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The Effect of Flipped Classroom on University Students' Critical Thinking Skills

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ABSTRACT

Entering the post-pandemic era, the main problem that often arises is using ideal learning methods. The flipped classroom model is a learning approach teachers use today and is widely recommended by experts. Experts believe that this model has various advantages, such as training various skills needed by students, one of which is critical thinking skills. This study aims to explore the impact of using the flipped classroom model on students' critical thinking skills. The researcher used a quasi-experimental method involving 2 study groups of 53 students. In this study, the researcher used a test in the form of writing an essay which was then assessed using a critical thinking skills assessment rubric developed by Finken & Ennis. Next, the researcher analyzed the data by running paired t-tests, independent sample t-tests, and one-way ANCOVA tests. The study results show that the flipped classroom model improves several aspects of students' critical thinking skills. In other words, students who receive treatment with the flipped classroom model can improve their thinking skills actively and critically. These findings indicate that lecturers can use the flipped classroom model in developing critical thinking skills through learning to write because this model is relatively more flexible and follows the characteristics

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of current students.

Keywords: Critical Thinking Skills; Flipped Classroom; Writing

1. Introduction

One of the challenges faced by universities in the era of the Industrial Revolution 4.0 is the gap between what the students have learned and the skills they have acquired at the university and what is needed by companies [1–3]. This condition has occurred until now because the world is changing so quickly, while higher education institutions seem slow to respond to this situation. On the other hand, although they have identified this gap, many universities still apply traditional learning methods and models that only focus on lecturers and ignore student aspects [4]. This condition hinders the development of various important skills needed in today's workplace [5, 6]. One of them is critical thinking skills, which play an important role in student success in the future [7].

Researchers and educational institutions worldwide have paid attention to this case. Some of these institutions include (a) The Assessment and Teaching of 21st Century Skills [8], The Bologna Process and The European Higher Education Era [9], and (c) The Partnership for 21st Century Learning [10]. The three institutions are part of an international movement that focuses on conceptual learning frameworks oriented towards the skills students need to become adaptive digital societies. In other words, learning in tertiary institutions should focus on the involvement of students who play a fundamental and important role [11–13]. Learning emphasising this framework will make university graduates more work ready and have high adaptive abilities. This is proven by several previous studies which support the argument that students with 21st-century skills are more competitive in the world of work [4, 14, 15].

With this international movement, almost all universities have changed the method and way of delivering lectures in recent years. Lecturers and instructors have shifted from the traditional teaching model to a learning model with active learning experiences. This teaching model focuses on student-centred activities that impact engaging and contributing to students acquiring the necessary knowledge and skills. Some of the learning models referred to include: (a) game-based learning, (b) cooperative learning, (c) problem-based learning, (d) collaborative learning, (e) flipped classroom learning, and (f) project based-learning [16–18].

Of the various teaching models, one model that has received much attention from teachers is the flipped classroom. This model is among the best choices because it emphasises flexibility and adaptability when used with other active learning methods [19–21]. A flipped classroom model with digital and audio-visual components can generate emotional connections with generation Z students or digital natives [22, 23]. In other words, the characteristics of Generation Z students are under the flipped classroom model. In addition, the flipped classroom model, which combines face-to-face and online meetings, tends to be preferred by Generation Z [24]. This makes the flipped classroom model interesting for further research.

The previous studies about the flipped classroom model has showed effective in acquiring knowledge and other important skills needed by the world of work [25–27]. As a student-centred approach, flipped classrooms can maximise face-to-face time [27]. The model also has the potential to provide time and opportunities for the development of active learning settings oriented towards exploring student engagement and satisfaction [28, 29].

Another positive impact of the flipped classroom model is that it can provide space for students' participation and encourage the development of an interactive learning environment [30]. The video aspect given to students before learning in class can encourage students to learn at their own pace and ability [31, 32]. This model also offers several other advantages, namely: (a) teaching time is much more flexible, (b) creating a dynamic and interactive learning environment, and (c) enabling in-depth conceptual investigations [33]. Previous studies have shown that this model contributes to academic achievement, increases student engagement, and reduces the students' cognitive load [34].

One aspect related to 21st-century skills is critical thinking skills. These skills consist of analysing and evaluating one's thinking processes. Furthermore, critical thinking is not categorised as an innate or natural ability but can be taught through effective pedagogical methods [35]. Therefore, this

skill is as important as other skills, such as critical problem-solving, creative thinking, and teamwork [36, 37]. These four skills are the Four Cs, key skills in the 21st century. With the complexity of the Four Cs, this study only focuses on critical thinking skills. This is done because focusing on the four skills in one study takes a relatively long time.

