring and editing. Generative AI also sometimes struggles with understanding complex contexts or generating content that fully meets specific needs without clear input. Additionally, using Gemini for sensitive data requires special attention to privacy and security to prevent the risk of data leakage. Gemini may also encounter problems processing and understanding visual content or vignette styles, and access to full features may require a fee or subscription, with limitations in some regions or for certain types of users.

Determining which is better between ChatGPT and Google Gemini depends on your specific needs and the context of use. If your primary need is text generation, such as creating articles, answering questions, or engaging in text-based conversations, ChatGPT may be a better fit. It is specifically designed to produce natural and relevant text. However, if you require a tool that can handle multiple types of data, including text, images, audio, and video, Google Gemini offers an edge with its multimodal capabilities, making it more versatile for applications that need various data formats. While ChatGPT mainly focuses on text and does not directly manage other formats, Google Gemini's ability to

process and generate content across various data types is ideal for multimedia tasks. ChatGPT integrates well with various platforms via APIs provided by OpenAI, offering ease of use for text-based applications, while Google Gemini is more suitable for integration within the Google ecosystem, providing broader integration potential with Google tools. In terms of quality and accuracy, ChatGPT is known for generating natural text, but if you need analysis or content generation outside of text, this could be a limitation. Google Gemini is expected to offer good quality across different formats, but its effectiveness in specific contexts requires evaluation based on its multimodal applications. Lastly, ChatGPT is widely available through OpenAI's platforms, with API access for various applications, while Google Gemini is more closely integrated with Google products and services, making it ideal for those already within the Google ecosystem. In general, ChatGPT excels in text-focused applications, while Google Gemini offers advantages for tasks requiring multimodal data processing. The best choice ultimately depends on your specific needs and the context in which we plan to use each tool.

V. CONCLUSION

From the two examples of answers provided by ChatGPT and Google Gemini, we can draw several conclusions regarding their approach to English language education. Both models utilize machine learning techniques to generate relevant text, but their presentation and focus differ. ChatGPT offers a practical guide to how AI can be used in English language learning, emphasizing applications such as personalized feedback, chatbots, and analytics tools. Google Gemini, on the other hand, highlights the long-term benefits of AI in education, focusing more on interactive learning systems and the potential for increased efficiency and accessibility. Both models stress the importance of personalization and interactivity, with ChatGPT highlighting the analysis of students' strengths and weaknesses, while Gemini emphasizes immersive learning experiences. When it comes to teaching efficiency, Google Gemini focuses on automated assessment systems and data-driven teaching, while ChatGPT addresses how automation tools can reduce teacher workload. Lastly, ChatGPT underscores the need for verifying AI-generated content to ensure accuracy, while Google Gemini highlights the role of AI in making education more accessible and overcoming barriers such as geography and financial constraints. Ultimately, both models offer valuable insights, but their emphasis on different aspects of AI in education reflects their unique strengths and approaches.

Both AI models, ChatGPT and Google Gemini, offer valuable insights into the transformation brought by AI in English language learning. Both highlight the benefits of personalization, interactivity, and efficiency offered by AI technology, although with slightly different emphasis and detail. The information provided by both models shows that AI has great potential to improve the learning experience, reduce teacher workload, and make English language learning more accessible to more people. However, it is important to still verify information and consider how these technologies can be effectively integrated into educational contexts.

Choosing between ChatGPT and Google Gemini depends on your specific needs. If you require text generation, such as creating articles or engaging in text-based conversations, ChatGPT is a better fit due to its focus on producing natural, relevant text. However, if you need to handle multiple types of data like text, images, audio, and video, Google Gemini's multimodal capabilities make it more versatile for multimedia tasks. While ChatGPT is ideal for text-based applications and integrates easily through APIs, Google Gemini is more suited for users within the Google ecosystem. ChatGPT is known for generating high-quality text, while Gemini provides good quality across various formats, but its effectiveness varies with context. Ultimately, the best choice depends on whether your focus is on text or multimedia tasks.

