

1. Introduction

1.1 Background to the Study

A wiki, according to Winder (2007), is an asynchronous mode of collaborative communication that allows people to create knowledge together that can be edited and revised by other people. Editing, discussion, and history pages are the three core characteristics of a wiki. Users can contribute their thoughts to the editing page and remark on other people's work. Through reciprocal conversation and mutual involvement, individuals can utilize discussion forums to discover challenges, negotiate meaning, and propose solutions (Marandi & Nami, 2013). The history section, on the other hand, is in charge of keeping track of changes and progression during the course. When the collaboration proceeded from discussion to its final stage, Bruns and Humphreys (2005) stated that conversation served as "a form of ongoing meta-analysis on the part of the authors" (p. 28).

Addis Ababa Science and Technology University (AASTU) is one of Ethiopia's higher education institutes. It presently operates under the motto "University for Industry." Its "What shall we do for you?" approach to the program's launch and research activities is based on this principle. To attain this purpose, students assigned to each university college should be assisted in becoming informed enough to effectively serve the industry. There are five colleges at this university. One of them is the College of Natural and Social Sciences. This college has several divisions, one of which is the English language division. It might be claimed that students in higher education, such as those at AASTU, should improve their writing skills by utilizing new language learning technology in general and wikis in particular, because they communicate through writing while learning. Students at this university have trouble in expressing their emotions through writing. As discussed by Lohnes and Kinzer (2007), employing a wiki-based collaborative writing project can assist students to improve their writing skills. In light of this, the focus of this research was to see how wiki-based collaborative writing affected their writing performance in an EFL writing setting when compared to face-to-face instruction.

1.2 Statement of the Problem

"What is the role of language teaching in the information technology society?" Warschauer (2001) posed this critical question. This is still a valid question. As he pointed out, answering this question can provide new insight into the goal of learning and teaching English at university for English language teachers and students. According to Warschauer, one way to engage students is to have them work on a project that involves negotiation, teamwork, goal setting, and meaningful communication. This means that university students must learn to acquire a new set of English language literacies, which include new ways of communicating through writing and the use of online tools like wikis.

In terms of the researchers' experience, university students have a strong attachment to technology. A well-equipped digital library with a high-speed internet connection is available. Furthermore, students require soft copies rather than hard copies. The majority of students have cellphones that may be used to visit various social networking sites. Wi-Fi is also available in their dorms and classrooms. This could be an opportunity to assist students in improving their writing abilities. Using wiki-based collaborative writing to improve students' writing proficiency is a crucial step (Lohnes & Kinzer, 2007). However, in the context of the current study, the impacts of wiki-based collaborative writing on students' writing performance is investigated. The major reason, as most of these teachers believe, is the incomprehensible writing that most students generate in answer to exam items.

The current study differs from others in that it looks into the effects of wiki-based collaborative writing on students' writing performance. Furthermore, the research context and setting are additional elements that distinguish this study from others in terms of participants, resources, analysis techniques, and study design.

Considering everything, writing plays a larger role at this level because most students' academic accomplishments are strongly linked to writing essays, term papers, assignments, and examinations. No one has yet researched the effects of wiki-based collaborative writing on students' writing performance in the context of Ethiopian higher institutions in general, and AASTU in particular- as far as our reading and understanding of the area goes. As a result, this study was carried out to propose solutions to the aforementioned issues concerning the teaching and learning of writing skills at the university level. Considering that the main objective of the study is to investigate how wiki-based collaborative writing affects students' writing performance, the research sought to provide answers to the following heuristic research questions.

1. Which groups' writing performances considerably improved in the posttest in terms of organization, content, vocabulary, grammar, and mechanics?
2. Will the post-writing test reveal a statistically significant improvement in the experimental group's writing skills in terms of content, organization, vocabulary, grammar, and mechanics?

1.3 Hypotheses of the Study

Wiki-based collaborative writing brings statistically significant changes on students' writing performance in terms of content, organization, vocabulary, grammar, and mechanics vis-a`-vis face-to-face instruction between and within groups.

2. Methods and Materials

2.1. Research Design

In this study, a quasi-experimental design was used. The intervention necessitates a quasi-experimental method with pre and posttests to compare control and experimental groups. The current study's first and second research questions necessitate quantitative data that can be gained from the intervention.

2.2. The Study Procedure

Prior to the study's implementation, AASTU's academic vice president, college dean, and Library and Documentation Service Director Offices received a letter of cooperation as well as the study's timetable. The study lasted ten weeks, with the treatment-taking place in the digital library (Block 44), while the control group received instruction in the classroom (Building 59, room 210). The following sections provide an overview of the overall teaching approach for both groups.

Instructional methodology for the two Groups. As this was quasi-experimental research, the control and experimental groups were given distinct instructions. The intervention lasted 10 weeks in total (3 hours each week). The next section discusses the technique for each section.

