

Using artificial intelligence-based instruction to develop EFL higher education students' essay writing skills

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Abstract

The present study investigated the use of artificial intelligence (*AI*), in terms of *Grammarly*, to develop the Egyptian higher education students' FL essay writing skills. The 100 randomly selected participants are English-majoring senior students and were equally divided into a control group and an experimental group with fifty participants each. Data were collected through three instruments, namely FL essay writing pre-and posttests and observation notes. The FL essay writing test was employed as a pretest and a posttest. The participants were trained over 12 weeks to write FL essays by using *AI*-based *Grammarly* instruction for the experimental group and by using a traditional method for the control group. During the experimental group's training period, the researcher recorded observation notes about the experimental group's comprehension of the *AI*-based *Grammarly* corrective feedback. Data were analyzed by using the Paired Sampling T-Test and the Independent Sampling T-Test. The findings indicated better improvement in the performance of experimental participants compared to their control group counterparts. The study presented teaching implications for FL essay writing instruction and recommended the incorporation of *AI*-based *Grammarly* instruction to the process of teaching FL essay to Egyptian senior students.

Keywords: *AI*-based *Grammarly* instruction, traditional method, Egyptian senior students, FL essay writing, teaching implications

إستخدام التدريس القائم على الذكاء الإصطناعي لتطوير مهارات طلاب التعليم

العالى لكتابة المقال باللغة الإنجليزية كلغة أجنبية

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رئيس قسم اللغات و الترجمة

المعهد العالى للدراسات النوعية - الهرم

بحثت الدراسة الحالية إستخدام الكاء الإصطناعى من حيث تطبيق جراملى لتطوير مهارة كتابة المقال باللغة الأجنبية لدى الطلاب المصريين بالتعليم العالى، و تم عشوائيا إنتقاء مائة مشارك من طلاب الفرقة الرابعة المتخصصين فى اللغة الإنجليزية، و تقسيمهم بالتساوى إلى مجموعة ضابطة و مجموعة تجريبية لكل منهما ٥٠ مشارك، و تم تجميع البيانات البحثية بثلاثة أدوات هى أختبارين لكتابة المقال باللغة الأجنبية ورصد الملاحظات، و تم إستخدام إختبار كتابة المقال باللغة الأجنبية كأختبار قبلى و بعدى ، و تم تدريب المشاركين على مدى ١٢ أسبوعا بإستخدام التدريس القائم على الذكاء الإصطناعى "جراملى" للمجموعة التجريبية و الطريقة التقليدية للمجموعة الضابطة ، و خلال فترة تدريب المجموعة التجريبية قام الباحث بتدوين ملاحظات على فهم طلاب المجموعة التجريبية للتعليقات التصحيحية التى قدمها تطبيق الذكاء الإصطناعى "جراملى"، و تم تحليل البيانات البحثية بإستخدام أختبار "ت" للعينات المقترنة و أختبار "ت" للعينات المستقلة، و أشارت النتائج إلى تحسن أفضل للمشاركين فى المجموعة التجريبية مقارنة بنظرائهم فى المجموعة الضابطة، و قدمت الدراسة مضامين لتدريس المقال باللغة الأجنبية ، و أوصت بدمج التدريس القائم على الذكاء الإصطناعى "جراملى" فى عملية تدريس المقال باللغة الأجنبية للطلاب المصريين بالفرقة الجامعية الرابعة.

الكلمات المفتاحية: التدريس القائم على الذكاء الإصطناعى "جراملى"، الطريقة التقليدية، الطلاب المصريين بالفرقة الجامعية الرابعة، كتابة المقال باللغة الأجنبية، مضامين تدريسية

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Introduction

The process of teaching English as a foreign or second language has become technology-oriented since the emergence of Siemens' (2004) and (2005) learning theory of connectivism. One of the technology-based tools employed in the development of EFL/ ESL learners' language skills is artificial intelligence (AI). Indeed, there are various AI-based applications that have been used to develop the writing skills of EFL/ESL learners. These applications include, among others, *KAKU*, *Quillbot*, *Wordtune*, and *Grammarly*. The AI-based *Grammarly* was chosen for the purpose of this study because of its availability and easy accessibility to the Egyptian EFL students. There is a free website of *Grammarly* which students can easily access and freely use for several times of writing corrections.