REFERENCES

- [1] Ahmad, B., Saleh, K., Alharbi, S., Alqaderi, H., & Jeong, Y. N. (2024). *Artificial Intelligence in Periodontology: Performance Evaluation of ChatGPT, Claude, and Gemini on the In-service Examination* (p. 2024.05.29.24308155). medRxiv.<https://doi.org/10.1101/2024.05.29.24308155>
- [2] Ananda, D. R. (2024). Students' Perception on AI Technology: Gemini as a Writing Assistant Tool. *Linguistics and ELT Journal*, 12(1), 46–54. <https://doi.org/10.31764/leltj.v12i1.24393>
- [3] Baytak, A. (2024). The Content Analysis of the Lesson Plans Created by ChatGPT and Google Gemini. *Research in Social Sciences and Technology*, 9(1), 329–350.
- [4] Carlà, M. M., Gambini, G., Baldascino, A., Boselli, F., Giannuzzi, F., Margollicci, F., & Rizzo, S. (2024). Large language models as assistance for glaucoma surgical cases: A ChatGPT vs. Google Gemini comparison. *Graefe's Archive for Clinical and Experimental*

- Ophthalmology*. <https://doi.org/10.1007/s00417-024-06470-5>
- [5] Fitria, T. N. (2021). Artificial Intelligence (AI) in Education: Using AI Tools for Teaching and Learning Process. *Prosiding Seminar Nasional & Call for Paper STIE AAS*, 4(1), 134–147.
- [6] Fitria, T. N. (2023). Artificial intelligence (AI) technology in OpenAI ChatGPT application: A review of ChatGPT in writing English essay. *ELT Forum: Journal of English Language Teaching*, 12(1), 44–58. <https://doi.org/10.15294/elt.v12i1.64069>
- [7] Fitria, T. N. (2024a). Artificial Intelligence (AI) News Anchor: How AI's Performance in Journalistic Sector? *Indonesia Technology-Enhanced Language Learning (iTELL) Journal*, 1(1), 29–42.
- [8] Fitria, T. N. (2024b). Using ChatBot-Based Artificial Intelligence (AI) for Writing an English Essay: The Ability of ChatGPT, Perplexity AI, and ChatSonic. *Journal of Language Intelligence and Culture*, 6(2), 103–128. <https://doi.org/10.35719/jlic.v6i2.139>
- [9] Fitria, T. N. (2024c). Using Google Bard as an AI-Powered Chatbot Tool for Writing English Essays. *International Journal of Computer and Information System (IJCIS)*, 5(3), 231–245. <https://doi.org/10.29040/ijcis.v5i3.171>
- [10] Fitria, T. N., Simbolon, N. E., & Afdaleni, A. (2023). Chatbots as Online Chat Conversation in the Education Sector. *International Journal of Computer and Information System (IJCIS)*, 4(3), 93–104. <https://doi.org/10.29040/ijcis.v4i3.116>
- [11] Günay, S., Öztürk, A., & Yiğit, Y. (2024). The accuracy of Gemini, GPT-4, and GPT-4o in ECG analysis: A comparison with cardiologists and emergency medicine specialists. *The American Journal of Emergency Medicine*. <https://doi.org/10.1016/j.ajem.2024.07.043>