Experimental group. The purpose of the study was explained utilizing an information sheet on the first day of week one. Following the introductory session, participants signed the consent form to express their willingness to participate in the study. The demographic information was obtained after they signed. Participants brainstormed about essays and essay writing in general during the second session (class). The

experimental group was then given pretests in the third session. The training for PBworks, which is the specific name of the wiki selected for the project, began in the first session of week 2. The training was divided into two parts: theoretical and practical.

Theoretical aspects of the training. How to log in to the workspace is covered in the theoretical portion of the course. These training points were boosted during the second week's initial session. The second day of the intervention focused on saving, editing, creating a new page, creating a folder, signing out, accessing the history page, creating a link, uploading files, inserting plugins, moving folders, and editing an account. The theoretical elements of the training were carried out in block 80, room 111, by producing power point presentations and utilizing an LCD projector.

Practical aspects of the training. The practical part of the training began on the third day of the intervention in week 2, on the first floor of the digital library. First, the researcher created the workspace <http://befikadulemma.pbworks.com>. Each workspace had its user list and settings, and it served as a repository for students' content. Following that, participant user names and passwords were created and provided for them. Every participant was allocated to a pair. There were a total of 17 pairs.

Then, using their user names and passwords, all participants attempted to access all points specified in the theoretical portion of the course in practice. They completed the first job and shared it with their coworkers (wiki). They reacted to what their friends had to say. They completed assignment two and shared it with their peers. Following the creation of the plan, each pair produced the first draft of the essay on their pages using the wiki interface.

In the second session of the intervention, participants did the first task posted on each page of the pairs. The instruction said 'examine the parts of the following essay and complete the activity below it.' The sample essay was posted on each page of the participants. On the third week of the intervention's third session, produced a summary of the aforementioned sample essay on their pages. Task three was completed by the pairs on week four of the intervention's first session. There was no introduction or ending paragraphs in the essay placed on the workspace. Therefore, using the body of the essay as a guide, pairs wrote their opening and ending paragraphs. They began by writing out the outline of the paragraph. They wrote the draft of the essay based on the outline. The experimental group pairs edit the written essay in the second session of week 4. The final essay was published on each pair's respective sites on the same day. Furthermore, on the second intervention session of week 4, participants in the experimental group completed the outline and draft of task for the fourth essay.

On the third intervention session of week 4, the drafted essay of day two was edited and each pair published the final version of the essay on the same day on the wiki pages. The focus of week 5 of the first intervention session was on task five (exercise 5). It was argumentative essay writing. On this day, the outline and draft of the essay were completed and posted on the wiki pages by each pair. The instruction for the task was: Some people think that the government should spend as much money as possible on developing space technology for the exploration of the moon and other planets. Others think that this money should be spent on solving the basic problems of society on Earth. Which view do you agree with? Use specific reasons and examples to support your answer.

On the second day of week 5, all pairs (17) did the following tasks. The first task was editing the drafted essay, which was done in the first intervention session, and the final essay was published on the workspace (wiki). In addition, the outline and draft of the expository essay for task 6 were completed and posted on Wiki. In the first session of week 6, each pair (17) discussed expository essay writing. A note about expository essay writing was put on the pages of each pair. All the participants of the pairs read, discussed, and shared their views via their pages. Each pair did one task on the first intervention session of the week. This instruction and the sample essay were posted on the pages of each pair. After this task was completed, task 8 was done. The instructions for this task were posted on the pages of each pair.

All pairs outlined the points that would be included in the essay. Besides to the outline, participants (all pairs) drafted the essay and posted it on their wiki pages for comments. All these were completed on the same day. In the second intervention session of week 6, editing the drafted essay and publishing the final version of the essay were the tasks of the pairs. In the last intervention session of week 6, emphasis was given to task 9. Next, the pairs drafted the essays and posted them on their pages.

In week 7 of the first intervention session, all pairs edited the drafted essay together using Wiki and posted it on their pages. Finally, they published the final essay and posted it on their wiki pages. In the second session, there were discussions about descriptive essay writing and the basic steps to writing an effective descriptive essay. All points related to descriptive essay writing were posted on the pages of all pairs (17). Then, using a wiki, all participants shared their thoughts on their respective pages.

Task 10 was done on the third intervention session of week 7. On this day, all pairs (17) discussed and produced the outline of the essay that would be written. Based on the outline, pairs wrote the draft of the essay on their pages. They were asked to write as many notes as they can that describe their dorm. Then they arranged their notes based on certain common features. Using this plan, they wrote a descriptive essay of appropriate length (three to five paragraphs).

On the first day of week 8, all pairs edited their drafted essay by collecting comments from their pairs posted on their page. Finally, pairs finalized the essays and posted them on their pages. On day 2 of week 8, participants did task 11. This task was also about descriptive essay writing.

This instruction was posted on the pages of each pair. Then, all pairs outlined the points that could be included in the essay and posted them on their pages. They then wrote a draft of the essay and shared it with their groups via wiki. Based on the comments they shared and received, they edited the drafted essay and published the final essay on day 3 of week 8. In week 9 of the first session, all pairs discussed narrative essays. The notes about narrative essay writing were posted on the pages of each pair. They read the sample essay and answer the questions that followed it. Then, they shared their answers on their wiki pages. On day 2 of the same week (9), students did task 13.

