

Effect of Concept Mapping Instructional Strategy on Secondary School Students Achievement in Economics in Mangu, Plateau State, Nigeria

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Abstract

The study sought to investigate the effect of concept mapping instructional strategy on secondary school students' achievement in Economics in Mangu Local Government Area of Plateau State. The population of the study consisted of all SSII students of economics in Mangu local government area of Plateau State. For the purpose of the research, the Economics Achievement Test (EAT) was used for data collection. The Economics Achievement Test (EAT) was used to determine students' level of learning Economic concepts. The simple random sampling technique was adopted in selecting the sampled schools, and intact classes in the two selected schools were used as the experimental and control groups. The experimental group was taught using the students' concept mapping instructional strategy, and the control group was taught using the lecture teaching method. The reliability of the instrument was estimated using the Kuder-Richardson method, and a reliability of 0.87 was obtained. In answering the research questions, the descriptive statistical tools of mean and standard deviation were used. While all hypotheses were tested using Analysis of Co-Variance (ANCOVA) at the 0.05% level of significance, The analysis was done with the use of SPSS (Statistical Package for Social Sciences). The findings of the study revealed that concept mapping instructional strategy does increase students' achievement in economics, male and female students had almost the same achievement in economics when exposed to concept mapping instructional strategy. The study recommended, among others, that teachers should be encouraged to incorporate collaborative learning activities that involve concept mapping because it is beneficial.

Keywords: *Concept mapping instructional strategy, students' achievement in Economics*

Introduction

Good education is only established when educational goals and objectives are met. And one of the determinants for attaining these goals and objectives is the students' academic performance in their respective areas, particularly in Economics. This academic achievement may be enhanced or hindered by the teaching methods adopted by the teacher in the teaching and learning processes. To this end, one of the goals of secondary school education is to equip the students to live practically in this modern age of science and technology (Federal Republic of Nigeria, 2014). Students at senior secondary level of education are required and expected to study one social science subject like Economics as a prerequisite to the study of courses such

as Accounting, Economics, Business Management among others. According to Alfred Marshall, the famous British economist, Economics is a study of mankind in the ordinary business of life, a body of knowledge, and a way of thinking about certain phenomena. Economics has become an important part of many educational systems around the world. Economics as a subject helps to develop in the learner skills such as analysis, experimentations, manipulation of variables, and making decisions which are very important in social economic investigations.

However, the West Africa Examination Council's (WAEC) Chief Examiner's Report (2017) shows evidence of poor Economics achievement. For instance, in 2017, only 177,800 candidates, representing 15% of the 1,184,384 that sat for the examination, obtained credits in five subjects, including, Economics. In 2022, the performance of students recorded was more than 5% lower than the previous year. The performance of students in Economics in the senior secondary school has not been encouraging lately, probably due to ineffective teaching and learning of the subject. Because the researcher believed that an effective teaching strategy is the bedrock of effective learning, Thus, the quality of the teaching strategy has a direct relation to the quality of student performance. Therefore, this poor performance has the potential to affect students who may want to study courses that require economics as a prerequisite for admission into courses such as Insurance, Accounting, Banking and finance, among others. Efforts are being continuously made to determine suitable strategies that will facilitate effective learning and understanding of Economics concepts at the senior secondary school level. This conscious effort prompts the researcher to undertake the study, which is to ascertain the effect of concept mapping instructional strategy on students' academic achievement in Economics in Mangu Local Government Area of Plateau State.

The importance and achievement of Economics objectives at secondary schools and other levels of learning have led to the exploration of new teaching methods. Thus, teaching method is the totality of all strategies, techniques, and ways that a teacher employs to maximize and facilitate classroom interaction. Teaching and instructional strategy can either be teacher-centered or student-centered method of teaching and learning processes. The teacher-centered method of teaching usually posts the teacher as the expert in charge of imparting knowledge to the learners. This teaching strategy involves lecture, drill and practice, teaching, and questioning. On the other hand, the student-centered method of teaching focuses on creating connections with the things they learn, such as problem-solving, concept mapping, and many others, which have improved deep learning in Economics. In this method, the teacher facilitates and provides an enabling environment for the students to exhibit their innate abilities.