One way to teach critical thinking skills is through learning to write. Writing is a multi-dimensional activity that does not arise naturally but must be practised continuously. Writing is one of the four language skills, a basic skill that university graduates must master. With good writing skills, university graduates can easily complete their work later. Therefore, learning to write in tertiary institutions is an important aspect that must be prioritized.

Several previous studies have raised the theme of writing, critical thinking, and the flipped classroom model. Regarding the flipped classroom, several studies have provided evidence that this model positively impacts achieving learning outcomes, reducing stress, etc. [38–40]. Several other studies have also analysed the flipped classroom model's impact on student's critical thinking skills [7, 24, 41, 42]. Specifically for writing learning, several previous studies have also been conducted by other researchers and show that the flipped classroom model positively impacts learning outcomes [32, 39, 43].

From some of these studies, a few researchers still focus on using the flipped classroom model in learning to write in the first language, which is intended to determine the increase in critical thinking skills. Therefore, the researcher is interested in raising this theme in this study. The formulation of the problem in this study is: What is the effect of the flipped classroom model on improving critical thinking skills in learning to write Indonesian?

2. Materials and Methods

2.1. Design, Site, and Research Participants

Based on the description in the background section, this study aims to determine the impact of using the flipped classroom model on the student's critical thinking skills through learning to write. To achieve this goal, the researcher used a quantitative research design with a quasi-experimental type. This research was conducted using a non-equivalent control group design because the experimental and control groups were not chosen randomly [44]. The design of this study applies a particular treatment to each group, namely the application of the flipped classroom model to the experimental group and the conventional model to the control group.

This research involved early semester students in the Islamic Banking Study Program at UIN Sultan Maulana Hasanuddin Banten. The participants of this research were 53 students who were taking Indonesian language courses (30 females and 23 males). The research participants were divided into the experimental group of 26 students and the control group of 27 students. The participants were selected randomly because both groups had relatively similar writing abilities. The participants are first-semester students taking Indonesian language courses (academic writing sub-discussion) aged between 17 and 21 in the odd semester of 2024/2025.

2.2. Instruments

In collecting data, researchers used two types of instruments, namely essay writing tests and critical thinking rubrics in writing. Students are asked to write essays with free themes (mastered by students) with a minimum word count of 500. The essay is developed into three main parts: one opening paragraph, at least three sections in the body of the essay, and one closing paragraph. The researchers gave participants 100 minutes to write essays in the pretest and posttest sessions.

Another instrument used in this study is the critical thinking assessment rubric in writing. Researchers use this rubric to identify various aspects of critical thinking skills in student writing. This rubric was developed from the critical thinking skills rubric by Finken ad Ennis [45]. There are several aspects of CTS in this rubric, namely: (a) focus, (b) supporting reasons, (c) reasoning, (d) organization, (e) convention, and (f) integration [4, 43]. The researcher gives 4 points as the highest score and 1 point as the lowest. Thus, the maximum total score that students can achieve is 24, and the lowest is 6.

2.3. Data Analysis

Based on the objectives of this study, the researchers used quantitative analysis techniques. Data collected

from the pretest and post-test were analysed using the SPSS 25.00 application. Researchers analysed the data by running paired t-tests, independent sample t-tests, and one-way ANCOVA tests. To answer the research question this time, the paired sample t-test was conducted to determine whether there was a significant increase in students' critical thinking skills from the two groups. In contrast, the independent sample t-test was used to determine whether the two groups had a significant difference. Finally, the researcher ran a one-way ANCOVA test to test the difference between the post-test scores of the two groups on the six aspects of critical thinking skills. The test also aims to control for the covariate (pretest) effect on each element and the post-test score.

2.4. Procedure

In the experimental and control classes, students received different treatments by implementing the flipped classroom model for the experimental class and the conventional model for the control class. Specifically, there are several stages of learning as illustrated in **Table 1** below.

Table 1. Procedure treatment pada experiment and control class.

