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Leveraging ChatGPT to enhance students' writing skills, engagement, and feedback literacy

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Abstract: The rapid development of technology has dramatically increased the use of AI chatbots in English Language Teaching (ELT). This research investigates the role of AI chatbots in English as Foreign Language (EFL) students' writing by addressing the following three main goals: (1) to measure how AI chatbots affect students' writing learning outcomes, (2) to evaluate their impact on writing feedback literacy and engagement, and (3) to explore how students use AI chatbots to improve these areas. Fifty Indonesian university students undertaking an Economic English course participated in this mixed-methods study, divided into an experimental group and a control group, each with 25 students. Data collection instruments included tests, questionnaires, and interviews. Quantitative data were analyzed statistically, while qualitative data were examined through thematic analysis. The findings revealed that the experimental group using AI chatbots showed significant improvements in writing outcomes. Additionally, this group demonstrated notable advancements in both writing feedback literacy and engagement. Students employed various strategies such as interactive writing practice, personalized learning plans, guidance on reading materials, acting upon feedback, peer feedback, gamified learning, and community building to enhance these areas. These results advance our understanding of the role of AI chatbots and inform instructional strategies in ELT.

Keywords: *AI chatbots, ChatGPT, Feedback literacy, Learning outcome, Writing engagement.*

1. Introduction

Writing is an intricate activity that entails the use of language to convey experiences, feelings, ideas, or information through written text. Educators of EFL, who instruct students in a language that is not their native tongue, strive to enhance their students' writing literacy [1]. This writing literacy involves building a solid understanding of sentence structure, punctuation, vocabulary, and grammar, as well as effectively tailoring writing for various contexts, tones, and audiences. Writing engagement is critical to the developmental process because actively participating in writing activities results in better linguistic outcomes, including enhanced complexity, accuracy, fluency, and proficiency. [2]. Additionally, effective writing feedback enhances feedback literacy and helps writers respond positively to constructive criticism [3]. Therefore, fostering writing literacy and engagement, along with providing effective feedback, are crucial components in developing proficient and skilled writers in EFL education.

Theories and practices from various disciplines are incorporated into research on writing feedback. These include EFL writing [4], educational psychology [5], higher education [6], and second

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language acquisition [7]. Lately, the focus of EFL writing research has undergone a shift. In the past, the main issue was whether feedback, including error correction, should be given. Nowadays, attention has moved toward discovering the most efficient methods for providing feedback and determining the best ways to improve learners' writing abilities. Researchers have observed this shift in the focus of studies [8], [9]. Both individual and contextual factors determine feedback's effectiveness since it is given within distinct socio-cultural, educational, and interpersonal contexts [10]. Lately, writing researchers and practitioners have increasingly focused on how EFL learners interpret and apply feedback and how they control their cognitive and emotional responses to it. This concept is referred to as writing feedback literacy [11], [12]. Therefore, understanding and enhancing feedback literacy in writing has become a key focus in EFL research to support learners' writing development better.

The evolving landscape of education has transformed educational feedback and tasks. Technology significantly aids in providing personalized feedback for students [13]. An AI chatbot can customize this feedback according to the student's proficiency, interests and level [14]. Unlike the conventional feedback model, a student-centered approach during the feedback process highlights the roles and responsibilities of student writers and the machine [15]. However, current studies on EFL writing feedback literacy are mostly restricted to case study methods and theoretical frameworks, which limits their applicability across various learning environments [16], [17]. New learning methods have been introduced by technology, such as technology-enhanced feedback, which is adjusted to meet students' needs regarding timeliness, format, and frequency [18]. Integrating technology-enhanced feedback can bridge the gap between theoretical research and practical application, offering more effective and adaptable learning experiences.

AI chatbots are one of the technological tools used to enhance educational feedback. These chatbots are capable of carrying out tasks that are usually linked to human intelligence in the academic field. These tasks encompass recommending assignment activities, developing customized learning materials, and evaluating exams using real-time data analysis [19]. The gathering of information, solving of problems, and offering of solutions are facilitated by AI chatbots, ranging from straightforward rule-based decisions to advanced image and voice recognition systems [20]. Educators may leverage AI chatbots to provide swift feedback to each student in various contexts by analyzing large volumes of data without being hindered by spatial or temporal constraints [21]. AI chatbots can facilitate students with contextualized, precise, and immediate feedback, thereby improving their writing learning outcomes. The understanding of AI chatbots' efficacy in EFL settings can be enhanced by examining their influence on the feedback process for EFL students, and the development of AI chatbot-assisted educational tools that foster writing feedback literacy can be supported [22]. Scholars and teachers can recognize optimal methods for incorporating AI chatbots in writing instruction based on these findings, potentially transforming how feedback is given and received in educational settings [23]. Thus, integrating AI chatbots into educational settings can revolutionize feedback methods, enhancing both teaching efficiency and student learning outcomes. With AI chatbots and cutting-edge tools becoming more prevalent in global education, scholars and teachers must comprehend existing and possible applications in EFL writing settings.

