

Revolutionising essay writing: a systematic review of Google Gemini

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Article Info

Article history:

Received Oct 1, 2024

Revised Jan 15, 2026

Accepted Jan 25, 2026

Keywords:

Artificial intelligence

Essay writing

Personalized feedback

Personalized tutoring

Systematic review

ABSTRACT

The emergence of generative artificial intelligence (GenAI) has significantly impacted the education sector in essay writing. This study focuses on Google Gemini as a viable alternative to ChatGPT. A systematic literature review (SLR) was conducted using preferred reporting items for systematic reviews and meta-analyses (PRISMA) method to investigate existing research on Gemini and its application in essay writing. The review examined articles published from 2022 to August 2024. It focuses on the years, research design, population, and learning theories involved in the use of Gemini. Several stages of the PRISMA method were implemented to filter and collect relevant information, resulting in a comprehensive analysis of articles discussing Gemini's role in essay writing across various publication platforms. The findings highlight the functions of Gemini in essay writing. It provides valuable insights for researchers and practitioners in language teaching and learning. This research aims to enhance understanding and promote the effective use of Google Gemini in education.

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1. INTRODUCTION

With the existence of large language models (LLMs) such as GPT4, Gemini 1.5, Claude, and Llama 3, there is a significant increase in generative artificial intelligence (GenAI) research and applications [1]–[4]. One of the GenAI that has not been much researched is Gemini, formerly known as Google Bard. In fact, it is one of the most stunning innovations in the world currently, as it is known for its remarkable ability to access information quickly via Google [5], [6].

Although GenAI has made remarkable impacts on humans' lives, there are also many negative effects brought by it [7], [8]. Educational institutions in the world are facing challenges while using GenAI. Among the issues faced while using GenAI are plagiarism, bias, and inaccuracy of data. They hinder students' creativity and critical thinking skills [9], [10]. GenAI also promotes academic dishonesty among students as they tend to copy directly from the answers given by GenAI without making their own judgment. Thus, it is the teachers' role to ensure that AI is used to its maximum benefits [11]. As Google Gemini is still a new AI in essay writing, there has not been much research carried out on it yet. Hence, this study aimed to address this issue through a systematic review carried out from January 2022 until August 2024, so that it can provide more useful insights for future research on it.

This study intended to address the following research questions: i) what is the distribution over time of the articles examining Gemini utilisation in essay writing? ii) what types of learners are commonly selected for the research? iii) what types of research are carried out regarding the use of Gemini in essay writing? iv) what learning theories are usually utilised to examine Gemini utilisation in essay writing? and v) what are the functions of Gemini in essay writing as mentioned in the previous research?

2. LITERATURE REVIEW

Gemini as a Google AI is formerly known as Bard. It is a pathways language model (PaLM) with 540 billion parameters built using the transformer architecture [12]. In fact, Gemini is known as one of the best GenAI nowadays [13]. LLM refers to a computational system trained to predict the chance that units of language, such as characters or words, can logically appear in a given text [14], [15]. These models are trained on data, typically scraped from the web. Thus, developers of LLM must process the training data before training the model. This involves breaking the text into units, namely tokens, which can be a word or part of a word, and later changing each token into an integer. Training is a multi-step process where the model makes relationships between various tokens. Each connection has a numerical weight. Each task the model performs involves different weights. The model computes the various weights to determine which combination best fits the task. Being the latest Google's LLM model, Gemini can handle a context length of 32K [9], [13]. In fact, Gemini is considered artificial generative intelligence (AGI). AGI are machines that are capable of performing any intellectual task that a human can do. In fact, AGI tools are more capable than human beings in processing data as they are LLMs with massive parameters trained on extremely large corpora [16]–[18]. Thus, AGI such as Gemini exhibits exceptionally high intelligence compared to earlier AIs. LLMs and LLM-based agents demonstrate advanced capabilities in various aspects such as programming, mathematics, and other applications [19]–[23].

In addition, Google had announced Gemini as Google's largest and most capable GenAI model [18]. This is because Gemini outperforms ChatGPT-4 in most natural language processing (NLP) tasks and it is designed to work on everything from data centers to mobile services. Gemini is optimised to work in 3 different formats (ultra, pro, and nano). The first version of the model, Gemini 1.0, was developed for three different sizes. The first model, Gemini Ultra is known as the most capable and largest model for highly complex tasks that require deep solving skills. It is able to work with different sources such as photos, videos and audio. Meanwhile, the second model, Gemini Pro is used for a variety of different tasks. Finally, Gemini Nano is known as the most efficient model among the three. Although there has been extensive research regarding GenAI and ChatGPT, there are still insufficient studies on Google Gemini. Therefore, this systematic review was carried out to examine the use of Google Gemini in the field of essay writing. It provides useful insights for researchers and practitioners in using Gemini to reduce the laborious tasks of essay writing, as Gemini is known not only to be able to generate ideas for students' essays and evaluate written work, but also provides practice and sample tests for students to further improve on their own [24]. In fact, it has become an integral tool for students as it aids in various learning tasks such as assignment development, essay writing, and coding [25].