- [12] Gupta, R., Hamid, A. M., Jhaveri, M., Patel, N., & Suthar, P. P. (2024). Comparative Evaluation of AI Models Such as ChatGPT 3.5, ChatGPT 4.0, and Google Gemini in Neuroradiology Diagnostics. *Cureus*, 16(8), e67766. <https://doi.org/10.7759/cureus.67766>
- [13] Hasanein, A., Sobaih, A., & Elshaer, I. (2024). Examining Google Gemini's acceptance and usage in higher education. *Journal of Applied Learning and Teaching*, 7(2). <https://doi.org/10.37074/jalt.2024.7.2.5>
- [14] Imran, M., & Almusharraf, N. (2024). Google Gemini as a next generation AI educational tool: A review of emerging educational technology. *Smart Learning Environments*, 11(1), 22. <https://doi.org/10.1186/s40561-024-00310-z>
- [15] Is, E. E., & Menekseoglu, A. K. (2024). Comparative performance of artificial intelligence models in rheumatology board-level questions: Evaluating Google Gemini and ChatGPT-4o. *Clinical Rheumatology*, 43(11), 3507–3513. <https://doi.org/10.1007/s10067-024-07154-5>
- [16] Islam, R., & Ahmed, I. (2024). Gemini-the most powerful LLM: Myth or Truth. *2024 5th Information Communication Technologies Conference (ICTC)*, 303–308. <https://doi.org/10.1109/ICTC61510.2024.10602253>
- [17] Joseph, T., Sanghavi, N., Kanyal, S., Majumder, K., Seidu-Aroza, H., & Godavarthi, A. (2024). Comparative Analysis of ChatGPT and Google Gemini in the Creation of Patient Education Materials for Acute Appendicitis, Cholecystitis, and Hydrocele. *Indian Journal of Surgery*. <https://doi.org/10.1007/s12262-024-04112-y>
- [18] Karaca, M. F. (2024). Is Artificial Intelligence able to Produce Content Appropriate for Education Level? A Review on ChatGPT and Gemini. *Proceedings of the Cognitive Models and Artificial Intelligence Conference*, 208–213. <https://doi.org/10.1145/3660853.3660915>
- [19] Lee, T. J., Campbell, D. J., Patel, S., Hossain, A., Radfar, N., Siddiqui, E., & Gardin, J. M. (2024). Unlocking Health Literacy: The Ultimate Guide to Hypertension Education From ChatGPT Versus Google Gemini. *Cureus*, 16(5), e59898. <https://doi.org/10.7759/cureus.59898>
- [20] Lorenzi, A., Pugliese, G., Maniaci, A., Lechien, J. R., Allevi, F., Boscolo-Rizzo, P., Vaira, L. A., & Saibene, A. M. (2024). Reliability of large language models for advanced head and neck malignancies management: A comparison between ChatGPT 4 and Gemini Advanced. *European Archives of Oto-Rhino-Laryngology*. <https://doi.org/10.1007/s00405-024-08746-2>
- [21] Masalkhi, M., Ong, J., Waisberg, E., & Lee, A. G. (2024). Google DeepMind's gemini AI versus ChatGPT: A comparative analysis in

