

**THE IMPACT OF AI-ASSISTED SELF-REGULATED LEARNING,
SPECIFICALLY CHATGPT, ON STUDENTS' ENGAGEMENT AND WRITING
SKILL ENHANCEMENT**

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Abstract

This experimental mixed-method study investigates factors influencing students' engagement with AI-assisted language learning tools, specifically ChatGPT, and explores how this contributes to their writing skill enhancement. To problematize the phenomena, the study draws on (i) survey-based quantitative data from 100 conveniently sampled BS-level students, and (ii) quantitative as well as qualitative data from pre-post-tests, conducted on 25 randomly sampled students from the survey pool. The research design is based on the theoretical framework of Computer-Mediated Communication (CMC). It implements the three self-regulated learning phases—forethought, performance, and self-reflection—in the experimental group. Non-normal data sets, evaluated using the Shapiro-Wilk test, prompted the use of non-parametric tests. Hence, the survey findings are based on the non-parametric tests, including Kruskal-Wallis H and Mann-Whitney U. In the survey findings, the factors, motivation, efficacy, efficiency and satisfaction, emerge as equally effective factors in students' engagement with ChatGPT, while knowledge and expressiveness have varied effects on students according to their levels of proficiency. The scores from the pre-post-tests are examined to assess learners' improvement in writing by using the Wilcoxon Signed-Ranks test. It reveals a highly significant improvement in learners' writing skills with a Z-score of -3.835 and asymptotic significance of .000, indicating that 80 per cent of participants improved their scores in the post-test. The qualitative analysis, based on the Cambridge English Assessment rubric, shows that with the treatment of ChatGPT, content and communicative achievement surface as the most notably enhanced areas in writing skills. Concordant with the qualitative analysis, the quantitative analysis confirms the positive influence of students' engagement with ChatGPT for learning English and improvement in English writing skills, offering valuable insights for educators and learners.

Keywords: human-computer interface; distributed learning environments; adult learning; teaching/learning strategies; 21st century abilities

Introduction

The recent developments in the field of mobile technology and Artificial Intelligence (AI) have led to the rise of several language learning tools/applications, particularly relevant

for the study of ESL/EFL in the field of education (see Castillo et al., 2023). The growing use of AI-assisted smartphones has augmented learners' attention to the use of applications with the belief that they can improve their language skills (Dizon & Tang, 2020). Bao (2019) argues that the use of mobile apps for language learning alleviates foreign language anxiety, particularly in relation to speaking skills in the ESL context. AI-assisted devices engage learners and save the time and effort of language instructors (Vall & Araya, 2023; Yang & Kyun, 2022; Fitria, 2021). Similarly, AI-assisted language learning holds the potential to facilitate self-regulated learning among students. It can warrant engagement in the learning process, leading to learners' improvement. Notwithstanding the educators' and researchers' encouragement for the use of technology in language learning, the integration of AI assistance for learners' academic work is still underused (Yeo, 2023). Apparently, two factors contribute to this situation: instructors' general perspectives about AI that discourage its integration into academic work and learners' general attitudes that restrict the use of AI to mere replication without innovation. They still seem to be in a dilemma about whether or not to benefit from AI-assisted technology for learning. Hence, there is an apprehension that the instructors and learners' rather myopic perception of AI capabilities may result in their underutilization in academic scenarios. The aim of this research is to encourage the use of AI-assisted language learning tools in language learning in view of their potential benefits and discourage the possibility of their underutilization by offering a more constructive insight into the learning processes in the ESL context. This entails incorporating innovative tasks and commands for the AI assistants that benefit the learners in their overall dynamic educational processes.

Many studies have explored the aspects related to self-regulated learning and AI-assisted language learning, specifically focusing on the factors that bring engagement and improvement in the learning process (see Qiu, Zhang, & Dong, 2024). However, the foci of these research studies are varied and different from the current one. For example, Ahmadi's (2018) study considers the use of technology to enhance learners' language skills in the classroom, advising teachers to accept it as a supporting tool for language teaching (also see Shadieff & Wang, 2022; Zawacki-Richter et al., 2019; Golonka et al., 2014). The emphasis of this research is to bring the concepts of self-regulated learning and AI-assisted language learning together in which the teachers' supervision is not required. With regard to AI, the focus of the current study is to explore learners' use of ChatGPT for the enhancement of their writing skills. ChatGPT is an AI-based educational tool that is widely used by learners across the globe. It has the potential to enhance the language learning experience by providing students with personalized language learning support. However, there is limited research on the use of ChatGPT in English language teaching, particularly in the context of ESL. The present study addresses this literature gap by exploring the use of ChatGPT in English language teaching at the undergrad university level. The study is anchored on the following research questions (RQ):

- (1) What factors influence students' engagement with ChatGPT in English language learning?
- (2) In what aspects does ChatGPT help students improve their English writing skills?

Literature Review

1.1. AI-Assisted Language Learning (AI-ALL)

AI-Assisted Language Learning (AI-ALL) has recently been recognized for its potential to develop and improve language learning. The research studies focus on the benefits, challenges,

and limitations accompanying these language-learning tools when integrated with artificial intelligence. The necessity for communication, social variation in language, and massive data for training are among the key considerations in implementing AI in language learning (Vall & Araya, 2023). With a shift towards Intelligent Computer Assisted Language Learning (ICALL), the application of AI in language learning has been recognized as a subordinate category of Computer Assisted Language Learning (CALL) (Pokrivčáková, 2019). The literature on AI-ALL encompasses a wide range of topics, including the challenges and merits of AI language learning tools, the integration of AI in university education, ESL/EFL education, and the role of mobile technology in language learning. The following studies provide valuable insight into the existing AI-ALL scenario.

Many language learning tools are available, including Duolingo, Talkio AI, Open AI, LangoTalk, Formative AI, and Speakingclubai. However, the most common open AI source used by university students is ChatGPT (Castillo et. al 2023). A systematic review of recent studies containing research on ChatGPT, highlights that using ChatGPT has a positive effect on the teaching-learning process as it can enhance the educational experience (Montenegro-Rueda, et.al, 2023). There is a significant scope in the educational research on AI in English as a Foreign Language (EFL) and English as a Second Language (ESL). AI-powered platforms, such as Google Assistant, have been incorporated into language learning activities as a support to facilitate the language acquisition process (Moulieswaran & Prasantha, 2023a). Educationists are more interested in studying the perception and challenges of ESL learners towards AI-assisted English language learning needs and opportunities (Moulieswaran & Prasantha, 2023b). The role of mobile-based formative assessments in AI-ALL ESL and EFL speaking tasks has also been explored, emphasizing the potential of assessments based on mobile-assisted language learning (Hasan, Islam, & Shuchi, 2021). Hence, a range of AI applications and tools are incorporated into language learning and testing.