3. METHOD

This study employed a systematic literature review (SLR) methodology. It encompasses the stages of collection, determination, analysis, and synthesis of various articles pertaining to the temporal distribution of research examining the utilisation of Gemini in essay writing, as well as the types of learners typically involved in these studies. To mitigate the risk of systematic errors or biases inherent in the SLR process, we adhered to a rigorous scientific procedure. The systematic review was conducted over a period from January 2022 to August 2024. It follows the preferred reporting items for systematic reviews and meta-analyses (PRISMA) reporting guidelines. These guidelines delineate a comprehensive framework for conducting systematic reviews, which includes several critical steps: i) protocol development and registration; ii) establishment of eligibility criteria; iii) identification of information sources; iv) systematic search of relevant literature; v) study selection; vi) data collection process; and vii) selection of data items. A quality appraisal method developed by previous researchers was used for this study [26].

SLR has been used as a scientific method to gain comprehensive insight into a specific research domain. It bridges the research gap and identifies the trends in this current study. The ways of review reporting were governed by the principles of PRISMA statements [27]. This study reviewed publications indexed in reputable journals and research platforms such as Scopus, WoS, ScienceDirect, IEEE, SAGE, Wiley, JSTOR, and Google Scholar to obtain an overview of Gemini utilization in learner types, research design, and the theories underpinning Gemini applications in essay writing.

For this study, a total of 155 articles related to Gemini and essay writing were obtained from the publication platforms. We searched through the platforms with the keywords ‘Gemini’ and ‘Essay Writing’ in all the major publication platforms mentioned above. As Gemini is a relatively new GenAI, there has not been much research on it yet. Thus, all the publication platforms were searched through to get more thorough findings for the research subject on Gemini. The time frame in the publication platforms was set to since year 2022 to 2024, whereas the parameters in Springer, WoS, Scopus, ScienceDirect, IEEE, SAGE, Wiley, and JSTOR were set to only articles, research articles, and conference papers. The advanced search function was used in all the publication platforms in order to get the related papers. As Gemini is a new subject, articles that contain the term ‘Gemini’ and ‘Essay writing’ were only found in Science Direct, SAGE, Springer, and Google Scholar. In total, there were 102 articles found in Google Scholar, 3 articles from SAGE, 47 articles obtained from ScienceDirect, and 3 articles found in Springer. The first researcher downloaded all the articles, and the second researcher checked through the findings. It was then verified by the third and fourth authors. Articles that did not consist of the term ‘Gemini’ and ‘essay writing’ were excluded. Abstract paper, thesis, and book chapter were also excluded from the list. The list of these articles was checked to ensure there were no repetitive articles. From these findings, only 31 articles that fulfilled the terms above were accepted for further studies. Table 1 shows the inclusion and exclusion criteria of the articles included in this research.

3.1. Procedures

Figure 1 shows the SLR process involved in this research. After downloading all 31 articles, they were read thoroughly by the researchers to determine the inclusion eligibility in the final review. Articles chosen must consist of empirical study and involve Gemini as a primary or additional component in essay writing. Types of documents selected for this research included journal articles and conference proceedings written in English. On the other hand, articles that do not address the actual application of Gemini in essay writing were omitted from the study. In addition, symposiums, editorial writings, meeting abstracts, books, book chapters, master thesis, Ph.D. thesis, and biographical items were also excluded. Articles that mention the term ‘Gemini’ but are about other topics and abstract or conceptual papers were also excluded, as they do not present the results of using Gemini clearly. The data collected for this study were determined using the qualitative content analysis method, as it allowed for more systematic and objective categorization of qualitative data [28]. The results were then presented using diagrams.

Table 1. Inclusion and exclusion criteria

Inclusion	Exclusion
– Must use Gemini as the main or additional component in essay writing.	– Articles that do not address the application of Gemini in essay writing.
– The articles present the results of the application of Gemini for essay writing and the instruments used in the evaluation of Gemini.	– Symposium, editorial writings, meeting abstracts, book, book chapters, master thesis, Ph.D. thesis, and biographical items are excluded.
– The types of documents chosen included journal articles and conference proceedings, written in English.	– Articles that mention the term ‘Gemini’, but are about other topics.
– The target language investigated can be either in English or other languages.	– Abstract paper
	– Conceptual paper
	– Design-based research
	– The study does not present the results clearly.

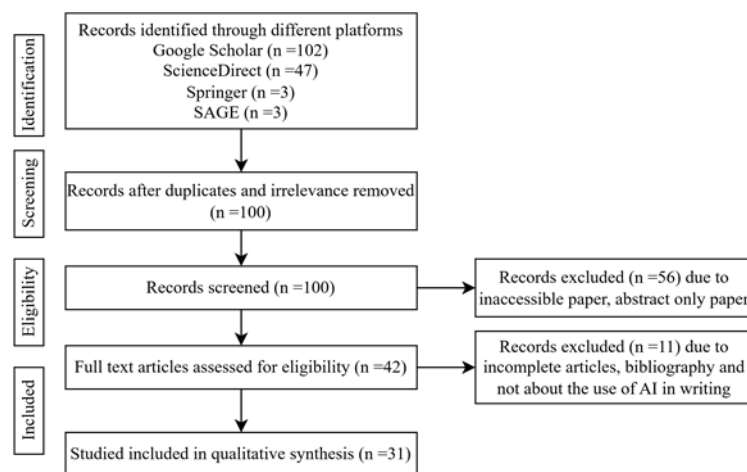


Figure 1. The systematic review processes

3.2. Categories

The year of the journal publications ranged from the emergence of Gemini in 2022 till August 2024. For the research design, three groups were determined: quantitative, qualitative, and mixed-method. Learner types and learning theories were identified from the papers and not pre-determined. The types of learners found from the papers included higher education institution (HEI) students, in-service teachers and secondary school students. The findings of the study are presented as follows.