Writing skills are chosen to be investigated because writing is an important productive complex skill. Fodil-Cherif (2021) and Zhao and Liao (2021) clarified that FL writing is not a simple task which depends on just presenting ideas; it includes multiple processes to accomplish the final form of the writing task. Thus, EFL learners are required to plan a main structure in which they should accurately synthesize sentences and paragraphs. In other words, FL writing skills are not restricted to knowledge of vocabulary, grammar, punctuation, spelling etc. Rather, FL writing skills require EFL learners to perform cognitive and metacognitive strategies. These strategies are embodied in generation of ideas, planning and organizing the essay writing structure (introduction, body paragraphs, and conclusion). The EFL learners are required to observe cohesion within the paragraphs and coherence among the paragraphs. In doing so, the EFL learners should rely on their background knowledge, retrieve stored knowledge, and create new information. The EFL learners should be also able to paraphrase, summarize, analyze, suggest solutions, and produce new written texts.

The recent trends of teaching FL writing skills assert the necessity of EFL learners' literacy of exploring, utilizing and using the various digital tools. These tools include electronic dictionaries, paraphrasing and editing services which offer assistance to help EFL learners accomplish

their FL writing tasks. There are different results of the impact of using digital writing assistants on developing the EFL learners' writing proficiency levels. For example, Moore, Rutherford, and Craw (2016) concluded that FL teachers have complementary roles to the success of digital writing tools in improving the EFL learners' writing skills. Miranty, Widiati, Cahyono, Sharif (2021) also found *Grammarly* as ineffective tool for teaching English writing compared to the teacher's corrective feedback. Similarly, Perry (2021) affirmed the necessity of FL teachers' guidance and well organization of the teaching and learning environment as pre-requisites for the useful employment of digital writing assistants to enhance the EFL learners' writing skills. In this regard, Thi and Nikolov (2022) explained that the use of *Grammarly* should be complemented by EFL teachers' feedback as both of them should be used side by side. Likewise, Gayed, Carlon, Oriola, and Cross (2022) reported negative findings on the use of digital learning tools on the improvement of FL writing skills. On the contrary, Hamouma and Menezla (2019), Kurniati and Fithriani (2022) and Faisal and Carabella (2023) found that the improvement of EFL learners' writing skills is positively correlated with the use of digital writing assistants. In addition, Kessler (2020) found that the lack of digital literacy on the part of Chinese teachers of English hampered the ability of Chinese EFL learners to improve their English writing skills through using digital writing assistants.

Statement of the problem

In the Egyptian FL teaching and learning context, Qoura and Elmansi (2023) highlighted the important successful role of *AI* in education, particularly during the Cronovirus pandemic. The *AI* keeps on providing solutions to learning difficulties and challenges in various educational fields. As for FL teaching and learning, Qoura and Elmansi explained that the Ministry of Education and that of Higher Education emphasize the necessity of employing and utilizing the technology-based innovations to improve the process of teaching and learning at state-run and private higher learning institutions alike. Qoura and Elmansi discussed the policies and possible implementations of equipping pre-service language teachers with advanced technology that serves the purposes of FL teaching and learning process. Thus, the need arises to investigate the impact of using an *AI*-based program on teaching FL writing skills in the Egyptian context. Therefore, it was necessary to explore the effectiveness of employing the *AI*-based *Grammarly* in teaching FL writing skills, particularly with the different results and findings reported in this regard.

The performance of fourth year students in writing FL essay needs to be further polished to reach satisfactory level of proficiency. Thus, the present study investigated the impact of using artificial intelligence (AI), in terms of *Grammarly*, on improving the Egyptian senior students' FL essay writing skills. It explored the FL essay writing skills which the participants need to develop and the usefulness of employing the AI-based *Grammarly* to develop the experimental participants' FL essay writing skills.

Questions

The present study attempted to answer the following questions:

1. What are the essay writing skills to be developed by students at Higher Institute of Specific Studies, Haram?
2. What are the features of AI-based instructions to develop essay writing skills?
3. What is the effect of AI-based *Grammarly* instruction on developing students' overall writing skills?
4. What is the effect of using AI-based *Grammarly* on developing each of the essay writing skills?

Hypothesis

The current study attempted to verify the following hypotheses:

1. There is a statistically significant difference between the experimental and the control groups' mean scores on overall essay writing skills pretest in favor of the experimental group.
2. There is a statistically significant difference between the experimental and the control groups' mean scores on overall essay writing skills on each of the writing skills post-test in favor of the experimental group.
3. There is a statistically significant difference between the experimental group's pre-post administrations of the writing skills test in favor of the experimental group's posttest performance.

Aims

The current study aimed to:

1. Determine the FL essay writing skills which the two investigated groups need to develop following their pretest performance.
2. Identify the features of AI-based instructions to develop essay writing skills.
3. State the effect of AI-based *Grammarly* instruction on developing students' overall writing skills according to their posttest performance.

