Automated writing evaluation tools for Indonesian undergraduate English as a foreign language students' writing

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ABSTRACT

Nowadays, many computer programs are used in the teaching of writing in the context of English as a foreign language (EFL). One of the functions of the computer programs is to provide feedback to EFL students' writing so that the quality of their writing can be improved. This study aimed to investigate whether the use of free automated writing evaluation (AWE) tools affect undergraduate EFL students' writing skills. In this experimental study, 35 Indonesian undergraduate students of English education department were asked to use two AWE tools, Grammarly and Grammark, in the writing course over four months. Data for this study were collected by using tests and questionnaire. Pre-test, middle test, and post-test were administered to examine the students' writing skill improvement. The findings indicate that the sequenced use of two AWE tools, Grammarly followed by Grammark, had a beneficial effect on students' writing skill improvement. This study confirms the benefits of free AWE tools in enhancing EFL students' writing skills.

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1. INTRODUCTION

Technology has been increasingly used by teachers of English as a foreign language (EFL) to help students improve their language skills. The rapid development of technology has triggered the creation of many programs to facilitate language learners to improve their language skills, including writing skills. [1] found that technology has demonstrated its efficacy in prewriting, drafting, revising, proofreading, and publishing written products. In addition, technology can be used in the process of holistic scoring and writing evaluation. According to Feng, Saricaoglu, and Chukharev-Hudilainen [2], technology can help teachers create successful classroom environments. The use of technological tools has influenced new teaching and assessment methods. Therefore, teachers should use technology in the classroom to create a more immersive learning environment because students often feel they can understand the lecture content better when technology is used [3].

With advancements in educational technology and increased reliance on technology, a number of studies have provided empirical evidence about the effectiveness of using technology in second language (L2) classrooms. Automated writing evaluation (AWE), for example, is one of innovative uses of technology in language education [4]–[6]. The application of AWE has enabled students to enhance their writing skills at their own pace; as a result, it promotes active participation and interaction in language classes [7]. AWE is computer software that can provide a score for an essay and feedback. [8], [9] found that AWE is one of the

leading computer programs based on artificial intelligence with computer language learning in the English as a foreign language (EFL) classroom. Through the development of AWE software, L2 students and instructors can now receive feedback on their language skills. In sum, AWE can save valuable time for instructors, particularly in L2 writing classrooms, because it provides immediate feedback.

AWE as a technological tool that can provide feedback is shown to have supported writing, teaching, and learning. Since writing practice and feedback are important for EFL writing development, a steady increase in AWE feedback can help teachers manage their workloads more effectively, aid learners' L2 development, and foster learner autonomy [10]. Furthermore, AWE potentially reduces grading load, facilitates individualized instruction, increases student independence and motivation for writing, helps teachers manage portfolios, and provides feedback on students' writing assignments [11].

Theory and research emphasize the importance of AWE in L2 development, particularly in L2 writing. AWE systems facilitate L2 writing development by supporting learners' reflective feedback [12]. These systems rapidly diagnose many essays, thus reducing teachers' workload [13]. Moreover, research results indicate that when AWE is used effectively to support the teaching and learning of writing, students appear to improve their writing performance [14].

As a result of its online resources and editing capabilities, the AWE program has evolved into writing assistance tools that make it easier for students to complete their assignments even though such a facility to some extent may harm students' ability to learn independently [15]. Additionally, much research has been conducted to examine the effectiveness of using commercial AWE tools, making it essential to investigate the implementation of these freely available AWE tools by individuals needing assistance from such programs [16]. As AWE systems are not without their limitations, more and more pieces of empirical evidence are needed to confirm the potential benefits of integrating AWE into teaching, particularly in the writing classes.

Feedback in AWE may include corrective feedback, focusing on formal aspects of learners' language to enhance linguistic precision. Automatic feedback provision can be executed by AWE because it has data for checking the accuracy in the use of English. In this research, the sources of feedback to use are Grammarly and Grammark. Grammarly is one type of electronic feedback that is applicable in this research context; it is a popular AWE program used in writing classes to help students and academics check spelling, grammar, and punctuation errors [17]. For example, Grammarly can be used to check grammatical and spelling accuracy in the students' thesis research proposal texts [18]. Moreover, Grammarly can be used for checking complex EFL writing genres, thus increasing productivity and freeing teacher time [19].