Researchers chose to conduct this study for three main reasons. Firstly, mastering writing skills is crucial for professional success and personal expression in the modern digital age. However, many students find writing challenging and frequently lack adequate feedbacks to improve their abilities [21]. AI chatbots can offer personalized, precise, and prompt feedback, assisting students in enhancing their writing abilities in ways that traditional feedbacks may not [19]. Second, utilizing AI chatbots in EFL writing contexts enables teachers to offer personalized feedback, thereby assisting students in writing more effectively [24]. This approach can also enhance students' writing quality and engagement by leveraging technology. Customized and instant feedback promotes improved writing habits by helping students learn from their mistakes and identify areas for improvement. Third, examining AI chatbots' impact on writing feedback literacy can reveal essential elements that affect how feedback is understood

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and how it enhances writing performance [25]. Therefore, AI chatbot adoption for writing feedback can be developed by insights gained from analyzing feedback data from students.

The adoption of AI chatbots in writing instruction is increasingly widespread. Given that AI chatbots can enhance individual proficiency levels in areas such as problem-solving, literacy, and writing, their contribution to feedback education and practices is expected to develop [25]. For AI chatbots to effectively enhance teacher feedback and improve students' comprehension of feedback, their application in feedback literacy must become more specialized within the educational context [26]. However, there is still limited empirical research on the effects of AI chatbots on students' writing outcomes, engagement, and literacy, particularly at the tertiary level in an EFL context. The research aims to investigate the impacts of AI Chatbots on students' writing outcomes, engagement, and literacy and to identify strategies for effectively using AI Chatbots to enhance these areas. The following three research questions were developed:

1. Does the implementation of AI Chatbots significantly affect students' writing learning outcomes?
2. Does the implementation of AI Chatbots significantly influence students' writing engagement and literacy?
3. What strategies do students employ to effectively utilize AI Chatbots to enhance writing learning outcomes, engagement, and feedback literacy?

2. Literature Review

2.1. AI Chatbots and EFL Learning

Despite the challenge of broadly defining AI chatbots, this study defines them as artificial intelligence applications that can engage in dialogue with users by processing and generating language, thereby providing interactive and personalized responses. Generally, AI chatbots for language learning utilize text-based chatbots, voice-based chatbots, mobile application chatbots, virtual assistants, and AI-powered digital helpers [27]. The implementation of AI chatbots in EFL has shown considerable promise [28], [29]. However, research on EFL supported by AI chatbots still requires extensive investigation.

Integrating AI chatbots into the EFL context has shown significant promise in increasing student engagement and improving language skills. AI chatbots like "Ellie" have been effectively used as conversation partners, encouraging active participation among Korean EFL learners and achieving high task success rates [30]. Similarly, AI mobile chatbots have been positively received in primary schools in Saudi Arabia, where they are seen as valuable tools for improving linguistic skills despite initial hesitancy due to unfamiliarity [27]. The use of ChatGPT to generate dialogue content for EFL chatbots has also been found effective, particularly for students at the elementary and intermediate levels, providing easily understandable and stimulating learning materials [31]. Moreover, the experimental chatbot "AsasaraBot," designed for Content and Language Integrated Learning (CLIL), has demonstrated its suitability in teaching cultural content alongside language skills, showing positive results in both public and private schools in Greece [22]. These studies collectively highlight the versatile applications and benefits of AI chatbots in EFL learning, from improving speaking competence and reducing anxiety to offering personalized and interactive learning experiences.

