STUDENTS' CRITICAL THINKING UNDER THREE MODELS OF TEACHING

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Abstract

The advancement of digital technology has evoked a new teaching paradigm and the incorporation of such technology into models of teaching has been highly appreciated in order to achieve certain learning goals such as students' critical thinking. This study investigates and examines the difference in critical thinking skills of students taught through the flipped classroom, pure online and direct instruction models. The method of the study is quasi-experiment implemented to students of English majors of Halu Oleo University. A total of 96 students participated as samples sitting in three different classes. Each class was attended by an equal number of 32 samples. Data were collected by giving samples a critical thinking skills test after the model implementation. The data were analyzed by means of two-way analysis of variance. Results of the study show that there is a significant difference of students' critical thinking skills after the implementation of the three models of teaching and the students from the flipped classroom is observed to have higher critical thinking skills.

Keywords: flipped classroom, direct instruction, critical thinking skills

Much of the teaching focus in the past has typically been on classroom-based learning or traditional classroom. It generally attempted to provide the necessary conditions for learning to occur through the interaction of among learners, teachers, and learning resources in the classroom (Magliaro et.al., 2005). Thus, the focus of classroom preparation and management has been design of syllabuses, methods and materials and on training teachers in how best to exploit the classroom as a source of meaningful input to learning (Richards, 2015). Thus, textbook and other classroom resources were seen as crucial carriers of both content and learning. In the traditional lecture students take notes and try to capture the concept while they are listening. In many times, unfortunately, the dynamic nature of the traditional lecture does not let the students to capture essential essence of the lecture while recording notes (Tucker, 2012).

The advent of internet and digital technology have provoked a new way of thinking referring to teaching and learning mode of delivery. The shift from teacher-centred to student-centred classroom has been a central issue. The inclusion of online resources and activities to supply or, even, to substitute the classroom teaching is not uncommon nowadays. Ally (2008) asserts that online learning is not just the delivery and dissemination of learning materials using the web / internet, but the learners and the learning process must be the focus of online learning. Clark (2008) describes online learning as a type of distance education in which teachers and learners are physically separated while processes and learning materials are delivered over the internet. Picciano and Seaman (2009) classify pure online learning on condition that all or almost all learning materials and activities are delivered online or over the internet and have no face-to-face meetings in the classroom.

Online learning is often also interspersed with face-to-face meetings called blended learning. One of the blended learning type which gains high popularity has been the so-called flipped classroom.

A flipped classroom is also called inverted classroom whereby the classroom and homework sessions are reversed. Traditionally, the classroom session started with a lecture given by lecturers during class time and might be followed-up with homework session to be done at home to empower students' learning. Conversely with a flipped classroom, the understanding of the lesson contents is done at home through listening to a video lecture posted online and the application through practice is done in the classroom through task completion and collaborative interaction with lecturers and peers.

Most experts seem to agree that models of teaching will continue to hold an important role in education particularly in developing students' capacity to learn. Joyce et .al. (2015) observed that direct instruction has been used by many researchers as a learning pattern that includes activities such as teachers explaining new concepts, testing their understanding by practicing under the direction of teachers (controlled exercises) and encouraging them to do the exercises under the guidance of the tutor (guided exercise) . Simply put, direct instruction can be characterized by the delivery of the material by the lecturer, followed by the provision of classroom-guided exercises and assignments related to the topic to be done at home. Magliaro et.al. (2005) identifies that direct instruction is a learning model that emphasizes the interaction between teachers, learners and other learning resources in classroom. Engelmann et al. (1998) maintains that direct instruction improve the efficiency of learning by emphasizing effective presentation techniques by following programmed learning materials and guided by regular learning sequences.

As with pure online, Ally (2008: 17) asserts that internet or online technology can be employed to access learning materials; to interact with the content, instructor, and other learners; and to obtain support during the learning process, in order to acquire knowledge, to construct personal meaning, and to grow from the learning experience. Warbington (2001) observes that the use of the internet has provided many benefits so that many universities now use distance learning technology. With online learning, the classroom becomes more fun and effective because it gives students wider opportunities to get online learning materials at unlimited time and place.