1.2. Self-Regulated Learning (SRL)

Self-regulated learning (SRL) in English language education refers to how learners take control of their learning by defining objectives, administering their progress, and monitoring their understanding, motivation, and behaviour (Uzunboylu, 2019). Various strategies such as planning, goal setting, self-monitoring, and self-reflection are utilized in SRL. These aspects are essential for language learners to manage their learning process effectively. SRL positively impacts language learning outcomes by enabling students to adapt their learning strategies to different tasks and contexts, improving language proficiency and academic achievement (Hursen, 2017).

Self-regulated learning (SRL) undergoes three phases: forethought, performance and self-reflection (Qiu et al., 2024). The forethought phase pertains to learners' beliefs and the processes they undergo (Zimmerman, 2000). Equally, SRL encourages self-efficacy which it categorizes as a part of the forethought phase. Bandura (2006) states that "self-efficacy is concerned with people's beliefs in their capabilities to produce given attainments" (p. 307). In language learning, self-efficacy fosters learner autonomy and contributes to developing students' language skills and effective communication (Uzunboylu, 2019). In the performance phase, learners perform the tasks with self-control and self-observation, which leads to the third phase of the self-reflection phase based on self-evaluation (Qui et al., 2024). Pintrich (2004) formulated four conventions regarding self-regulated learning strategies: (a) learners actively construct understanding, formulate objectives, and choose strategies; (b) they control the direction of their learning; (c) their strategies are based on goals; and (d) their strategies

incorporate personal and contextual qualities (as cited in Wang & Bai, 2017). These conventions are adaptable in AI-assisted language learning. Artificial assistants, such as Alexa, have been investigated in autonomous second language learning, highlighting the importance of suitable training and constant guidance for students using AI for self-reliant, outside-classroom language learning (Dizon & Tang, 2020). Moreover, the implementation of self-regulated learning models in e-learning and AI's ability to improve the teaching of foreign languages have been discussed, emphasizing the enrichment of language skills through AI-powered platforms (Moulieswaran & Prasantha, 2022; Nggawu, 2019).

In English language education, SRL is crucial in promoting learner needs required in the 21st century, as it aligns with the demands for effective communication skills in a globalized world. It is relevant in designing instructional approaches and new learning environments for language education since it emphasizes the importance of learner-centred pedagogy and the integration of technology-based learning to support students in becoming self-regulated learners (Uzunboylu, 2018). Hence, self-regulated learning is a dynamic approach to English language education which equips learners with the essential skills to take ownership of their education process, adapt to diverse learning contexts, and achieve proficiency in English language skills. Besides, this approach is recognized for empowering students to become independent and lifelong learners.

1.3. Student Engagement

Various factors influence student engagement in English language learning. Students' readiness to learn a new language and their attitudes are influenced by social and psychological factors such as anxiety, motivation, and self-esteem (Sabbah, 2017). The association between classroom management, students' engagement, and learning attitudes significantly influence motivation to learn a language (Dipolog, 2022). Similarly, learners' higher level of English language proficiency and engagement in academic performance are positively correlated; the higher the level of language proficiency, the better the students' engagement in learning (Othman & Chuah, 2021). Instructors' behaviour and attitude also play an active role in affecting student engagement in language learning classes (Karafil & Oğuz, 2019). Other factors include students' beliefs about language learning and using learning strategies crucial to improving their language proficiency and engagement (Liao, 2006). It is important to widen students' perceptions regarding AI learning as constructive and educative, so that they are positively motivated towards learning from AI assistance. Affective strategies emerging from personal factors like motivation and reinforcement, and social strategies based on environmental factors like collaboration with peer learners facilitate language learning by enhancing students' engagement (Zakaria et al., 2019). Duyen and Hao's (2023). Findings support the idea that affective and social motivating factors positively contribute to language learning. Pushpalatha (2022) terms the social factor of collaborative work with fellow language learners as experiential learning and recognizes it as an important foundation for English language instruction. Hence, student engagement in English language learning is influenced by many psychological, affective and social factors, including teaching methods, student attitudes,

language proficiency, and learning strategies. Understanding these factors facilitates identifying potential causes of successful learning and vice versa.

1.4. Writing Skill Enhancement and AI

Virtual education during the COVID-19 pandemic provided opportunities for developing reading, listening, and writing skills (Kamil, 2022). During this period, the diversion towards digital tools for learning and teaching opened new avenues, resulting in several new studies. To enhance writing skills in English language learning, various technological tools and approaches have been introduced. For instance, mobile applications are used to improve critical thinking and writing skills among pre-service teachers (Haerazi, Utama, & Hidayatullah, 2020). Collaborative filtering automatic assessment systems and mobile game applications have been developed to address the lack of progress in English writing skills and boost students' motivation to learn English vocabulary (Zhang, 2022; Elaish et al., 2019). Error analysis techniques and the use of social media like Google+ and Twitter have been investigated to enhance the academic essay writing skills of ESL learners (Risnawati et al., 2022; Amjad, 2021; Wil et al., 2019). The content produced on digital platforms and tools has been vital in researching more relevant methods of learning writing skills. However, these applications and tools have either been purposefully designed for educational purposes or been used as resource material incorporated into the educational curriculum to bring variety. Introducing AI technology, such as educational robot teaching resources, has improved students' interest in English learning and their application ability (Huang, 2021). Furthermore, using an AI writing assessment system has been shown to lessen teachers' work and improve students' writing skills (Sun & Li, 2020). Task-based approaches and gamification have also been employed to enhance writing skills in EFL students (Pingmuang & Koraneekij, 2022). There is a great opportunity in artificial intelligence for both learners and instructors for language development at all levels of learning. The instructors can bring diversity to their practice by training students to give commands to AI tools so that their intervention is constructive in the learning process.