Employing AI chatbots in EFL learning primarily serves the dual purposes of language acquisition and effective language learning. AI chatbots, like Microsoft's Xiaoying, have been shown to significantly improve learners' speaking accuracy, grammar, and pronunciation through consistent practice and immediate feedback, thus enhancing language acquisition [32]. These chatbots also contribute positively to the affective domains by boosting students' motivation, interest, and confidence in using the language, thereby reducing anxiety and emotional barriers associated with speaking a foreign language (Han, 2020). Moreover, AI-driven chatbots, such as those developed for CLIL, provide interactive and engaging learning environments that integrate cultural content with language practice [22]. The incorporation of AI chatbots into EFL learning has demonstrated considerable potential in boosting student engagement and enhancing language skills.

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Numerous studies on AI chatbots in the EFL context reveal that these tools reduce emotional barriers, offer instant feedback for prompt self-correction, and allow for consistent practice, thereby improving learners' language acquisition and understanding [27], [30], [31], [32], [33]. However, a piece of research based on short-term experiments with few participants is challenging to generalize [34]. Although AI chatbots are seen as advantageous for improving EFL education, plentiful prior studies have seldom investigated the actual learning results of students. Furthermore, there is limited knowledge about the way EFL students interact with AI chatbots, how their engagement with these tools affects their enjoyment of learning, or how effectively they acquire writing feedback literacy.

2.1. EFL Writing Feedback Literacy, Engagement, and Outcome

The foundational concept of student feedback literacy originates from the perspective of academic literacies, who view literacy not just as a technical skill but as a complex social practice influenced by broader social and cultural forces. Feedback literacy is integrated into this framework, encompassing three interrelated dimensions: knowing (epistemological), being (ontological), and acting (practical) [35]. This conceptualization recognizes that becoming feedback literate is not just about understanding feedback on academic knowledge but also involves engaging with feedback for personal and professional growth, interpreting and using feedback effectively, and developing a confident academic identity. The process is complex and multifaceted, influenced by learners' perceptions of their educational environment and relationships with their educators, making the acquisition of feedback literacy a challenging yet essential component of academic success. Other researchers built upon this with a process-oriented approach, which involves implementing actions, managing emotions, making assessments, and valuing feedback [36]. Emphasis was placed on student feedback literacy, highlighting the necessity for students to understand the significance of feedback in writing instruction. This practice includes developing the skill to assess the value of feedback and establishing the required amount of external assistance. They also stress the importance of managing behaviors and emotions, especially when receiving critical feedback, reflecting the portrayal of confident learners [35]. Feedback literacy entails utilizing feedback to improve current task performance and guide future tasks.

A framework for student feedback literacy comprising four key elements was developed by Molloy et al. (2020): taking action, managing affect, making judgments, and appreciating feedback processes [37]. Acting upon feedback is a vital aspect of feedback literacy, requiring learners to engage with and apply feedback to harness its full potential. Students need to be furnished with a range of strategies to use feedback efficiently and to develop their identities as active participants in their learning. Managing affect requires students to cultivate positive attitudes, like active engagement, to participate in feedback activities effectively. The development of evaluative judgment involves making assessments, necessitating that students comprehend what defines quality work and cultivate the skills to evaluate their own or others' work accurately. Therefore, fostering these elements of feedback literacy is essential for empowering students to utilize feedback and enhance their learning outcomes effectively.

3. Methods

3.1. Research Methods

This study employed a mixed-methods research approach. Mixed-method research involves the collection, analysis, and integration of both quantitative and qualitative techniques in a single study to obtain a comprehensive understanding of the research problem [38]. This approach can produce more robust results than using either method alone. In the context of this study, the mixed-method approach aims to quantitatively examine the effects of AI chatbot implementation on students' writing learning outcomes, feedback literacy, and engagement while also qualitatively exploring how students improve in these areas.

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3.2. Participants

The study involved two separate groups of students enrolled in the same course, Economic English, at one of the private universities in Indonesia, with each class consisting of 25 students. This current study employed purposive sampling to choose the samples. The criteria for sample selection in this study are as follows: Firstly, students must be enrolled in the Economic English course. Secondly, both the control and experimental groups must have comparable English writing abilities, as evidenced by pretest results showing no significant differences between the two classes. Additionally, students must actively participate in all aspects of the study, including the use of AI chatbot technology for the experimental group. Lastly, students should have sufficient time to commit to all research sessions without significant interruptions. Meeting these criteria ensures the validity and reliability of the data, enabling an accurate evaluation of the impact of AI chatbot technology on students' writing skills.