4. Determine the effect of using *AI*-based *Grammarly* on developing each of the essay writing skills.
5. Verify the statistically significant difference between the two investigated groups' performance in the FL essay writing posttest.
6. State the *AI*-based *Grammarly*'s effectiveness in developing the experimental group's performance in the FL essay writing posttest.

Significance of the study

The current study is significant because it:

1. Copes with the up-to-date trends of TEFL in Egypt; it comes as a response to Qoura and Elmansi's (2023) call for relying on *AI* in teaching and learning the four English language skills.
2. Serves the main goals of the Ministry of Higher Education to improve the English proficiency levels of students at higher learning institutes.
3. Attempts to develop the teaching methods employed at the department of Languages & Translation, Higher Institute for Specific Studies, Haram.
4. Looks into ways to develop the EFL learners' FL skills of academic writing.
5. Provides *AI*-based insights into the development of English curricula at the Department Languages and Translation, Higher Institute for Specific Studies, Haram.
6. Highlights the importance of learning FL writing skills among English-majoring students.
7. Provides indication about the practicality of using *AI*-based instruction for FL teaching in Egypt.
8. Contributes to the TEFL literature in general and to that of FL teaching in the Egyptian context in particular.
9. Is not only restricted to benefit the researcher's English-majoring students, but also provides the researcher' student-teachers in Matrouh University with insights into teaching English writing skills.

Delimitations

It is expected that the findings of the current study will positively contribute to the process of teaching FL essay to the fourth-year students at the Higher Institute for Specific studies, Haram. It is also hoped that the expected findings will be useful to FL essay teaching at any other higher learning institutions.

Literature review

Miranty, Widiati, Cahyono, Sharif (2021) discussed the effectiveness of using *Grammarly* to teach writing to non-native speakers of English. The participants were 80 English-majoring freshmen at the faculty of Education affiliated to a public university in Indonesia. Data were collected by three instruments: English writing pre-and posttests and a questionnaire. In addition, the teacher of English writing course was interviewed. The participants were divided into a control group and an experimental group. In the Writing pre-and posttests, the participants were asked to write an argumentative essay. The findings indicated differences in the experimental group' English writing improvement compared to that of the control group. However, these differences were not statistically significant. Moreover, the experimental group' higher gained score due to the employment of *Grammarly* was not statistically more significant than that of the control group. In other words, Miranty found that *Grammarly*-based instruction was not more effective in teaching English writing compared to the traditional method represented in the teacher' corrective feedback. However, Miranty, et al. asserted that there are various benefits of *Grammarly* in learning English writing, particularly its e-feedback. In the interview, the writing course teacher emphasized the *Grammarly* advantage of saving the participants' time in fulfilling the writing task. However, the teacher explained that the main *Grammarly* drawbacks are related to its ability to realize cohesion and coherence within the written text. In this context, the researcher of this paper is one of the opinions that cohesion and coherence are two cognitive features of writing that a software application can hardly achieve with high quality compared to the human brain.

Zinkevich and Ledeneva (2021) experimentally evaluated the effect of using the AI-based *Grammarly* to enhance the essay writing skills of ESP learners. Zinkevich and Ledeneva used the AI-based *Grammarly* tool to assess 100 essays written by one hundred master students. The purpose was identifying the existent language errors which marked the participants' English written essays. The analysis of written essays was carried out in terms of five dichotomies, namely 'intent', 'domain', 'audience', 'formality' and 'tone'. Zinkevich and Ledeneva clarified that the *Grammarly* detected errors of the participants' written essays include excessive usage of personal pronouns, punctuation and sentence structure. Zinkevich and Ledeneva explained that the AI-based *Grammarly* is a writing assistant tool which can polish the participants' written essays. However, *Grammarly* cannot think or write the essay on

behalf of the students. It rather helps the students to overcome the persisting errors of writing and avoid repeating them based on their understanding of the *Grammarly* attached corrective feedback. Zinkevich and Ledeneva recommended the use of *Grammarly* premium version because of its multiple advantages compared to the free version. The *Grammarly* premium version offers various functions such as choice of words, writing styles and tones. In spite of various types of writing assistance which the *AI-based Grammarly* offers, Zinkevich and Ledeneva asserted that *Grammarly* cannot be considered by any means as a substitution for the language teachers. This attributed to the fact that *Grammarly* tool falls short of providing remedies for the content, structure and coherence issues. *Grammarly* cannot determine lack of thesis statements, cannot differentiate between relevant and irrelevant arguments, cannot determine the adequacy of examples or facts, cannot determine logicality of conclusions and the relevancy of linking words and transitional phrases.

