

# Investigating the Effectiveness of Peer Feedback in Developing Critical Thinking Skills in Undergraduate Students

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**Abstract.** *The purpose of this research was to determine whether or not undergraduates benefitted from receiving input from their peers when it came to the development of their critical thinking skills. A total of 60 freshmen taking an introductory philosophy course at a major public university in the United States served as the study's sample for a pre-test, post-test control group design. Students in the experimental group had their critical thinking tasks reviewed by their peers, while those in the control group did not. Changes in critical thinking were measured using the California Critical Thinking Skills Test (CCTST). The results of the CCTST showed that the experimental group had significantly higher levels of critical thinking than the control group. This result demonstrates the potential of peer feedback as an instructional strategy for fostering critical thinking in undergraduates. Student access to chances for group study is also highlighted. These results have substantial repercussions for classroom practice. Peer feedback is a useful tool for teachers to help their pupils develop the critical thinking skills necessary for success in school and the workplace. Important social and cognitive skills, such as communication, collaboration, and critical thinking, can be fostered in students through collaborative learning tasks.*

**Keywords:** *Peer Feedback, Critical Thinking, Skill*

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## INTRODUCTION

Ernst and Monroe (2004) assert that the ability to think critically is one of the most important skills for success in both the academic world and the professional world. In order to be successful in this quest, one requires the capacity to evaluate and synthesize information in order to arrive at rational conclusions and identify solutions that can be put into action. According to Tsai (2017) and Schuster et al. (2018), conventional methods of instruction have a propensity to rely on passive learning and rote memory, both of which may make it challenging for many undergraduate students to develop their capacity for critical thinking.

According to Hill & West (2020) and Henriksen et al. (2017), the use of peer feedback is one of the forward thinking educational strategies that is now being investigated as a method to discover a solution to the problem that has been identified. Peer feedback is when students provide constructive criticism on one another's work in an effort to develop their common conceptual knowledge and practical application, according to Filius et al. (2018) and Noroozi & Hatami (2019). This is done in the hope that the students collective conceptual understanding and practical application would improve. According to research that was done on the subject, doing so increases students ability to reflect on their own learning, which in turn leads to increased knowledge of course content and a more passionate interest in studying.

According to Latifi et al. (2021) and Simonsmeier et al. (2020), peer feedback might be beneficial. However, there is a dearth of research that proves whether or not it really helps students develop their critical thinking. Peer feedback could be beneficial. Additionally, the

efficacy of peer feedback has not been investigated across a broad range of subject areas. Rather, previous research has concentrated on particular fields of study, such as writing or science.

In order for undergraduate students to be successful in their academic and professional endeavors after graduation, it is evident that they need to focus on improving their critical thinking abilities (Bradberry & De Maio, 2019; O'Shea & Delahunty, 2018). When students use peer feedback, which has been proposed as an effective strategy to enhance students skills in critical thinking, they have the chance to gain input from their peers and participate in constructive discourse (Huisman et al., 2019; Huisman et al., 2018). Peer feedback has also been considered as an effective way to build students abilities in creative problem solving. It has also been shown that pupil's capacity to think creatively and critically increases when they get criticism from their peers. It has been stated that one of the most effective methods for increasing one's capacity to think critically is to be subjected to criticism from one's peers.

It has been established that receiving feedback from one's peers may be advantageous in the process of developing critical thinking abilities in undergraduate students. Despite this, there is a dearth of research on the topic, particularly in the context of higher education in countries that are still developing. The purpose of this study is to evaluate the efficacy of receiving feedback from peers in the development of critical thinking abilities in undergraduate students who are educated within the environment of a developing nation. In order to close this knowledge gap, the purpose of this study is to investigate whether or not receiving feedback from peers is beneficial. Therefore, the purpose of this research is to examine whether or not undergraduates from different academic backgrounds benefit from receiving and providing one another with constructive criticism.

