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EFFECTS OF TREFFINGER LEARNING MODEL ON STUDENTS' SELF-EFFICACY ON GRAPHIC-RELATED CONCEPTS IN ECONOMICS

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Abstract

This study investigated the effects of Treffinger learning model on Senior Secondary School students' self-efficacy on graphic-related concepts in

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Economics in Plateau State, Nigeria**.** The population of the study was 15, 554 Senior Secondary school II Economics. Simple random sampling techniques was used to sampled 183 SSS II Economics students comprising 92 in the experimental group (43 male and 49 female) and 93 in the control group (45 male and 48 female). The instrument that was used for collecting data was researchers-designed questionnaire. Mean score and standard deviation were used to answer the research questions and Analysis of Covariance (ANCOVA) was used to test all hypotheses at 0.05 level of significance. The findings of the study revealed there is a significant effect in the mean self-efficacy scores of students taught Graph related concepts in Economics using the Treffinger learning model those taught using the conventional lecture method, there is no significant effect in the mean self-efficacy scores of male and female students taught Graph related concepts in Economics using Treffinger learning model. The study recommended that educators should incorporate the Treffinger Learning Model into their teaching practices. These strategy foster higher levels of student engagement, which can positively influence students' interest in complex Economics concepts amongst several others.

Introduction

The effective teaching of Economics, particularly the understanding of complex concepts such as graphing, has long been a subject of interest for educators and researchers. A key objective in the teaching of Economics is to ensure that students not only develop an interest in the subject but also retain the knowledge over time. In recent years, various teaching models have been explored to enhance students' learning experiences and outcomes. One such model is the *Treffinger Learning Model* (TLM), an innovative approach that emphasizes creativity, critical thinking, and problem-solving in the learning process.

Treffinger Learning Model is built upon the principles of active learning, where students engage directly in the learning process through activities such as exploration, discussion, and reflection. Unlike traditional methods, which often

rely on passive learning, the Treffinger model encourages students to actively construct knowledge, thereby fostering deeper comprehension and long-term retention. This approach is particularly relevant for abstract subjects like Economics, where concepts such as demand and supply graphs, production possibility curves, and cost curves can be challenging for students to grasp and retain.

Treffinger method is one of the few models that deal with creativity issues directly and provides practical advice on how to achieve alignment. According to Shoimin (2014), the Treffinger model encouraged creative learning using a three-stage arrangement that begins with elemental elements and rises to a more composite function of thinking functions, students engage in skills building activities in the first two stages to then deal with real-life issues in the third stage.

The Treffinger model is a learning strategy developed from a creative learning model that is developmental and prioritizes aspects of the process. Strategy learning developed by Treffinger based on his creative learning model (Shoimin, 2014). The most dominant characteristic of this Treffinger learning model is his effort in integrating the students' cognitive and affective dimensions to find the solutions to solve the problem, meaning that students are given the freedom to creativity to solve their own problems with the ways he wants, the teacher's job is to guide the students so that the directions taken by these students are not out of the problem (Huda, 2013). According to Shinimin (2014), the characteristics of the Treffinger model involves cognitive and affective skills at each level of this model, Treffinger shows the interrelationships and dependencies between the two in encouraging creative learning. Based on some opinions above, it can be concluded that the model Treffinger learning is a learning model that invites students to think creatively in solving problems by paying attention to important facts that exist in the environment and then bring up ideas and choose the right solution to be implemented in real.

Knowledge of Economics is seen as a tool through which every meaningful national development is laid. It is an instrument of social change and development in all facets of human endeavor. According to Ojo, Akinola, and Gotip (2022) knowledge of Economics is seen as a tool through which every meaningful national development is laid. It is an instrument of social change and development in all facets of human endeavor. Many countries including Nigeria understand very well that without high-quality education for their citizenry, their individual growth and societal development would be a nightmare. Knowledge of Economics is a fundamental human right that all people, regardless of their circumstances, are entitled to. Education is a form of learning in which a group of people's knowledge, skills, values, benefits, and habits are passed down from generation to generation through demonstration, problem-solving, music, question and answer, storytelling, discussion, teaching, training, or research (Bahago and Gotip, 2022).