Gayed, Carlon, Oriola, and Cross (2022) investigated the effectiveness of using the *AI-based* writing assistant (*KAKU*) to help EFL learners overcome cognitive difficulties which hinder their production of well-written English text. The participants were ten Japanese EFL learners enrolled in the language school, at the institute of technology, Tokyo. The *AI-based KAKU* tool was designed to include five main elements. First, there is an engine to suggest words, second, a menu of language selection, and third, a translation facility where the EFL learners can write the text in their mother tongue which will be translated to the target language. In this regard, the research of this paper believes that EFL learners should not be encouraged at any expense to write the intended-essay task in their mother language and then translate it into English. Indeed, this method does not effectively work in developing the EFL learners' writing skills. This method does not take into considerations the syntactic differences that may exist between the EFL learners' mother tongues and the English language. The researcher suggests that it would be better that Gayed et al, encouraged their students to write a few sentences in English before using the *AI-KAKU* to process their writing. Gayed, et al. used text inspector to analyze the participants' diversity of lexical knowledge, selection of vocabulary, complexity of syntax and writing fluency. Gayed, et al. found that *KAKU* was ineffective in improving the EFL learners' writing ability in terms of vocabulary diversity, and selection of words. However, the only privilege of *AI KAKU* was related to syntactic complexity. The researcher of this

paper believes that the failure of *AI KAKU* to improve the Japanese EFL learners' writing ability in terms of lexical diversity and selection could be related to the different connotative meanings between Japanese and English words. It is improper to rely on first language translation as a main way to improve the FL writing skills.

Javier (2022) conducted a technical review on ways of integrating the *AI-based Grammarly* into the teaching of English writing to ESL learners in the Philippine Normal University. Javier clarified that teachers of English academic writing seeks the assistance of digital tools to develop their students' English writing skills. The selection of such digital tool should be based on its affordability and accessibility. *Grammarly* is one of the most affordable and accessible digital tools that can be exploited in enhancing the quality of teaching English academic writing. According to Javier, *Grammarly* provide features of 'correctness', 'clarity', 'engagement', 'delivery' and 'plagiarism'. Language teachers may exploit the advantages of *Grammarly* in correcting their students' writing errors in terms of tenses, plural forms, subject-verb agreement, well-formed patterns, and grammar rules. Javier termed these advantages as the 'micro-levels' of academic writing. On the other hand, language teacher can pay attention to correct features which are considered as drawbacks of *Grammarly* such as 'content', 'argument' and writing structure. Javier termed these features as 'macro-levels' of academic writing. That is, there are limitations to the use of *AI-based Grammarly* to enhance the EFL learners' writing skills. The researcher of this paper is one of the opinions that these limitations are restricted to its ineffectiveness of developing the organization and content of writing. Suggested solutions to address these limitations could be pertinent to technical development of its software and the well-preparation and training of FL teachers to compensate for the ineffective role of *Grammarly* in enhancing the coherence and cohesion elements of FL writing skills.

Thi and Nikolov (2022) analyzed the effect of teacher's feedback and *AI-based Grammarly* feedback on developing the essay writing skills of 27 undergraduates. The participants were enrolled as English-majoring freshmen in Myanmar University and classified as low-intermediate EFL learners. Data were collected through the administrations of pre-and posttests. The participants were trained over a period of 13 weeks to write argumentative and narrative essays with the help of using *AI-based Grammarly* tool. They fulfilled four essay writing tasks during that training period. Thi and Nikolov reported that the language teacher's feedback comprised various broad issues of writing at the levels of words,

sentences and text. On the other hand, the *Grammarly* provided feedback covered the participants' errors in using 'determiners', 'prepositions', and language style. Thi and Nikolov explained that the teacher's feedback was related to various issues of the participants' writing concerns, whereas the *Grammarly* based feedback addressed 'superficial' levels of the participants' language errors. Hence, Thi and Nikolov suggested the incorporation of using both types of feedback to enhance the participants' essay writing skills. Language teachers should exploit the advantage of using *Grammarly* feedback as a helping tool that inside the classes and encourage students to use outside the classes as well. This helps reduce teachers' burden to explain the rules behind these feedback to every individual learner. The integration of *Grammarly* feedback also reduces time constraints of FL classes and sustains the efficacy of teacher's feedback to enhance the students' writing skills. Teachers should also select the appropriate corrections provided by Grammarly including language errors. However, corrections related to content, essay structure, and organization require teachers' clarification and intervention.