4. RESULTS AND DISCUSSION

This systematic review utilized 31 articles in total. Table 2 (see Appendix) presents a summary of these articles. All selected articles are detailed in the provided table for reference.

4.1. Research question 1: distribution over time examining Gemini usage in writing

Studies about Gemini only started to emerge in the year 2023. There were no studies on Gemini in the year 2022. However, the studies on Gemini have begun to increase significantly starting the year 2024. In total, there were 31 articles on Gemini and essay writing. Table 3 and Figure 2 show the distribution of studies since year 2022 until August 2024.

Table 3 and Figure 2 show that the number of articles on Gemini has increased more than 7 times in the year 2024 compared to the year 2023. This implies that more researchers have started to examine the use of Gemini recently. This is probably due to the growing demand for the use of Gemini in essay writing since 2024. More researchers have started to see the potential of Gemini as it not only assists students' learning but also reduces teachers' burden [29], [30]. In fact, the marking done by Gemini is comparable to the marking done by humans. Nevertheless, compared to ChatGPT, there are still not many studies carried out on Gemini and this has called on for more studies on it.

Table 3. Number of studies about Google Gemini from 2022 to 2024

Year	Number of studies
2022	0
2023	4
2024	27
Total	31

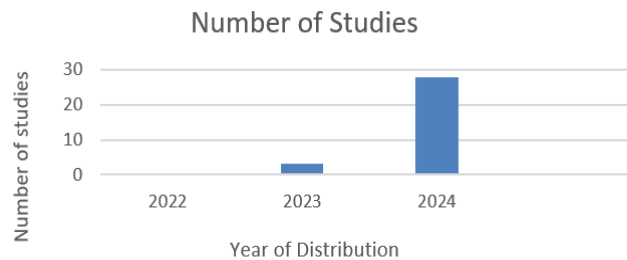


Figure 2. Number of studies from 2022 to 2024

4.2. Research question 2: types of learners commonly selected for the research

There were different types of learners selected for the studies on Google Gemini and essay writing. In total, there were a total of 16 samples involved using Gemini. Table 4 and Figure 3 show the types of learners selected for studies on Gemini.

As shown in Table 4 and Figure 3, the majority of the respondents involved were from HEI students. They constituted 68.75% of the overall studies on Gemini. This is followed by three studies conducted on in-service teachers or 18.75% of the overall studies. There was one study conducted with secondary school students and also one study conducted at workplace. This shows that research on the use of Gemini among other types of learners is still lacking. Thus, there is a need to research the use of Gemini with other age groups as well [31], [32].

Table 4. Types of learners selected for studies on Gemini and essay writing

Type of learners	Number of studies
HEI	11
Teachers	3
Secondary	1
Workplace	1
Total	16

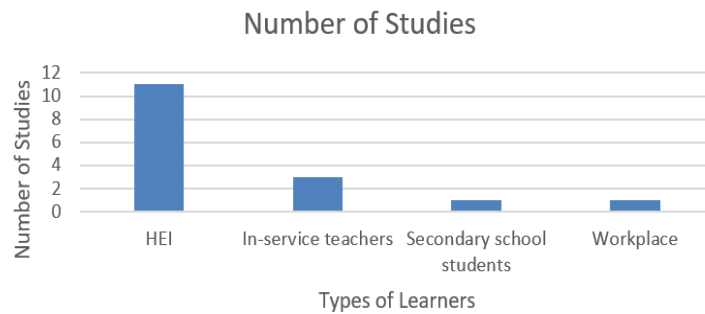


Figure 3. Number of studies according to types of learners

4.3. Research question 3: types of research design and data collection methods applied to examine Gemini usage in essay writing

The analysis indicated that the most frequently used method to gather information regarding Gemini usage in essay writing was qualitative. Table 5 presents the types of studies and frequency used. 19 studies conducted used qualitative method with document analysis being the most frequently used method. The second most frequently used method was quantitative (8 studies) that included mostly questionnaires. In addition, there were also four studies conducted using mixed method.

Table 5. Types of studies used

Types of studies	Number of studies
Qualitative	19
Quantitative	8
Mixed-method	4

Generally, there were many different types of instruments used to collect data regarding Gemini and essay writing. Table 6 and Figure 4 show the types of instruments used to collect the data. Figure 4 shows the different types of instruments used to examine usage of Gemini in essay writing that consisted of document analysis (16 studies), questionnaires (6 studies), semi-structured interviews (6 studies), sentiment analysis (3 studies), systematic review (3 studies), web scraping (1 study), observation (1 study), experiment (3 studies) and, scoping review (1 study). This shows that the researchers had employed different types of methods in collecting data for the study to triangulate the findings from the study.

Table 6. Types of research instruments used

Types of research instruments used	Number of studies
Document analysis	16
Semi-structured interviews	6
Questionnaires	6
Systematic review	3
Sentiment analysis	3
Web scraping	1
Scoping review	1
Experiment	3
Observation	1