A concept map refers to graphical tools that are used in teaching to organize and present knowledge. A concept is a perceived regularity in events, objects, or records of events or objects. Concept mapping is a method that allows students to understand the relationships between ideas by creating a visual map of the connections (William and Trochim, 2016). Once the learners are familiar with the idea and process, they can eventually construct their maps, either individually or collaboratively. By so doing, it enhances their learning process and, hence, improves students' academic achievement. Concept mapping can help Economics students organize and visualize these complex ideas, making it easier to understand and remember them; develop analytical and problem-solving skills that are important in economics; encode and retrieve information more effectively; and help students develop a deeper understanding of the subject matter.

Student academic achievement refers to the level of success that students attain in their academic pursuits. Mohammed (2019) opined that achievement is the attainment of set objectives measured by the score obtained through a test. It generally refers to the grades, test scores, and overall performance of students in educational settings. Academic achievement can measure various aspects such as knowledge acquisition, critical thinking skills, problem-solving abilities, and mastery of subject areas. It is often used as an indicator of a student's academic growth and potential for future success. Student academic achievement is influenced by many factors, including the quality of education, educational resources, teaching methods, student motivation, and individual characteristics.

Apart from achievement, gender is another vital variable in teaching and learning. Gender plays a role in students' experiences and may impact their performance in various ways. Several aspects related to gender, such as social, cultural, biological, and psychological factors, might contribute to these differences. Firstly, societal expectations and gender stereotypes often influence the educational opportunities available for students. For instance, certain subjects or fields of study might be traditionally associated with a particular gender, leading to differences in the choices students make. Such gender-related bias can affect self-perception, motivation, and engagement in academic pursuits. Furthermore, biological factors like hormonal fluctuations during adolescence can affect learning and cognitive abilities differently among males and females. These differences might lead to variations in cognitive development, information processing, and memory retention, influencing academic achievement.

Empirically, Onuoha, Ejimonye, Eneogu, and Ugwuanyi (2016); Eric (2018); Olukoya and Jimoh (2022); and Dorji (2022) reported that concept mapping has been shown to improve student learning and academic achievement in economics and other subjects. Wushishi, Danjuma and Usman (2013) and Gregory, John and Lazarus (2021) revealed that students who were taught Economics using the concept mapping instructional strategy had higher achievement scores than their counterparts taught with the lecture instructional strategy. They concluded that if concept mapping is properly used, it will enhance students' achievement in learning economics. Tosin and Oreoluwa (2019) reported that there was no significant difference in the performance and retention of male and female students, respectively. They concluded that gender has no significant influence on secondary school students' performance and retention in Economics.

Aim and Objectives of the Study

The aim of this study is to investigate the effect of concept mapping instructional strategy on secondary school students' achievement in Economics in Mangu Local Government Area of Plateau State. Specifically, the objectives of the study are to:

1. determine secondary school students' achievement in Economics in the experimental and control groups
2. Find out the achievement of male and female students in Economics after exposure to concept mapping instructional strategy.
3. Find out the interaction effect of treatment and gender on students' achievement in Economics.

Research Questions

For the purpose of this research work, the following research questions were raised to guide the study.

1. What are the pretest and posttest achievement Mean score of students in the experimental and control groups?
2. How different is the achievement of secondary school male and female's students in Economics after exposure to concept mapping instructional strategy?
3. What is the interaction effect of treatment and gender on achievement of students in Economics?

Hypotheses

The following Hypotheses was formulated to guide the study and would be tested at 0.05 level of significance.

1. There is no significant difference in the achievement of secondary school students in Economic when taught with concept mapping instructional and conventional instructional strategies.
2. There is no significant difference in the achievement of male and female secondary school students in Economics when taught using concept mapping instructional strategy.
3. There is no significant interaction effect of treatment and gender on students' achievement in Economics.

