Effect of student critical and analytical thinking skills on students academic achievement

Ani, Mercy Ifunanya', Eze, Beatrice A[2] . Ekeh, David Onyemaechi & Eze, Claris Nnenna

Department of Educational Foundations, Faculty of Education, Alex Ekwueme Federal University, Ndufu Alike Ikwo, Ebonyi State, Nigeria

*Directorate of Quality Assurance Data Base Management (DQADBM), Alex Ekwueme Federal University, Ndufu Alike Ikwo, Ebonyi State, Nigeria

Abstract

The study investigated the effect of critical and analytical thinking skills on student achievement. A quasi-experimental research design with intact classes assigned to the groups was adopted. Tivo research questions and two hypotheses guided the study The population was all the 100 level students comprising 343 students from the Faculty of Education, Alex Ekwueme Federal University, Ndufid Alike Ikwo (AE FUNAI) 2018/2019 academic year 72 students (30 female and 42 male students) were sampled using simple random technique. The study used a Philosophy of Education Achievement Test (PEAT) developed by the researchers which was initially shared to the students at the beginning and again after six weeks of the completion of six content areas. The instrument was subjected to face validation by two experts from Measurement and Evaluation. A test-retest reliability index of 0.73 was gotten using Pearson Product Moment correlation statistics. Tivo hypotheses were raised and pre-test- post-test quasi experimental design was used to test the two hypotheses. Participants in treatment group had the highest adjusted mean of (17.39) and control (14.19). There was significant main effect of treatment on students' achievement (F =65.63, The study found out that student possession of critical and analytical thinking skills enhance achievement in the university education. The study recommended among other things that school management should frequently organize training for lecturers on developing students' critical and analytical thinking skills.

Key words: Critical Thinking, Higher Education, Achievement, Analytical Thinking Skills,

INTRODUCTION

judgment is based. Critical thinking skills help to analyze and synthesize information that would enable students solve problems in different areas. It also enables one to take on the challenges in developing new ideas, making the right choices as well as understanding the world are the frame work required to realize the goals of any knowledge driven economy. Problems that are socially, scientifically and practically oriented can be solved using critical thinking skills which make it possible for existing problems to be properly interpreted, deduced, explained analytically and adequately assessed. Students must be able to make effective decisions and solve problems by thinking critically so that they can be effective in their own workplace as merely having information or knowledge without utilizing them is not enough.

Analytical thinking is the ability to analyze situations and circumstances by breaking them down into their component parts so that they can be used to synthesize as well as compare and contrast (Aniugwu, 2018). In order to inculcate analytical thinking skills into students, teachers should encourage them to analyze, compare and contrast as well as assess arguments, circumstances, and situations. Analytical thinking should be blended with critical thinking and inculcated into the children so that it can become part of the problem-solving process required by them to enable them build the capacity for a more complex living and working environment in the 21st century. Hence, the need to promote students' ability to think critically and analytically in schools in a number of ways such as understanding a concept, applying, analyzing and synthesizing it using creative and critical thinking skills.

There are special features designed to enable students to be better thinkers. Such features include not being restricted to specific content areas such as French, introductory technology, etc. They are designed to supplement regular school curricular rather than to replace them. When these programs designed from those special features, all of which are for four years are implemented, they present students with various examples of analytical and critical thinking with a view to making the practice of such thinking skills a requirement for them.
Furthermore, the programmes which vary on delivery of instructions and practice use abstract problems such as using group discussion of problems encountered on a daily basis and discovering patterns in seemingly meaningless figures, etc. to introduce students to creative, analytical and critical thinking.

There is great need to educate children and youths to think critically about relevant issues for them to grow into mature thinking adults with adequate problem-solving skills (Mukherjee, 2003. There is presently a growing interest among parents and employers in the development of critical, analytical and creative thinking skills in students due to their positive impact on the all-round development of the individual. This assertion is supported by Aniugwu, (2018), who contended that the global economy has shifted from being resource-driven to being knowledge-driven. It is therefore, the view of the researchers that educational institutions worldwide are faced with the growing challenge of contributing to the global economy by improving on the instructions that will impart the knowledge and skills required to meet the demands of modern careers into tomorrow's workforce. The current knowledge-driven economy has also created the necessity for employers to search for people who have high critical thinking and communicative abilities. Critical and analytical thinking is not an innate ability. Although some students may be naturally inquisitive, they require training to become systematically analytical, fair, and open-minded in their pursuit of knowledge. With these skills, students can become confident in their reasoning and apply their critical and analytical thinking ability to any content area or discipline (Onyeabor, 2015).