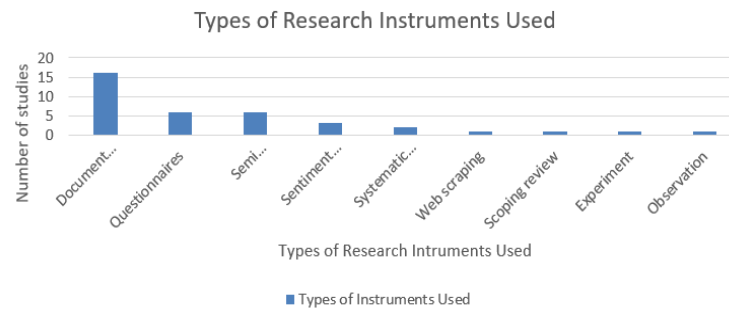


Figure 4. Types of instruments used to collect the data

4.4. Research question 4: learning theories mentioned in the studies

There were many different learning theories mentioned in the studies regarding Gemini utilization in essay writing. The three most common learning theories mentioned were social cognitive theory, social cultural theory, and constructivist. This is because Gemini scaffolds students' learning by providing personalized tutoring and feedback. These are important elements for students' learning [33], [34]. Compared to the traditional way of teaching, Gemini not only provides immediate feedback and responses based on the prompts keyed in by the students, it also provides practice for students to learn further on their own [35]–[38]. Gemini has become an integral tool for students as it assists students in various tasks such as assignment development, essay writing and coding [39]–[41]. Other learning theories that were mentioned in the study include innovation theory as Gemini is one of the latest innovations in Google, moral foundation, socio-construction of technology, and self-directed learning. Gemini provides support and scaffolds students' learning and promotes them to learn independently without the need to rely on their teachers.

4.5. Research question 5: functions on Gemini in the studies

Generally, there were many functions of Gemini in assisting students' essay writing. The most frequently mentioned function is the ability of Gemini to generate ideas. This is because Gemini is built using the corpus of data from Google. In fact, Gemini is known for its remarkable ability to generate information quicker than other GenAI tools [9], [13]. Thus, Gemini is used for brainstorming sessions, report writing, and creative storytelling.

Besides, Gemini is also frequently used for essay evaluation or grading. Students can use it to check on their strengths and weaknesses in essay writing and improve them before submitting the essay to the teacher. Gemini is also able to improve students' language in terms of content, grammar, and organization. Being a GenAI, Gemini is able to generate grammatically accurate sentences for students to model.

Studies conducted show that Gemini is also frequently used to give personalized feedback and learning to students [24]. Other functions of Gemini mentioned in the studies include automated essay writing, automated detectors of AI-generated texts, summarization, independent learning, translation, intelligent tutoring system, and coding. To sum up, there are indeed many benefits of Gemini for essay writing as found in the studies.

5. DISCUSSION

The findings of this study highlighted the use of Gemini in essay writing. Studies on Gemini have only started to emerge since 2023. However, Gemini had received significant attention in the following year. Studies on Gemini have increased by more than 6 times in the year 2024 compared to 2023. This shows that more researchers have started to see the importance of Gemini in essay writing as it not only assists students in their essay writing, but it also eases teachers' burden in teaching [31], [42]. However, most of the studies on Gemini were only conducted in HEI, such as universities and colleges. There was a lack of studies conducted with other age groups of learners. 68.75% of the studies were conducted at higher learning institutions such as with university students. Hence, more studies should be conducted with other age groups of learners. Besides that, the most frequently used research design is qualitative studies. A total of 61.29% of the studies were conducted using qualitative methods and 4 of them were case studies. This is because qualitative studies enable researchers to investigate more thoroughly the research involved. The most frequently used instrument in the studies regarding Gemini and essay writing was document analysis. 50% of all the studies were conducted using document analysis. Other frequently used research instruments consist of questionnaires and semi-structured interviews.

The use of Gemini in essay writing is supported mainly by social learning theories, namely social cultural theory, social cognitive theory, social construction of technology, and constructivist theory. This is because students learn about essay writing through interaction with Gemini. They actively construct knowledge through interaction with Gemini, which provides personalized tutoring, feedback and samples of essays for students to follow. Similar to ChatGPT, studies have shown that personalized feedback from Gemini promotes students' critical thinking skills and improves students' essay performance [43]–[47]. However, Gemini further enhanced this function as it can provide different responses based on students' level of proficiency. The canvas function in Gemini enables students to choose the length of the responses from Gemini. Figure 5 shows the function of canvas that enables users to choose different types of responses based on the same query.

Thus, the weaker students can choose a shorter response while the more advanced students can choose longer response. This is termed as a differentiation strategy, and this feature is only available in Gemini [5], [7]. Nowadays, Gemini has become an integral part of students' learning. In fact, it is one of the most recommended AI tools to be used for school students due to its safety feature, since it will not generate data from users' input. Apart from that, being a multimodal GenAI, Gemini can produce not only text and images but also sound. This feature enables different types of learners to progress in their own way [48], [49].