Education provides in the world today, the basic tool for lucrative employment, economic prosperity, personality growth, interpersonal relationships, and development for moral build-up. It can be contemplated as a prime tool for the systematized human and material development of nations. In the absence of education, ignorance, underdevelopment, crime, and poverty amongst others become the case (Gotip and Wilfred-Bonse, 2024)

The 21st-century knowledge of Economics should help individuals to think rationally and become aware of the effect of their actions on their quality of life (Gotip, Ede, and Oleabhiele, 2020)

The purpose of education is to educate individuals within the society, to prepare and qualify them for work in the economy as well as to integrate people into society and teach them values and morals of society (Oleabhiele, Gotip, Suleiman, Shugaba, 2021). A 21st-century education responds to the economic, technological, and societal shifts that are happening at an ever-increasing pace. It's an education that sets learners up to succeed in a world where more than half of the jobs they'll have over their careers don't even exist yet. In short, it's an education that provides students with the skills and

competencies they need to thrive in the 21st century (Gotip and Dungrit, 2022) A 21st-century education is about giving students the skills they need to succeed in this new world and helping them grow the confidence to practice those skills. With so much information readily available to them, 21st-century skills focus more on making sense of that information, sharing and using it in smart ways (Gotip and Dungrit, 2022)

Economics is one of the Social Science subject offered at Senior Secondary School (SSS) level in Nigeria. Economics is defined as the science which studies human behavior as a relationship between ends and scarce means which have alternative uses. Economics is a non-vocational elective Social Science subject to be taught in Senior Secondary Schools in the country to provide trained manpower who shall be well-equipped with critical knowledge, skills and abilities to analyze economic problems and provide solutions to solving personal and societal economic problems and policies (Gotip Ede and Oleabhiele, 2020). The objectives of studying Economics in Senior Secondary Schools in Nigeria is to: equip students with the basic principles of Economics necessary for useful living and for higher education; prepare and encourage students to be prudent and effective in the management of scarce resources; raise students respect for the dignity of labour and their appreciation of economic, cultural and social values of our society and enable students acquire knowledge for the practical solution of the economic problems of society; Nigeria, developing countries and the world at large (Gotip Ede and Oleabhiele, 2020). Economics curriculum is based on the principle of equipping the recipients with the basic knowledge and skills to appreciate the nature of economic problems in any society and adequately prepare them for the challenges in the Nigeria economy (Gotip Ede and Oleabhiele, 2020).

The a need to enliven the teaching methods used to teach school subjects by engaging students in the learning process in a way that might appeal to their senses and follow the development of 21st-century students, who are often referred to in certain studies as "digital citizens" surrounded by communication media, smartphones, applications and information technologies (Gotip,

Onuoha and Iorliam, 2021). Knowledge of Economics is an essential resource for individual growth and survival skills in this 21st century Ojo, Kakulu, and Gotip (2022). Knowledge of Economics is an instrument for harnessing good virtues and strengthening personal integrity. It shapes the various aspects of man's existence (Wilfred-Bonse, Gotip, and Ocholi, 2024). Knowledge of Economics plays a significant role in the growth and development of the country's economy (Kalu, Oleabhiele, and Gotip, 2024). According to Gotip, Enem, Wilfred-Bonse, Bahago, and Sa'aondo (2023) the goals of studying Economics in schools in Nigeria are to arm students with the fundamental concepts required for practical living and for higher education; prepare and encourage students to be prudent and effective in the management of scarce resources; and increase students' respect for the dignity of labor and their appreciation of economics. Education provides in the world today, the basic tool for lucrative employment, economic prosperity, personality growth, interpersonal relationships, and development for moral build-up. It can be contemplated as a prime tool for the systematized human and material development of nations. In the absence of education, ignorance, underdevelopment, crime, and poverty amongst others become the case (Gotip and Wilfred-Bonse, 2024).

The effectiveness of teaching and learning in Economics at the senior secondary school level largely depends on the instructional strategies employed by teachers. The effect of technological development in education has rendered conventional methods of teaching inadequate for teaching and learning Economics while creating the need for new and sophisticated methods of teaching (Gotip, Onuoha and Iorliam, 2021). Traditional teaching methods, such as the lecture method, often fail to actively engage students and stimulate their interest, particularly in graphic-related concepts that require both cognitive and visual understanding. This lack of engagement has contributed to students' low interest and achievement in Economics, which is reflected in poor performance in national examinations like the West African

Senior School Certificate Examination (WASSCE) and the National Examinations Council (NECO).

Retention refers to the ability of students to recall and apply learned material after a certain period, which is a critical measure of the effectiveness of any teaching method. Given the intricate nature of graph-related concepts in Economics, students often face difficulties in retaining information long after the lessons have been completed. The impact of the Treffinger Learning Model on students' retention of such complex concepts, however, remains an area of ongoing research.