A number of research studies [20]–[22] found that Grammarly is easy to use and helpful for essay writing. It also offers accurate grammar, clear explanations, and quick corrections, and improves students' writing skills and self-confidence writing. In addition to Grammarly, Grammark can highlight incorrect use of the passive voice, word phrases, run-on sentences, and transitions [23]. In sum, AWE tools, particularly Grammarly and Grammark for EFL students, were used to draw students' attention toward language accuracy when writing because Grammarly automatically detects wordness, use of articles, use of spelling, word choice, punctuation, style, whereas Grammark is used for checking word phrases, transitions, passive voice, and run-on sentences.

This study, therefore, aims to examine the effects of the use of AWE tools, more particularly Grammarly and Grammark, on the writing skills of Indonesian EFL undergraduate students. In addition, as such innovative tools might be new for some students, understanding how they perceive the use of Grammarly and Grammark in writing classes seems worth investigating. Therefore, the following research questions were posed in light of the purposes of the study: i) Are there any significant differences in writing skills among Indonesian undergraduate EFL students who used AWE tools?; ii) To what extent do AWE tools affect Indonesian undergraduate EFL students' writing skills?; and iii) How do Indonesian undergraduate EFL students respond to the use of AWE tools?

2. RESEARCH METHOD

This quantitative study involves data collection procedures generating numerical data analyzed using statistical methods [24]. Pre-test, middle test, and post-test were used in this study. In experimental studies, one or more variables are controlled to see how they affect another variable (dependent variable) [25]. Throughout the 14 weeks during a semester, a class of students were asked to use two AWE tools (i.e., Grammarly and Grammark, as shown in Figure 1 and Figure 2) to practice their writing skills both in class and outside of class. Results of pre-test and post-test were compared to determine whether there were differences in the students' writing skills. A Likert scale survey was used to ascertain learners' responses toward the use of AWE tools to improve their writing skills.
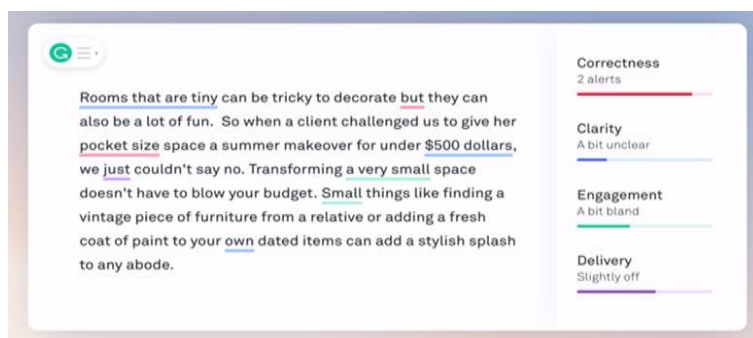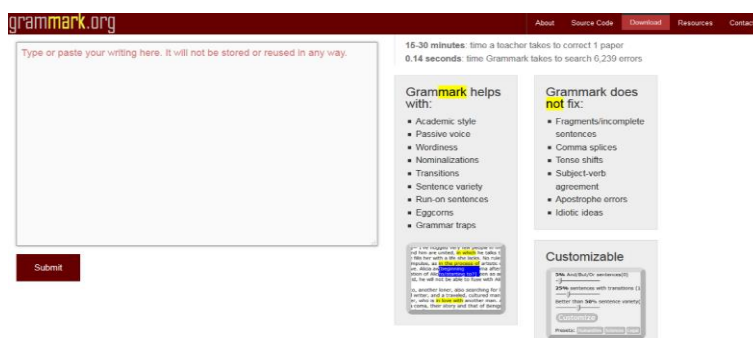
Figure 1. Automated writing evaluation-Grammarly

Figure 2. Automated writing evaluation-Grammark

2.1. Participants

The participants of this study (n=35) students of the English education department from a public university in Banten Province, Indonesia, where English is taught as a foreign language. The participants were first-year students of the English education department from the faculty of teacher education and training. The study lasted 14 weeks, from April to August 2021. The following criteria were used to select the participants: i) Being currently registered in an EFL writing class where the instructor used Grammarly and Grammark; and ii) Being voluntarily willing to participate in the study.