3.3. ChatGPT Implementation

The "English Textbook for Economics Students," developed by the researchers in 2019, is the textbook used in both the control and experimental groups [39]. The control group employed traditional face-to-face teaching methods. Furthermore, participants engaged in practice exercises from the textbook for their homework. However, in the experimental group, along with using the textbook and attending lectures, students also utilized ChatGPT as an AI chatbot exclusively for receiving feedback. The researchers employed AI content detection software, such as Turnitin, to check the originality of the students' texts to ensure they are free from AI-generated content.

In this current study, writing learning outcomes are assessed in terms of language, organization, communicative achievement, and content. ChatGPT provided students with opportunities for self-directed learning and demonstrated potential as an instructional tool. In this study, online writing exercises were assigned by the teacher, and students were encouraged to use ChatGPT during their writing process. This teacher encouraged students to consider what they had gained from revising their work, such as new formal sentence structures, clauses, synonyms, and vocabulary, which they might not have otherwise incorporated into their writing. She ensured that students used ChatGPT as a homework strategy outside the classroom by providing specific instructions and criteria for its use. This involved outlining the frequencies and procedures for using the chatbot, along with how learners' interaction with it can be measured. Moreover, the educator consistently tracked students' progress and provided feedback. This method ensured that students were accountable for using the AI chatbot and effectively incorporating its features into their writing.

This study was conducted in several stages. A post-test control-only design was used for the quantitative data to answer the first and second research questions. The researchers used purposive sampling to select two intact classes, designating them as the control and experimental groups. An English writing test was administered as a post-test after ensuring that all participants were similar in terms of proficiency level, native language, and age. To avoid any potential bias associated with the instructor, the same teacher was assigned to lead both groups. Sixteen weeks were required to complete the intervention. Following the intervention, the instructor employed identical evaluation methods and testing instruments to conduct the posttest for both the control and experimental groups. Additionally, feedback literacy and writing engagement were assessed through post-test questionnaires that participants were required to complete. A qualitative method to gather more detailed data using semi-structured interviews was employed. For interpretative analysis, eight students were randomly chosen and interviewed, with four from each group. Two 60-minute writing tasks were used to evaluate students' English writing skills for the post-test. An analytical scoring rubric was used to assess the students' written texts [40]. The scoring system allocated 25 points each for vocabulary, sentence structure, organization and coherence, and format and substance. The range of scores extended from 0 to 100. Inter-rater reliability was employed by the researchers to ensure the validity of the writing scores.

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3.4. Data Collection

A questionnaire consisting of 20 items on a 5-point Likert scale was used by the researchers to measure writing feedback literacy. Taking action, managing emotions, forming judgments, identifying various feedback sources, and valuing feedback were the five indicators addressed. Students' feedback literacy in English writing was measured by this instrument, which was based on prior research [41]. The questionnaire was translated into Indonesian to make sure it was precise. Before distribution, the questionnaire was pilot-tested on ten students and was found to be reliable ($\alpha = .91$).

The researcher used a scenario-based, event-level method to measure students' writing engagement in this study. Three different scenarios were created based on specific past moments to collect data on students' cognitive, emotional, and behavioral engagement. This study employed the Motivation and Engagement Scale, adapted from Martin (2009), to measure students' writing engagement [42]. In each scenario, participants rated their engagement on a scale from 0 to 100. Students' writing engagement was measured based on the average score. High reliability ($\alpha = .92$) was demonstrated by the modified scale in this sample.

The researchers randomly selected eight students from participants from experimental class to take part in the interview. To guarantee a random sample, eight names were picked at random for each group in a container. The researchers conducted semi-structured interviews to collect data on how students use AI chatbots to improve writing outcomes, engagement, and feedback literacy. Each interview was approximately 20 to 25 minutes long.

3.5. Data Analysis

In data analysis, SPSS version 27 was used to analyze statistical analysis for writing engagement, feedback literacy, and writing outcome data. Statistical analysis utilized both descriptive and inferential methods. Summary and interpretation of dataset characteristics through descriptive analysis provided insights into central tendency and dispersion. An inferential analysis, specifically an independent sample t-test, was used in this study to explore significant differences between the findings of the experimental and control classes. Inferential statistics were employed to derive conclusions about the broader population from the data sampled.