The instruction was posted on the pages of each pair. All pairs put the outline of the essay and shared it with their pairs using their pages. Following the outline, they wrote the draft of the essay and posted it on the workspace (wiki). On the last session (day 3) of week 9, using the comments found on their pages, all pairs edited their drafted essay and published the final essay on their pages. Individual posttest writing was delivered to all experimental group participants on the first day of week 10. The next part discusses the teaching-learning approach used in the control group.

Control group. The teaching-learning approach used in the control group is discussed in this section. The purpose of the study was conveyed via an information sheet in the first week of day one. Following the introduction of the study's purpose, participants expressed their agreement to participate in the study by signing the consent form. In addition, students were given an information sheet describing the study. The demographic information was obtained once they signed. On the second day, participants brainstormed about essays and essay writing. Then, on day three, pretests were administered. Students were introduced to the course objectives on the second day of class in week two. They read from the course material. Then, on the same day, they completed the first assignment face-to-face with the assistance of the teacher, using paper and pen. Following that, they reflected on their responses to the class. In the second class of the week, participants did second task ace-to-face using paper and pen. Finally, they were asked to reflect on their answers for the class.

After students reflected their answers, they wrote the summary of the essay within one paragraph on day 3 of week 3 using paper and pen. In the end, they read their summary for the class. In week 4 of the first class, students did task 3. The sample essay from the material had no introductory and concluding paragraphs. So, using the body of the essay as a guide, students wrote their own introductory and concluding paragraphs, and those who were randomly selected read their paragraphs to the class. First, they wrote the outline of the paragraph. Based on the outline, they wrote their draft essay face-to-face. On the second day of week 4, the

students edited the drafted essay of day one face-to-face using paper and pen. On the same day, they wrote their final essays and submitted them to the teacher. Moreover, participants produced the outline and draft of the essay for task 4 face-to-face on day 2.

On the last day of week 4, the essay, which was drafted on day 2, was edited and the final version of the essay was written on the same day using paper and pen and submitted to the instructor for further comments. In week 5 of the first class, students did task five. It was about argumentative essay writing. On this day, the outline and draft of the essay were completed using paper and pen with the help of the teacher.

On the second day of the week, all participants did the following tasks. The first task was about editing the drafted essay and publishing the final essay face-to-face using paper and pen. Moreover, the outline and draft of the expository essay of task 6 were completed face-to-face. The drafted essay was written on day 2 of week 5 and was edited and published in the third class.

On the first day of week 6, students discussed expository essay writing. They used the material as a reference for writing an expository essay. The instruction was ‘The paragraphs below can provide a meaningful expository essay. However, they are not in the right order. Please give their correct orders and write your justification in one paragraph. After this task was completed, task 8 was done.

All students outlined the points that would be included in the essay. Besides the outline, participants drafted their essays face-to-face using paper and pen. All these were completed on the same day. Editing the drafted essay and publishing the final version of the essay face-to-face using paper and pen were the activities performed in the second class of week 6. The last day (3) of the week (6) was about task 9. Then, students wrote the outline of the essay face-to-face using paper and pen.

In week 7 of the first class, all participants edited the drafted essay. Finally, they published the final essay using pen and paper and submitted it to the teacher. On the second day, there were discussion sessions about descriptive essay writing and the basic steps to writing an effective descriptive essay. All points related to descriptive essay writing were put in the teaching material. Finally, all participants read notes about descriptive essay writing from the teaching material. Task 10 was started on the third day of week 7. On this day, all students discussed and produced the outline of the essay they were going to write individually. Based on the outline, they wrote the draft of the essay using pen and paper.

In the first class of week 8, all participants edited the drafted essay by themselves. Finally, all students wrote the final essay using pen and paper and submitted it to the teacher. On day 2 of week 8, participants did task 11. This task was about descriptive essay writing. After reading the instruction, all students outlined the points that could be included in the essay using pen and paper individually. Next, they wrote the draft of the essay. Finally, they edited the drafted essay and published it on the 3rd day of week 8. In week 9 of the first session, all students discussed narrative essays. They read notes and a sample narrative essay from the teaching material and answer the questions that follow it. Then, they shared their answers with the class.

All of the participants created an outline for the essay and requested their teacher to review it. They used pen and paper to write the draft of the essay after following the outline. On the last session (day 3) of week 9, all students independently revised their written essays and published the final essays using pen and paper. Individual posttest writing was delivered to all participants in the control group on the first day of week 10.

2.3. Data Gathering Tools

Tests and sample essays from the wiki-discussion and history pages were included in this section. What kind of data would be collected, and how would it be collected? The sections that follow explain which instruments are best for which research issues.