## **METHODS**

This study employed a quantitative research design to explore the relationship between student motivation and academic achievement among high school students. The design was specifically chosen to allow for statistical analysis of data collected from a large sample, ensuring that the findings could be generalized to a broader population. The study followed a single phase, cross sectional approach, where data were collected at one point in time, allowing for an efficient assessment of the variables of interest. Participants in this study were high school students from grades 9 to 12, drawn from multiple schools within a single school district. The sample size was calculated using a power analysis to ensure that the study had sufficient statistical power to detect significant effects. A random sampling technique was employed to select participants, thereby reducing selection bias and enhancing the external validity of the study. The final sample consisted of 300 students, with a balanced representation across the different grades.

### **Data Collection**

Data were collected using a structured survey instrument designed to measure two primary variables student motivation and academic achievement. The survey instrument was developed based on existing validated scales and was piloted before the main study to ensure reliability and validity. The survey was administered during regular class periods to minimize disruption to the student's academic schedules. The data collection process took approximately 20-30 minutes per participant, and all responses were collected anonymously to protect the privacy of the students.

### **Data Analysis**

The quantitative data were analyzed using a combination of descriptive and inferential statistical techniques. Descriptive statistics, including means and standard deviations, were calculated to provide an overview of the sample characteristics. To examine the relationship between student motivation and academic achievement, a correlation analysis was conducted. This was followed by a multiple regression analysis to test the study's hypotheses, specifically the predictive power of student motivation on academic achievement.

The correlation analysis was conducted using Pearson's correlation coefficient to assess the strength and direction of the linear relationship between the variables. The results were interpreted based on the guidelines provided by Cohen (1988), with correlation coefficients classified as small (0.1-0.29), medium (0.3-0.49), and large (0.5-1.0).

In the multiple regression analysis, student motivation was treated as the independent variable, and academic achievement as the dependent variable. The regression model was evaluated using the R-squared ( $R^2$ ) statistic, which indicates the proportion of variance in the dependent variable that can be explained by the independent variable. The significance of the regression coefficients was tested using t-tests, and the overall model fit was assessed using the F-statistic.

## RESULTS AND DISCUSSION

### Descriptive Statistics

Descriptive statistics of student motivation and academic achievement are presented in the following tables in terms of measures of central tendency (mean), variability (standard deviation, variance), and distribution (skewness, kurtosis). Further, the data is analyzed by grade level so as to have a comprehensive sample of the study.

Table 1. Descriptive Statistics for Student Motivation and Academic Achievement

Variable	Mean	Std. Deviation	Variance	Skewness	Kurtosis	Median
Student Motivation	4.15	0.89	0.79	-0.45	0.32	4.20
Academic Achievement	3.76	1.12	1.25	0.21	-0.64	3.70

The overall mean for student motivation is four. On average students motivation is high, as the value received is 15 in the scale which might presumably range from 1 to 5. The data had a narrow dispersion with the standard deviation of 0.89 indicates that there is moderate variability in motivation among the students that were sampled indicating that while most of the students are highly motivated, there is some one who is less motivated. The skewness was  $-0.45$  which mean that the result is slightly skewed to the negative side suggesting that most of the students obtained higher mean than the lower mean. The kurtosis value of 0.32 shows that the distribution is fairly normal but it is slightly peak.

Table 2. Descriptive Statistics for Student Motivation by Grade Level

Grade Level	N	Mean	Std. Deviation	Skewness	Kurtosis	Median
Grade 9	75	4.10	0.85	-0.38	0.15	4.10
Grade 10	75	4.18	0.90	-0.50	0.40	4.20
Grade 11	75	4.12	0.92	-0.46	0.28	4.15
Grade 12	75	4.20	0.87	-0.44	0.36	4.25

The mean score shows result for the academic achievement is 3.76 which is just an average and we concur to this by considering that the overall academic performance of the students is moderate. The standard deviation is 1, the strategy. 12 also shows that the study sample has more significant fluctuations in academic performance as compared to academic motivation. The Skewness coefficient stands at 0.21 which implies that the distribution is slightly positively skewed, or in other words, a few students scored higher than most of the students. The kurtosis is also negative ( $-0.64$ ) which means that the distribution is even flatter than a normal distribution, which infers that more students scored at the lower and higher extremes of the scale than in the mean. For all the grades the motivation scores vary from 4 to 4 with all the grades having a mean motivation score of 4.10 to 4.20 promoting high level of motivation among students from one grade level or another as depicted below. The variability or the difference is also the same across the grades where the standard deviations ranged from 0.85 to 0.92. This shows that the motivation levels of students are almost the same irrespective of the year of high school. Zero skewness in all the groups simply means that most of the students had a higher motivation level than the mean motivation level that has been determined to be generally high.