2.2. Instruments

Two instruments were used to collect the data (writing tests and questionnaires). The topics for the pre-test, middle-test, and post-tests were based on educational issues discussed in the argumentative texts in the writing course. Analytic scoring rubric [26] was used to rate the undergraduate EFL students' writing skills. The study took place from April to August 2021. A pre-test was administered to the 35 students in April, the results of which served as the starting point of this study. During the study, the participants were assigned to use Grammarly and Grammark, two free AWE tools, making a total of 14 weeks of 90-minute sessions. Then, in May, a middle test was administered. A post-test was administered to the students in July 2021, marking the final point of the writing results. All the writing tests were moderated for instruction clarity and topic familiarity.

Grammarly and Grammark were introduced to students during the experimentation via an online teaching-learning process. The participants were divided into two sessions non-randomly; the first session used Grammarly and the second session used Grammark. The two free AWE tools were used in this study because of their unrestricted availability for work. The undergraduate EFL students were given various topics to write about in a word processing program. Next, each student in the same class typed or uploaded a text to the AWE tools for correction. The students then submitted their texts for review and scoring to their teacher's Google Drive.

An online questionnaire was distributed to the 35 students through google form to elicit information about the effectiveness of using Grammarly and Grammark. The questionnaire consisted of twenty statements adapted from [27], [28]. The 5-point Likert scale was used in this study. The responses range from 1 indicating 'strongly disagree' to 5 'strongly agree'. The validity of the questionnaire was measured through SPSS version 20. Meanwhile, Cronbach's Alpha was employed to measure the reliability of the instrument.

2.3. Data collection procedure

The data for this study were obtained from the first-year English students at a public university in Banten Province. The first researcher spent the first hours of class discussing with the students the components of argumentative texts. The students then received training in the use of Grammarly and Grammark during the second session of the course. After familiarizing the students with the AWE tools, the first researcher guided the students to continue practicing using the AWE tools. The students were provided with topics with which they are familiar for their compositions. However, different topics were assigned to the students for the pre, middle, and post-tests. Following that, students uploaded their original and corrected writings to the instructor's google drive. The instructor provided feedback on errors that the AWE tools did not adequately explain, such as when and why to use a particular verb tense. The learners and instructor analyzed the initial and final drafts to help them become more aware of computer-generated errors. After the experiment, all participants completed a questionnaire to ascertain their attitudes toward the use of AWE tools to improve their writing skills.

2.4. Data analysis

The students' writing essays, which had been developed with the use of Grammarly and Grammark, were scored by two raters using a modified analytical scoring rubric [29] with possible maximum score of 100. The students' writing texts were scored on the basis of three components: diction (40 points), language use (30 points), and mechanics (30 points). Content and organization were scored separately as they were the results of teacher feedback. To answer the first research question, pre-test and middle test scores were compared, and then the pre-test and post-test scores were analyzed using analysis of variance (ANOVA). To find the answer to the second research question, paired t-test was employed so as to find out the differences between pre-test and middle test, pre-test, and post-test scores. Then, the means of the Indonesian undergraduate students who used Grammarly and Grammark were recalculated. The null hypothesis to be tested is H_0: There is no significant difference in the writing skills among Indonesian undergraduate EFL students using AWE tools.

Regarding the third research question, the students' responses to the questionnaire were sent through Google Form on a 5 Likert scale calculated with SPSS. In this study, we used qualitative data to describe students' responses to Grammarly followed by Grammark to improve their writing quality. Then, to address this research question, descriptive statistics were used. Its purpose is to ascertain whether students favor using AWE tools in the form of Grammarly and Grammark. SPSS version 20 was used to analyze the data to result in descriptive statistics to explore their opinions about using AWE tools to improve their writing skills.

3. RESULTS

This study examined the effects of the use of AWE tools (Grammarly and Grammark) on EFL students' writing skills. It also attempted to determine if there were significant differences among the scores of the pre-test, middle-test, and post-test to see whether AWE tools improved the students' writing skills. The answers for the research questions are discussed in the following sections.