- ophthalmology. *Eye*, 38(8), 1412–1417. <https://doi.org/10.1038/s41433-024-02958-w>
- [22] Meral, G., Ateş, S., Günay, S., Öztürk, A., & Kuşdoğan, M. (2024). Comparative analysis of ChatGPT, Gemini and emergency medicine specialist in ESI triage assessment. *The American Journal of Emergency Medicine*, 81, 146–150. <https://doi.org/10.1016/j.ajem.2024.05.001>
- [23] Mihalache, A., Grad, J., Patil, N. S., Huang, R. S., Popovic, M. M., Mallipatna, A., Kertes, P. J., & Muni, R. H. (2024). Google Gemini and Bard artificial intelligence chatbot performance in ophthalmology knowledge assessment. *Eye*, 1–6. <https://doi.org/10.1038/s41433-024-03067-4>
- [24] Omar, M., Nassar, S., Hijaze, K., Glicksberg, B. S., Nadkarni, G. N., & Klang, E. (2024). *Generating Credible Referenced Medical Research: A Comparative Study of Openai's Gpt-4 and Google's Gemini* (SSRN Scholarly Paper No.4780940)<https://doi.org/10.2139/ssrn.4780940>
- [25] Perera, P. (2023a). *Preparing to Revolutionize Education with the Multi-Model GenAI Tool Google Gemini? A Journey towards Effective Policy Making*. <https://doi.org/10.36348/jaep.2023.v07i08.001>
- [26] Perera, P. (2023b). *Preparing to Revolutionize Education with the Multi-Model GenAI Tool Google Gemini? A Journey towards Effective Policy Making*. <https://doi.org/10.36348/jaep.2023.v07i08.001>
- [27] Phillips, V., Kiryakoza, F., Arefin, S., Choudhary, N., & Garifullin, R. (2024). ChatGPT versus Google Gemini: A comparison to evaluate patient education guide created on common neurological disorders. *Discover Artificial Intelligence*, 4(1), 79. <https://doi.org/10.1007/s44163-024-00189-2>
- [28] Pudasaini, S., Miralles-Pechuán, L., Lillis, D., & Salvador, M. L. (2024). *Survey on Plagiarism Detection in Large Language Models: The Impact of ChatGPT and Gemini on Academic Integrity* (No. arXiv:2407.13105). arXiv. <https://doi.org/10.48550/arXiv.2407.13105>
- [29] Rana, N., & Katoch, N. (2024). AI for Biophysical Phenomena: A Comparative Study of ChatGPT and Gemini in Explaining Liquid–Liquid Phase Separation. *Applied Sciences*, 14(12), Article 12. <https://doi.org/10.3390/app14125065>
- [30] Rane, N. (2024). Enhancing the quality of teaching and learning through Gemini, ChatGPT, and similar generative Artificial Intelligence: Challenges, future prospects, and ethical considerations in education. *TESOL and Technology Studies*, 5(1), 1–6. <https://doi.org/10.48185/tts.v5i1.1000>
- [31] Rane, N., Choudhary, S., & Rane, J. (2024a). *Gemini or ChatGPT? Efficiency, Performance, and Adaptability of Cutting-Edge Generative Artificial Intelligence (AI) in Finance and Accounting* (SSRN Scholarly Paper No. 4731283). <https://doi.org/10.2139/ssrn.4731283>
- [32] Rane, N., Choudhary, S., & Rane, J. (2024b). Gemini Versus ChatGPT: Applications, Performance, Architecture, Capabilities, and Implementation. *SSRN Electronic Journal*. <https://doi.org/10.2139/ssrn.4723687>
- [33] Ranjan, J., Ahmad, A., Subudhi, M., & Kumar, A. (2024). Assessment of Artificial Intelligence Platforms With Regard to Medical Microbiology Knowledge: An Analysis of ChatGPT and Gemini. *Cureus*, 16(5), e60675. <https://doi.org/10.7759/cureus.60675>
- [34] Rossettini, G., Rodeghiero, L., Corradi, F., Cook, C., Pillastrini, P., Turolla, A., Castellini, G., Chiappinotto, S., Gianola, S., & Palese, A. (2024). Comparative accuracy of ChatGPT-4, Microsoft Copilot and Google Gemini in the Italian entrance test for healthcare sciences degrees: A cross-sectional study. *BMC Medical Education*, 24(1), 694. <https://doi.org/10.1186/s12909-024-05630-9>
- [35] Saeidnia, H. R. (2023). Welcome to the Gemini era: Google DeepMind and the information industry. *Library Hi Tech News, ahead-of-print*(ahead-of-print).<https://doi.org/10.1108/214>
- [36] Sallam, M., Al-Mahzoum, K., Almutawaa, R. A., Alhashash, J. A., Dashti, R. A., AlSafy, D. R., Almutairi, R. A., & Barakat, M. (2024). The performance of OpenAI ChatGPT-4 and Google Gemini in virology multiple-choice questions: A comparative analysis of English and Arabic responses. *BMC Research Notes*, 17(1), 247. <https://doi.org/10.1186/s13104-024-06920-7>
- [37] Shukla, M., Goyal, I., Gupta, B., & Sharma, J. (2024). A Comparative Study of ChatGPT, Gemini, and Perplexity. *International Journal of Innovative Research in Computer Science & Technology*, 12(4), 10–15.