Tests (Timed Writing Essays). The TWE is a standardized test used in English-language institutes to assess students' writing performances. On a test, participants were given a question or a series of questions and

asked to compose an essay about one of these themes in one hour. Researchers recommend the timed writing assignments (compositions) like most employed in this study (Alegra de la Colina & Garca Mayo, 2007; Watanabe & Swain, 2007; Wigglesworth & Storch, 2009; Storch, 2013). The students in this study were given questions on pretests and posttests to answer the first research question. The essay-writing test was designed to evaluate the student's writing skills. At the end of week 10, as previously stated, all individuals completed the pre and posttests separately. The pre and posttests were evaluated using the Jacobs, Zinkgraf, Wormuth, Hartfiel, and Hughey (1981) rubric. Content, organization, vocabulary, grammar, and mechanics were among the five criteria used to evaluate writing abilities. Each criterion is worth a different number of points (content is worth 30 points, the organization is worth 20 points, vocabulary is worth 20 points, grammar is worth 25 points, and mechanics is worth 5 points). The average scores of all these measurement components were totaled to compute the overall writing performance (100 points).

The rubric has been validated by a few researchers (Shehadeh, 2011; Ansarimoghaddam & Tan, 2013; Annas, 2016). To ensure the reliability of the observational rating in both situations, the researcher used inter-rater reliability (IRR) to estimate the adjustment between the scores of both raters. According to Hallgren (2012) "The intraclass correlation (ICC) is one of the most often used statistics for analyzing IRR for an ordinal, interval, and ratio variables". ICCs are suited for research with two or more graders, according to Hallgren, and are used when raters rate all of the participants' essays in a study. Although the data in this study was ordinal and the study's pre and posttests were scored by two raters, the ICC was used.

ICC values range from 0 to 1, with ICC values less than 0.40 indicating poor agreement, ICC values between 0.40 and 0.59 indicating fair agreement, ICC values between 0.60 and 0.74 indicating good agreement, and ICC values between 0.75 and 1 indicating excellent agreement (Cicchetti, 1994).

The inter-rater reliability and degree of agreement between the raters were assessed using ICC in this study. The researchers used the average mean score of all 68 students' pretests provided by the two raters in the study for each component (content, organization, vocabulary, grammar, and mechanics). Furthermore, because the researcher used the two raters' average scores for each component, the focus of ICC was on average measures. The average ICC measures of the two raters were .764 in the ICC analysis, suggesting acceptable agreement between the two raters and, as a result, acceptable inter-rater reliability.

The Cohen's d effect size was also calculated in the current investigation, in addition to the statistical significance between the two groups. Statistical significance, according to Cohen (1992), is the least interesting aspect of the study's findings. The findings should be expressed in terms of a magnitude not simply whether a treatment affects people, but how much it affects them. The magnitude of the experimental effect is measured in effect size, which is a quantitative measure. According to Cohen, the stronger the relationship between the two variables, the larger the effect size is. For the analysis of the two research questions, Cohen's d effect size (d) was first calculated. The effect size lies between 0 and 1, with .10 being small, .30 being medium, and .50 and above being large (*ibid*). As indicated by Cohen, the effect size between two groups could be calculated simply by dividing the mean differences of the two groups value by the square root of the standard deviation of the two groups divided by 2 ($d = \frac{|m_1 - m_2|}{\sqrt{\frac{s_1^2 + s_2^2}{2}}}$). The value of N (total number of participants) in the independent samples t-test (experimental and control groups) was 68.

Where,

Cohen's d (d) = effect size between the experimental and control group

m_1 = the mean of the experimental group

m_2 = the mean of the control group

s_1^2 = standard deviation of the experimental group

s_2^2 = standard deviation of the control group

As a result, the practical significance or effect size of both groups was computed. The analysis indicated that there was also a large effect size between the control and experimental groups' writing performance in terms of content, organization, vocabulary, language use, and mechanics.

2.4. Data Analysis Procedure

Two raters assessed and rated the participants' pre and post-tests using the aforementioned writing rubrics after they completed the post-essays. Each rater graded each participant's essay based on one dependent variable with five components (overall writing performance with content, organization, vocabulary, grammar, and mechanics). The average mean scores of each dependent variable on each participant's pre and posttests were calculated once the raters concluded the rating, as previously stated. All of the results were recorded and organized in an Excel spreadsheet. Each rater assigned a score to each participant, and the average scores of each dependent variable on the pre and posttests of the essays were calculated. The information was then analyzed using the Statistical Package for Social Science (SPSS) Version 24. The control and experimental groups were compared in five different ways. Five separate comparisons were made between the control and experimental groups. These comparisons were made based on student's overall writing performance in terms of content, organization, vocabulary, language use and mechanics.

Pre and Posttests Analysis. Independent samples t-tests and descriptive statistics were used to analyze the collected data to answer the first research question. The results from the pre and posttests were compared to examine if there were statistically significant differences between the experimental and control groups. SPSS was used to do statistical computations. The alpha level of significance $p < .05$ (95% confidence) was determined before data collection and was used throughout the study. That was because it has been agreed on in educational research that the alpha level of significance $p < .05$ (95% confidence) is one of the most commonly used levels of significance (Ary, Jacobs, & Reazavieh, 2002). In the current study, the assumption of T-test has been met. As it is reported in the analysis section, there were statistically significant differences between the control and experimental groups' writing performance in all components on the posttest ($p < .05$).