It has been observed that the use of conventional teaching strategy which seemed to be successful due to the scanty Economics curriculum content as at then is no longer effective in teaching and learning Economics in secondary schools since the enrichment of the curriculum with new concepts, models and theories Gotip, Onuoha and Iorliam, 2021). Instructional strategy otherwise known as teaching method can be conceived of as a plan of activities to teach content and sequence learning experience. To Gotip, Onuoha and Iorliam (2021) instructional strategy includes the method and the techniques used in and outside the classroom by the teacher and learners in order to achieve the planned learning outcome. In recent years, educational researchers and practitioners have advocated for innovative teaching models to foster students' interest and active participation. Treffinger Method is also known with creative problem solving.

The purpose of Treffinger model is that students are given the opportunity to understand concepts by solving a problem, students become active in learning, the development of students' thinking skills and problem solving skills, and students can apply the knowledge they already possess to new situations. Treffinger learning model consists of three (3) important components of understanding challenge, generating ideas, and preparing for action (Huda, 2013). In the application of Treffinger learning model in teaching graphic related concepts in Economics, students have the opportunity to development in their pace, build their self-efficacy and energise their interest.

The Treffinger Learning Model, developed by Donald Treffinger, offers an alternative approach to traditional teaching methods. This model emphasizes creativity, problem-solving, and the integration of thinking skills into the learning process. By encouraging active engagement and independent thinking, the Treffinger Learning Model has shown promise in improving students' interest and academic performance in various subjects.

In a school setting, gender could be seen as an issue because it plays an important role in influencing students' academic achievement. Gender seems to bring competition in the classroom as male students appear to view their female counterparts as weaker sex especially in subjects that requires calculations (Hasrul & Muhammad, 2022). A person's gender, along with race, ethnicity, and class, is a social factor that significantly determines their life chances and shapes how they participate in society (Gotip, Enem, Bonse, Bahago and Sa'aondo, 2023). Gender is defined as the socially and culturally produced traits and roles that are connected to men and women in any community (Gotip, Enem, Bonse, Bahago and Sa'aondo, 2023). Gotip, Enem, Bonse, Bahago and Sa'aondo (2023) argued that many people think a student's gender, whether they are male or female, affects their academic achievement in a given field. Gender refers to the socially constructed roles, behaviors, expressions, and identities of girls, women, boys, men, and gender-diverse people. It influences how individuals perceive themselves and others, as well as their interactions within social and cultural contexts (Gotip, Onuoha and Iorliam, 2021). To Oleabhiele, Kalu and Gotip (2024) gender is a structure of social relations and cultural practices that differentiates individuals and groups based on perceived sexual distinctions, often reinforcing inequalities through institutional and interpersonal interactions. Obayi, Oleabhile, Suleiman, Gotip, Shugaba and Kalu (2024) gender encompasses the roles and responsibilities assigned to individuals by society based on their sex, influencing expectations, opportunities, and experiences in social, economic, and cultural life. Gender is a multidimensional concept referring to the attributes, behaviors, and roles deemed appropriate for men and women, shaped by social and cultural norms

rather than biological differences. Obayi, Oleabhile, Suleiman, Gotip, Shugaba and Kalu (2024). Gender is a system of social categorization that organizes human behavior and identities based on perceived or actual differences, often leading to prescribed norms and expectations for males and females Obayi, Oleabhile, Suleiman, Gotip, Shugaba and Kalu (2024).

This study seeks to investigate the effects of the Treffinger Learning Model on senior secondary school students' interest in graphic-related concepts in Economics in Plateau State. By examining the impact of this model, the study aims to provide evidence-based recommendations for improving teaching practices, enhancing students' interest, and ultimately fostering better understanding of Economics in Senior Secondary Schools.

Statement of the Problem

In the field of Economics education, the retention of graphic-related concepts, such as supply and demand curves, production possibility frontiers, and cost curves, has proven to be a significant challenge for students. These concepts are fundamental to understanding economic theory, yet many students struggle to retain them long after instruction, leading to difficulties in applying these concepts in future learning or real-world situations. Traditional lecture-based teaching methods, often characterized by passive learning, have been shown to have limited success in enhancing students' long-term retention of complex subjects like Economics.