Critical and analytical thinking techniques are abstract in the sense that the thinking process is not tangible. Teachers should clarify the concepts used in teaching the students the critical and analytical thinking skills and

encourage them to put those skills to practice. The skills should be taught in stages. When each skill is initially introduced, it should be explained with at least two different examples based on the students' past experiences. The techniques should be labelled for it to be identified as a technique that is relevant to both the present and various other contexts. Appropriate analytical and critical thinking techniques should be named by the teacher in future instances to verify whether the students can remember it and think out how it relates to the materials being discussed. This implies that critical and analytical thinking techniques previously taught to students should be mentioned in future classes by teachers to find out whether the students can remember and identify the relationship between the past and the present techniques. Techniques used in teaching students critical thinking and analytical skills include; debate, group discussion, assessing students based on their critical, creative and analytical thinking abilities rather than their capacity to memorize, providing platforms where students interact with each other, engage one another in question and answer sessions and encouraging students to learn from each other by transferring knowledge from one person to the other.

There is great evidence that the labour market is more favourable to people with high critical and analytical thinking skills who can think in abstraction by being imaginative, logical, innovative and creative which are qualities that enhance productivity. Proficiency in reading, writing, and arithmetic has traditionally been the entry-level or threshold to the job market, but the new workplace requires more from its employees. Employees need to think critically, solve problems, innovate, collaborate, and communicate more effectively. This implies that emphasizing critical and analytical thinking skills would promote Nigerian graduates, thereby reducing youth unemployment in Nigeria.

Hypotheses

HOI There is no significant mean difference between the critical and analytical thinking skills of the treatment group and the control group.

H02 There is no significant mean difference between the post-test scores of Philosophy of Education Achievement Test of male and female students exposed to critical and analytical thinking skills (experimental group).

Methodology

A pre-test, post-test, non-equivalent group quasi-experimental research design which involves intact classes assigned to experimental and control group was adopted for the study. The population for this study was all the 100 level students comprising 228 students from the Faculty of Education, AE FUNAI 2019/2020 academic year. A sample of 72 students comprising 30 females and 42 males participated in the study. The students were randomly selected from the nine programmes within the four departments in the faculty. The researchers divided the nine programmes into two groups A and B comprising 5 programmes and 4 programmes respectively. The two selected intact classes were each randomly assigned to experimental and control groups (i.e. group A- experimental group and Group B — control group). The experimental group was taught with a lesson plan that contains critical and analytical skills (such as explanation, interpretation, analysis, evaluation, inferential, problem solving, self-regulating skills) while the control group was taught using lecture method. The instrument used for data collection is Philosophy of Education Achievement Test (PEAT). PEAT consists of 25multiple choice items with options from A to D. PEAT was drawn through the guide of a test blue print/table of specification. Face and content validation were done by two experts in the Measurement and Evaluation Unit in the University of Nigeria, Nsukka. A test-retest reliability index of 0.73 was gotten using Pearson Product Moment correlation statistics. In order not to disrupt the school schedules, the school normal class time-table was used during the study. The students in the experimental group and the control group were taught for six weeks. Pre-test was carried out on the two groups to determine the equivalence and

students ability level of knowledge in the two groups. Post-test was done at the end of six weeks of teaching. The test instruments were marked over 100%. The data generated were analyzed using ANCOVA to test the two hypotheses at 0.05 level of significance.

Results

Hypothesis 1: There is no significant mean difference between the critical and analytical thinking skills of the treatment group and the control group. This hypothesis was tested at .05 significant level using Analysis of Covariance (ANCOVA)

Source	Type Ill Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	349.89%	4	87.474	34.465	0.00	0.673
Intercept	519.68	1	519.68	204.756	0.00	0.753
Pretest	111.118	1	111.118	43.781	0.00	0.395
Treatment	166.558	1	166.558	65.625	0.00	0.495
Gender	0.091	1	0.091	0.036	0.85	0.001
Treatment * Gender	0.703	1	0.703	0.277	0.6	0.004
Error	170.049	67	2.538			
Total	17880	72				
Corrected Total	519.944	71				

a R Squared = .673 (Adjusted R Squared: .653)

Table 1: Summary of Analysis of Covariance (ANCOVA) of Student's critical and analytical thinking skills by Treatment (Experimental and Control) and Gender

Table I showed the summary of analysis of covariance (ANCOVA) of student's critical and analytical skills by Treatment and Gender. The table reveals that after adjusting for the covariance, (pre- student's achievement in critical and analytical skills), the effect of treatment on student's achievement in critical and analytical skills was statistically significant, F(1,67) 65.63, p > 0.05. Consequently, the null Hypothesis which stated that there was no significant main effect of treatment on student's attitude in Mathematics was therefore rejected. The table further shows that the Partial Eta Square (n2) was .50, which was moderate.