Grounded theory was utilized during the qualitative phase for the analysis of the data [43]. The transcripts in Word documents were exact copies of the audio recordings from the interviews. To ensure the accuracy of the transcriptions, members conducted verification [44]. The transcripts were subjected to a three-stage thematic analysis aimed at addressing the study question following the collection of participants' feedback. At the theme assignment stage, researchers accurately reviewed transcripts multiple times to identify essential themes reflecting students' experiences in the writing class. Content analysis followed after that to identify the major themes and categories. During the categorization stage, themes underwent refinement, amalgamation, or removal as deemed necessary. In the concluding phase, the researcher carefully examined the transcripts, marking significant details of the students' accounts using labels and notes in the margins. During the labeling stage, each category was assigned a label that reflected its underlying content, and Cohen's Kappa coefficient confirmed interrater reliability at .91.

4. Results

The research aims to investigate the impacts of AI Chatbots on students' writing outcomes, engagement, and literacy and to identify strategies for effectively using AI Chatbots to enhance these areas. The results from the study are as follows.

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Table 1.
Result of writing learning outcome.

Class	N	Mean	Std. deviation	Std. error mean
Experimental Class	25	85.92	3.60	0.72
Control Class	25	77.16	6.30	1.26

4.1. Impact of AI Chatbot Implementation on Students' Writing Learning Outcomes

Table 1 presents the writing learning outcomes for two groups. The experimental class, comprising 25 students, achieved an average score of 85.92. Their performance was relatively consistent, reflected by a standard deviation of 3.60 and a standard error mean of 0.72. In contrast, the control class, also with 25 students, attained a lower average score of 77.16. The variation in their scores was more significant, as indicated by a standard deviation of 6.31 and a standard error mean of 1.26. This data suggests that the experimental class outperformed the control class in this section. Therefore, it indicates that the AI chatbot implementation used in the experimental class was more effective in enhancing writing learning outcomes than the method employed in the control class.

Table 2.
Independent samples test for writing learning outcome.

		Levene's test for equality of variances		t-test for equality of means						
									95% confidence interval of the difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean difference	Std. error difference	Lower	Upper
Post-test	Equal variances assumed	3.57	0.065	6.028	48	0.000	8.76	1.45	5.83	11.68
	Equal variances not assumed			6.028	38.15	0.000	8.76	1.45	5.81	11.70

The researcher conducted normality and homogeneity tests before performing an independent sample t-test. The results, shown in Table 2, reveal a Sig. (2-tailed) value of less than 0.05. This indicates a significant difference between the writing learning outcomes of the experimental and control classes.

Table 3.
Result of writing learning outcome.

Class	N	Mean	Std. deviation	Std. error mean
Experimental class	25	86.48	3.18	0.64
Control class	25	77.28	6.34	1.267

4.2. Impact of AI Chatbot Implementation on Students' Writing Feedback Literacy and Writing Engagement

Table 3 illustrates the writing feedback literacy of two groups. The experimental class, consisting of 25 students, achieved an average score of 86.48. Their scores showed slight variation, with a standard deviation of 3.18 and a standard error mean of 0.64. On the other hand, the control class, also with 25 students, had a lower average score of 77.28. Their scores were more spread out, indicated by a standard deviation of 6.34 and a standard error mean of 1.27. This information suggests that the experimental

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class performed better than the control class in this section. Therefore, it indicates that the AI chatbot implementation used in the experimental class was more effective in improving writing feedback literacy than the one used in the control class.

Table 4.
Independent samples test for writing feedback literacy.

		Levene's test for equality of variances		t-test for equality of means						
							Mean difference	Std. error difference	95% confidence interval of the difference	
		F	Sig.	t	df	Sig. (2-tailed)			Lower	Upper
Post-test	Equal variances assumed	8.70	.005	6.486	48	0.000	9.20	1.41	6.34	12.05
	Equal variances not assumed			6.486	35.33	0.000	9.20	1.41	6.32	12.07

After conducting normality and homogeneity tests, the researcher carried out an independent sample t-test. The outcomes of this test are presented in Table 4. The table shows that the Sig. (2-tailed) value is below 0.05, signifying a significant difference in writing feedback literacy between the experimental and control classes.

Table 5.
Result of writing engagement.

Class	N	Mean	Std. deviation	Std. error mean
Experimental class	25	86.88	3.37	0.67
Control class	25	76.96	5.68	1.13

Table 5 displays the writing engagement of students in the two groups. The experimental class, made up of 25 students, had an average score of 86.88. Their scores varied minimally, as shown by a standard deviation of 3.37 and a standard error mean of 0.67. Conversely, the control class, which also included 25 students, recorded a lower average score of 76.96. Their scores were more dispersed, with a standard deviation of 5.68 and a standard error mean of 1.13. These results indicate that the experimental class outperformed the control class in this area. Thus, it suggests that the AI chatbot implementation used in the experimental class was more effective in enhancing writing engagement than the method used in the control class.