1.5. Computer-Mediated Communication Competence Model (CMCCM)

This study adapts the CMCC model to collect quantitative data on students' perspectives on the factors influencing reliance on AI-assisted tools. This model is suitable to test any type of technological communication which involves factors that activate the process of communication and bring positive outcomes (Spitzberg, 2006). According to this model, the higher the factors of knowledge and motivation, the better the outcomes of CMC Competence. These two factors, namely, knowledge and motivation, give rise to the skills of attentiveness, composure, coordination, and expressiveness (Spitzberg, 2006). These skills effectively generate competence outcomes, including appropriateness, effectiveness, co-orientation, and satisfaction. There are other factors of media (interactivity, adaptability, efficiency, and being public or private), message (task orientation, socioemotional orientation, and openness) and context (culture, chronology, relation, environment, and function) active in the process of any computer-mediated communication. When messages are delivered through the selected medium, the receiver filters them through the expected criteria, so these expectancies are the

outcomes of the experiences with CMC. The measures selected for the current study from among these have been outlined in the methodology.

2. Methodology & Data

The experimental research design for this study adopts a QUAN-Qual approach to allow dynamic investigation of the phenomena in both qualitative and quantitative dimensions. This mixed-method design is suitable for an in-depth analysis as the two research questions, (a) factors influencing students' engagement with ChatGPT in English language learning and (b) aspects in which ChatGPT helps students improve their English writing skills, require a profound inquiry. For RQ1, a survey (n=100) was conducted, centralizing on six factors – motivation, knowledge, satisfaction, efficacy, efficiency, and expressiveness. It was based on the theoretical framework of Computer-Mediated Communication (CMC), explicitly centralising on the CMC Competence Measures (version 5) developed by Spitzberg (2006). This framework was selected because it supports the study examining communication competence in AI-assisted self-regulated learning and provides a structured assessment of relevant competencies. For RQ2, a subset from the survey pool (n=25) was treated as an experimental group. Also, self-regulated learning (SRL) was implemented in collaboration with AI assistance so as to facilitate the realization of independent learning that AI tools offer. Considering the three phases of SRL (see 2.2), in the forethought phase, students were tasked with a writing prompt in the pre-test; then they attempted the post-test after practising with an AI assistant as a part of the performance phase; lastly, in the self-reflection phase, they were given a choice to attempt the second task in the post-test after self-evaluation. ChatGPT 3.5 was selected as the most commonly used tool by students for AI-assisted language learning (AI-ALL) due to their preferences. The selection was also based on the practical application of this study. To validate the results of the study, the Shapiro-Wilk normality test was applied to both datasets. The non-parametric tests, Kruskal-Wallis H and Mann-Whitney U were applied to identify which factors from the six measures categorized in the survey varied among learners according to their proficiency level. For the results of pre-post-tests, the non-parametric test, Wilcoxon Signed-Ranks, was applied to quantify the improvement in writing skills after the treatment phase.

2.1.Context

As a part of the blended learning strategy, this study was conducted in a traditional university classroom setting, supplemented by tasks for computer-mediated communication in computer laboratories or students' accommodations. The survey, pre-test and post-test were conducted in the classrooms, whereas for the treatment phase, students were given tasks for home assignments which they were instructed to submit after a week to promote self-regulated learning. The participants were third-semester students in their BS programs, with the targeted proficiency level in English language skills at this stage aligned with the CEFR B2 level, in accordance with the roadmap of their BS curriculum.

2.2.Participants

There were two data sets in this study. Based on the convenience sampling approach, the first group of 100 participants was pooled to conduct a structured survey designed on a Likert scale. In this sampled pool of participants, learners were asked to assess their CEFR level of

English language proficiency. 17 % of participants gauged their proficiency level at pre-intermediate (A2), 69 % at intermediate (B1), and 14 % at upper-intermediate (B2). Subsequently, using the random sampling method, a subset of 25 students was drawn from the survey pool. Diversity in demographics was implemented by employing random selection so that any bias was minimized and the representativeness of the students was increased. Here, convenience and random sampling support a broad yet focused exploration of the research questions by complementing a profound approach with resource efficiency.

2.3.Data Collection

For the first data set, a survey of 18 questions adapted from the CMC Competence Measure (version 5) was conducted to explore research question 1 on the factors influencing student engagement with ChatGPT in English language learning. There were 6 factors, including motivation, knowledge, efficacy, expressiveness, satisfaction, and efficiency, each containing 3 questions in the survey. The survey provided the learners with free space to share their opinions without any social or emotional pressure from their teachers and peers.

For the second randomly sampled data set that was drawn from the pool of survey participants, three stages of analysis were applied to investigate both RQs for the effects of ChatGPT on students' engagement and improvement in English writing skills. These included pre-test manual writing assignments, ChatGPT-assisted essay writing tasks, and post-test manual writing assignments. Each stage had two questions for students based on two themes: cyber-bullying and tourism. They were given the choice to attempt questions on both topics or either of the two based on their need for practice so as to facilitate the motivational aspect of self-regulated learning. The Cambridge English Assessment rubric for writing tasks (B2) was used to evaluate the students' responses (2021). The CEFR B2 level corresponds to their language course level as the third course in the road map of their BS curriculum. Content, communicative achievement, organization, and language were the identified areas of the rubric in all three stages.

2.4.Data Analysis

Quantitative analyses of both data sets, the survey participants and the experimental group were conducted using SPSS 23. As the data set comprised a hundred participants from the survey, it was first evaluated for normal distribution using the Shapiro-Wilk Test (Royston, 1982). When the results confirmed that the data is non-normally distributed, non-parametric tests were applied to explore which factors influenced students' engagement with ChatGPT in English language learning. The first non-parametric test was the Kruskal-Wallis H Test, which was used to identify if there was any difference in the distribution of the variables (see Vargha & Delaney, 1998). This test has the ability to handle data variance effectively. Two factors, namely knowledge and expressiveness, came out to have varied distribution as far as the proficiency levels of the participants are concerned. Then, there was a need for a detailed comparison to see the significance of differences among three groups of language proficiency: pre-intermediate, intermediate, and upper-intermediate for both knowledge and expressiveness, a Post Hoc test named the Mann-Whitney U Test was applied. This test was selected for its precision in non-normally distributed contexts.

From the second dataset, the instructor's observations of the pre-tests and post-tests, regarding the factors influencing students' engagement with ChatGPT, and in what aspects ChatGPT helps the students in English writing skills, were recorded, qualitatively. The

observations and feedback of the instructor provided a deep insight into the qualitative analysis of the learners' scripts and how much improvement they were able to make after the treatment. The observations specifically identified the significantly developed areas in their writing tasks using the Cambridge English Assessment rubric for writing tasks of B2 CEFR level (2021).