Methodology

The design of this study is a quasi-experimental design. Specifically, the non-equivalent pretest and posttest control group design This design was considered appropriate for the study because randomization was not allowed by the school authority because it would disorganize their class arrangement. The population of this study consisted of all 22 public senior secondary schools in Mangu Local Government Area of Plateau State. There are 1,489 SSII students of economics in the study area. The researcher chose SSS2 (two) because they are not in the examination class like the SS3 class or the SSS1 class which is new to senior classes. Two (2) schools and a sample of 44 students were used as intact classes for the study. The experimental group had 19 students, while the control group had 25 students.

The Economics Achievement Test (EAT) was used as an instrument for data collection. The Economics Achievement Test (EAT) was used to determine students' level of learning Economic concepts. EAT contains sections A and B. Section A contains items on the biodata of the students. Section B is comprised of 20 multiple-choice objective test items with four options (A–D) per item for the students to answer. In which the students were asked to select by ticking or by cycling the correct option. Content validity for the EAT was established by experts in the fields of research, measurement and evaluation, and economics education at the University of Jos. Kuder Richardson Formula 21 was employed to determine the reliability of the Economics Achievement Test (EAT).

The Economics Achievement Test (EAT) was administered to the experimental group and the control group at the same time as the pre-test. The EAT was used to determine students' level of knowledge before the implementation of concept mapping as an intervention programme. Students in the experimental and control groups received the same instruction using the same length of time (period). The concept mapping instructional strategy was used

to teach the experimental group, while the lecture or conventional instructional strategy was used to teach the control group. Thereafter, the EAT was re-administered to both groups as a post-test at the end of the instructions. The researcher marked and scored the pre-test and post-test, assigned scores based on the predetermined scoring rule, and generated quantitative data, which was used for analysis. The analysis was done with the use of SPSS (Statistical Package for Social Sciences). In answering the research, the descriptive statistical tools of graph, mean, and standard deviation were used. While all hypotheses were tested using Analysis of Co-Variance (ANCOVA) at a 0.05% level of significance,

Results

Research Question One

What are the pretest and posttest achievement mean score of students in the experimental and control groups?

Table 1

Pre-test and post-test Achievement Mean Scores of Students in the Experimental and Control Groups

Group	N	Pre-test		Post-test		Mean Gain	\bar{x} - difference
		Mean	SD	Mean	SD		
Experimental	19	49.47	4.97	85.79	9.76	36.32	31.92
Control	25	51.00	5.59	55.40	11.72	4.4	

Table 1 reveals the results of the pre-test and post-test achievement mean scores of students in economics in the experimental and control groups. In the experimental group, the post-test achievement mean score was 85.79 and the standard deviation was 9.76, higher than the pre-test mean score of 49.47 and the standard deviation of 4.97, with a mean gain of 36.32, indicating that there was an increase in the achievement of students after treatment. Also, for the control group, the mean score was 51.00 and a standard deviation of 5.59 at the pre-test, while the post-test mean score of students increased to 55.40 and a standard deviation of 11.72. The findings show that students in the experimental group had a higher achievement mean score after treatment using the concept mapping instructional strategy than those in the control group who were not given treatment, with a mean difference of 31.92. This means that at the pre-test, the students in both groups had low achievement, but after the intervention using the concept mapping instructional strategy, the experimental group performed better than the control group. It implies that concept mapping as an instructional strategy does improve students' achievement in Economics.

Research Question Two

How different is the achievement of secondary school male and female's students in Economics when exposed to concept mapping instructional strategy?