Table 6.
Independent samples test for writing engagement.

		Levene's test for equality of variances		t-test for equality of means						
									95% confidence interval of the difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean difference	Std. error difference	Lower	Upper
Post-	Equal	3.21	0.079	7.500	48	0.000	9.92	1.32	7.26	12.57

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test	variances assumed									
	Equal variances not assumed			7.500	38.99	0.000	9.92	1.32	7.24	12.59

After conducting normality and homogeneity tests, the researcher performed an independent sample t-test. The outcomes of this test are presented in Table 6. The table indicates a Sig. (2-tailed) value of less than 0.05, demonstrating a significant difference in writing engagement between the experimental and control classes.

4.3 Student Strategies for Effectively Utilizing AI Chatbots to Enhance Writing Learning Outcome, Feedback Literacy and Engagement

Follow-up interviews were utilized to answer the third research question. A Word document was initially created to transcribe the audio recordings from the interviews. The accuracy of the transcriptions was ensured through member verification, following Dörnyei's (2007) recommendations [45]. Participants were then given access to their interview transcripts to verify the data and suggest any necessary changes. Researchers meticulously analyzed these transcripts to identify themes that could form the basis of study questions. Key themes were identified by researchers repeatedly reviewing the transcripts in the initial stage. A content analysis was conducted next to identify the main topics or categories. Single categories were formed by merging similar or overlapping themes during the categorization process. Researchers, in the final stage of labeling, marked essential information in the margins of the transcripts and designated labels corresponding to the core material of each category. Primary categories for the learner interviews were established by organizing excerpts and codes. Another qualitative expert independently reviewed and coded the data to ensure objectivity. Any uncertainties were resolved through discussion until agreement was reached, resulting in inter-rater solid reliability with an r-value of .86. Further confirmation of the data's reliability was provided by Cohen's Kappa of .92. A professor specializing in mixed-methods research reviewed the final data as an external expert. The strategies employed by the students were categorized into several approaches.

Thematic analysis reveals that student interviews provide valuable insights into the methods they use to improve their writing abilities, as evidenced by their responses and comments. One student highlighted the use of chatbots in interactive writing practice.

"Using chatbots has drastically enhanced my writing fluency and creativity." (S1)

Another student emphasized the value of personalized learning plans provided by chatbots

"Chatbots provided tailored lessons which allowed me to identify and address weak areas in my writing." (S2)

Students were also impressed by the resource recommendations from chatbots.

"Chatbot recommendations of reading materials and writing tools have greatly expanded my knowledge and improved the quality of my writing." (S3)

These strategies illustrate how chatbots play an integral role in helping students enhance their writing skills and achieve more excellent learning outcomes.

Meanwhile, the findings of interviews shed light on how students develop feedback literacy through comments they leave on class exams. One student highlighted the value of using chatbots to understand feedback.

"Using chatbots to clarify feedback from teachers or peers allows me to better comprehend its context and intention behind any comments made." (S4)

Students also emphasized the significance of acting upon feedback provided through chatbots:.

"Chatbots provide specific steps for responding to feedback, which has proven indispensable in my quest for writing skills development."(S5)

Additionally, students appreciated the peer feedback practice facilitated by chatbots.

> "Participating in peer review sessions using chatbots has enhanced my ability to give and receive constructive criticism, further improving my writing proficiency." (S6)

Interviews conducted with students reveal strategies using AI chatbots to increase engagement, as evidenced by their comments. One student highlighted the impact of gamified learning with AI chatbots.

> "Gamified learning elements enabled by AI chatbots have made studying more enjoyable and motivating." (S7)

One student highlighted the value of lessons with AI chatbots.

> "Interactive lessons have enabled me to stay engaged and focused throughout my learning experience".(S8)

Student feedback also highlighted the significance of AI chatbots for building community.

> "AI chatbots help us connect with each other, making learning together more enjoyable and supportive. This leads to better engagement and improved learning outcomes through interactive and community-based activities." (S9)

These strategies underscore the critical role chatbots can play in helping students develop feedback literacy, improve writing engagement, and enhance their writing skills.