The quantified scores from both pre-test and post-test data were tested for normality to determine if a parametric paired t-test was to be applied or a non-parametric Wilcoxon Signed-Ranks test to determine if there lies any significant difference between the performance before and after the intervention of ChatGPT. The Shapiro-Wilk test determined the data to be non-normal; hence, the non-parametric Wilcoxon Signed-Ranks test suitable for determining any significant difference between data pairs was applied (see Rochon, 2012). This test is the most suitable in this context as it provides a pre-post intervention comparison by offering accuracy in a non-normal distribution. Employing the normality tests and non-parametric tests ensured rigorous analysis appropriate for enhancing result reliability and validity. Similarly, this experimental mixed-methods design facilitated a holistic understanding by quantifying engagement and improvements with qualitative insights for depth.

3. Results

The following are the qualitative and quantitative results of this mixed-method study:

3.1. Survey Analysis

To explore RQ 1 i.e., factors that influence students' engagement with ChatGPT in English language learning, a survey of 18 Likert-scale questions was conducted on conveniently sampled 100 respondents. There were 6 factors taken from CMC Competence Measures, including motivation, knowledge, satisfaction, efficacy, efficiency, and expressiveness. Each construct represented 3 adapted questions in the survey. Before analysing the most significant factors in the data, a normality test called the Shapiro-Wilk test was applied by taking a variable from each construct as a sample to configure if the data was appropriate for a parametric test.

Table 1
Shapiro-Wilk Test of Normality.

	Shapiro-Wilk Test		
	Statistic	Df	Sig.
Motivation 1	.790	100	.000
Efficacy 1	.752	100	.000
Efficiency 1	.695	100	.000
Satisfaction 1	.693	100	.000
Expressiveness 1	.689	100	.000
Knowledge 1	.746	100	.000

As evidenced by the Shapiro-Wilk test results in the table above, each variable shows significant deviation from normality. The statistics ranging from .689 to .790 strongly suggest

that the distribution of scores for these variables is not normal. Hence, the Kruskal-Wallis test was applied to determine if there was any difference in the data distribution of the variables.

Table 2
Kruskan-Wallis Test.

	Kruskan-Wallis Test	
	Sig.	Decision
Motivation	.142	Hypothesis retained
Efficacy	.253	Hypothesis retained
Efficiency	.057	Hypothesis retained
Satisfaction	.787	Hypothesis retained
Expressiveness	.024	Hypothesis rejected
Knowledge	.008	Hypothesis rejected

The level of significance is .05.

Each construct representing the influential factor for students' engagement with ChatGPT was calculated into an average group variable for the test. All these mean variables were tested as independent samples with the variable of English language proficiency. The null hypothesis for each independent test was that the distributions of the variable were not significantly different across proficiency levels. For the four constructs - motivation, efficacy, satisfaction, and efficiency - the null hypothesis was retained as the results showed no significant difference. However, the last two constructs, expressiveness and knowledge, showed significant differences across proficiency levels. So, the null hypotheses for these two constructs were rejected for the p-value of the expressiveness factor at .024 and knowledge at .008 while the significance level was set at .05. Moreover, the factors including motivation, satisfaction, efficiency and efficacy had an equal effect on the learners - whichever level of language proficiency they belonged to. Hence, to pinpoint where the differences in the effect of knowledge and expressiveness lay between specific groups, a post hoc test, the Mann-Whitney U test, was applied.

In the Mann-Whitney U test, the comparisons were made between groups for English language proficiency (pre-intermediate, intermediate, and upper-intermediate) regarding expressiveness and knowledge means. As there were 3 pairwise comparisons of the factors, knowledge and expressiveness, the Bonferroni correction was applied to reduce the risk of obtaining false-positive results. Following are the results with the adjusted significance level of 0.0083:

Table 3
Mann-Whitney U Test.

	Pre-Intermediate vs. Intermediate	Intermediate vs. Upper-Intermediate	Pre-Intermediate vs. Upper-Intermediate
Asymptotic Significance (2-tailed)			
Expressive	.102	.063	.007
Knowledge	.261	.006	.007

The table depicts that between the two levels of English language proficiency – pre-intermediate and intermediate learners, neither the factors of expressiveness nor knowledge were significantly different as both the values were above .0083. In the second comparison between the intermediate and upper-intermediate levels of language proficiency, the knowledge mean showed a significant difference at the adjusted significance level. It indicates that upper-intermediate learners had a statistically significant lower rank in knowledge compared to intermediate-level learners, whereas the factor of knowledge was not significant. Lastly, in the last comparison between pre-intermediate and upper-intermediate learners, the factors of expressiveness and knowledge significantly differed, suggesting that ChatGPT had a varying effect on learners of different levels. Hence, all the factors – motivation, knowledge, satisfaction, efficiency, efficacy, and expressiveness – influenced students’ engagement with ChatGPT in English language learning, but the factors of expressiveness and knowledge varied across the learners in terms of their levels of proficiency.

3.2. Pre-Test & Post-Test Intervention Analysis

Table 4

Scores of the pre-test and post-test by using rubrics from Cambridge English Assessments (2021)

Participant #	Pre-Test Scores					Post-Test Scores				
	Content /5	Communicative Achievement /5	Organization /5	Language /5	Total /20	Content /5	Communicative Achievement /5	Organization /5	Language /5	Total /20
1	4	3	1	3	11	3	3	1	3	10
2	2	1	1	2	6	4	3	2	1	10
3	3	3	2	3	11	3	4	3	2	12
4	3	3	2	3	11	4	4	3	3	14
5	3	3	1	3	10	3	4	2	3	12
6	2	2	1	3	8	4	4	2	3	13
7	3.5	3	2	3	11.5	4	4	3	2	13
8	3	3	3	3	12	3	3	3	3	12
9	2	3	2	3	10	3	4	3	3	13

10	3	2	2	2	9	2	2	1	2	7
11	3	3	3	3	12	4	4	3	3	14
12	3	3	2	2	10	4	4	3	3	14
13	2	2	3	3	10	4	3	3	4	14
14	2	2	2	4	10	4	3	4	3	14
15	3	3	3	3	12	4	4	3	4	15
16	4	4	2	2	12	4	4	3	4	15
17	3	3	2	3	11	3	3	2	3	11
18	3	3	3	3	12	3	3	3	3	12
19	1	3	2	4	10	3	3	3	4	13
20	2	2	2	2	8	4	4	2	3	13
21	2	3	2	4	11	4	4	3	4	15
22	2	3	2	4	11	4	4	3	4	15
23	2	3	3	3	11	3	3	3	3	12
24	3	4	3	4	14	4	4	4	4	16
25	3	3	2	3	11	4	3	3	3	13