Meeting	Experimental Group with Flipped Classroom	Control Group with Conventional Model
1	Pretest	Pretest
2	In class: The lecturer explains the flipped classroom model used in the writer's lesson At home: Students watch video materials and PPT about writing paragraphs	Lecturers provide explanations related to learning to write and homework At home: Students do homework in the form of writing paragraphs
3	In the classroom: 1) students discuss paragraph writing material with colleagues and lecturers 2) students write paragraphs according to instructions from the lecturer 3) provide feedback on colleagues' writings At home: 1) students watch video material about essays that are shared on the WhatsApp group 2) students take quizzes for knowledge about essays through the Kahoot application	In the classroom: 1) students pay attention to the presentation of material about writing paragraphs 2) students write paragraphs according to the examples given by the lecturer At home: 1) students take quizzes via the Google form 2) students revise their paragraphs
4	In the classroom: 1) students discuss essays with colleagues and lecturers 2) students determine the theme and title of the essay 3) students compose an essay framework At home: 1) students watch a video on how to write an essay according to the framework that has been prepared (the video link is shared on the WhatsApp group) 2) students read 2 or 3 sample essays	In the classroom: 1) students listen to the lecturer's explanation about writing essays 2) students compose an essay framework At home: 1) students work on essay understanding quizzes 2) students compose an essay framework with a new theme
5	In the classroom: 1) students discuss writing essays in their groups 2) students start writing essays 3) students consult their essays with colleagues and lecturers At home: 1) students revise essays based on suggestions/input from colleagues and lecturers 2) students send final essays via email to lecturers	In the classroom: 1) students pay attention to the lecturer's explanation of the practice of writing essays 2) students pay attention to an example of an essay displayed by the lecturer 3) students write essays according to the framework they make At home: 1) students revise the essay they have done 2) the student sends the revised essay by e-mail
6	Post-test	Post-test

3. Results

Table 2 presents the measurement results regarding the descriptive statistics of the experimental group. The researcher ran a t-test to determine the mean score, standard deviation, and mean standard error.

In addition to the experimental group, the researcher ran a t-test on data from the control group. **Table 3** presents the measurement results regarding the descriptive statistics of the controls. Like the experimental group, the researcher ran a t-test to find out the mean score, standard deviation, and standard error of the mean.

Table 2. Descriptive statistics (experiment group).

	$\overline{X}$	Std. Dev	Std. Error Mean
Focus-Pre	1.85	0.543	0.107
Focus-Post	3.38	0.637	0.125
Supporting Reason-Pre	1.92	0.484	0.095
Supporting Reason-Post	3.23	0.514	0.101
Reasoning-Pre	1.77	0.514	0.101
Reasoning-Post	3.12	0.516	0.101
Organization-Pre	2.12	0.588	0.115
Organization-Post	3.38	0.496	0.097
Convention-Pre	1.96	0.445	0.087
Convention-Post	3.46	0.508	0.100
Integration-Pre	2.08	0.560	0.110
Integration-Post	3.58	0.578	0.113

Table 3. Descriptive statistics (control group).

	$\overline{X}$	Std. Deviation	Std. Error Mean
Focus-Pre	2.07	0.385	0.074
Focus-Post	2.19	0.557	0.107
Supporting Reason-Pre	2.00	0.480	0.092
Supporting Reason-Post	2.26	0.447	0.086
Reasoning-Pre	1.93	0.550	0.106
Reasoning-Post	2.30	0.609	0.117
Organization-Pre	2.11	0.506	0.097
Organization-Post	2.52	0.509	0.098
Convention-Pre	2.19	0.396	0.076
Convention-Post	2.67	0.620	0.119
Integration-Pre	2.30	0.542	0.104
Integration-Post	2.67	0.679	0.131

Tables 2 and **Tables 3** conclude that the measurement results in the experimental and control groups in the pretest session have almost the same average value. On the other hand, the mean scores of the two groups in the post-test session had a significant difference. That is, the average value of the experimental group using the flipped classroom model outperforms the control group using the conventional model. Even though the two treatments had the same impact on increasing critical thinking skills, the improvement in the experimental group was much greater. To find out about the increase is significant, further tests need to be carried out by researchers.

A paired sample t-test was run to determine the flipped classroom's and conventional models' impact on students' critical thinking skills. The test results are shown in **Table 4** for the experimental group and **Table 5** for the control group. In **Table 4**, information is obtained that changes in the average score of critical thinking skills on the focus aspect [$t = -9.667$, $p < 0.00$], the average score on the supporting reasoning aspect [$t = -12.143$, $p < 0.00$], the average score -reasoning aspect [$t = -12.223$, $p < 0.00$], organisation aspect average score [$t = -8.323$, $p < 0.00$], convention aspect average score [$t = -10.817$, $p < 0.00$], and the integration aspect average score [$t = -10.043$, $p < 0.00$] was stated to be significant in the experimental group (the flipped classroom

model). In the Paired Sample T-test, it is known that the sig. (2-tailed) value is 0.00, which means less than 0.05, meaning that there is a significant difference in the average results of the pre-test and post-test. Thus, we can conclude that students' critical thinking skills increased significantly from the pre-test to the post-test.

Table 4. Paired sample t-test (experiment group).