As far as flipped classroom is concerned, Collis and Moonen (2006) argues that collaborative learning environment both inside and outside the classroom encourages peer interaction among students from various skills and let them learn from each another to become communities of practice through which students have more opportunities to develop critical thinking and enhance their own learning processes. Jones (2008) contends to say that it enables students to access to the learning contents ahead of class and progress. Flores, et.al. (2016) put forward that it creates more time for teachers to interact with the students at individual and group level to fully understand their learning needs and support them accordingly.

Having the aforementioned insights of teaching model, we realize that each model has its own advantages and might be effective to help students learning. Nevertheless, as far as critical thinking skills is concerned, it is still questionable whether any models prove to be effective to apply or just a particular model.

The findings of studies examining the effect of different models of teaching on students' learning have been mixed. Studies by Rahardjo (2007) and Yudiernawati et.al. (2015) indicated superior results with models of teaching while studies by Derwin (2009) and Syafitri (2014) indicated little or no significant effect. Rahardjo (2007) reported that model of teaching emphasizing on student-centered learning is more effective to develop students' thinking ability. Yudiernawati et.al. (2015) observed that there was a significant difference of students' achievement after being taught through project based learning and direct instruction. Meanwhile, Derwin (2009) compared the critical thinking of some adults and the result shows no significant difference between those learning through online and direct instruction in their critical thinking. Syafitri (2014) found that there was not any significant difference of ability to comprehend reading texts among students taught under flipped classroom as compared to traditional teaching. Although much work has been done to date, more studies need to be conducted to ascertain

the effects of models of teaching on students' capacity to learn, particularly on students' critical thinking skills.

The purpose of this study was to investigate and examine the critical thinking skills of students after the implementation of the flipped classroom as compared to pure online and direct instruction models. This study was identified as being of importance to teachers and students in providing them the best model to develop students' critical thinking skills.

METHOD

The study was conducted as a three-group quasi-experiment study. It involved the use of three experimental groups including a treatment group with a flipped model, a treatment group with a pure online model and a treatment group with a direct instruction model. The population for the study consisted of undergraduate English majors at the University of Halu Oleo. The assumption was made that the participants represented a sample of undergraduate students majoring in English. Therefore, the findings and implications of the study should be generalized to the extent that future groups of students are similar to the participants. Participants in this study were 96 enrollees in a reading course offered through the English department during their second year in the university in 2017. This provided 32 students for each group. The 32 students designated as the first group were taught using a Flipped Classroom model. Another 32 students designated as the second group were taught using a pure online model and the other 32 students were taught using a direct instruction model (see Table 1.1).

Table 1. Samples Distribution at Each Models of Teaching

Models of Teaching			Total
Flipped Classroom	Pure Online	Direct Instruction	
32	32	32	96

The first treatment was the application of the flipped classroom model, where the lecturer combined online and face to face meetings. The online learning process was done through online learning format (Learning Management System) of *edmodo* to transmit video integrated with you-tube containing the lecture content and to assign students to watch it, to fill out quizzes and to taking notes before attending classroom session during which students perform task completion, interaction and discussion. The second treatment is the application of pure online learning model whereby the students did all the learning activities through online media including discussion. The last treatment was the application of direct instruction (face-to-face) learning model whereby the students attend a face to face instruction starting from lecture delivery session until questions/answers or discussion sessions and then followed by giving tasks assigned to be done at home.

Before receiving instruction, the first and the second group were introduced to the procedures of using a learning management system (edmodo) since they had to employ such a system to participate in online activities. This was to ensure that they had the literacy of the format and the required learning facilities such as laptops or smart phones.

Materials and Instruments

Both groups were told that the learning session would be followed by a written evaluation on the material presented and the score would count toward their grade in the course. The classes were given learning materials about critical thinking skills on how to interpret, analyze, evaluate, make inference, explain and self regulate towards reading texts.

The test instrument employed in this study was developed to measure the critical thinking skills of the students towards some reading texts. The written evaluation was subjected to Cronbach's Alpha which yielded a reliability coefficient of 0.88. Validity of each question was established by a panel of

experts with expertise in critical thinking and language skills. There were 6 questions on the test which were worth four points each.