Zhao (2022) reported on the advantages of using the AI-based *Wordtune* to help EFL learner to improve their writing. This could be done by providing different options for the EFL learners to select the best suggestion which expresses their intended thoughts of writing. The AI-based *Wordtune* can also sustain the EFL learners' length ability of writing. The AI-based *Wordtune* is a *natural language processing* program that changes the structure patterns of EFL learners' uploaded sentences and provides synonyms list in order to keep the original meaning of the students' uploaded texts. The researcher of this paper believes that the *Wordtune* drawbacks are related to two reasons: having a translation facility and the restricted of its free version. As for the first reason, the *Wordtune* provides translation facility from different languages including Arabic to English. This facility violates the main purpose of teaching FL writing because it indirectly encourages EFL learners to write their FL essays in their native languages. As such, it is considered as a clear encroachment of the cognitive and metacognitive strategies of learning FL writing skills. Indeed, the AI-based *Wordtune* considers the translation facility as a privilege because, in its opinion, helps to develop the writing skills of EFL learners, particularly the beginners. In this regard, the researcher of this paper gives an utmost warning to FL instructors as this way of teaching writing cannot be as constructive as intended by the AI-based *Wordtune* tool. Instead of relying on translation, FL instructors can effectually depend on reading authentic English texts which can virtually develop the EFL learners'

cognitive and metacognitive strategies necessary for developing FL writing skills. As for the second reason, the AI-based *Wordtune* is issued in two versions, namely a free version and a premium version. The free version, which is preferred and can be affordable by many EFL learners, is only restricted to a limited number of sentences daily. As such, the free version of AI-based *Wordtune* does not provide ample use of its services to most EFL learners. And, the premium AI-*Wordtune* could be costly and not affordable for many EFL learners in spite of its offered discount for students and educators.

Rationale and conceptual framework

The rationale and conceptual framework of the present study are based on Siemens' (2004) and (2005) learning theory of connectivism. Willy-nilly, technology has become a main component of the process of FL teaching and learning. Thus, FL teachers and instructors should exploit the various advantages offered by the technological tools to improve the EFL learners' mastery of FL language skills. In this regard, the contributions of different AI-based applications, including *Grammarly*, should be ultimately utilized for improving the English proficiency levels of the Egyptian EFL learners. As such, the current study investigates the improvement of Egyptian EFL students' essay writing skills on the basis of using the AI-based *Grammarly* tool.

Method

Research design

The current study employed the mixed method of both quantitative and qualitative analysis (Pérez Cañado, 2018, Fitria, 2021; Nazari, Shabbir, and Setiawan, 2021; Kurniati and Fithriani, 2022; and Yousofi, 2022). In terms of quantitative analysis, the current study relied on the use of Paired Samples T-T and the Independent Samples T-Test. The researcher's observations on the experimental group's understanding of the AI-based *Grammarly* feedback and their performances in the pre-posttests of FL essay writing were qualitatively reported.

Participants

The 100 randomly selected participants are fourth-year students at the Department of Languages and Translation, Higher Institute for Specific Studies, Haram. They were equally divided into a control group and an experimental group with fifty participants each. Data were collected during the first term of the academic year 2022-2023.

Procedure

The study is part of the extended academic course of Essay and Conversation. The students have to sit for its final examination at the end of the second term of the academic year 2022-2023. The 12-week study

was carried out during the first term of the academic year 2022-2023. The 100 participants sat for the FL essay writing pretest and posttest at the beginning and end of the first term, 2022-2023. The 100 participants equally divided into a control group and an experimental group with fifty participants each. The participants were trained to write FL essays by using *AI-based Grammarly* instruction for the experimental group and by using a traditional method for the control group. The experimental group was taught the privileges and advantages which the *AI-based Grammarly* offers. For this purpose some websites were used to familiarize the experimental group with the use and usefulness of using the *AI-based Grammarly*. Examples of these websites are '*Demo Document*' at <https://demo.grammarly.com/>, '*what Grammarly can do*' at <https://www.scribbr.com/language-rules/best-grammar-checker/> and '*examples of Grammarly corrections*' at <https://support.grammarly.com/hc/en-us/articles/360003474732-Grammarly-Editor-User-Guide>. Then, the experimental group practically used the *AI-based Grammarly* in writing essays like '*Education has an important role in national development*'. A separate file is prepared containing excerpts of the participants' work of using *AI-based Grammarly*. Another prepared file is submitted; it includes samples of the experimental group's posttest' handwritten essays on the importance of learning English. The FL essay writing test was piloted before data collection by using 22 participants. The Cronbach's Alpha coefficient was .92 suggesting high reliability for the FL essay writing test.