	Paired Differences							
				95% Confidence Interval of the Difference				
	$\overline{X}$	Std. Dev	Std. Error Mean	Lower	Upper	T	*Df*	*p*
Focus	−1.538	0.811	0.159	−1.866	−1.211	−9.667	25	0.000
Sup. Reasoning	−1.308	0.549	0.108	−1.529	−1.086	−12.143	25	0.000
Reasoning	−1.346	0.562	0.110	−1.573	−1.119	−12.223	25	0.000
Organization	−1.269	0.778	0.152	−1.583	−0.955	−8.323	25	0.000
Convention	−1.500	0.707	0.139	−1.786	−1.214	−10.817	25	0.000
Integration	−1.500	0.762	0.149	−1.808	−1.192	−10.043	25	0.000

Table 5. Paired sample t-test (control group).

	Paired Differences							
				95% Confidence Interval of the Difference				
	$\overline{X}$	Std. Dev	Std. Error Mean	Lower	Upper	*T*	Df	*P*
Focus	−0.111	0.641	0.123	−0.364	0.142	−0.901	26	0.376
Sup. Reasoning	−0.259	0.526	0.101	−0.467	−0.051	−2.563	26	0.017
Reasoning	−0.370	0.792	0.152	−0.684	−0.057	−2.431	26	0.022
Organization	−0.407	0.747	0.144	−0.703	−0.112	−2.833	26	0.009
Convention	−0.481	0.700	0.135	−0.758	−0.205	−3.574	26	0.001
Integration	−0.370	0.926	0.178	−0.737	−0.004	−2.078	26	0.048

On the other hand, the same findings also occur in the control group, as shown in **Table 5**. The table indicates a significant change in the average scores of the six aspects of students' critical thinking skills who study using the non-flipped classroom model. In other words, the conventional model also impacts improving students' critical thinking skills, although smaller than the flipped classroom model. In other words, the model also impacts improving students' critical thinking skills, but the flipped classroom model has a more significant impact.

Table 6 shows the results of the one-way ANCOVA test, which was applied to investigate differences between learning groups using the flipped classroom model to improve students' critical thinking skills by controlling the covariate (pre-test). One thing that must be done is that the researcher must conduct a preliminary examination to find out that there are no violations of several aspects, namely: (a) normality, (b) linearity, (c) homogeneity of variance, (d) homogeneity of the regression slope, and (e) measurement reliable covariate. Further analysis can be carried out because the measurement results show no data breaches. The one-way ANCOVA test aims to find out and examine the differences between the two groups (the flipped classroom model and the conventional model) in improving students' critical thinking skills.

Table 6. Tests of between-subject effects.

Source	Dependent Variable	Type III SS	*Df*	*MS*	*F*	*P*
Correct Model	Pretest	10.735[a]	1	10.735	4.413	0.041
	Posttest	409.664[a]	1	409.664	104.510	0.000
Intercept	Pretest	7811.490	1	7811.490	3.211E3	0.000
		15991.229	1	15991.229	4.060E3	0.000
Skill	Pretest	10.735	1	10.735	4.413	0.041
	Posttest	409.664	1	409.664	104.510	0.000
Error	Pretest	124.057	51	2.432		
	Posttest	199.903	51	3.920		
Total	Pretest	7960.000	53			
	Posttest	16510.000	53			
Corrected Total	Pretest	134.792	52			
	Posttest	609.547	52			

Table 6 presents the results of the one-way ANCOVA test. The table shows a significant difference between the experimental group with the flipped classroom model and the control group with the conventional model in improving students' critical thinking skills [F = 4.413, p = 0.041]. Thus, these results indicate that the group with the flipped classroom model is more effective than the conventional model group in improving students' critical thinking skills.

4. Discussion

In learning and teaching in tertiary institutions, learning models and methods greatly determine student success. The flipped classroom is a relatively new learning model widely recommended by education experts today. The results of this study state that the flipped classroom model is proven to be more effective in improving students' critical thinking skills in academic writing when compared to the conventional model. Although the traditional model can also encourage these skills, the flipped classroom model has more significant potential.

One of the things that make the flipped model significantly impact the achievement of student learning outcomes is the activity of watching videos [46]. Viewing videos on this learning model can increase understanding of how to write well. These conditions encourage students to try hard to improve their writing skills to be better. On the other hand, learning media in videos with non-verbal communication features is also beneficial for students in understanding writing material [47, 48]. Video display features in facial expressions and gestures can allow students to analyse and understand the language presented. This is supported by several previous studies claiming that videos can improve students' writing skills [20, 49, 50].