2.5. Validity and Reliability of the Tests

The validity and reliability of the tests were verified before collecting data. Reviewers checked the face and content validity of the pre and posttests. The tools were pilot tested to detect possible appropriateness, clarity, and flaws in measurement procedures including instructions, item content, and time limits. Participants in the experimental group were similar to those in the control group in that they attended the same institution and came from similar socioeconomic backgrounds. Their writing performance was also at the same level before the intervention. It was checked by using pretests. As mentioned earlier, the average ICC measures of the two raters were .764 in the ICC analysis, suggesting acceptable agreement between the two raters and, as a result, acceptable inter-rater reliability.

3. Result of the Study

3.1 Quantitative Analysis of Pre-intervention Data

Before the wiki intervention, pretests were used to determine the baseline scores of students' writing performance. The baseline scores were used for two purposes. The first objective was to see if the two groups

(control and experimental) were equivalent and that there were no differences in writing performance between them. The second reason was to compare the posttest findings to determine the treatment's effects. The pretests were analyzed using descriptive statistics, an independent samples t-test, and a paired sample test.

Analysis of pretests. During the study's pre-intervention phase, 68 participants were asked to write an essay that served as a pretest having five paragraphs. The participants had 1:30 hours to respond to the following question: *what were the three most important reasons for you to come to AASTU to further your studies?* Two English language instructors with over 20 years of teaching experience evaluated the students' pretests. Both groups' pretests were graded with good agreement by the raters. For all dependent variables, the average student scores were determined. The findings of this analysis are described in this part, starting with the overall writing performance as determined by the five measurement components.

Overall writing performance. The analysis of overall writing performance in the pretest focuses on adding up all of the mean scores of the five dependent variables assessed by two raters in terms of content, organization, vocabulary, grammar and mechanics. The experimental and control groups' writing performances were compared in terms of overall writing performance using descriptive statistics and an independent-samples t-test.

Table 1: Results of the descriptive statistics and independent samples t-test of both groups in terms of overall writing performance (pretests)

Overall writing performance	Control Group		Experimental Group		T-value	P
	N	Mean	N	Mean		
	33	81.9	35	85.2	-1.6	.107
Content	33	24.7	35	25.7	-1.1	.266
Organization	33	16.9	35	17.7	-1.8	.083
Vocabulary	33	16.9	35	17.7	-1.8	.083
Grammar	33	21	35	21	-.03	.976
Mechanics	33	3.5	35	3.6	-2.5	.800

The participants in the control group (N = 33) had an average mean score of 81.9, whereas the experimental group (N = 35) had an average mean score of 85.2, as shown in Table 1 above. The results of the independent sample t-test indicated no statistically significant differences at the point $p < .05$ in the overall writing performance between the control and the experimental groups ($t = -1.6$, $p = .107$) even though the average mean score of the experimental group is slightly higher than that of the control group.

Writing performance in terms of content. The essays' content analysis focuses on "subject knowledge, topic coverage, and the relevance of details, substance, and number of details" (Shehadeh, 2011, p. 291). In this variable, the participant could receive a maximum of 30 points and a minimum of 14.5. In terms of content, the experimental and control groups' writing performance was compared using descriptive statistics and an independent-sample t-test. In terms of content, the participants in the control group (N = 33) had an average mean of 24.7, while the experimental group (N = 35) had an average mean of 25.7, as shown in Table 1. According to the results of the descriptive statistics, the experimental group's mean content score is higher than the control groups. However, the results of the independent sample test, obtained from the pretest, indicated no statistically significant difference in writing performance between the control and the experimental groups ($t = -1.1$, $p = .266$).

Writing performance in terms of organization. The organization of an essay is evaluated for "fluency of expression, clarity in the statement of ideas, support, organization of ideas, sequencing, and development of ideas," among other things (Shehadeh, 2011, p. 291). An individual can achieve a maximum score of 20 in this variable and a minimum score of 12.5. The experimental and control groups' writing skills were compared in terms of essay organization using descriptive statistics and an independent-sample t-test. According to Table 1, the control group (N = 33) received an average mean score of 16.9, but the experimental group (N = 35)

received an average mean score of 17.7 in the essay organization. Even if the experimental group's average was higher, the independent samples t-test findings revealed no significant difference in the two groups' writing ability in terms of organization ($t = -1.8, p = .083$).

Writing performance in terms of vocabulary. Evaluators look at "range, the accuracy of word/idiom choice, mastery of word forms, appropriateness of register, and efficacy in the transmission of meaning" when it comes to vocabulary (Shehadeh, 2011, p. 291). In this variable, the participant can obtain a maximum of 20 points and a minimum of 12. The experimental and control groups' vocabulary writing abilities were compared using descriptive statistics and an independent-sample t-test. In terms of vocabulary, the participants in the control group ($N = 33$) scored an average of 16.9, whereas the experimental group ($N = 35$) scored 17.7, as seen in the table above. The experimental group outperformed the control group in terms of word usage, according to the average mean. The results of the independent sample t-test obtained from the pretest indicated that there was no significant difference in writing performance ($t = -1.8, p = .083$).