Null hypothesis were developed to test the research questions of the study. A two-way analysis of variance was used to test the hypothesis of no difference in performance among the groups. An alpha level of .05 was used in testing the hypothesis. The data were analyzed with the SPSS.

RESULTS

Before performing the hypothesis test, a prerequisite test of data analysis was conducted in terms of data normality and homogeneity. Table 2 shows the calculated significance values of both Kolmogorov-Sminov and Shapiro-Wilk columns with p-value (sig) higher than alpha ($\alpha = 0,05$) values in all cells. For example, in the column of the critical thinking skill (CTS)-Flipped Classroom, it is obtained a significance value of 0.163 in column Kolmogorov-Sminov and 0.964 in the Shapiro-Wilk column. Because the value of sig > 0,05, then data of critical thinking skill from the Flipped Classroom group had normal distribution. Similarly, the value of significance in the subsequent cells also showed a significance value > 0.05. It can be concluded that all data on the three cells are normally distributed.

Table 2. Tests of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
1. CTS-Flipped Classroom	.133	32	.163	.964	32	.359
2. CTS-Pure Online	.107	32	.200[*]	.957	32	.232
3. CTS-Direct Instruction	.078	32	.200[*]	.982	32	.864

CTS= Critical Thinking Skills

The homogeneity of variants between groups was tested by using Bartlett test. The results of the analysis obtained Chi-Square value (X_2count) of 9.458 which was lower than X_2tabel of 18.307. It is concluded that the three data sets had homogeneous variant. Thus, the data requirements for variance analysis were met.

Each experimental group was given the same written test of critical thinking after being subjected to the flipped classroom, pure online and direct instruction as outlined in the design and procedures of the study. Mean scores and general results from each of the three groups are presented in Tabel 3 and the results of analysis of variance test are reported in Table 4.

Tabel 3 Test Scores of Flipped Classroom, Pure Online and Direct Instruction Groups

	N	Mean Score	Standard Deviation	Low Score	High Score	Variance
Flipped Classroom (Group 1)	32	76.39	12.108	51	97	146.607
Pure Online (Group 2)	32	65.84	13.986	41	92	195.614
Direct Instruction (Group 3)	32	64.89	10.023	44	85	100.451

Diagram 1 shows in graph that the critical thinking skill of students from the flipped classroom learning ranks first followed by pure online model and direct instruction (face-to-face).

Diagram 1. Students' Critical Thinking Skills under Three Models of Teaching
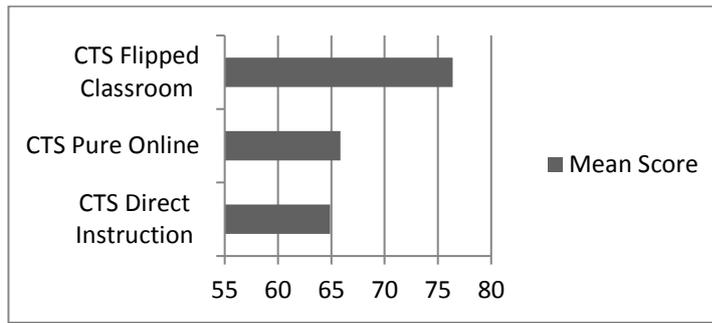
Tabel 4. Analysis of Variance for Differences among Treatment Groups Scores

Source	df	Mean Square	F	Sig
Model	2	1303.981	8.626	.000
Error	90	151.174		
Corrected Total	95			

The F value of 8.826, reported in Table 4, indicated a significant difference in group mean scores since it is higher than F_{tabel} (3,09). The significant value for the model is 0.000 or lower than alpha score (0.05). This shows that there is a significant difference of the critical thinking skills of the students taught through flipped classroom as compared to through pure online and direct instruction.

Further analysis which was shown by *Tuckey* HSD showed the critical thinking skills of students taught under Flipped Classroom is significantly higher than the other two models.