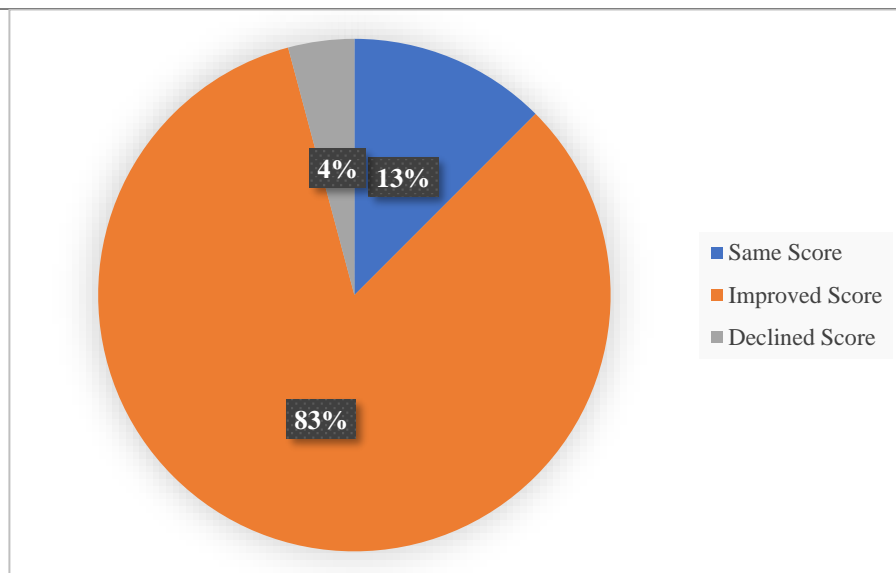


Fig. 1. Percentage of participants whose scores remained the same improved and declined in the post-test.

Reading the total scores of the evaluation reveals that most students benefitted from the self-regulated practice. Also, the improvement in the score was most significant in the areas of content and communicative achievement. Also, it is noteworthy that except for the 10th participant, the majority of the participants, at 21 %, improved their score after attempting the ChatGPT tasks. Three participants maintained the same score.

3.2.1. *Difference Between the Pre and Post Tests*

To address RQ 2, the significance of improvement among learners was studied. Before determining the difference between the proficiency level of the students before and after the treatment, the Shapiro-Wilk test of normality was applied.

Table 5
Shapiro-Wilk Test of Normality.

	Shapiro-Wilk Test		
	Statistic	Df	Sig.
Pre-Test	.908	25	.028
Post-Test	.916	25	.042

In the pre-test, the Shapiro-Wilk statistic is 0.908, with a significance level of 0.028. The p-value was below 0.05, indicating that the data were not normally distributed. Similarly, in the post-test, the Shapiro-Wilk statistic was 0.916, with a significance level of 0.042. Again, since this p-value was below 0.05, it is concluded that the data were non-normal. Hence, the Wilcoxon Signed-Ranks test was applied to determine the difference between the pre-test and post-test scores.

Table 6
Wilcoxon Signed-Ranks Test.

Post-Test - Pre-Test	N	Mean Rank	Sum of Ranks
Negative Ranks	2 ^a	4.50	9.00
Positive Ranks	20 ^b	12.20	244.00
Ties	3 ^c		
Total	25		

a. Post-Test < Pre-Test; b. Post-Test > Pre-Test; c. Post-Test = Pre-Test

Z= -3.835; Asymptotic Significance = .000

The above table presents a significant difference between the pre-test and post-test. In the negative ranks, the post-test scores were less than the pre-test scores in only 2 cases. The mean rank for these cases was 4.50, with a total sum of ranks of 9.00. It shows that the post-test score was not substantially lower across the dataset on average. In the positive ranks, there were 20 cases that showed the post-test scores as greater than the pre-test scores. The mean rank for these cases was 12.20, with a total sum of ranks of 244.00. This suggests that the learners scored higher on the post-test after the treatment, and the extent of improvement was significant across these cases. There were only 3 ties in the ranks where the score remained unchanged. Also, Z represents the statistical value of -3.835, depicting that the difference lay more towards positive ranks. The asymptotic significance (p-value) at .000 was less than the conventional alpha level of 0.05, indicating that the differences between the pre-test and post-

test scores were statistically significant, denoting an overall improvement in the writing skills of the learners.

3.3. Qualitative Observation

The section provides a comprehensive analysis for RQ 2 which studies the aspects in which ChatGPT helps students improve their English writing skills. In the pre-test, participants were given paragraph-writing tasks; during the treatment phase, they gave a series of seven commands to the open AI source (ChatGPT); finally, in the post-test, they attempted paragraph-writing tasks. Following are the tasks and commands:

1. Ask ChatGPT to generate an outline on the given essay topic and use it as a sample to create your own.
Command: Provide me with an essay outline for a descriptive essay of four paragraphs on (the topic).
2. Ask ChatGPT to provide you with vocabulary words.
Command: Provide ten vocabulary words I may use in my essay on (the topic).
3. Construct the first paragraph of your essay using any five words from the list.
Command: Revise the following paragraph and correct grammatical and spelling errors:
4. Write the two body paragraphs and ask ChatGPT to provide feedback on language and style.
Command: Read the following paragraphs and provide your feedback on language and style.
5. Using the feedback by ChatGPT, rewrite the paragraphs and ask the chatbot to revise.
Command: Revise the paragraphs for grammar, spelling, and style, and provide the list of errors corrected.
6. Ask ChatGPT to provide a concluding paragraph based on the body paragraphs.
Command: Generate a concluding paragraph based on the above body paragraphs.
7. Use the paragraph as a model and write the conclusion in your own words.