3.1. Differences in writing skills among Indonesian undergraduate EFL students using AWE tools (Grammarly and Grammark)

3.1.1. Independent two-sample test

To address the first research question, independent two-sample test and ANOVA were used to determine whether there were any significant differences in writing improvement among Indonesian undergraduate EFL students using AWE tools. In this study, based on the value of Sig (2tailed) $(p=0.000)<0.05$, it can be concluded that there is a difference of means between the use of first Grammarly and the second Grammarly. The mean of the first Grammarly was 82.400, while the mean of the second Grammarly was 85.542. In sum, as shown in Table 1, there is a significant difference in the students' scores from the first Grammarly test to the second one.

Table 1. Independent two-sample test (The result of tests from 1st and 2nd Grammarly)

Group	Variables	Test	No	Mean	St. Deviation	Sig (2-tailed)
Group 1	Grammarly 1	1	35	82.400	2.379	0.000
Group 2	Grammarly 2	2	35	85.542	2.393	

The results of the first and second Grammark tests in this study are statistically very similar, as shown in Table 2. This implies that there is no statistically significant difference between the two tests. Then, based on the Sig (2-tailed) (p=0.611)>0.05, a comparison was made between Grammark's first and second scores, that is, when going from 90.400 to 89.028. In conclusion, it is possible to conclude that there is a difference in means between the first and second Grammarks in this study.

Table 2. Independent two-sample test (The result of tests from 1st and 2nd Grammark)

Group	Variables	Test	No	Mean	St. Deviation	Sig. (2-tailed)
Group 1	Grammark 1	1	35	90.400	1.958	0.611
Group 2	Grammark 2	2	35	89.028	15.625	

3.1.2. ANOVA

In accordance with the results of the ANOVA test, with the Sig. (2-tailed) of 0.01<0.05, it is concluded that there is an effect between the pre-test and the middle-test of Grammarly as displayed in Table 3. This finding suggests that Grammarly offered feedback on the participants' writing, particularly in the aspects of grammar, punctuation, mechanics, and style. This consequently improved their writing quality in terms of accuracy.

Table 3. ANOVA (pre-test and middle-test of Grammarly)

Group	No	Mean	St. Deviation	t-value	Sig. (2-tailed)
Pre-test	35	79.9143	2.507	2.678	0.01
Middle test	35	88.571	2.581		

Additionally, the results of the next ANOVA analysis, with the Sig (2 tailed) of 0.00<0.05, indicate significant differences between the pre-test and the post-test of Grammark, as can be seen in Table 4. This empirical evidence suggests that the students can be encouraged to correct their mistakes by giving them a sense of awareness and autonomy when using Grammark. In conclusion, Grammark helped them significantly improve the students' writing performance.

The one-way ANOVA test showed that the null hypothesis, "There is no significant difference in the writing skills among Indonesian undergraduate EFL students using AWE tools (Grammarly and Grammark)," was rejected. The pre-test and post-test results show that AWE tools improved students' writing performance. Based on the findings of this study, Grammarly and Grammark provided similar writing feedback to help participants improve their grammar, punctuation, mechanics, and style. In conclusion, after using Grammarly and Grammark, the students improved their writing performance and were motivated to correct their mistakes themselves, which eventually increased their awareness and autonomy.

Table 4. ANOVA (pre-test and post-test of Grammark)

Group	No	Mean	St. Deviation	t. value	Sig. (2-tailed)
Pre-test	35	79.9143	2.507	4.176	0.0
Post-test	35	93.50	2.581		

3.2. How AWE tools (Grammarly and Grammark) affect Indonesian undergraduate EFL students' writing skills?

To answer the second research question, paired t-test was used to determine the effect of AWE tools on Indonesian undergraduate EFL students' writing skills, followed by comparing the results of using Grammarly twice and Grammark twice among the students from the pre-test, middle-test, and post-test. The results show that using paired t-test, the Sig. was 0.00<0.05. Based on the means, there was a difference, where the pre-test value was 79.9143 and the middle-test was 88.571. The difference from Grammarly is significant as can be seen in Table 5.