This study's results align with several previous studies; most students in tertiary institutions tend to prefer learning systems that use multimedia and new innovations [51, 52]. Compared to traditional learning models, this happens because multimedia elements influence learning success, such as pictures, videos, and audio videos. This finding also confirms that the involvement of the learning process through video is a global issue that continues to receive attention from educators. By implementing the flipped classroom model, teachers have participated in spreading learning video content to a new generation and contributing to encouraging the use of new technology for educational purposes [53]. In addition, the learning process using the flipped classroom model, such as discussions with colleagues and teachers and watching videos at home, can stimulate their interest and attraction to learning to write, thus impacting learning outcomes.

Another aspect that makes the flipped classroom model able to encourage learning effectiveness is the active learning component. Classroom learning sessions are helpful for actively involving students through various activities such as collaboration, interaction, and discussion to improve students' writing and critical thinking skills [7, 24, 42]. Arslan [54] claims that collaborative activities have long been proven to improve students' thinking skills. Several studies have shown that the flipped classroom model impacts increasing active aspects of student interaction and discussion. This increase can be seen in their enthusiasm when discussing and interacting with the discussed topics [39, 55].

This study's results align with Almulla's view [56] which states that students who experience the learning model with the flipped classroom model show positive perceptions about increasing engagement and interaction during the learning process. The flipped classroom model provides more opportunities to interact with peers and teachers in productive and active learning by utilising critical thinking skills [41, 55, 57].

Another factor that can potentially increase the effectiveness of student learning with the flipped classroom model is lecture material study sessions at home. Students feel much better prepared to learn in class by studying the material to be explored. In other words, students come to class more prepared and have an initial idea of the course material [58, 59]. As we already know, the main difference between the flipped classroom model and the traditional class is the learning time of lecture content. In flipped classes, students study range before class in their own time and space and at their own pace [35]. On the other hand, in conventional classes, students study content in class using a method at a pace determined by the lecturer. With this condition, students carry out rich cognitive activities such as in-depth information processing and higher-order thinking processes. This happens because students have more time to think about content and activate relevant prior knowledge of course material [60, 61].

Apart from improving learning outcomes, the flipped classroom model also has the potential to enhance students

critical thinking skills. The achievement of a much higher critical thinking score is a reflection of student content mastery. In the flipped classroom model, students first study content before learning. This allows them to become more active members of the team. Thus, students can make good connections between what they have learned and what they are currently doing [62, 63]. These findings support previous studies that linked the flipped classroom model to improving students' critical thinking skills [59, 64]. In conclusion, these findings indicate that the flipped classroom model can be the best choice for lecturers to teach in the post-pandemic era as it is today.

5. Conclusions

The results of this study indicate that students in tertiary institutions can take advantage of the flipped classroom model in learning to write in Indonesian language courses. This is shown by the tendency in learning based on the flipped classroom model to encourage students' writing and critical thinking skills to improve. This study provides authentic evidence of the benefits of the flipped classroom model after the experimental group received treatment. Thus, the researcher emphasized that teaching through the use of flipped classrooms can encourage students' critical thinking skills to improve.

From a pedagogical perspective, this research emphasises the importance of learning environments both in the classroom and at home that support active and cohesive interactions between students and lecturers. On the other hand, these results also contribute to using an ideal learning model/approach by combining technology products into pedagogical practice. This study shows that students get various advantages in practising the flipped classroom model. One of them is the advantage of accessing the material before the class meeting so that they have prior knowledge about the content being studied in class. These results provide a comprehensive picture of how to design a flipped classroom model in teaching writing to improve students' critical thinking skills.

Author Contributions

Conceptualization, H. (Helaluddin); methodology, G.I.; software, D.; validation, G.I., H. (Haryadi), and D. & S.M.U.; formal analysis, H.H.; investigation, G.I.; resources, D.; data curation, G.I., H. (Haryadi); writing—original draft preparation, H. (Haryadi); writing—review and editing, G.I., B.S., S.M.U.; supervision, D., & S.M.U.; funding acquisition, H. (Helaluddin), G.I., D., B.S., H. (Haryadi), & S.M.U. All authors have read and agreed to the published version of the manuscript.

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Institutional Review Board Statement

The study was conducted and approved by the Institutional Review Board of UIN Sultan Maulana Hasanuddin Banten, Indonesia (Approved on August 03, 2024).

Informed Consent Statement

Participants consent were waived due to the study posing minimal risk and involving routine educational practices that do not require formal consent under institutional guidelines.

Data Availability Statement

The data supporting the reported results are available on request from the corresponding author. Due to privacy and ethical restrictions, the data are not publicly accessible.

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Conflicts of Interest

The authors declare no conflict of interest.

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