Writing performance in terms of language use (grammar). The use of sentence structures and constructions, precision and correctness in the usage of agreement, number, tense, word order, articles, pronouns, prepositions, and negation are all examined in the evaluation of grammar (Shehadeh, 2011, p. 292). A participant's maximum score in this variable was 24.5, and their lowest score was 16. The two groups' writing performance in terms of grammar was compared using descriptive statistics and an independent-samples t-test. In terms of grammar, the two groups of participants had similar mean scores ($M = 21$). Furthermore, pretest findings revealed no significant changes in writing skill in terms of grammar between the control and experimental groups ($t = -.03, p = .976$).

Writing performance in terms of mechanics. The mechanics of the essays are examined in terms of "spelling, punctuation, capitalization, paragraph indentation, and other conventions" (Shehadeh, 2011, p. 292). In this variable, a participant could receive a maximum of 5 points and a minimum of 2. In terms of mechanics, the experimental and control groups' writing performances were compared using descriptive statistics and independent samples t-test. The participants in the control group ($N = 35$) had an average mean score of 3.5 in mechanics, while the experimental group ($N = 35$) had a score of 3.6. The experimental group outperformed the control group in mechanics, according to the average mean score of the two groups. Furthermore, the results of the independent samples t-test obtained from the pretests indicated that there was no significant difference in writing performance in terms of mechanics between the groups ($t = -.25, p = .800$).

In summary, an independent samples t-test was used to assess the participants' overall writing skills in terms of content, organization, vocabulary, grammar, and mechanics. Accordingly, the data demonstrated that there was no statistically significant difference in overall writing ability between the control and experimental groups. After this pre-test data analysis, the following section is about post-intervention data analysis, which includes posttests, and students' essays.

3.2 Analysis of the Posttests (post-intervention data).

Following the completion of the grading by the raters, the average mean scores of each dependent variable were computed. All of the variable mean scores were recorded and arranged in an excel file. After that, the data was put into SPSS version 24 for analysis. The researchers used the total mean scores of all participants' posttests as evaluated by the two raters. Each research question is analyzed against the obtained data in the following sections.

Research question one. Which groups' writing performances considerably improved in the posttest in terms of organization, content, vocabulary, grammar, and mechanics? is the first research question. The objective of this question was to compare posttest performance in terms of content, organization, vocabulary, language usage (grammar), and mechanics between students in the control group (face-to-face writing instruction) and the experimental group (wiki-based collaborative writing teaching). To answer the study's

first question, descriptive statistics and an independent samples t-test were used. Given that the two groups had no significant differences on the pretest at the beginning of the study, it is plausible to believe that any significant changes in their mean scores on the posttest were caused by the intervention. The descriptive and inferential statistics for both groups' final posttest scores are shown in Table 2.

Overall writing performance (posttests). The average mean scores and independent-samples t-test findings for both groups in terms of content, organization, vocabulary, language usage, and mechanics are shown in this section.

Table 2: Results of the descriptive statistics and independent samples t-test of both groups in terms of each aspects of writing

Components	Control Group			Experimental Group			P	Effect size -d	Status of effect size
	N	Mean	SD	N	Mean	SD			
Content	33	25.5	3.3	35	28.5	1.4	.000	0.7	Large
Organization	33	17.2	1.2	35	18.9	1.0	.000	0.6	Large
Vocabulary	33	16.8	1.5	35	19.0	1.2	.000	0.6	Large
Grammar	33	22.1	2.0	35	23.1	1.7	.000	0.6	Large
Mechanics	33	3.9	0.4	35	4.8	0.4	.000	0.7	Large
Overall writing performance	33	82	9	35	94.3	7	.000	0.6	Large

According to Table 2, the posttests mean score of the control group in content is 25.5, whereas, the mean score of the experimental group is 28.5. According to the descriptive statistics analysis, the experimental group outperformed the control group in terms of the content of the essay. An independent samples t-test was used to determine whether there was a statistically significant difference in content between the two groups. The research revealed that the experimental group performed better in terms of content. As a conclusion, there was a statistically significant difference between the two groups at the $p < .05$ level in both groups' scores ($p = .000$) with a Cohen's d effect size of 0.7. This implies that wiki-based collaborative writing assisted students in significantly improving their writing performance in terms of content.

Table 2 also shows that the experimental group outperformed the control group. An independent samples t-test was used to investigate the effects of wiki-based collaborative writing on students' writing performance in essay organization. The study revealed statistically significant differences in both groups in terms of organization scores at the $p < .05$ ($p = .000$) with a Cohen's d effect size of 0.6. This is also demonstrated by the fact that wiki-based collaborative writing improves participants' writing skills in terms of organization.