All these tasks were linked with two themes: (a) cyberbullying and (b) tourism. The following are the randomly selected screenshots of the commands that one of the participants sent to ChatGPT for composing an essay on the importance of international tourism:

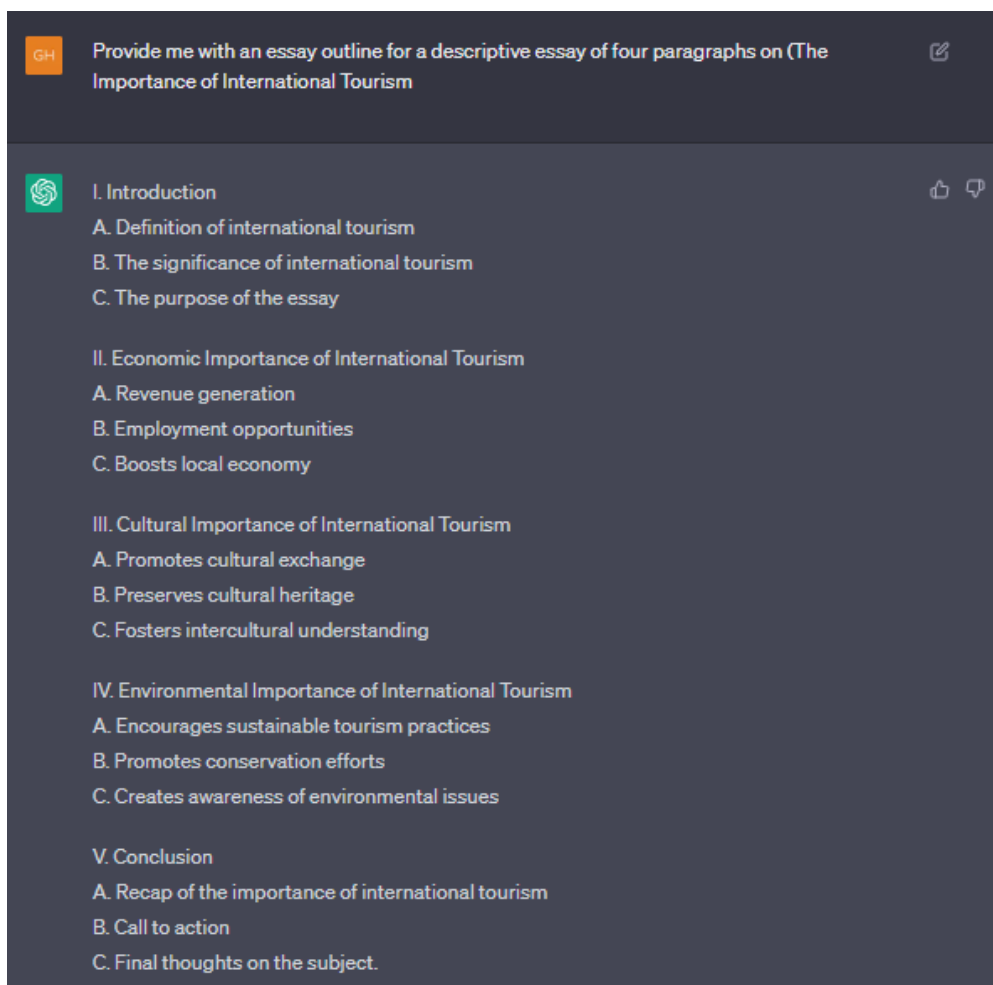


Fig. 2. ChatGPT response to the 1st command in the treatment phase

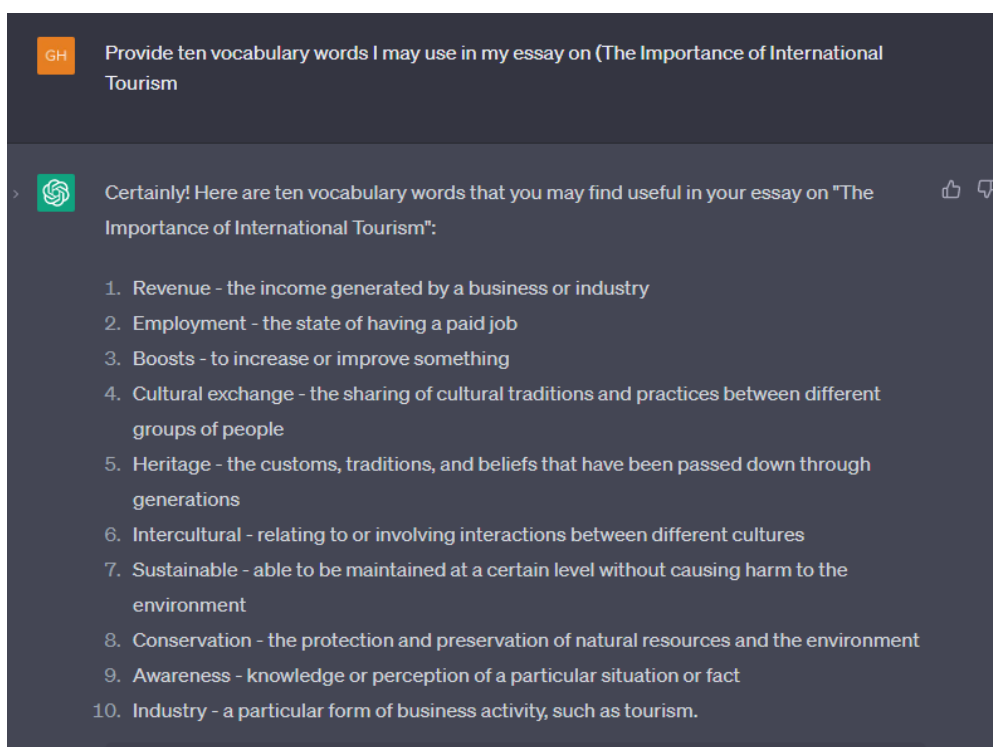


Fig. 3. ChatGPT response to the 2nd command during the treatment phase

On an average level, the participants showed a weak attempt to use lexical resources and grammatical structure accurately in their pre-test. They showed a deficiency in communicative achievement and content compared to organization and language. Moreover, the range and variety in lexical choices and sentence range were limited as only a few participants exhibited variety in their word choice. The grammatical arrangement of sentences was erroneous on average. There were very few students whose language skills were flawless. There was no command related to paragraph structure, as the students' assessed proficiency level was B2. Hence, many students failed to build a properly structured paragraph, lacking coherence and organization. It is noteworthy that the commands for ChatGPT addressed all four areas of writing skills categorized in the rubric, yet most of the students failed to upgrade their skills in the areas of language and organization. The students who performed below average level needed more guidance in these two areas. The commands given to the AI assistant focused on the organization of the essay and not the paragraph. However, the language issues were addressed thrice in these commands, which was insufficient in some cases. More prompts for essay writing are suitable for further improvement.