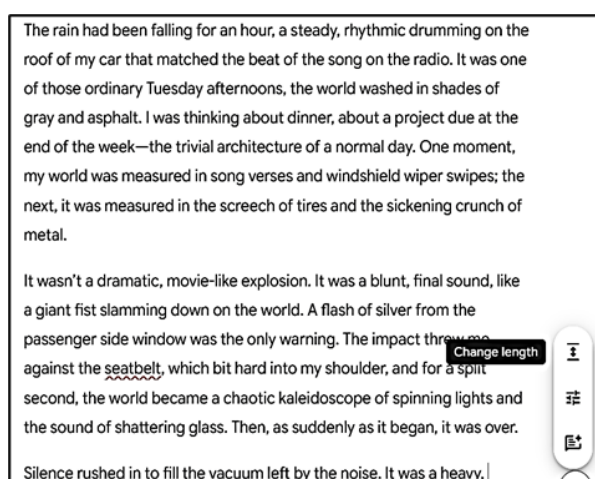


Figure 5. Canvas function in Gemini

6. CONCLUSION

This study presents a systematic review of research articles examining the application of Gemini in the domain of essay writing, adhering to the PRISMA methodology. A total of 31 research articles were sourced from various journal publications and Google Scholar since Gemini is still a new AI. Given that Gemini has only been available since 2022, the volume of studies conducted on this topic has been relatively limited until recently. Notably, the year 2024 has seen a substantial increase in the number of publications related to Gemini, indicating a growing interest among researchers in this innovative tool. However, it is important to note that most existing studies have predominantly focused on university students. This underscores a significant gap in the literature, highlighting the necessity for further investigation into the utilization of Gemini across diverse age groups of students. Ultimately, this study aims to offer valuable insights for both researchers and practitioners seeking to effectively integrate Gemini into essay writing practices. By identifying the current trends and gaps in the research, it lays the groundwork for future studies that could enhance our understanding of Gemini's applicability in various educational contexts. Moreover, this study highlights the importance of training teachers to integrate Gemini with academic integrity in their classrooms. The limitations to this study include the omission of non-English or unpublished studies that might provide more valid data to the study of Gemini and essay writing. It is recommended that future studies can be carried out on learners apart from HEI students such as secondary and primary school students utilizing different types of data collection instruments apart from document analysis in the field of essay writing such as second language acquisition. Future research can also be carried out to cross-compare Gemini with ChatGPT or Claude. Finally, since there was still a lack of experimental studies regarding the use of Gemini, more empirical studies can be carried out in different types of classrooms focusing on other language skills apart from essay writing.

FUNDING INFORMATION

No external funding provided.

AUTHOR CONTRIBUTIONS STATEMENT

This journal uses the Contributor Roles Taxonomy (CRediT) to recognize individual author contributions, reduce authorship disputes, and facilitate collaboration.

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C : Conceptualization

M : Methodology

So : Software

Va : Validation

Fo : Formal analysis

I : Investigation

R : Resources

D : Data Curation

O : Writing - Original Draft

E : Writing - Review & Editing

Vi : Visualization

Su : Supervision

P : Project administration

Fu : Funding acquisition

CONFLICT OF INTEREST STATEMENT

The authors state no conflict of interest.

DATA AVAILABILITY

The data that support the findings of this study are available from the corresponding author, [WWL], upon request.

REFERENCES

- [1] L. Cai, M. M. Msafiri, and D. Kangwa, "Exploring the impact of integrating ai tools in higher education using the zone of proximal development," *Education and Information Technologies*, vol. 30, no. 6, pp. 7191–7264, Apr. 2025, doi: 10.1007/s10639-024-13112-0.
- [2] A. Chai and A. H. A. Hamid, "The impact of flipped learning on students' narrative writing," *International Journal of Advanced Research in Education and Society*, vol. 4, no. 4, 159–175 Jan. 2023, doi: 10.55057/ijares.2022.4.4.15.
- [3] S. Hashim, M. K. Omar, H. Ab Jalil, and N. Mohd Sharef, "Trends on technologies and artificial intelligence in education for personalized learning: systematic literature review," *International Journal of Academic Research in Progressive Education and Development*, vol. 11, no. 1, Feb. 2022, doi: 10.6007/IJARPE/v11-i1/12230.
- [4] J. Kamali, A. Paknejad, and A. Poorghorban, "Exploring the challenges and affordances of integrating chatgpt into language classrooms from teachers' points of view: an ecological perspective," *Journal of Applied Learning & Teaching*, vol. 7, no. 2, Jul. 2024, doi: 10.37074/jalt.2024.7.2.8.
- [5] M. Thelwall, "Is Google Gemini better than ChatGPT at evaluating research quality?," *Journal of Data and Information Science*, vol. 10, no. 2, pp. 1–5, Apr. 2025, doi: 10.2478/jdis-2025-0014.
- [6] E. Supriyadi, "Exploring Google bard's (Gemini) role in enhancing research articles in computational thinking and mathematics education," *Papanda Journal of Mathematics and Science Research*, vol. 3, no. 1, pp. 28–37, Mar. 2024, doi: 10.56916/pjmsr.v3i1.707.
- [7] S. Kotmungkun, W. Chompurach, and P. Thaksanan, "OpenAI ChatGPT vs Google Gemini: a study of AI chatbots' writing quality evaluation and plagiarism checking," *English Language Teaching Educational Journal*, vol. 7, no. 2, pp. 90–108, Nov. 2024, doi: 10.12928/eltej.v7i2.11572.
- [8] W. Alharbi, "The use and abuse of artificial intelligence-enabled machine translation in the efl classroom: an exploratory study," *Journal of Education and e-Learning Research*, vol. 10, no. 4, pp. 689–701, Oct. 2023, doi: 10.20448/jeelr.v10i4.5091.
- [9] B. Ogunleye, K. I. Zakariyyah, O. Ajao, O. Olayinka, and H. Sharma, "A systematic review of generative ai for teaching and learning practice," *Education Sciences*, vol. 14, no. 6, Jun. 2024, doi: 10.3390/educsci14060636.
- [10] R. Sparrow, "Friendly AI will still be our master. or, why we should not want to be the pets of super-intelligent computers," *AI and SOCIETY*, vol. 39, no. 5, pp. 2439–2444, Oct. 2024, doi: 10.1007/s00146-023-01698-x.
- [11] S. Z. S. Naing and P. Udomwong, "Public opinions on ChatGPT: an analysis of reddit discussions by using sentiment analysis, topic modeling, and SWOT analysis," *Data Intelligence*, vol. 6, no. 2, pp. 344–374, May 2024, doi: 10.1162/dint_a_00250.
- [12] Y. Yao, J. Duan, K. Xu, Y. Cai, Z. Sun, and Y. Zhang, "A survey on large language model (LLM) security and privacy: the good, the bad, and the ugly," *High-Confidence Computing*, vol. 4, no. 2, Jun. 2024, doi: 10.1016/j.hcc.2024.100211.
- [13] M. Imran and N. Almusharraf, "Google Gemini as a next generation ai educational tool: a review of emerging educational technology," *Smart Learning Environments*, vol. 11, no. 1, May 2024, doi: 10.1186/s40561-024-00310-z.
- [14] Y. Xiao and S. Yu, "Can ChatGPT replace humans in crisis communication? the effects of ai-mediated crisis communication on stakeholder satisfaction and responsibility attribution," *International Journal of Information Management*, vol. 80, Feb. 2025, doi: 10.1016/j.ijinfomgt.2024.102835.