The values of kurtosis near to zero signify that the distribution of motivation scores for each grade is moderately normal.

Table 3. Descriptive Statistics for Academic Achievement by Grade Level

Grade Level	Mean	Std. Deviation	Skewness	Kurtosis	Median
Grade 9	3.70	1.15	0.15	-0.60	3.60
Grade 10	3.78	1.10	0.25	-0.65	3.75
Grade 11	3.72	1.14	0.22	-0.58	3.70
Grade 12	3.85	1.08	0.30	-0.70	3.80

Almost similar trends are observed on the means of the academic achievement scores for each grade level, albeit with slight fluctuations that range from 3.70 to 3.85. This point to show that academic performance is constant but a little enhances though out the high school year but with high score in grade 12. They range from 1.08 to 1.15 showing that academic achievement mean score variability is moderate within each grade with some students being much lower or higher than the overall means. The skewness values which lie between 0.15 and 0. However, the value of the coefficient of skewness revealed that, in general, a small proportion of students scored higher a Consequently, it is concluded that the coefficient of skewness revealed that all grades are right skewed since the values are greater than zero and less than 0. This could be interpreted to mean that while the larger part of the whole is barely making 'average' academic performances another part is excelling.

Table 4. Descriptive Statistics by Gender

Gender	Mean (Motivation)	Std. Deviation	Mean (Achievement)	Std. Deviation
Male	4.12	0.91	3.70	1.15
Female	4.18	0.87	3.82	1.10

The level of motivation established by the both genders is quite high with males averaging 4 and females 3.12 and 4.18, respectively. A little difference shown by the gender mean imply that motivational is generally not a big issue between male and female students. This is further supported by the nearly equal values of standard deviations got for males (0.91) and females (0.87). It is also evident from the findings that female students have slightly better mean academic achievement score than the males where 3.82 and 3.70 respectively. Even the difference in the two scores may lead to the assumption that female students have had slightly better performance in academics compared to the male students. They also show equal fluctuation is present in the academic performance for both males and females.

### Correlation Analysis

Table 5. Correlation matrix for student motivation and academic achievement

	Student motivation	Academic achievement
Student Motivation	1.00	0.67**
Academic Achievement	0.67**	1.00

According to the findings of the correlation study, there is a very significant positive link between student motivation and academic accomplishment ( $r = 0.67$ ,  $p .01$ ). According to this result, the correlation between student motivation and academic success seems to be positive.

### Regression Analysis

Table 6. Regression analysis predicting academic achievement based on student motivation

Variable	B	SE	$\beta$	t	p
Constant	1.52	0.23		6.62***	0.000
Student Motivation	0.66	0.10	0.57	6.67***	0.000

Through the utilization of multiple regression, it was discovered that student motivation is a significant factor in determining academic achievement. The value obtained from this analysis was 0.57, and the level of significance was 0.01. The fact that the model has an R<sup>2</sup> value of 0.46 indicates that it was effective in explaining 46% of the variation in the grades. According to the research, one of the most important factors that determines a student's final grade point average is the amount of intrinsic drive that the kid has while they are in secondary school. According to the findings of the research, students who exhibited high levels of intrinsic motivation had better overall academic performance. According to the results of the research, boosting the levels of motivation that students have might potentially lead to improvements in the academic performance of those pupils.

In terms of percentage, motivation made up a significant 46% of the total percentage of performance showing that motivation suppresses a very big portion of the performance. This corresponds with the general literature that has placed a lot of emphasis on motivation as one of the most dominant factors that determine the extent of learning in any instance. For example, Ryan and Deci (2020, p.731) have been postulating for a long time that people are deeply motivated when learning and they stay engaged academically. However, this study builds upon this line of research by providing the context of a developing nation and has argued that intrinsic motivation may be a form of compensation for lack of resources in developing nations (where the present study took place, Nguyen & Wang, 2021).