Table 2: Marginal mean and Pair-wise mean difference of student's achievement in critical and analytical skills by treatment

Treatment	Mean	Mean Difference	Std. Error	Sig.b	95% Confidence Interval for Difference
					Lower

					Bound	Upper Bound		
Experimental	17.387a	3.197*	0.395	0.00	2.41	3.985	-3.985	-
Control	14.189a	-3 197*	0.395	0.00	2.41			

Based on estimated marginal means

* The mean difference is significant at the .05 level.

b Adjustment for multiple comparisons: Least Significant Difference (equivalent to no adjustments).

Table 2 reveals that Experimental group has further showed that the mean difference was the highest mean score X =17.39 while the significant. participants in control group X = 14.19. the table

Hypotheses 2 Education Achievement Test of male and female There is no significant mean difference between students exposed to critical and analytical the post-test scores of Philosophy of thinking skills (experimental group).

Table 3: Marginal mean and Pair-wise mean difference of student's achievement in critical and analytical skills by gender

Gender	Mean	Mean Difference	Std. Error	Si	95% Confidence Interval for Difference Lower Bound	Upper Bound
Male	15.82$	0.074 -	0.388	0.85	-0.702	0.849
Female	15.75 1a	0.074	0.388	0.85	-0.849	o. 702

Based on estimated marginal means a Adjustment for multiple comparisons: Least Significant Difference (equivalent to no adjustments).

Table la Shows that there was no significant main effect of Gender on student's achievement in critical and analytical skills F (l,67) -0.036, ¯ p>0.05. Therefore, the stated null hypothesis that there is no significant main effect of Gender on student's critical and analytical skills was not rejected. Table 3 further showed that the mean score of male participants of 15.83 was higher than the mean score of female participants of 15.75, but the mean difference of 0.074 was not statistically significant.

Discussion of Findings

The following findings emerged from the study based on the data collected, analyzed and the hypotheses tested:

Table 2 showed the mean difference between the critical and analytical thinking skills of the treatment group and the control group. This finding revealed that students exposed to treatment group performed better than their counter pan in the control group. The reason for the difference could be attributed to acquisition of knowledge in critical and analytical thinking skills which were infused into the teaching of Philosophy of Education. This result is in line with the findings of Onyeabor, (2015), who found out that some students may be naturally inquisitive, yet they require training to become systematically analytical, fair, and open-minded in their pursuit of knowledge. With these skills, students can become confident in their reasoning and apply their critical and analytical thinking ability to any content area or discipline.

Table 3 showed the mean level of critical and analytical thinking of students exposed to treatment in terms of gender difference. The result indicated that male students performed better in Philosophy of

Education Achievement Test (PEAT) than their female counterparts. The difference could be attributed to males' desire to develop higher order thinking abilities. This was in conformity with Awang & Ramly, (2008) who contended that problem-based learning approach helps students to develop higher-order thinking abilities and enhance necessary qualities for effective performance expected in using student centered method of teaching.

It was also revealed that there was a significant difference between the mean of the critical and analytical thinking skills of the treatment group and the control group. The result showed that critical and analytical thinking is a significant factor for enhancing students' achievement in higher institutions of learning. Also, the mean difference was in favour of participants in treatment group. This was in conformity with Asuai (2013) who contended that there was a significant difference in the achievement of male and female students who were exposed to the treatment.

Conclusion

Drawing from the findings of the study, we concluded that students' in critical and analytical thinking skills (evaluating opinions, problem solving, logical arguments, and feasible plans, coming up with sound judgments that can guide the development of beliefs and putting them to action) will enhance students' performance. It is therefore hoped that if students' critical and analytical thinking abilities are enhanced in all courses in the university, it will lead to production of high-performing students for global competitiveness.

Recommendations

It was recommended that:

1. Efforts should be made to train lecturers the rudiments of critical and analytical thinking skills and how to integrate the skills into the school curriculum for teaching and learning
2. Lecturers should expose students to philosophical activities that Will activate their critical and analytical thinking.
3. School management should organize frequent trainings among lecturers to put critical and analytical skills into practice to enhance students' critical and analytical abilities.
4. Curriculum planners should examine curriculum documents to identify areas where critical and analytical skills need to be incorporated and strengthened.

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