- [15] B. Jury, A. Lorusso, J. Leinonen, P. Denny, and A. Luxton-Reilly, "Evaluating llm-generated worked examples in an introductory programming course," in *Proceedings of the 26th Australasian Computing Education Conference*, Jan. 2024, pp. 77–86, doi: 10.1145/3636243.3636252.
- [16] M. X. Morris, D. Fiocco, T. Caneva, P. Yiapanis, and D. P. Orgill, "Current and future applications of artificial intelligence in surgery: implications for clinical practice and research," *Frontiers in Surgery*, vol. 11, May 2024, doi: 10.3389/fsurg.2024.1393898.
- [17] S. Garg, A. Ahmad, and D. Ø. Madsen, "Academic writing in the age of AI: comparing the reliability of ChatGPT and bard with SCOPUS and Web of Science," *Journal of Innovation and Knowledge*, vol. 9, no. 4, Oct. 2024, doi: 10.1016/j.jik.2024.100563.
- [18] R. Islam and I. Ahmed, "Gemini-the most powerful LLM: myth or truth," in *2024 5th Information Communication Technologies Conference (ICTC)*, May 2024, pp. 303–308, doi: 10.1109/ICTC61510.2024.10602253.
- [19] A. T. Trinh, A. S. Nguyen, T. T. Thai, N. Caussé, and N. Pébère, "A comparative study of lithium salts for the corrosion inhibition of 2024 aluminium alloy," *Applied Surface Science Advances*, vol. 21, Jun. 2024, doi: 10.1016/j.apsadv.2024.100606.
- [20] Y. Qian, J. Liu, L. Shi, J. Y.-L. Forrest, and Z. Yang, "Can artificial intelligence improve green economic growth? evidence from china," *Environmental Science and Pollution Research*, vol. 30, no. 6, pp. 16418–16437, Oct. 2022, doi: 10.1007/s11356-022-23320-1.
- [21] A. Pack, A. Barrett, and J. Escalante, "Large language models and automated essay scoring of english language learner writing: insights into validity and reliability," *Computers and Education: Artificial Intelligence*, vol. 6, Jun. 2024, doi: 10.1016/j.caeai.2024.100234.
- [22] Y. Shao, C. Huang, Y. Song, M. Wang, Y. H. Song, and R. Shao, "Using augmentation-based ai tool at work: a daily investigation of learning-based benefit and challenge," *Journal of Management*, vol. 51, no. 8, pp. 3352–3390, Nov. 2025, doi: 10.1177/01492063241266503.
- [23] W. M. Ahmed, A. A. Azhari, A. Alfaraj, A. Alhamadani, M. Zhang, and C.-T. Lu, "The quality of ai-generated dental caries multiple choice questions: a comparative analysis of ChatGPT and Google bard language models," *Heliyon*, vol. 10, no. 7, Apr. 2024, doi: 10.1016/j.heliyon.2024.e28198.
- [24] L. Jürgensmeier and B. Skiera, "Generative ai for scalable feedback to multimodal exercises," *International Journal of Research in Marketing*, vol. 41, no. 3, pp. 468–488, Sep. 2024, doi: 10.1016/j.ijresmar.2024.05.005.
- [25] A. Williams, "Comparison of generative AI performance on undergraduate and postgraduate written assessments in the biomedical sciences," *International Journal of Educational Technology in Higher Education*, vol. 21, no. 1, Sep. 2024, doi: 10.1186/s41239-024-00485-y.
- [26] M. J. Page *et al.*, "The PRISMA 2020 statement: an updated guideline for reporting systematic reviews," *BMJ*, vol. 372, no. n71, Mar. 2021, doi: 10.1136/bmj.n71.
- [27] D. Moher *et al.*, "Preferred reporting items for systematic review and meta-analysis protocols (PRISMA-p) 2015 statement," *Systematic Reviews*, vol. 4, no. 1, Dec. 2015, doi: 10.1186/2046-4053-4-1.
- [28] J. W. Creswell and J. D. Creswell, *Research design: qualitative, quantitative and mixed methods approaches*, SAGE Publications, 2022.
- [29] A. Baytak, "The content analysis of the lesson plans created by ChatGPT and Google Gemini," *Research in Social Sciences and Technology*, vol. 9, no. 1, pp. 329–350, Mar. 2024, doi: 10.46303/ressat.2024.19.
- [30] P. Perera and M. Lankathilake, "Preparing to revolutionize education with the multi-model GenAI tool Google Gemini? a journey towards effective policy making," *Journal of Advances in Education and Philosophy*, vol. 7, no. 8, pp. 246–253, Aug. 2023, doi: 10.36348/jaep.2023.v07i08.001.
- [31] X. Hu and W. Gong, "Modeling Chinese EFL learners' intention to use generative ai for L2 writing through an integrated model of the TAM and TTF," *Education and Information Technologies*, vol. 30, no. 13, pp. 18157–18179, Aug. 2025, doi: 10.1007/s10639-025-13505-9.
- [32] A. H. S. Kumar, "Analysis of ChatGPT tool to assess the potential of its utility for academic writing in biomedical domain," *Biology, Engineering, Medicine and Science Reports*, vol. 9, no. 1, pp. 24–30, Jan. 2023, doi: 10.5530/bems.9.1.5.
- [33] W. Crain, *Theories of development: concepts and applications*, Routledge, 2024.
- [34] S. Wibowo, M. N. Wangid, and F. M. Firdaus, "The relevance of Vygotsky's constructivism learning theory with the differentiated learning primary schools," *Journal of Education and Learning (EduLearn)*, vol. 19, no. 1, pp. 431–440, Feb. 2025, doi: 10.11591/edulearn.v19i1.21197.
- [35] J. N. K. Wah, "Artificial intelligence in language learning: a systematic review of personalization and learner engagement," *Forum for Linguistic Studies*, vol. 7, no. 9, Sep. 2025, doi: 10.30564/fls.v7i9.10336.
- [36] M. Li, C. Li, Y. Chen, and G.-J. Hwang, "Effects of an automated evaluation mechanism on students' writing performance and higher-order thinking in an ar-based formative-peer-assessment learning mode," *Education and Information Technologies*, vol. 30, no. 15, pp. 21889–21928, Oct. 2025, doi: 10.1007/s10639-025-13611-8.
- [37] W. Wiboolyasarini, K. Wiboolyasarini, K. Suwanwihok, N. Jinowat, and R. Muenjanchoey, "Synergizing collaborative writing and ai feedback: an investigation into enhancing L2 writing proficiency in wiki-based environments," *Computers and Education: Artificial Intelligence*, vol. 6, Jun. 2024, doi: 10.1016/j.caeai.2024.100228.
- [38] F. Yavuz, Ö. Çelik, and G. Yavaş Çelik, "Utilizing large language models for EFL essay grading: an examination of reliability and validity in rubric-based assessments," *British Journal of Educational Technology*, vol. 56, no. 1, pp. 150–166, Jan. 2025, doi: 10.1111/bjet.13494.
- [39] A. L. Ng and J. Ong, "ChatGPT vs Bard: which is a better writer?," in *2024 IEEE Conference on Artificial Intelligence (CAI)*, IEEE, Jun. 2024, pp. 307–312, doi: 10.1109/CAI59869.2024.00066.
- [40] A. Mager, O. C. Norocel, and R. Rogers, "Advancing search engine studies: the evolution of Google critique and intervention," *Big Data & Society*, vol. 10, no. 2, Jul. 2023, doi: 10.1177/20539517231191528.
- [41] Y.-L. Chen, C.-C. Hsu, C.-Y. Lin, and H.-H. Hsu, "Robot-assisted language learning: integrating artificial intelligence and virtual reality into english tour guide practice," *Education Sciences*, vol. 12, no. 7, Jun. 2022, doi: 10.3390/educsci12070437.
- [42] N. M. Daud, "From innovation to stress: analyzing hybrid technology adoption and its role in technostress among students," *International Journal of Educational Technology in Higher Education*, vol. 22, no. 1, May 2025, doi: 10.1186/s41239-025-00529-x.
- [43] L. J. Q.-Júnior, R. Q. Gurgel, A. A. de S. Araújo, D. Correia, and P. R. M.-Filho, "ChatGPT: the new panacea of the academic world," *Revista da Sociedade Brasileira de Medicina Tropical*, vol. 56, 2023, doi: 10.1590/0037-8682-0060-2023.
- [44] S. S. Sundar and M. Liao, "Calling BS on ChatGPT: reflections on AI as a communication source," *Journalism & Communication Monographs*, vol. 25, no. 2, pp. 165–180, Jun. 2023, doi: 10.1177/15226379231167135.