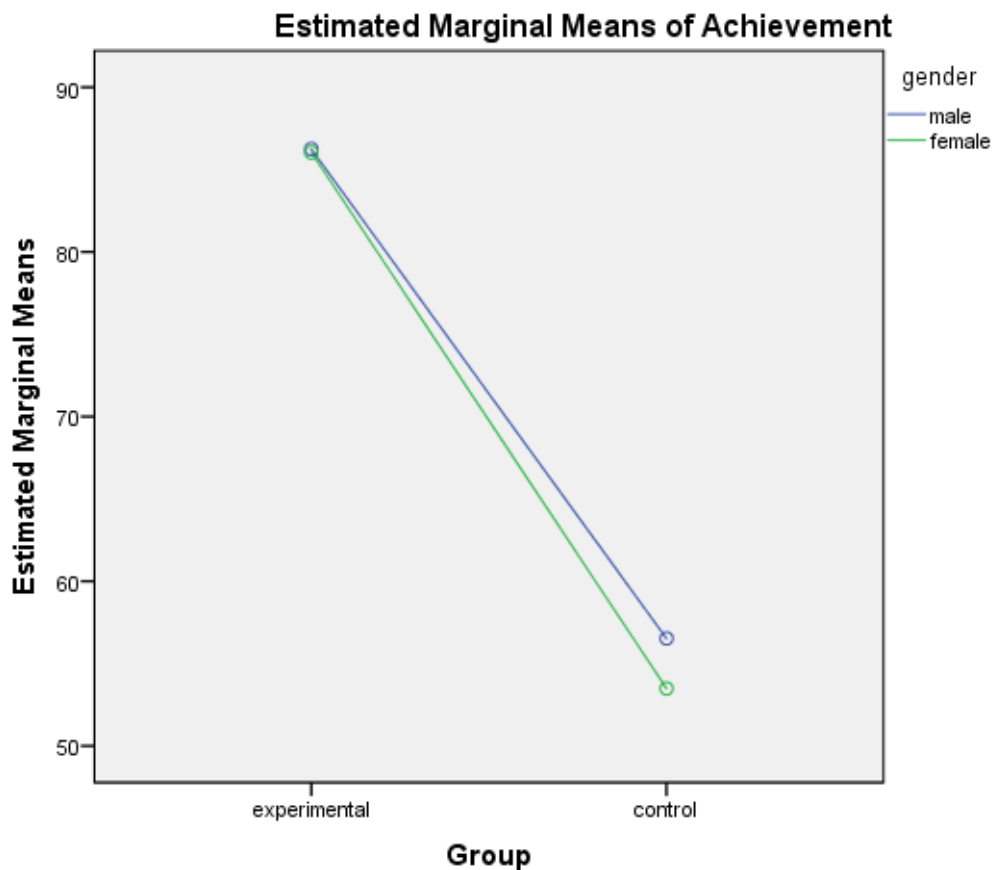
Table 2
Achievement of Male and Female Students Exposed to Concept Mapping Instructional Strategy

Group	Gender	Post-test			\bar{x} - difference
		N	Mean	SD	
Experimental	Male	10	83.00	10.59	5.89
	Female	9	88.89	8.21	

Table 2 reveals the result of the post-test achievement mean score of male and female students exposed to concept mapping instructional strategy in Mangu Local Government Area of Plateau State. From the result, male students had a post-test mean score of 83.00 and a standard deviation of 10.59. Also, female students had a post-test mean score of 88.89 and a standard deviation of 8.21 with a mean difference of 5.89, indicating that there was an increase in the achievement mean score of male and female students after treatment, with females having higher achievement scores than males.

Research Question Three

What is the interaction effect of treatment and gender on achievement of students in Economics?



Covariates appearing in the model are evaluated at the following values: covariate = 50.34

Figure 1: Interaction Effect of Treatment and Gender on Students' Achievement in Economics

Figure 1 presents the profile plot showing the interaction effect of treatment and gender on the achievement of students in Economics in Mangu Local Government Area of Plateau State. The interactive pattern shows that the plots for male and female students did not intercept; since the two lines are not crossed but more parallel, there is no likelihood of an interaction effect between treatment and gender on the achievement of students in Economics. It further shows that the interaction effect between treatment and gender on the achievement of students in Economics may not be attainable.

Hypothesis One

There is no significant difference in the achievement of secondary school students in Economics when taught with concept mapping instructional and conventional instructional strategies.