Tabel 5. Comparison of Mean Score of Critical Thinking Skills among Models of Teaching

Multiple comparison				
Critical Thinking Skills : Tukey HSD				
Models of Teaching	Models ofTeaching	Mean Difference	Std. Error	Sig.
Flipped Classroom	Pure Online	10.549[*]	3.0738	.003
	Direct Instruction (face to face)	11.503[*]	3.0738	.001
Pure Online	Direct Instruction (face to face)	.954	3.0738	.948

Based on observed means.
The error term is Mean Square(Error) = 151.174.

The mean score from the flipped classroom group is significantly higher than from pure online and from direct instruction. Reported in Table 5, the score differences are about 10,549 point from pure online and 11,503 point from direct instruction. Meanwhile, the mean score from the pure online group is not significantly higher than from direct instruction group. The difference in score is only about 0,954 which is very small.

DISCUSSION

The hypothesis of this study, that there would be no significant difference among group mean scores, was rejected. It means that there was a significant difference of the critical thinking skills of students taught under the three models (flipped classroom, pure online and direct instruction). This

suggests that variations existing in the students' scores were determined by the difference in models of teaching implemented.

The difference in the students' score may be attributed to varied theories underlying the models. The direct instruction is proposed by the behaviorist school of thought which sees learning as a change in observable behavior caused by external stimuli in the environment (Skinner, 1974); therefore, lecturers need to provide the necessary conditions for learning to occur through the interaction of among learners, teachers, and learning resources in the classroom (Magliaro et.al., 2005). The flipped classroom is based on the constructivism (Piaget, 1978; and Vygotsky, 1978) which claims that students interpret the information and the world according to their personal reality, that they learn by observation, processing and interpretation and then personalize the information into personal knowledge (Wilson, 1997). Hence, the students need to work with other learners to provide them real life experience and allow them to use their metacognitive skills. The pure online model is based on constructivism and also connectivism (Siemens, 2005) which sees learning not to be under the control of students due to changing environment, innovations and changes that students have to unlearn what they have learned in the past, and learn how to learn and evaluate new information (Ally, 2008). Therefore, students should be given control of the learning process. The difference in the theories underlying each model might result in the different effect towards the learning students undertake.

Another reason can be ascribed to the fact that both flipped and pure online models were basically adhered to a more student-centered learning as compared to the direct instruction model. Flipped classroom and pure online emphasizes students' active participation in planning, managing and controlling their own learning. Both models utilize the use of online learning platform supported by internet technology to support students' activities online. Direct instruction model is more teacher-centered; that lecturers determine the content of learning, explain it and provide tasks either guided or independent (Joyce, et al. 2015)

The result of this study were in line with a study by Rahardjo (2007) reporting that model of teaching emphasizing on student-centered learning is more effective to develop students' thinking ability. Yudiernawati et.al. (2015) observed that there was a significant difference of students' achievement after being taught through project based learning and direct instruction. Hamid (2015) investigating the difference of students' comprehension in reading under two instructional model. He found that reading collaboratively was better than using non-collaborative strategies. Furthermore, a study by Adistana (2015) investigating the difference of students' intellectual ability under blended learning cooperative and competitive found that learning cooperatively is better to develop intellectual ability than learning through competition. This shows that models of teaching which promote interaction among learners were proven to be better.

Having compared the mean score from the three groups, the present study indicated that the flipped classroom model was more effective than pure online and direct instruction model in teaching the critical thinking skills of students. This result can be attributed to theories underlying the flipped classroom. Theoretically, flipped classroom model is a combination of teacher-centered learning concept and students' centered learning with a more emphasis on the learner's activity. In this model, students form their knowledge through experience (Brown et.al., 1989) and lecturers do not transfer knowledge but support learning (Rhodes & Bellamy, 1999) through the use of technology and class discussions. In this case, students are actively shaping their knowledge meaningfully which enables them to better understand and process the material learned.

In addition, flipped classroom applies Bloom's taxonomy (1978) to both modes of delivery that the development of lower-order thinking is done outside the classroom/online and higher-order thinking is done in the classroom with the support from lecturers and peers. The out-of-class learning is teacher-centered by utilizing digital technology as a medium for materials or input delivery while face-to-face meetings in the classroom are used to interact with students and help them with tasks that are usually

done as homework (Bergmann & Sams, 2012). Learning becomes more effective with the use of technology (Bates and Pool, 2003) and more time for discussion (Bowen, 2006) so that lecturers better understand the learning needs and provide appropriate assistance. Tucker (2012) states that a very meaningful lesson in flipped classroom occurs as a result of the use of extra class time.