- [45] J. V. Pavlik, "Collaborating with ChatGPT: considering the implications of generative artificial intelligence for journalism and media education," *Journalism and Mass Communication Educator*, vol. 78, no. 1, pp. 84–93, Mar. 2023, doi: 10.1177/10776958221149577.
- [46] A. M.-Rogowska, W. Kucza, and K. Gajdka, "AI in communication: theoretical perspectives, ethical implications, and emerging competencies," *Communication Today*, pp. 16–29, Nov. 2024.
- [47] H. P. Pangestu and T. Suwartono, "Exploring the role of artificial intelligence (AI) support in assisting students' english-speaking skills," *English Education, Linguistics, and Literature (Educalitra)*, vol. 3, no. 2, pp. 134–147, 2024, doi: 10.5281/zenodo.13134979
- [48] T. R. McIntosh *et al.*, "From Google Gemini to OpenAI q (Q-star): a survey on reshaping the generative artificial intelligence (AI) research landscape," *Technologies*, vol. 13, no. 2, Jan. 2025, doi: 10.3390/technologies13020051.
- [49] T. Hirose and T. Shimizu, "Enhancing english presentation skills with generative artificial intelligence: a guide for non-native researchers," *Medical Science Educator*, vol. 34, no. 5, pp. 1179–1184, May 2024, doi: 10.1007/s40670-024-02078-w.