5. Discussion

In this current study, an AI chatbot can enhance writing learning outcomes by offering an external perspective, as it operates independently of the human viewpoint. Within an AI chatbot environment, ChatGPT can produce learning analytics data that instructors can utilize to provide relevant and contextual feedback, thereby improving writing learning outcomes [46]. Furthermore, feedback from AI chatbots enables students to assess their writing abilities more effectively. By utilizing AI chatbots to acquire feedback, students are likely to respond more positively, thus enhancing their writing learning outcomes. One significant advantage of AI chatbot writing programs is their ability to provide immediate feedback on writing performance. AI chatbots, unlike traditional methods, provide instant insights that students can utilize to enhance their writing immediately. The feedback is grounded in objective standards established by the AI chatbot, offering students precise and reliable guidance to achieve better outcomes.

Based on the findings, an AI chatbot is a powerful tool for enhancing writing engagement and feedback literacy. The capabilities of AI chatbots encompass automated writing evaluation, intelligent search algorithms, text generation, and natural language processing [19]. Regarding giving feedback on students' writing, the AI Chatbot excels at identifying tone, offering style advice, and correcting grammar and spelling. AI chatbots save authors time and let them focus on refining their ideas by automatically detecting and correcting errors without human intervention. Additionally, the AI chatbots can deliver feedback that is customized to meet the unique writing level and needs of each individual. Significant differences exist between traditional writing instruction and that provided by AI chatbots. Feedback from teachers and peers in a traditional class may be inaccessible or unreliable, while AI chatbots provide available, consistent, objective, and precise feedback. The AI chatbot's consistent feedback encourages learners, reduces confusion, and provides clear guidance. Additionally, the AI chatbot boosts student confidence and participation by increasing engagement through interactivity. Class utilizing AI chatbot promotes critical thinking and offers personalized feedback, resulting in higher performance and productivity. Learners feel validated and recognized when feedback is personalized to their specific needs, leading to improved outcomes. Other researchers in the language learning field support this finding [19], [21], [25]. For instance, Guo et al. (2022) highlighted the effectiveness of AI chatbots in enhancing language learners' motivation and outcomes [21]. Sasikumar et al. (2023) claimed that AI chatbot has been particularly effective in offering feedback to EFL students [19]. Mahapatra (2024) suggested that AI chatbots should be created to enhance human skills rather than replace them, significantly improving learning [25]. AI chatbots should be developed and used to

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support students and to improve their writing feedback literacy, similar to the ChatGPT tool utilized in this study.

By offering automated story generators, AI chatbots can also enhance writing engagement, helping writers brainstorm ideas when they encounter creative blocks. This finding echoes previous research, which claimed that ChatGPT as AI Chatbot has been shown to increase productivity in professional writing tasks by 40% and improve output quality by 18% [47]. Participants also reported increased enjoyment and likelihood of using the tool in their jobs. Likewise, AI chatbots can enhance writing engagement by facilitating timely assistance, tailored recommendations, and effective communication, striking a balance between quick aid and human expertise [48]. Instructors in face-to-face writing classes interact directly with students, providing personalized and timely feedback. This feedback usually includes explanations and discussions, aiding learners in understanding areas for improvement. Permitting questions and clarifications and using face-to-face interaction alone is insufficient to drastically improve students' writing feedback literacy, engagement, and outcomes. In contrast, an AI chatbot like ChatGPT can deliver immediate feedback on different writing criteria, such as vocabulary, organization, and grammar [25]. AI chatbots offer considerable convenience by delivering nearly instant writing feedback despite the teacher's lack of a personalized approach. Nevertheless, to interpret and effectively use the feedback from these tools, students need to possess a basic understanding of writing feedback. AI chatbots should be used alongside face-to-face instruction for optimal support of students' academic writing development, engagement, and feedback literacy.