Table 5. A paired t-test (Pre-test and middle test of Grammarly)

Group	No	Mean	St. Deviation	T. Value	Sig. (2-tailed)
Pre-test	35	79.9143	2.507	-20.581	0.00
Middle test	35	88.571	2.581		

Then, based on the analysis results using paired t-test, a Sig. was 0.00<0.05. From the mean of the pre-test, the value was 79.9143, while the post-test value was 93.500, and it was proven that there was a significant difference. So, it can be concluded that there is a difference between the pre-test and the post-test of using Grammark as displayed in Table 6. Moreover, in line with the previous explanation, the two AWE tools provided immediate feedback on similar grammar, punctuation, and writing style, increasing the undergraduate EFL students' awareness of and capability in detecting and reformulating their mistakes in the texts. The different sequence in the application of AWE tools benefited learners because Grammarly and Grammark have similar characteristics for giving immediate feedback to writing texts.

Table 6. A paired t-test (Pre-test and post-test from Grammark)

Group	No	Mean	St. Deviation	T. Value	Sig. (2-tailed)
Pre-test	35	79.91	2.507	-28.404	0.00
Post-test	35	93.50	1.311		

3.3. Undergraduate EFL students respond to the use of AWE tools (Grammarly and Grammark)

The results of the analysis of the undergraduate EFL students' perceptions of the use of Grammarly as revealed in Table 7 show that feedback from Grammarly helps them a lot, particularly for their writing assignments (M=4.31). The students believe that Grammarly in their writing assignments help their grammar (M=4.23) and that the use of Grammarly in their essay is very effective in supporting the writing process (M=4.20). However, the students were not convinced that the use of Grammarly is effective in improving the result of their writing assignments (M=3.89), nor do they believe that Grammarly in their writing assignments helps their vocabulary (M=3.94).

Table 7. Mean presentation of respondents (Grammarly)

Statement	Median	Mean	SD
The feedback from Grammarly makes it easier to understand the content of my writing assignments.	4.00	4.14	0.601
Feedback from Grammarly helps me a lot, particularly for my writing assignments.	4.00	4.31	0.676
Grammarly's feedback gives me better diction, language use, and mechanics in my writing assignments.	4.00	4.11	0.676
The use of Grammarly in my essay is very effective in the form of its fast response.	4.00	4.14	0.601
The use of Grammarly in my essay is very effective in supporting the writing process.	4.00	4.20	0.677
The use of Grammarly in my essay is very effective related to the word suggestions are given.	4.00	3.51	0.702
The use of Grammarly is effective in improving the result of my writing assignment.	4.00	3.89	0.676
The use of Grammarly made me happy after I got its feedback to complete my writing assignments and my writing skills.	4.00	3.86	0.692
After I used Grammarly, I felt happy because can write more for my writing assignments.	4.00	3.63	0.731
I felt more confident to submit my writing assignments after I used Grammarly.	4.00	4.09	0.781
I believe that Grammarly in my writing assignments helps my vocabulary.	4.00	3.94	0.725
I believe that Grammarly in my writing assignments helps my mechanics.	4.00	3.83	0.664
I believe that Grammarly in my writing assignments helps my punctuation.	4.00	3.94	0.684
I believe that Grammarly in my writing assignments helps my sentence coherence.	4.00	3.89	0.718
I believe that Grammarly in my writing assignments helps my grammar.	4.00	4.23	0.646
I believe that Grammarly in my writing assignments helps me generate ideas.	3.00	3.14	0.733
I believe that Grammarly in my writing assignments helps my techniques.	3.00	3.49	0.702
I believe that Grammarly in my writing assignments helps my style.	3.00	3.34	0.725
I believe that Grammarly in my writing assignments helps my logic development.	3.00	3.40	0.812
I believe that Grammarly in my writing assignments helps my organization.	3.00	3.71	0.710

The students' responses to the questionnaire show positive appreciation about the use of Grammarly. There were six statements with the highest scores: 1, 2, 4, 7, 10, to 16. To be more specific, statement 1 saying that the feedback from Grammarly makes it easier for them to understand the content of the writing assignments was positively accepted by 88.6% students. Next, statement 2 suggests that feedback from Grammarly helps them a lot in writing assignments (88.6%). Then, statement 4 states that the use of Grammarly in their essay is very effective in the form of its fast response, with a score of 88.6%. Statement 7 proves that the use of Grammarly is effective in improving the result of the students' writing assignment, with its highest score of 87.2%. Moreover, in statement 10, students felt more confident to submit their writing assignments after using Grammarly, with a score of 80.0%. Finally, statement 16 shows that the students believe that Grammarly in their writing assignments helps their grammar, with a score of 88.6% as revealed in Table 8.