In Table 2, as the experimental group performed better in vocabulary ($M=19.0$) than participants in the control group ($M=16.8$), there was a statistically significant difference in vocabulary between the two groups at the $p < .05$ ($p = .000$) with a Cohen's d effect size of 0.6.

According to the data presented in Table 2, the experimental group's mean grammar score ($M=23.1$) is greater than the control group's mean score ($M=20.1$). As a result, at $p < .05$, there was a statistically significant difference ($p = .000$) with a Cohen's d effect size of 0.6. This indicates that participants in the experimental groups profited from wiki-based collaborative writing to increase their grammatical knowledge while writing.

As per Table 2, the experimental group did better in mechanics ($M=4.8$) than the control group ($M=3.9$). In the posttest, an independent samples t-test was used to investigate the influence of wiki-based collaborative writing on students' writing performance in mechanics. The study revealed a statistically significant difference in mechanics scores between the two groups at the $p < .05$ level ($p = .000$) with a Cohen's d effect size of 0.7. The

favorable influence of wiki-based collaborative writing on enhancing students writing performance in terms of mechanics is the cause for improving their knowledge of mechanics during writing. Generally, there were statistically significant differences in all components of the posttest.

Research question two. The second research question is, 'Will the post-writing test reveal a statistically significant improvement in the experimental group's writing skills in terms of content, organization, vocabulary, grammar, and mechanics?' To explore any statistically significant changes in the posttest findings compared to the pretest results of the experimental group's participants, descriptive statistics and paired samples t-tests (paired t-tests) were utilized. The following is a summary of the descriptive and inferential statistics generated for participants' final posttest scores compared to their pretests in terms of overall writing performance (content, organization, vocabulary, grammar and mechanics) of the experimental group.

Table 3: Descriptive statistics and paired samples t-test results of the experimental group (posttest)

Experimental group	Tests	Mean	SD	Correlation	P	Effect size-d	Status of the effect size
Content	Pretest	24.7	4.0	.48	.000	0.5	Large
	Posttest	28.5	1.4				
Organization	Pretest	16.9	2.0	.15	.000	0.5	Large
	Posttest	18.9	1.0				
Vocabulary	Pretest	15.8	2.0	.04	.000	0.6	Large
	Posttest	19.0	1.2				
Grammar	Pretest	21.0	2.2	.13	.000	0.4	Large
	Posttest	23.1	1.7				
Mechanics	Pretest	3.5	0.9	-.01	.000	0.7	Large
	Posttest	4.8	0.4				
Overall writing performance	Pretest	81.9	9.0	.33	.000	0.8	Large
	Posttest	94.3	4.6				

The average mean scores of the experimental group participants improved in the five components of writing, according to the descriptive analysis above. As evidenced by the posttest results, incorporating wiki-based collaborative writing allowed participants to support each other utilizing their materials, which helped them improve their writing skills.

A paired samples t-test (paired t-test) was used to investigate the effects of wiki-based collaborative writing on students' writing performance in the posttests (content out of 30%, organization out of 20%, vocabulary out of 20%, language usage out of 25%, and mechanics out of 5%). Participants in the posttests performed higher in all components. Then, as indicated in Table 3, there was a statistically significant difference at the $p < .05$ level in the scores of the posttests compared to the pretests in all components with large Cohen's d effect sizes in content, $d = 0.5$; organization, 0.5 ; vocabulary, 0.6 ; language use, 0.4 ; mechanics, 0.7 and overall writing performance, 0.8 . This indicated that the participants' writing performance in the experimental group improved significantly on the posttest in all components (content, organization, vocabulary, grammar, language usage and mechanics). Finally, at the $p < .05$ level, there were statistically significant differences in posttest scores compared to pretest values in all variables with a large effect size.

4. Discussions

The results of the pretests of the two groups indicated that there were no statistically significant differences between the participants of the control and the experimental groups in the dependent variables (overall writing performance in terms of content, organization, vocabulary, language use (grammar) and mechanics).

'Which group's writing performance (control group; face-to-face training or experimental group; wiki) will show statistically significant improvement in the posttest for organization, content, vocabulary, grammar, and mechanics?' was the first question of the study. For content, organization, vocabulary, language use and mechanics, the results showed that there were statistically significant differences at $p < .05$ between both groups' scores with a large effect size. The explanation for the change is that the wiki allowed participants to share acceptable language during the collaboration process via wiki. The experimental group outperformed all dependent variables, according to the average mean scores (content, organization, vocabulary, language use, and mechanics). The contributions students made on the wiki-discussion and history pages were the primary causes of considerable changes in their writing performance. This is demonstrated through a qualitative study of sample writings taken from wiki-discussion and history pages by students.

The efficiency of wiki technology in affording online environments that foster students' positive collaborative behaviors while engaging in collaborative writing tasks helped students enhance their writing performance, according to the findings of prior wiki research in EFL writing classes. The main findings suggest that wiki aids students in collaboratively co-constructing the wiki-text by allowing them to add ideas, expand and elaborate on them, edit their own and others' texts, and link wiki pages (Bradley *et al.*, 2010; Arnold, Ducate, & Kost, 2012; Aydin & Yildiz, 2014).