APPENDIX

Table 2. Summary of the articles used in this study

No.	Author (s)	Year	Methodology (types of research)	Methodology (instruments used)	Types of learners	Key findings (functions of Gemini for essay writing)	Learning theories used in the article
1	Hawley and Hollans	2024	Qualitative	Document analysis	-	- Ideas generation	-
2	Saliba <i>et al.</i>	2024	Qualitative	Semi-structured interview	In-service teachers	- Language (content, organization, language) - Personalised feedback	TPCK framework
3	Yavuz <i>et al.</i>	2024	Qualitative	Document analysis	HEI students	- Ideas generation - Essay grading	Not mentioned
4	Sourati <i>et al.</i>	2024	Qualitative	Document analysis	-	LLM and personality traits	Moral foundation theory
5	Ashrafimofhari <i>et al.</i>	2024	Qualitative	Document analysis	-	- Preparation of business entrance exam - Generate human-like text, answer questions, translation and summarization - Personalised learning - Reduce grading workload	Not mentioned
6	Sadikoglu <i>et al.</i>	2023	Qualitative	Document analysis	-	- AI in social media - Text editing - Summarisation - Document counting	-
7	Lee <i>et al.</i>	2024	Quantitative	Document analysis	-	- LLM generated text (LGT) detection methods	-
8	Pangestu and Suwart	2024	Qualitative	Semi-structured interviews	HEI students	- Functions of Gemini in speaking	-
9	Sallai <i>et al.</i>	2024	Quantitative	Questionnaires Semi-structured interviews Observation Pre-test and post-test Document analysis	HEI students	- Personal assistant - Searching for information - Language skills	-
10	Ogunleye <i>et al.</i>	2024	Qualitative	Systematic review	HEI students	-	-

Table 2. Summary of the articles used in this study (*continued*)




No.	Author (s)	Year	Methodology (types of research)	Methodology (instruments used)	Types of learners	Key findings (functions of Gemini for essay writing)	Learning theories used in the article
11	Bahroun <i>et al.</i>	2023	Quantitative	Questionnaires	-	- Automated essay grading - Intelligent tutoring systems - Personalised learning	-
12	Tan <i>et al.</i>	2024	Quantitative	Document analysis	-	-	-
13	Raman <i>et al.</i>	2024	Mixed method	Sentiment analysis	HEI students	-	Innovation theory
14	Wecks <i>et al.</i>	2024	Qualitative	Document analysis	HEI students	- Essay evaluation - Personalised learning - Adaptive instruction	Social cognitive theory 'Scaffolding'
15	Kloker <i>et al.</i>	2024	Quantitative	Questionnaires	HEI students	- Assignment development - Essay writing - Coding	-
16	Kau <i>et al.</i>	2024	Qualitative	Document analysis	-	- Text generation - Language translation - Content generation - Virtual assistants - Automated essay writing - Report generation - Creative storytelling	-
17	Li <i>et al.</i>	2024	Qualitative	Document analysis	-	-	-
18	Yu <i>et al.</i>	2024	Qualitative	Document analysis Semi-structured interviews	Secondary School students	-	-
19	Kamali <i>et al.</i>	2024	Qualitative	Systematic review Questionnaires Semi-structured interviews	In-service teachers	- Personalised feedback - Brainstorming - Ideas generation - Independent learning	-
20	Tian <i>et al.</i>	2023	Qualitative	Sentiment analysis	-	-	-
21	Zeng <i>et al.</i>	2024	Quantitative	Experiment	-	-	-
22	Yan <i>et al.</i>	2024	Qualitative	Document analysis	-	- Formative evaluation - Feedback	Sociocognitive Theory Constructivist Theory
23	Gupta <i>et al.</i>	2024	Mixed methods	Web scraping Sentiment analysis	-	-	Socio construction of technology (SCOT) theory
24	Jiang <i>et al.</i>	2024	Qualitative	Document analysis	-	- Automated detectors of AI-generated texts	-
25	Wiboolyasarin <i>et al.</i>	2024	Quantitative Quasi-experimental design	Experiment	HEI students	- Corrective feedback	Sociocultural theory (Vygotsky, 1978)
26	Wang <i>et al.</i>	2024	Mixed-method design	Questionnaires Semi-structured interview	HEI students	-	Self-directed learning (SDL)

Table 2. Summary of the articles used in this study (*continued*)




No.	Author (s)	Year	Methodology (types of research)	Methodology (instruments used)	Types of learners	Key findings (functions of Gemini for essay writing)	Learning theories used in the article
27	Shao <i>et al.</i>	2023	Qualitative	Document analysis	In-service teachers	-	Constructivist
28	Wong	2024	Qualitative	Document analysis Systematic review	HEI and workplace	-	-
29	Satpute <i>et al.</i>	2024	Qualitative	Questionnaires	-	- Coding - Automatic scoring - Immediate feedback	-
30	Lee <i>et al.</i>	2024	Quantitative	Experiment	-	-	-
31	Tzirides <i>et al.</i>	2024	Mixed method	Scoping review	HEI	-	-

BIOGRAPHIES OF AUTHORS






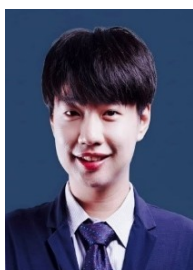
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