Table 3
ANCOVA Result on Post-test Achievement of Students in the Experimental and Control Groups

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	10044.096 ^a	2	5022.048	41.724	.000	.671
Intercept	1578.981	1	1578.981	13.118	.001	.242
Covariate	74.277	1	74.277	.617	.437	.015
group	10010.368	1	10010.368	83.168	.000	.670
Error	4934.881	41	120.363			
Total	221575.000	44				
Corrected Total	14978.977	43				

a. R Squared = .671 (Adjusted R Squared = .654)

Table 3 presents the posttest achievement scores of students exposed to concept mapping instructional strategy and those not exposed. The result shows that $F(1,41) = 83.17$, $p < 0.05$. Since the p-value of 0.000 is less than 0.05 level of significance, the null hypothesis was rejected, indicating that there was a significant effect of concept mapping instructional strategy on the achievement of students in Economics. The result further reveals an adjusted R squared value of .654, which means that 65.4 percent of the variation in the dependent variable which is achievement in Economics is explained by variation in the treatment of concept mapping instructional strategy, while the remaining is due to other factors not included in this study. This implies that concept mapping instructional strategies can help improve students' achievement in economics.

Hypothesis Two

There is no significant difference in the achievement of male and female secondary school students in Economics when taught using concept mapping strategy.

Table 4
Male and Female Students Achievement in Economics in the Experimental Group

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	287.861 ^a	2	143.931	1.616	.230	.168
Intercept	644.992	1	644.992	7.241	.016	.312
Covariate	123.592	1	123.592	1.387	.256	.080
Gender	165.902	1	165.902	1.862	.191	.104
Error	1425.297	16	89.081			
Total	141550.000	19				
Corrected Total	1713.158	18				

a. R Squared = .168 (Adjusted R Squared = .064)

Analysis of Covariance (ANCOVA) was conducted to determine if there is a significant difference in the achievement of male and female students taught Economics using a concept

mapping instructional strategy. Table 4 shows that the main effect of gender yielded $F(1,16) = 1.86$, $p > 0.05$, since the p-value of 0.191 is greater than 0.05 level of significance, the null hypothesis was retained, indicating that there was no significant effect of gender on the achievement of students taught Economics with concept mapping instructional strategy. The result further reveals an adjusted R squared value of .064 which means that 6.4 percent of the variation in the dependent variable which is achievement in Economics is explained by gender, while the remaining is due to treatment and other factors not included in this study. This implies that concept mapping instructional strategies can help increase achievement in economics for both male and female students.

Hypothesis Three

There is no interaction effect of treatment and gender on students' achievement in Economics.

Table 5
Interaction of Treatment and Gender on Achievement of Students in Economics

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	10094.892 ^a	4	2523.723	20.152	.000	.674
Intercept	1174.430	1	1174.430	9.378	.004	.194
Covariate	107.987	1	107.987	.862	.359	.022
Treatment	6905.952	1	6905.952	55.145	.000	.586
Gender	18.724	1	18.724	.150	.701	.004
Treatment* Gender	13.225	1	13.225	.106	.747	.003
Error	4884.086	39	125.233			
Total	221575.000	44				
Corrected Total	14978.977	43				

a. R Squared = .674 (Adjusted R Squared = .654)

Analysis of Covariance (ANCOVA) was conducted to determine if there is an interaction effect between treatment and gender achievement in Economics. Table 5 reveals the main effect of treatment yielded $F(1,39) = 55.15$, $p < 0.05$, since the p-value of 0.000 is less than 0.05 level of significance, the null hypothesis was rejected, indicating that there was a significant interaction effect of treatment on the achievement of students in Economics. Again, the main effect of gender yielded $F(1,39) = .150$, $p > 0.05$. Since the p-value of 0.701 is greater than the 0.05 level of significance, the null hypothesis was retained, indicating that there was no significant effect of gender on the achievement of students in Economics. The result also reveals that $F(1, 39) = .106$, $P > 0.05$, since the p-value of 0.747 is greater than 0.05 level of significance, the null hypothesis was retained, indicating that there was no significant interaction effect of treatment and gender on achievement of students in Economics.