Collaborative learning environments both inside and outside the classroom encourage interaction between friends and enable them to learn from one another (Collis and Moonen, 2006). This model allows students to study learning materials prior to classroom meetings and progress in learning (Jones, 2008). Flipped Classroom enables learning to suit learning styles and abilities (Bergmann and Sams, 2012) and gives students flexibility and freedom in learning (Flores, et.al., 2016). These activities encourage students to improve the learning process and develop their critical thinking skills.

As for online learning, the internet has been used to access learning materials; to interact with the content, instructor, and other learners; and to obtain support during the learning process, in order to acquire knowledge, to construct personal meaning, and to grow from the learning experience (Ally, 2008). However, in this study, the students did not show similar or better scores in critical thinking skills as compared to those from the flipped classroom. One explanation has been that students might have been disadvantaged by low internet connection and also inadequate facilities as reported by some students in the study. Therefore, the result of this study should be taken in caution providing students without any hindrance with that classical reason may perform differently.

In comparison to the direct instruction implemented in this study, Bergmann and Sams (2012) argue that the traditional teaching approach spent an excessive amount of time to deliver content, but less opportunities to develop practical skills through knowledge share amongst learners. In contrast with the flipped model, classroom lecture is recorded and provided in video format and given as homework and all those exercises mostly done at home as homework are worked out during class time through group discussion and pair works with the help of teachers, friends or experts. This approach allows students to pre-visit the lesson contents before class in order to empower themselves to take control of the classroom session (Toqeer, 2013). The idea is that students who read or learn materials before class would be more well-prepared and most probably to be actively involved in a classroom discussion. This flexibility also provides opportunities to address different ability and special need concerns. Teachers can also underpin any knowledge gaps and take remedial action. In addition, the collaborative learning environment encourages peer interaction among students from various skills and let them learn from each another to become communities of practice (Collis and Moonen, 2006).

This finding is in line with several studies conducted abroad, among others are, Kharat (2015), Moraros et al. (2015) and Fahim (2011). Kharat et al. (2015) observed that flipped classroom can develop higher-level thinking skills because students can engage in active learning, interact with friends and use learned knowledge to analyze, synthesize, apply their knowledge to evaluate, build, design and create new things. Moraros et al. (2015) investigated students of the master's program and found that 80% of college students considered flipped classroom to be effective, and their value was higher after the application of Flipped Classroom. This format of learning is said to provide more opportunities for students to engage in critical thinking processes, facilitate learning independently and interact with and learn from friends more effectively. Fahim et al. (2011) who examined the differences in critical thinking skills of students taught by traditional approaches and e-learning learning found that the application of e-learning and digital technology in language learning improved students' thinking skills, especially male students. Students who received e-learning had higher critical thinking skills than those who did not.

CONCLUSION

The employment of digital technology as subsequent media to promote more learning on the part of students has been shown as well or better than the merely traditional teaching which requires lecturers to present material per se in a classroom. The digital technology has been proven beneficial to facilitate the provision of more knowledge input to students outside the class so that students will be well-prepared to actively participate in classroom discussion and task completion. The use of such technology, however, should consider existing facilities in support to the learning media. In a fully online classroom, for example, inadequate facilities such as internet connection and online learning culture may serve as drawbacks. The students with high motivation may end up not well performing provided such a condition. Therefore, it is of necessity to consider the provision of such facilities before deciding to implement an online class. With flipped classroom, the students develop their learning capacity within two mode of delivery that is through face-to-face classroom interaction and online activities. In addition, the concept of flipped class which reverses the learning of lower and higher level of thinking has been proven to facilitate learning goals attainment. Having said that, it is justifiable that the students' critical thinking skills vary from among the different models of teaching. Additionally, the critical thinking skills of the students are found to be more effective when they are taught through the flipped classroom model. Thus, it is suggested that flipped classroom is to be used to develop critical thinking skills of the English majors.

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