The mean scores of the experimental group's overall writing performance in terms of content, organization, vocabulary, language use, and mechanics have improved. Furthermore, the results were statistically positive with a large effect size. This revealed that the wiki allowed participants to edit, comment on, discuss, and revise their peers' texts regardless of time or location, contributing to the experimental group's overall better writing performance compared to their pretest scores. The findings of Kahany and Khosravian (2014), as well as Hosseinpour and Biria (2014), support the current research finding. This also indicates that wiki-based collaborative writing can help participants improve their overall writing performance in terms of the above-mentioned components. Hence, participants in the experimental group have shown improvement in their overall writing in terms of content, organization, vocabulary, language use, and mechanics. The findings from the study indicated that writing with wikis enables students to improve their overall writing performance in all components. This was expected because the literature shows that collaborative writing in general, and collaborative writing using social media like a wiki, in particular, improves the writing performance of students (Annas, 2016; Ramanair *et al.*, 2017; Kioumarsis *et al.*, 2018; Vurdien, 2020). The significant results of the present study shared similar findings with the study of the above researchers.

The findings of Vurdien showed that EFL students were enthusiastic about wiki writing and that collaborative wiki writing increased meaning transmission and information exchange. According to Kioumarsis and his colleagues' findings, all of the participants in the study were university students, and students in the treatment group cooperated in their writing. According to Ramanair *et al.* (2017), wikis enabled learners better engage when producing academic projects. They also came to the conclusion that wikis were popular among students. According to Anna's (2016) research, the pre and posttest findings demonstrated that collaborative writing via wiki increased the learners' writing abilities. The results of Alshumaimeri's (2011) pre and posttests demonstrated substantial differences between the pre and posttests within the experimental group.

5. Conclusions and Recommendations

5.1. Conclusions

In terms of overall writing performance, there was a statistically significant difference between the experimental and control groups, with a large effect size. The experimental group outperformed the control group. When the control group's posttest was compared to the experimental group's posttest using an independent samples t-test, the experimental group's participants' writing performance improved significantly. The experimental group participants contributed to each task they accomplished, and they made revisions relating to meaning and surface changes. The experimental group's writing accuracy, vocabulary acquisition, and overall writing performance all improved in general. In addition, mechanics-related errors were reduced. Students collaborated on each activity given on the workspace, as evidenced by the study of sample essays selected from the wiki-discussion and history pages. This improved participants' performance during the posttest writing process.

5.2. Recommendations

This quasi-experimental study was conducted at Addis Ababa Science and Technology University on freshman engineering students. The study examined the potential effects of wiki-based collaborative writing on students' writing performance. The findings generated several suggestions for teachers and students who would be interested in wiki-based collaborative writing vis-a'-vis face-to-face writing instruction. The following are the recommendations of the study.

- i. Teachers should be given pedagogical and technical training to integrate wiki-based collaborative writing to teach writing skills.
- ii. Workshops should be organized to create awareness about the role of wiki-based collaborative writing for students and teachers.
- iii. The technology and the students' acceptance of the online learning environment should be used to extend the pedagogical benefits of collaborative writing work using the wiki.
- iv. Teachers should help students to implement continuous computer-based processes, such as reviewing or reading and editing, and frequent peer interaction, as a collaborative writing project, can foster self-reliant engagement in purposeful tasks associated with the writing process. Such engagement can also motivate students to spend more time on tasks. Student-centered writing can allow EFL learners to accommodate individuals' learning of self-regulation to develop their writing skills.

While wiki-based collaborative writing has proven to be useful, incorporating it without care could harm the learning process. The findings of the study provide insights into English language teaching and instructional technology fields. Incorporating wiki-based collaborative writing into EFL writing lessons can increase students' performance in a variety of areas.

Limitations of the study. There are certain limitations to this study. First, the participants were all first-year engineering students. As previously stated, the study's sole purpose was to investigate the effects of wiki-based collaborative writing technology on students' writing performance in specific classes at Addis Ababa Science and Technology University; no attempt was made to generalize beyond the study's participants from

freshman engineering classes in Social Sciences, Health, Applied Sciences, English Language Departments, Natural Sciences, and Medicine. A detailed explanation is suggested to enhance the findings' transferability to other instances with similar characteristics.

Second, the researcher managed the training sessions for the students as well as the teaching learning process. This could have influenced the study's results. It would have been more natural if the students had been taught by a teacher who was not affiliated with the researcher.

Thirdly, the current study used one-pretest and one-posttest questions to examine students' writing skills. Increasing the number of questions in both the pre and posttests, on the other hand, can improve the study's trustworthiness.

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Competing of Interest

The authors declare that there is no conflict of interest.

Consent for publication

We have agreed - to - submit to the Journal of Social Sciences and Language Studies and approved the manuscript for



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