3.3.1. Samples of Tests on Topic One

A pre-test task for an introductory paragraph on tourism

Case 1: There are many places in Pakistan that should be visited. by the people. actually international tourism play an important role in boosting country economy. Tourist from the different part of come to visit Pakistan to enhance beauty of nature. They capture the moment of the nature. Tourist actually explore the nature's beauty.

Case 2: Tourism is a very important part of any country. Tourism can increase the GDP of the country. Healthy environment can increase the tourism of the country. Tourism can also define the beauty of that country. It is very important for the tourists to respect the culture of that country.

A post-test task for a body paragraph on challenges for the tourism industry in Pakistan

Case 1: Economic impact on international tourism is contribution to GDP, development and different foreign exchange earnings. Example of benefits from international earning by positive economic impact. In 2000 foreigner wants to come and see the beauty of nature. but after that they are afraid of felt unsaved and afraid from different tourism cases. Cultural exchange by international tourism exposure to diverse cultural tradition and custom is promoting mutual understanding. To enhance our country's culture and also improve it, improve economic resources which help us to improve and grow the international tourism.

Case 2: One the major problem in the tourism industry in Pakistan is the security situation. Persistent security, concerns including instability in certain regions, have deterred potential tourists from exploring the country's diverse and culturally rich landscapes. This issue hampers the growth of tourism sector, preventing Pakistan from fully capitalizing on its historical sites, scenic beauty and cultural attractions.

3.3.2. *Samples of Tests on Topic Two*

A pre-test for an introductory paragraph on cyberbullying

Case 3: Cyberbullying has become a major ongoing concern. It has got the limelight when a lot of cases have been filed in Lahore's session court. It has been reported that the social media is used mostly by the bully defenders. Moreover, the crime has got severity in major districts in Punjab.

Case 4: Cyber bullying has become a serious problem effecting many people, especially on the internet and social media. Cyberbullying including using technology to harm, intimidate or harass others. It can take various forms, such as means comments, spreading rumors online or sharing private information without permission, make rumors for anyone, intimidate and anonymity for anyone then the person who who made fake rumors then he's perpetrator.

A post-test task for an introductory paragraph on the harassment in social media

Case 3: Harassment is when one person threatens, embarrasses or targets another person. This harassment is majorly done through social media these days. A lot of people have been suffering from depression and anxiety after being victimized by the harasser. The parliament is really concerned to prevent such lawful act and it has legislated laws on cyber security. In this way, this harassment can be prevented and the harasser gets penalized.

Case 4: Social media harassment is a big problem nowadays, people go through different type of online bullying, means comment and messaging they don't want. Because some can hide behind fake names, it's hard to stop them. This makes it tough for victim. They feel really upset, anxious or even very bad mentally. To, fix this. we need to tell more to people about it make social media rules stricter, and teach everyone how to use the social media in safe way.

4. Discussion

4.1. Research Question One

The factors, including motivation, satisfaction, efficiency, and efficacy, had equal influence on the learners with regard to their engagement with the AI tool, ChatGPT. Their level of English language proficiency, whether at the pre-intermediate, intermediate, or upper-intermediate level, did not affect the students' engagement. The most varied factors in making ChatGPT an engaging learning tool were expressiveness and knowledge. Between the pre-intermediate and intermediate English language proficiency levels, there were no significant differences in the aspects of expressiveness or knowledge, as both metrics exceeded the threshold of .0083. In the subsequent analysis between intermediate and upper-intermediate proficiency levels, a noteworthy distinction was observed in the average knowledge scores, highlighting a statistically significant lower ranking in knowledge among upper-intermediate learners compared to those at the intermediate level, while the significance of knowledge alone did not stand out. Furthermore, in the final comparison between pre-intermediate and upper-intermediate learners, both expressiveness and knowledge presented significant disparities, indicating that ChatGPT's impact varied across different proficiency levels. Therefore, various elements – including motivation, knowledge, satisfaction, efficiency, efficacy, and expressiveness – played a role in shaping students' interaction with ChatGPT for learning English, with expressiveness and knowledge exhibiting variability among learners based on their proficiency levels. The results of this study validate the observations made in other studies that affective, social, and psychological factors influencing students' engagement in learning are vital for the success of the learning process (Duyen & Hao, 2023; Dipolog, 2022; Zakaria et al., 2019; Sabbah, 2017). It was observed that the students were really comfortable in attempting tasks, as they positively corresponded to the idea of implementing changes in their classroom tasks using ChatGPT. Also, knowledge, satisfaction, and efficiency helped boost the student's self-confidence and self-efficacy. They showed a responsible attitude towards being given a choice for assessing and monitoring their self-regulated learning. This observation strengthens the findings stated in the previously discussed studies (see Badura, 2006; Pintrich, 2004; Zimmerman, 2000).

4.2. Research Question Two

The Students' Scripts:

The most significant aspects of improvement in the writing skills of students were content and communicative achievement. Students could communicate the relevant information and put their ideas across in a clearer expression, noticeably after the ChatGPT commands. Confirming observations in the studies conducted by Montenegro-Rueda et al., (2023) and Huang (2021), this study shows that AI-assisted language learning significantly contributes to language learning. In the pre-test, most students showed weakness in laying their argument or

thought accurately, but this dramatically changed after the students made use of ChatGPT. In the pre-test, only 2 participants scored 4 on 5 in the content, and another 2 scored 4 on 5 in the communicative achievement category, while in the post-test, 15 scored 4 on 5 in content, and 14 scored 4 on 5 in the communicative achievement. ChatGPT made a significant contribution to improving these two skills in writing tasks. Most of the students were indifferent about the organizational value of paragraph writing. The introductory and body paragraphs evidently showed pre-planning, but most students lacked the skill to knit ideas coherently in a paragraph. In the pre-test, only 7 participants scored 3 on 5 in the organization category but only 1 participant improved the score in the post-test from those who scored 3. Also, there was a lack of variety in some cases, not only in terms of lexical choices but also in sentence range. Five students scored 4 on 5, and thirteen scored 3 on 5 in the language category. However, most students' scores remained the same in the language section as only 4 improved their scores to 1 point increase and in the case of 3 participants, the scores declined by one point. A significant reason behind this outcome was the imposition of using a set of commands for ChatGPT. Given an option to include more commands according to their needs, the results would have shown more improvement.