Table 8. The percentage of respondents (Grammarly)

Statement	Median	Mean	SD
The feedback from Grammarly makes it easier to understand the content of my writing assignments.	4.00	4.14	0.601
Feedback from Grammarly helps me a lot, particularly for my writing assignments.	4.00	4.31	0.676
Grammarly's feedback gives me better diction, language use, and mechanics in my writing assignments.	4.00	4.11	0.676
The use of Grammarly in my essay is very effective in the form of its fast response.	4.00	4.14	0.601
The use of Grammarly in my essay is very effective in supporting the writing process.	4.00	4.20	0.677
The use of Grammarly in my essay is very effective related to the word suggestions are given.	4.00	3.51	0.702
The use of Grammarly is effective in improving the result of my writing assignment.	4.00	3.89	0.676
The use of Grammarly made me happy after I got its feedback to complete my writing assignments and my writing skills.	4.00	3.86	0.692
After I used Grammarly, I felt happy because can write more for my writing assignments.	4.00	3.63	0.731
I felt more confident to submit my writing assignments after I used Grammarly.	4.00	4.09	0.781
I believe that Grammarly in my writing assignments helps my vocabulary.	4.00	3.94	0.725
I believe that Grammarly in my writing assignments helps my mechanics.	4.00	3.83	0.664
I believe that Grammarly in my writing assignments helps my punctuation.	4.00	3.94	0.684
I believe that Grammarly in my writing assignments helps my sentence coherence.	4.00	3.89	0.718
I believe that Grammarly in my writing assignments helps my grammar.	4.00	4.23	0.646
I believe that Grammarly in my writing assignments helps me generate ideas.	3.00	3.14	0.733
I believe that Grammarly in my writing assignments helps my techniques.	3.00	3.49	0.702
I believe that Grammarly in my writing assignments helps my style.	3.00	3.34	0.725
I believe that Grammarly in my writing assignments helps my logic development.	3.00	3.40	0.812
I believe that Grammarly in my writing assignments helps my organization.	3.00	3.71	0.710

Then, from the descriptive statistics of the questionnaire results from students' perceptions of Grammark as shown in Table 9, "*I believe that Grammark in my writing assignments helps my grammar*" (M=3.83), "*the use of Grammark in my essay is very effective in the form of its fast response*" (M=3.77), as well as "*I believe that Grammark in my writing assignments helps my mechanics*" (M=3.77). However, respondents were not convinced that "*the use of Grammark is very effective in improving the result of my writing assignment*" (M=3.74), nor did they believe that Grammark in the writing assignments helped their punctuation (M=3.71).

Table 9. Mean presentation of respondents (Grammark)

Statement	Median	Mean	SD
The feedback from Grammark makes it easier to understand the content of my writing assignments.	4.00	3.63	0.770
Feedback from Grammark helps me a lot, particularly for my writing assignments.	4.00	3.51	0.702
Grammark 's feedback gives me better diction, language use, and mechanics in my writing assignments.	4.00	3.63	0.808
The use of Grammark in my essay is very effective in the form of its fast response.	4.00	3.77	0.690
The use of Grammark in my essay is very effective in supporting the writing process.	4.00	3.60	0.695
The use of Grammark in my essay is very effective related to the word suggestions are given.	4.00	3.54	0.980
The use of Grammark is effective in improving the result of my writing assignment.	4.00	3.74	0.741
The use of Grammark made me happy after I got its feedback to complete my writing assignments and my writing skills.	4.00	3.43	0.850
After I used Grammark, I felt happy because can write more for my writing assignments.	4.00	3.40	0.812
I felt more confident to submit my writing assignments after I used Grammark	4.00	3.69	0.631
I believe that Grammark in my writing assignments helps my vocabulary.	4.00	3.86	0.494
I believe that Grammark in my writing assignments helps my mechanics.	4.00	3.77	0.690
I believe that Grammark in my writing assignments helps my punctuation.	4.00	3.71	0.710
I believe that Grammark in my writing assignments helps my sentence coherence.	4.00	3.57	0.815
I believe that Grammark in my writing assignments helps my grammar.	4.00	3.83	0.707
I believe that Grammark in my writing assignments helps me generate ideas.	4.00	3.66	0.684
I believe that Grammark in my writing assignments helps my techniques.	4.00	3.63	0.770
I believe that Grammark in my writing assignments helps my style.	3.00	3.40	0.695
I believe that Grammark in my writing assignments helps my logic development.	4.00	3.74	0.780
I believe that Grammark in my writing assignments helps my organization.	4.00	3.63	0.598