Data collection instruments

Data were collected through three instruments, namely a FL essay writing test and observation (Al Mukhallafi, 2020, Kim and Kim, 2020, Miranty, Widiati, Cahyono, Sharif, 2021, Sarwat and Anjum, 2021, Kurniati and Fithriani, 2022). The FL essay writing test was employed as a pretest and a posttest. The participants were asked to write an argumentative essay on '*Learning English has great importance nowadays*'. The total mark of the FL essay writing test was 100 marks. During the experimental group's training period, the researcher recorded observation notes on the experimental group's comprehension of the *AI-based Grammarly* feedback. This technique of data collection was employed in other studies such as those of Alamri (2021), Thi and Nikolov (2022) , and Zhao (2022). In other words, the recorded observation notes identified whether the *AI-based Grammarly* feedback was understandable, or whether the experimental group needed further elaboration, explanation and clarification from the researcher.

Data analysis

In terms of data quantification, the employment of Paired Samples T-Test helped to determine how the two groups' participants performed in the FL essay writing pretest and posttest. It also identified the statistical significant differences in these two groups' performances in the FL essay writing posttest. The use of Independent Samples T-Test determined the effectiveness of using the AI-based *Grammarly* in teaching FL essay writing skills. In terms of qualitative analysis, the participants' performances in the pre-and posttests were described to determine the FL essay writing skills which they need to develop and how the AI-based *Grammarly* contributed towards partial or full development of these skills.

Table 1 introduces the descriptive statistics of the control and experimental groups' performances in EFL essay writing pretest and posttest. The descriptive statistics includes the minimum and maximum scores, mean scores and standard deviations. The descriptive statistics indicates that both groups had almost similar performances in the FL essay writing pretest where the minimum and maximum scores were (48-56) and (49-57) the control and experimental groups respectively. The mean scores were also quite similar (17.47) and (17.50) for the two groups successively. The experimental group' standard deviation (4.30) was relatively higher than that of the control group (4.25) indicating a relatively similar variance in the two groups' performances in the pretest. The finding rejects the first hypothesis that there is a statistically significant difference between the experimental and the control groups' mean scores on overall essay writing skills pretest in favor of the experimental group. In addition, the two groups' pre-test performances indicated that they were in need to develop FL essay writing skills. These skills include proper use of FL grammar (spelling, tenses, and punctuation marks), realization of cohesion and coherence elements, and essay planning and organizing skills. As for essay planning, the examined groups need to develop the writing skills of writing topic sentences, generating ideas, retrieving information, and paraphrasing. They are also in need to observe the essay organization including the introduction, body paragraphs and conclusion (Table 2).

Table 1: Descriptive statistics of Paired Samples T-Test

	N	Mean	Std. Deviation	Std. error mean	Minimum	Maximum
Posttest control score	50	22.6473	6.54302	.42530	59	70
Posttest experimental score	50	41.9304	12.64241	.96361	60	88
Pretest control score	50	17.4741	4.25813	.64381	48	56
Pretest experimental score	50	17.5023	4.30045	.50164	49	57

Table 2: The participants' writing skills that need to be developed

Writing Skills	Description
Grammar	Tenses Spelling Punctuation Editing Revision
Cohesion	Paragraph unity
Coherence	Unity among different paragraphs
Planning	Thesis statement Generation of ideas Retrieval of information Paraphrasing
Organization	Introduction Body paragraphs Conclusion

Table 3 indicates that the posttest performance values of the experimental group' descriptive statistics were higher than those of the control group. The former's minimum and maximum scores (60-88) and mean score (41.93) highly differed from those (59-70) and (22.64) of the latter's. In addition, the former' standard deviation (12.64) was largely higher than that of the latter's (6.54) in the posttest. As such, there is higher variance in the experimental group's posttest performance in comparison to that of the control group. Thus, the experimental group's performance in FL essay writing posttest highly exceeded that of the control group. Furthermore, Table 3 indicates that such differences in FL essay writing posttest were statistically significant since the p value was < 0.05. The finding accepts the second hypothesis that there is statistically significant difference between the experimental and the control groups'

mean scores on overall essay writing skills on each of the writing skills post-test in favor of the experimental group.