Discussion

The findings showed that students in the experimental group had a higher achievement mean score after treatment using the concept mapping instructional strategy than those in the control group who were not given treatment. This means that at the pre-test, the students in both groups had low achievement, but after the intervention using the concept mapping

instructional strategy, the experimental group performed better than the control group. It implies that concept mapping as an instructional strategy does improve students' achievement in Economics. Abamba, Efe, and Esiekpe (2021) compared the effects of concept and mind mapping on students' academic achievement and retention and revealed that concept maps improve students' achievement and retention significantly better than the lecture method. Concept mapping, as believed, involves creating visual representations of knowledge and relationships between concepts, which help students organize and connect their understanding of the teaching and learning processes. The null hypothesis was rejected, indicating that there was a significant effect of concept mapping instructional strategy on the achievement of students in Economics. Implementing that concept-mapping instructional strategy can help increase students' achievement in Economics. The result of the study is in line with those of Onuoha, Ejimonye, Eneogu, and Ugwuanyi (2016) and Olukoya and Jimoh (2022), who showed that students who received the concept mapping teaching approach performed well in academics. Thus, when it is said that this instructional strategy can increase students' achievement in economics, it means that using concept mapping techniques in teaching economics has the potential to capture students' attention and engage them more effectively with the subject matter. By visually representing key concepts, relationships, and ideas in economics, students may find the material more accessible and engaging, leading to increased achievement and motivation to learn.

Findings on the difference in the achievement of secondary school male and female's students in Economics exposed to concept mapping instructional strategy revealed that there was an increase in the achievement mean score of male and female students after treatment with female having a higher achievement than the male. The null hypothesis was retained, indicating that there was no significant effect of gender on the achievement of students taught Economics with a concept-mapping instructional strategy. Thus, when it is stated that the concept mapping instructional strategy can help increase students' achievement in Economics for both male and female students, it means that the teaching approach has the potential to positively impact students of both genders in learning Economics. By utilizing concept mapping techniques, educators can provide a visual and interactive learning experience that appeals to diverse learning styles and preferences, regardless of gender. The finding is in line with Tosin and Oreoluwa (2019) study on the effect of gender on Economics students' academic performance in secondary schools, which showed that there was no significant difference in the performance and retention of male and female students, respectively. Therefore, the use of concept mapping as an instructional strategy is expected to contribute to an increase in achievement in Economics among both male and female students.

The findings on the interaction effect of treatment and gender on the achievement of students in Economics revealed that the intersection could not hold because the plot was not extrapolated. Therefore, it implies that the interaction effect between treatment and gender on the achievement of students in Economics is not attainable. The null hypothesis was retained, indicating that there was no significant interaction effect of treatment and gender on the achievement of students in Economics. When it is stated that there was no significant interaction effect of treatment and gender on the achievement of students in Economics, it means that the impact of the treatment (which could be a specific teaching method, intervention, or program) on students' achievement in Economics is not significantly different

for male and female students. In other words, the treatment's effectiveness does not vary based on gender. This finding suggests that treatment has a similar effect on the academic achievement of both male and female students in Economics.

Conclusion

The study concluded that employing concept mapping techniques as part of the instructional approach in teaching Economics has the potential to enhance students' engagement and enthusiasm for the subject. On the interaction effect of treatment and gender on the achievement of students in Economics, the study concluded that the treatment does not have a varying effect based on gender when it comes to influencing students' achievement in learning Economics.

Recommendations

Based on the findings and conclusions, the following recommendations were made:

1. Teachers are encouraged to promote inclusive instructional practices that consider the diverse needs and preferences of all students. This may involve offering a variety of instructional approaches beyond concept mapping, such as group activities, real-world case studies, or multimedia resources, to ensure all students have the opportunity to engage with the subject material in ways that resonate with them.
2. Educators play a crucial role in the implementation of instructional techniques such as concept mapping. Therefore, by providing professional development opportunities that familiarize teachers with the benefits and best practices of concept mapping can enhance its effective use in the classroom. Additionally, training programs can address strategies for addressing diverse learning preferences and promoting gender-inclusive teaching methods.
3. Teachers are also encouraged to incorporate collaborative learning activities that involve concept mapping because it is beneficial. This can be done by encouraging students to work together in creating concept maps that can foster a sense of shared ownership of learning, promote peer-to-peer knowledge exchange, and potentially contribute to a more inclusive and engaging classroom environment.

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