The questionnaire informing the use of Grammark shows that there were two statements with the highest score, that is, statements 16 and 20. Statement 16 which says "*I believe that Grammark in my writing assignments helps my grammar*" scores 71.4%. Next, statement 20, stating "*I believe that Grammark in my writing assignments helps my vocabulary*" amounts 85.8% as shown Table 10. This study has found that the use of AWE tools in terms of Grammarly followed by Grammark had a beneficial effect on students' writing and that students show positive attitudes toward the tools. In addition, Grammarly and Grammark were used to determine whether or not there was a statistically significant difference in improvement between the two groups who used the computer programs, respectively.

Table 10. The percentage of respondents (Grammark)

Items	SA	A	N	D	SD
The feedback from Grammark makes it easier to understand the content of my writing assignments.	5.7%	62.9%	20%	11.4%	0%
Feedback from Grammark helps me a lot, particularly for my writing assignments.	2.9%	54.3%	34.3%	8.6%	0%
Grammark's feedback gives me better diction, language use, and mechanics in my writing assignments.	8.5%	57.1%	22.9%	11.4%	0%
The use of Grammark in my essay is very effective in the form of its fast response.	11.4%	57.1%	28.6%	2.9%	0%
The use of Grammark in my essay is very effective in supporting the writing process.	2.9%	62.9%	25.7%	8.6%	0%
The use of Grammark in my essay is very effective related to the word suggestions are given.	14.3%	42.9%	28.6%	11.4%	2.9%
The use of Grammark is effective in improving the result of my writing assignment.	11.4%	57.1%	25.7%	5.7%	0%
The use of Grammark made me happy after I got its feedback to complete my writing assignments and my writing skills.	2.9%	54.3%	28.6%	11.4%	2.9%
After I used Grammark, I felt happy because can write more for my writing assignments.	2.9%	51.4%	28.6%	17.1%	0%
I felt more confident to submit my writing assignments after I used Grammark	5.7%	60%	31.4%	2.9%	0%
I believe that Grammark in my writing assignments helps my vocabulary.	2.9%	82.9%	11.4%	2.9%	0%
I believe that Grammark in my writing assignments helps my mechanics.	11.4%	57.1%	28.6%	2.9%	0%
I believe that Grammark in my writing assignments helps my punctuation.	8.6%	60%	25.7%	5.7%	0%
I believe that Grammark in my writing assignments helps my sentence coherence.	5.7%	57.1%	28.6%	5.7%	2.9%
I believe that Grammark in my writing assignments helps my grammar.	14.3%	57.1%	25.7%	2.9%	0%
I believe that Grammark in my writing assignments helps me generate ideas.	5.7%	60%	28.6%	5.7%	0%
I believe that Grammark in my writing assignments helps my techniques.	11.4%	45.7%	37.1%	5.7%	0%
I believe that Grammark in my writing assignments helps my style.	2.9%	42.9%	45.7%	8.6%	0%
I believe that Grammark in my writing assignments helps my logic development.	17.1%	42.9%	37.1%	2.9%	0%
I believe that Grammark in my writing assignments helps my organization.	2.9%	60%	34.3%	2.9%	0%

SA=Strongly agree; A=Agree; N=Neutral; D=Disagree; SD=Strongly disagree

4. DISCUSSION

Regarding the first research question, the undergraduate EFL students' writing skills were significantly improved as shown in the results of the two measurements: the pre-test and the middle-test as well as between the pre-test and the post-test. This was determined by comparing the results of both sets of tests. According to these findings, new developments in computer technology, such as AWE tools, particularly Grammarly and Grammark for computers, aided in developing proposed writing skills.