Table 3: Paired Samples T-Test of the participants' FL essay writing test

Test	M	SD	N	DF	t-value	Sig.
Pretest control score	17.4741	4.25813	50	49	4.06	0.062
Posttest control score	22.6473	6.54302	50	49		
Pretest experimental score	17.5023	4.30045	50	49	23.42	0.000
Posttest experimental score	41.9304	12.64241	50	49		

Table 4 introduces the statistical results of the Independent Samples T-Test which were in favour for the experimental group. These results indicated the largely higher improvement of the experimental group's posttest performance in FL essay writing compared to that of the control group. The former's gained mean score (24.43) was largely higher than that of the control group (5.17). The difference in the two groups' gained mean scores was statistically significant as the p value was < 0.05 . The large difference in the gained mean scores of both groups is attributed to the effectiveness of *AI-based Grammarly* in developing the experimental group's writing skills compared to that of the tradition method in improving the control group's writing skills. Therefore, the present study accepts the third hypothesis that there is a statistically significant difference between the experimental group's pre-post administrations of the writing skills test in favor of the experimental group's posttest performance. These findings are similar to those reported by Hamouma and Menezla (2019), Zinkevich and Ledeneva (2021), Javier (2022), and Kurniati and Fithriani (2022). On the other hand, these findings contradict those reported by Miranty, Widiati¹, Cahyono, Sharif (2021), Thi and Nikolov (2021) and Gayed, Carlon, Oriola, and Cross (2022).

Table 4: Independent Samples T-Test of the FL essay writing test

Groups	N	M Gain score	SD	DF	t-value	Sig.
Control	50	5.17	2.28	49	19.36	0.000
Experimental	50	24.43	8.34	49		

Undoubtedly, the *AI-based Grammarly* provided invaluable feedback in terms of grammar writing skills show in Table 2. These grammar writing skills include spelling, punctuation, editing and revision. That useful feedback helped to improve the experimental group's FL essay writing skills compared to the control group. This was evident in the experimental group's avoidance of making grammatical mistakes in comparison to the control group's performance in the posttest. In other words, the experimental group made less grammatical errors in terms of punctuation, tenses, spelling, and word selection compared to their control group counterparts.

On the other hand, it is necessary to record the observation notes which the researcher wrote down during the practical implementation of the *AI-based Grammarly* to teach FL essay writing skills to the experimental group. It was found that discussion of *Grammarly* provided feedback, interaction between the FL instructor and participants, and the FL instructor's explanation, clarification, elaboration and in many cases simplification of *AI-based Grammarly* are indispensable aspects for the successful use of *Grammarly*-based teaching of FL essay writing skills. This finding was evident in different instances. For examples, the FL instructor had to explain certain *Grammarly*-based corrections which the participants found difficulty to comprehend. These corrections include the different usages of semi-colon and colon and the placement of comma after the introductory phrases. Another example includes the Concord agreement in the present simple tense when the participants had difficulty in determining the subjects of the main verbs due to different structures of written sentences. The difference between types of independent and dependent clauses requires the FL instructor's intervention along with the *Grammarly*-based feedback. Selection of words, particularly the multiple-meaning words, also needs the FL instructor's clarification. Even though the *AI-based Grammarly* managed to a certain extent to handle the issues of cohesion and coherence, there are other instances in which the *Grammarly*- suggested sentences were irrelevant to the controlling idea to realize cohesion. In addition, some *Grammarly* suggested discourse markers were irrelevant to the previous paragraphs in order to achieve coherence. The observation findings are compatible with the findings reported by Moore, Rutherford, and Craw (2016), Kessler (2020) and Perry (2021).

Conclusion, discussion and implications

It is hoped that the present study partially provides a response to Qoura and Elmansi's (2023) call for the importance of using *AI*-based

tools in the TEFL process in Egypt. As for the first question regarding the essay writing skills to be developed by students at Higher Institute of Specific Studies, Haram, the present study concluded that the two investigated groups had similar performances in the FL essay writing pretest. The two groups had problems in checking their errors in grammar, spelling, punctuation, planning and organizing the written essays. Thus, the current study rejects the first hypothesis that there is a statistically significant difference between the experimental and the control groups' mean scores on overall essay writing skills pretest in favor of the experimental group.

As for the second and third questions about the features and effect of AI-based *Grammarly* instruction on developing students' overall writing skills, the two groups' performances were improved in the FL essay writing posttest due to the contributions of the AI-based *Grammarly* for the experimental group and the traditional method for the control group. However, the improvement in the experimental group's performance highly exceeded that of the control group. there is no doubt that the experimental group greatly benefited from the AI-based *Grammarly* feedback in developing their grammar writing skills covering the use of tenses, spelling, punctuation, editing and revision. Thus, the current study accepts the second hypothesis that there is statistically significant difference between the experimental and the control groups' mean scores on overall essay writing skills on each of the writing skills post-test in favor of the experimental group.