Meanwhile, students utilized AI chatbots for interactive writing practice as a learning strategy to improve their writing outcomes. Previous research indicates that such practice provides real-time feedback and iterative improvement, leading to increased writing proficiency among the student body [15]. Additionally, AI chatbots assist in detecting and correcting grammar-related mistakes as well as stylistic issues, contributing to more polished writing styles. This personalized and adaptive learning approach aims to increase students' motivation and confidence in their writing abilities. Research highlights the significance of personalized learning plans in improving writing outcomes. Studies show that tailored educational approaches cater specifically to an individual student's strengths and weaknesses, resulting in more efficient learning. AI chatbots play a pivotal role in this regard by analyzing students' writing patterns and providing customized feedback and resources. Previous studies have also indicated that these interventions result in significant increases in writing skills, as they target specific areas of need while encouraging mastery over writing techniques [34]. Students use AI chatbots as writing tools and for reading materials guidance, which expands their knowledge and improves writing quality. These chatbots provide access to vast databases of information and diverse perspectives, offering personalized feedback and suggestions that help refine arguments and deepen understanding of complex topics [49]. Furthermore, their interactive nature encourages deeper learning while maintaining student engagement, resulting in more successful retention of material.

In this current study, students employ the value of using chatbots to understand feedback as a learning strategy to improve feedback literacy. A previous study supported this finding by claiming that AI chatbots offer detailed and timely feedback, helping students better internalize the feedback they receive [24]. This immediate and clear communication aids students in recognizing their mistakes and understanding the rationale behind suggested corrections, thereby enhancing their ability to apply feedback effectively in future assignments. Moreover, students highlighted the significance of acting upon feedback provided through chatbots to improve writing feedback literacy. Mahapatra (2024) found that when students actively engage with feedback from AI chatbots, they develop a deeper understanding of writing conventions and critical thinking skills [25]. Additionally, students appreciated the peer feedback practice facilitated by chatbots, which further improved their feedback literacy. This statement echoes a previous finding that AI chatbots can simulate peer feedback by offering diverse perspectives and constructive critiques, mirroring the collaborative learning environment found in peer review sessions [50]. This practice allows students to gain insights from multiple viewpoints, enhancing their ability to evaluate their own and others' writing critically.

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According to thematic analysis, students often use gamified learning strategies with AI chatbots to increase engagement. Studies show that adding elements such as points, badges and leaderboards into AI chatbot interactions can significantly boost student motivation and participation [51]. These gamified features make learning more interactive and enjoyable, leading to an engaging educational experience for both teachers and learners. Furthermore, one student highlighted the benefit of lessons with AI chatbots for increasing writing engagement. Research supports this observation, showing how AI chatbots can adapt their content to each student's interests and skill levels, maintaining high levels of engagement [52]. AI chatbots may also help build a community for writing engagement, according to research [53]. Such virtual communities encourage peer-to-peer support that increases writing task engagement and commitment.

6. Conclusion

This study investigates how AI chatbots could potentially improve EFL students' writing learning outcomes, engagement, and feedback literacy. Fundamentally, this research could provide insights into enhancing the efficiency and perceived significance of feedback, employing AI chatbots to enhance writing feedback literacy. By offering personalized feedback, this method aims to bridge the gap between learners' expectations and teachers' feedback. Teachers may implement dialogic teaching, fostering less hierarchical interactions between teachers and students. This approach promotes open-mindedness and acceptance by viewing learners as energetic participants rather than passive recipients of one-sided feedback. This approach is essential for developing and maintaining students' literacy in writing feedback. Therefore, ChatGPT, as an AI chatbot, is highly valued for assisting students in understanding feedback during the writing process and benefits from the fresh data it offers.

This study, while offering valuable insights into writing learning outcomes, engagement, and feedback literacy, still has a few limitations. The fundamental principles of ChatGPT as an AI chatbot form the basis for the discussed designs and strategies. However, the characteristics of each AI chatbot can vary depending on the course topic's objectives. Methods to enhance feedback literacy should be developed that are specifically tailored to the context of each AI chatbot application. AI Chatbots' implementation to different learning levels can be impacted by changes in the curriculum. Additionally, since this is a new area of research, this study is grounded in a limited literature review instead of a comprehensive database.

Further research could provide evidence on how AI chatbots enhance feedback literacy among EFL learners. As AI chatbots become more accepted and popular, researchers should consider cultural differences in education when applying these tools. Teachers can use AI chatbots to develop English skills frameworks and provide high-quality feedback. For example, ChatGPT offers self-directed learning, boosting student engagement and real-time feedback by highlighting areas for improvement. This personalized approach helps students develop essential habits and techniques. Integrating technology for feedback allows teachers to save time for other essential tasks, but successful implementation needs proper resources, infrastructure, and training. Including ChatGPT in language and writing courses promotes regular use and skill development. Encouraging peer review and collaboration with ChatGPT further improves writing skills and fosters a sense of community among students.

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