In terms of responding to student writing, much of the research that utilizes AWE frames a given technology for a specific purpose: to evaluate a particular improvement of writing measure (e.g., grammar and usage error reduction) [30], [31]. Moreover, under the present results, previous studies have demonstrated that AWE technology is typically examined in writing research studies for a specific, often narrow purpose, that is, to evaluate a particular writing improvement measure, to mine data for changes in writing performance, or to demonstrate the effectiveness of a single technology [32], [33].

Then, the participants knew they made fewer mistakes in their texts after receiving immediate feedback from AWE tools. The feedback from AWE tools varies from spelling, word choice, punctuation, style, word phrase, transition, passive voice, to run-on sentences. This indicates that the feedback from the AWE tools were useful for time management while they were doing the writing tasks. This finding aligns with finding that AWE tools like Grammarly help writers become more fluent by saving them time while composing ideas. This results in greater language output [34]. Moreover, AWE systems' implementation and design to assist in teaching and learning writing are covered in this course [35], [36]. In sum, the undergraduate EFL students who participated in the study had the beliefs that feedback from AWE tools is required to produce good writing because they are helped to detect various types of errors in their texts.

As for the second research question, this study sought to determine to what extent AWE tools affect Indonesian undergraduate EFL students' writing skills. Grammarly and Grammark, the two AWE tools utilized in this study, were found to offer feedback on similar writing aspects, assisting the undergraduate EFL students in improving their grammar, punctuation, mechanics, and style, and thus their writing accuracy. This study shows that the t-test results revealed positive effects among the undergraduate EFL students participating in the proposed AWE programs, confirming the earlier study's findings [37]–[39].

Moreover, this study's conclusions align with the previous research in that proponents of AWE systems argue these tools can increase writing practice, improve learner motivation and accuracy, and foster learner autonomy [40], [41]. However, receiving feedback from the teacher regarding the aspects of writing not aided by the AWE tools seems to be still essential, confirming that technology assists learners in certain writing areas but not others. In addition, all of the essays the students wrote were corrected in seconds, saving the teacher both time and an enormous amount of work, making it challenging to provide consistent feedback in a short period [42], [43]. These findings are also compatible with recent studies showing how L2 writers

who engage in output practice guided by teacher feedback and consistent actions contribute to developing L2 writing skills [44], [45].

Regarding the undergraduate EFL students' perceptions about the use of AWE tools, it was found that they positively responded to the potential effect of using AWE on improving some aspects of their writing skills. This finding is in line with previous studies in that students who took the initiative to develop their writing skills independently had a positive perception of using AWE; there is a positive correlation between students' perceptions and their essay quality [46]–[48]. The participants in this study had positive opinions of AWE and believed it helped address deficiencies in their grammar knowledge, word usage, writing style, and writing mechanics. This finding was also similar to the ones reported by previous researchers [49], [50] that AWE can help students avoid plagiarism and support writing from sources when performing writing assignments. In sum, AWE tools may help students improve their performance and help increase interest, motivation, and self-esteem in the writing class.

5. CONCLUSION

The current study aimed to determine the effects of using automated writing evaluation tools on students' argumentative writing texts as well as to explore students' perceptions about the use of the tools. The use of AWE tools in Grammarly followed by Grammark affected the undergraduate English as a foreign language students' writing skills, motivated them to reformulate their errors through a sense of awareness and autonomy. However, it is important to note that human guidance is still required to compensate the limitations of the AWE tools, thus making it clear that these technological tools are recommended to use in writing classes in conjunction with teacher feedback. Furthermore, it is critical to recognize that writing motivation and quality are linked to writing learners' objectives and needs. Therefore, even though AWE tools have demonstrated their limitations, such as in content development, they may be beneficial to both teachers and students when used with appropriate monitoring and guidance from the teacher.

The findings of this study suggest the importance of giving students more autonomy when they do their writing assignments. Providing students with additional writing opportunities for practices and offering a list of topics or allowing them to select topics of interest to develop might be the next possible recommendation for teachers. In addition, discussions among teachers using the tools might be encouraged to clarify any doubts students may have when using AWE tools. An implication is that examples of written texts should be provided to gain more concrete ideas about writing a better and more organized written text. More broadly, further research is also needed to examine the application of AWE tools in EFL writing with the use of peer feedback. Moreover, revising aspects of the writing content syllabus that students may have misunderstood may lead to new findings.

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