The Sample Cases:

The sample scripts were taken from the pre-post-tests of participants 4, 8, 9, and 13. The results scores of all the participants except the 8th one improved, whose score remained constant at 12, whereas the others improved from 11, 10, and 12 in the pre-test to 14, 13, and 14 in the post-test, respectively. There were evident mistakes in language, including grammar, spelling, capitalization and punctuation, in all four samples. The students paid more attention to conveying the main idea of their topic, which contributed to the significant development in content and communicative achievement. Lastly, the organization area was completely ignored by the students, as observed in the given samples. The students began their paragraph with a topic sentence, but the coherence between supporting details was absent, and the concluding sentence was either missing or abrupt. The pre-test task of Case 1 ended with a supporting sentence, "tourist actually explore nature's beauty". This sentence was a random addition as it did not connect with the previous sentence and failed to conclude the opening section. In the post-test, Case 1 attempted to conclude the discussion by providing a solution to the problem faced by the Pakistani tourism industry (see 4.2.1). Here, the language error was found in the complex structure which the student could not handle, but the communicative achievement and organization were significantly improved. Participant 8 was one of the three rare cases whose performance remained constant. Even in the division of the rubric, the scores for all four categories remained constant (see Table 3). The researcher observed that these participants were not eager to improve in the tasks. Their communication with ChatGPT was as constructive as the others, yet they did not show much interest in adapting to the suggestions. Participant 9 and 13 improved their scores in content and communicative achievement, but the latter advanced their organization skills, too. Moreover, participant 9 constructed the topic sentence better than the one in the pre-test. Also, there was a reference to "lawful acts and legislated laws" for proposing a solution (see 4.2.1). So, the integration of ChatGPT brought a strong content and practical approach to the text.

5. Conclusion

It is concluded that with a broader perspective, open AI tools like ChatGPT can help learners become independent and proficient in language learning. The results further support the analyses presented in the previous research studies on AI-assisted language learning which state that the AI tools are efficient in improving students' performance in the English language (see Montenegro-Rueda et al., 2023; Moulieswaran & Prasantha, 2023a; Moulieswaran & Prasantha, 2023b). Therefore, instead of labelling the AI tools as a detour from productive learning, the need is to steer it towards self-regulated learning. The results from the survey determined that the factors, including motivation, expressiveness, efficacy, efficiency, satisfaction, and knowledge, contribute to the student's confidence in ChatGPT's usefulness in engaging learners and improving English. Also, ChatGPT has the capacity to address all areas of academic writing skills, including content, communicative competence, organization, and language. Thus, this study reinforces the findings presented in past studies which highlight that if learners focus on their areas of improvement in self-regulated learning, there are positive chances of improvement with the help of AI assistance (see Moulieswaran & Prasantha, 2022; Nggawu, 2019; Uzunboylu, 2018). As shown, after only one cycle of writing practice, the majority of the students were able to improve their writing skills. Hence, if the practice continues, after identifying learners' weak areas, more focus could be placed on their improvement, which is likely to result in a significant positive effect on their writing skills. These results, thus, confirm the practical possibility of productive and independent language learning with the integration of AI assistance and self-regulated learning.

6. Future Implications and Limitations

The implications of this study are manifold. It explains the multidimensional role of AI-ALL in English language education, highlighting its potential as both an engagement tool and a means for enhancing specific language skills. It opens a new perspective for the teachers to train their students to utilize the AI tools for language learning, which offers a shift from dependence on AI with zero effort from the learner to a self-regulated learning process that enhances engagement and improvement due to the influence of factors including satisfaction, efficiency, and knowledge. It is also significant in implementing new policies in formative and summative assessments, and curriculum design. Moreover, ChatGPT can be explored with a range of activities tailored for learners at different stages of proficiency, potentially increasing its effectiveness in language education. While the current study offers invaluable insight into the impact of AI-assisted self-regulated learning on students' engagement and writing skill enhancement, it is important to highlight that the sample size of the learners may hinder the generalizability of the study. Hence, future research may include a more diverse range of demographic characteristics of participants and data collection methods. Moreover, the study used only one post-test to observe the effect of self-regulated learning using AI assistance. A rigorous study could test the effect of this practice multiple times so as to achieve better results in participants' writing skills by applying variation in commands for ChatGPT according to the individual needs of the students.

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Appendix

Questionnaire

The Impact of AI-Assisted Self-Regulated Learning, specifically ChatGPT, on Students' Engagement and Writing Skill Enhancement

Thank you for participating in this study. This questionnaire aims to identify the factors influencing students' engagement with Chat GPT in English language classes and investigate if Chat GPT helps students improve their English language skills. Your participation is voluntary, and your responses will be kept confidential.

Demographics

What is your name? _____

What is your age? _____

Select the current level of your English language proficiency:

Pre-intermediate (A2)		Intermediate (B1)		Upper-intermediate (B2)	
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How long have you been learning English?

Less than ten years		More than ten years	
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For this survey, indicate the degree to which each statement regarding your use of Chat GPT is true or untrue using the following scale:

1 = NOT TRUE

2 = UNDECIDED

3 = TRUE

Factors Influencing Students' Engagement with Chat GPT	1	2	3
Motivation			
1. I am motivated and plan to use Chat GPT for my English language tasks.			
2. I look forward to learning the English language with the use of Chat GPT.			
3. I enjoy taking help from Chat GPT to communicate in the English language class.			
Efficiency			
4. I can use Chat GPT to improve my English language skills.			
5. I find Chat GPT an efficient tool for learning English.			

6. I believe that Chat GPT enhances my productivity.			
Efficacy			
7. I feel good about using Chat GPT to improve my English language skills.			
8. I quickly understand how to use Chat GPT for my English language tasks.			
9. Chat GPT is a tool I use sometimes to engage in English language learning.			
Satisfaction			
10. I am generally satisfied when I use Chat GPT for English language tasks.			
11. I am confident that I will be able to improve my English language skills with Chat GPT.			
12. I feel competent in using Chat GPT to learn English.			
Expressiveness			
13. I am very articulate in my English language tasks when I use Chat GPT.			
14. I am very expressive in English language communication when I use Chat GPT.			
15. I use Chat GPT to improve my writing style in English.			
Knowledge			
16. I am familiar with using Chat GPT for English language learning.			
17. I use Chat GPT for assignments in the English language.			
18. I use Chat GPT to provide feedback on my writing style.			

Adapted from CMC Competence Measure (Version 5):

Spitzberg, B. H. (2006). Preliminary development of a model and measure of computer-mediated communication (CMC) competence. *Journal of Computer-Mediated Communication*, 11(2), 629–666.

<https://doi.org/10.1111/j.1083-6101.2006.00030.x>