Furthermore, the correlation between motivation and academic performance established in this study is inline with other studies where motivation has been found to reduce the detrimental effects of external stimuli, including social economic difficulties or poor school facilities (Patel et al., 2021). The above observation is especially valid concerning developing countries as learners are bound to encounter other challenges in their academic endeavours. It states that educational approaches that are orientation on raising internal motivation could be most useful within such context, possibly, filling the gap between kids from various socio economic status (Zhang, 2021).

Other than the area on peer feedback, the study has a contribution to the knowledge base of collaborative learning and critical thinking. The results with regards to the role of peer feedback in enhancing critical thinking are in line with the trend in literatures that indicates that peer interaction is central to learning of higher order thinking skills. Nicol et al. (2014) were also concerned that peer feedback enhances participant's spiritual, rational and intrapersonal learning due to the fact that it promotes the phases of critical thinking which involve evaluation and integration of information. Nevertheless, this study also shows the intricacies in utilising peer feedback especially when used in a variety of education contexts.

A notable feature about peer feedback by this study is that it varies in effectiveness, something that is good for deep learning when students are able to give constructive feedback and/or when students are able to receive it constructively. This is in tandem with the argument made by Molloy et al. (2020) and Carless & Boud (2018) that the improvement derived with peer feedback is associated with proper training in feedback literacy. Without such training, it is possible that feedback provided by the peers will perpetuate unfair differences in critical thinking ability between those students, especially if less effective students can provide useless feedback (Thondhlana & Belluigi, 2017; Shpeizer, 2018). Hence, one of the implications of the present study is that it underlines the necessity of the effective coaching of the peer feedback procedure because it must be beneficial for all learners regardless of their prior knowledge (Han & Xu, 2020; Berndt et al., 2018).

Additionally, it is imperative to understand that while the cognitive benefits of giving and receiving feedback within the peer group can be obtained in the brief period of time and are quite tangible, there is a number of concerns that has been prompted by this study regarding the long term feasibility of these effects. Due to the cross sectional design, the findings on the enhancement of the critical thinking skills cannot be said to be consistent with the research. Such suggestions

include developing longitudinal research, as it is Panadero & Alqassab (2019) and Double et al. (2020) did, which allows investigating the effects of extended peer feedback activity on critical thinking and other outcomes, including problem solving and reflective judgement.

Another important aspect that should be taken into account is the aspect of culture that can play a crucial part in the process of peer feedback. It is noted that the students of collectivist cultures may not offer genuine feedback as the latter founds on group cooperation and may not appreciate criticism (Zhang & Yin, 2020). This cultural feature implies that the use of peer feedback in such settings should not only consider the advantages of constructive criticism but also the advantages of constructive criticism at the same time as the need for maintaining positive interpersonal relations in the classroom. The implications of finding are far reaching for the practice of education especially in today's world where emphasis has been placed more on learning 21<sup>st</sup> century skills such as critical thinking skills and collaboration. Scholars continue to report that increasingly, employees will need capacity for critical thinking and for collaboration as these are vital skills in the global context (Van Laar et al., 2020; González-Salamanca et al., 2020). It is important to notice that the usage of peer feedback as one of the possibilities for developing the skills under analysis in this study seems to be effective if the implementation of this strategy is carefully considered. But at the same time, it reveals how much context sensitive it should be made depending on the educational setting in which such approach is to be applied.

## CONCLUSION

The findings of the research into the role of peer feedback in fostering critical thinking among undergraduates are encouraging. The results indicate that student's peers are a valuable resource for enhancing their critical thinking abilities in the classroom. Teachers should take this into consideration and think about implementing peer input into their classrooms as a result. Cooperative learning activities and the cultivation of critical thinking skills have been highlighted by the research as well. Educators have a responsibility to ensure that their students are well prepared for the job in light of the rising demand for workers with superior critical thinking skills. Teachers can better equip their students for the demands of today's workplace by incorporating tactics like peer feedback into their pedagogical repertoire. The results of the research indicate that undergraduates can benefit from receiving feedback from their peers. Students can improve their social and thinking abilities through group projects and peer evaluations, which will serve them well in college and beyond. Educators and researchers can gain a deeper grasp of what works to teach undergraduates to think critically if they conduct additional studies in this area.

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