Furthermore, the two p values, which were < 0.05 , of the Paired Samples T-Test and the Independent Samples T-Test provide evidence of the higher positive effectiveness of using the AI-based *Grammarly* in improving the experimental group's performance in FL writing and in teaching FL essay writing skills in comparison to that of the control group and the use traditional method to develop the control group's FL essay writing skills. Thus, the current study accepts the third hypothesis that there is a statistically significant difference between the experimental group's pre-post administrations of the writing skills test in favor of the experimental group's posttest performance. These findings were compatible with those reported by Hamouma and Menezla (2019), Zinkevich and Ledeneva (2021), Javier (2022), and Kurniati and Fithriani (2022). The findings also contrasted those reported by Miranty, Widiati, Cahyono, Sharif (2021), Thi and Nikolov (2021) and Gayed, Carlon, Oriola, and Cross (2022).

As for the fourth question about the effect of using AI-based *Grammarly* on developing each of the essay writing skills, the present

study recommends the incorporation of the *AI-based Grammarly* into the teaching process of FL essay writing to the English-majoring students at the Higher Institute for specific studies, Haram. This incorporation will yield positive effects in enhancing those students' FL writing skills because it has the potentials to improve their ability of checking the grammatical errors including tenses, Concord agreement in the present simple tense, punctuation, and spelling. Therefore, FL instructors at the Department of Languages and Translation are advised to train their students on applying the *AI-based Grammarly* at the while and post writing stages of FL essay writing. The EFL students can benefit from the use of *AI-based Grammarly* in learning about proper use of punctuation, the differences between types of clauses (main clauses and subordinate clauses), checking errors of grammar and spelling. The successful use of *AI-based Grammarly* can encourage other teaching staff to look for useful *AI-based* tools to teach listening, speaking, and reading-based academic courses. The successful trial of using *AI-based Grammarly* to improve the fourth year students' FL essay writing can be extended to other writing-based academic courses being taught at the Department of Languages and Translation. In other words, the *AI-based Grammarly* can also be beneficial to FL instructors who are in charge of teaching other academic courses such as 'Grammar', 'Research Writing', and 'Graduation Papers'. The present study also urges FL instructors, who are teaching the other language skills pertinent academic courses, to find suitably appropriate *AI-based* tools that can help students' improve their performance in listening, speaking and reading. Thus, other *AI-based* appropriate tools can be exploited to teach academic courses such as 'Listening', 'Phonetics', and 'Reading and Vocabulary Development'. Indeed, the use of *AI-based* tools can flourish the process of teaching English at the Department of Languages and Translation, Higher Institute of Specific Studies, Haram. This recommendation comes in agreement with the guidelines of Ministry of Higher Education to improve the English proficiency levels of students at higher learning institutions and to exploit *AI-based* tools to enhance the TEFL process in the Egyptian context as emphasized by Qoura and Elmansi (2023).

On the other hand, the implementation of *AI-Grammarly*-based instruction- to teach FL essay writing skills- should be supported by the FL instructor' explanation, clarification and simplification. The finding adds a new role to FL instructors when using technology-based applications in teaching FL skills. Those FL instructors should be well-prepared and trained on using various technology-based applications in teaching different language skills. The finding asserts Qoura and

Elmansi's (2023) initiative, plan and recommendation to redesign student-teachers' curricula, particularly the teaching practicum, based on equipping them with knowledge of using different technology-based applications in teaching FL skills. The finding is also compatible with those reported by Moore, Rutherford, and Craw (2016), Kessler (2020) and Perry (2021).

It is necessary for FL instructors to the EFL learners' attention to avoid using any of the translation facilities offered by *AI*-based writing assistant tools. The EFL learners should be wary against using such facilities that seriously and negatively affect their cognitive abilities of FL essay writing. This negative effect is attributed to the fact that writing the FL essay in the mother tongue then translating it into English is grave and fatal mistake which does not observe the syntactic differences between the English and Arabic languages. Therefore, the effective use of any *AI*-based tools for developing FL essay writing skills should mainly depend on the EFL learners' own written FL texts that can be the content of *AI*-based feedback corrections.

Recommendations

The present study recommended the following topics for further research:

1. A study may investigate the impact of *AI*-based *Grammarly* on students' motivation and attitudes towards learning FL essay writing
2. A study can examine the effect of *AI*-based *Grammarly* on students' learning styles and strategies of FL essay writing.
3. A detailed study may be required to provide in-depth analysis of the writing features which the *AI*-based *Grammarly* provides.
4. A study may explore the effects of other *AI*-based applications on developing the students' skills of listening, speaking and reading.
5. A study may investigate the training courses which prepare FL instructors to efficiently use *AI*-based applications to teach the four language skills.

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Online resources

'Demo Document'

<https://demo.grammarly.com/>,

'Examples of Grammarly corrections'

<https://support.grammarly.com/hc/en-us/articles/360003474732-Grammarly-Editor-User-Guide>.

'What Grammarly can do'

<https://www.scribbr.com/language-rules/best-grammar-checker/>

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