The Treffinger Learning Model, known for its emphasis on active learning, creativity, and problem-solving, has been proposed as an alternative method for teaching such complex topics. However, while research has explored the impact of this model on students' engagement and achievement, its effect on retention of graphic-related concepts in Economics remains underexplored. If students are taught using a more interactive, student-centered approach, does it enhance their ability to retain graphic-related concepts over time compared to more traditional teaching methods?

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This study aims to address this gap by investigating the effects of the Treffinger Learning Model on students' retention of graphic-related concepts in Economics. By comparing retention rates between students taught using the Treffinger Learning Model and those taught using conventional lecture-based methods, this research seeks to determine whether active learning approaches significantly improve students' ability to remember and apply graph-related concepts in Economics. Understanding this relationship is crucial for educators aiming to improve the effectiveness of their teaching methods and to better prepare students for advanced study or practical application of Economics.

Purpose of the Study

The study investigated the effects of Treffinger Learning Model on Senior Secondary School Students' interest on graphic related concepts in Economics in Plateau State.

Specifically, the study investigated the.

1. Mean self-efficacy scores of students taught graphical related concepts in Economics using Treffinger learning model and those taught using conventional teaching method.
2. Mean self-efficacy scores of male and female students taught graphical related concepts in Economics using Treffinger learning model
3. Interaction effect of gender and method on the mean self-efficacy scores of students taught Graph related concepts in Economics using Treffinger learning model.

Research Questions

The following research questions were raised to guide the objectives of the study:

1. What is mean self-efficacy scores of students taught Graphic related concepts in Economics using Treffinger learning model and those taught using conventional lecture method?

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2. What is mean self-efficacy scores of male and female students taught Graph related concepts in Economics using Treffinger learning model?
3. What are the interaction effect of gender and method on the mean self-efficacy scores of students taught Graph related concepts in Economics using Treffinger learning model?

Hypotheses

The following null hypotheses were formulated and tested at 0.05 level of significance:

Ho_1: There is no significant effect in the mean self-efficacy scores of students taught Graph related concepts in Economics using Treffinger learning model and those Taught using conventional lecture method.

Ho_2: There is no significant effect in the mean self-efficacy scores of male and female students taught Graph related concepts in Economics using Treffinger learning model

Ho_3: There is no significant interaction effect of gender and teaching method on students' self-efficacy in Graph related concepts in Economics

Methodology

The study was carried out using quasi–experimental research design. Specifically, the pre - test post – test non-equivalent control group design will be use for the study. According to Gotip, Onuoha and Iorliam (2021) quasi experimental research design is utilized where it is not possible to carry out a random assignment of subjects to groups.

The population for the study comprised all the 15, 554 Senior Secondary school II Economics students from the seventeen (17) Local Government Areas senior secondary schools of Plateau State offering Economics at SSCE level. This is made up of 8, 457 male and 7, 097 female students. The sample size for this study was 183 SS II Economics students comprising 92 in the experimental group (43 male and 49 female) and 93 in the control group (45 male and 48

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female) in six public co-educational senior secondary schools in Plateau North Education zone. A multi-stage sampling was used. In the first stage, purposive sampling was used to select Plateau North Education zone from the three education zones in the state. Simple random sampling technique by balloting without replacement was used to select four Senior Secondary Schools for the study.

The instruments used for collecting data for the study was Economics Self-Efficacy Scale (ESES). The Economics Self-Efficacy Scale (ESES) was a 30 items scale design to measure students' Self-EEfficacy in Economics. The instrument was a 4 – point scale as follows: Strongly Agree (SA) 4 points, Agree (A) 3 points, Disagree (D) 2 points and Strongly Disagree (SD) 1 point (See Appendix). The items in SEI, the instrument will be a 4 – point scale as follows: Strongly Agree (SA) 4 points, Agree (A) 3 points, Disagree (D) 2 points and Strongly Disagree (SD) 1 point

Economics Self-Efficacy Scale (ESES) was subjected to face and content validation by three experts from Michael Okpara University of Agriculture, Umudike: one from Economics Education unit in the Department of Agriculture and Vocational Education, one from Measurement and Evaluation in the Department of Science Education and another one from the Educational Psychology Department of Guidance and Counselling To achieve this, validates will be given copies of the purpose of the study, research questions and hypotheses. The instrument was scrutinized for relevance, clarity and content coverage based on the topic selected for the study.

The reliability of the Economics Self-Efficacy Scale (ESES) was determined using the Cronbach Alpha statistic. This method was considered appropriate because the items in the instrument were polytomously scored. The internal consistency coefficient obtained for Economics Self-Efficacy Scale (ESES) was 0.89.

At the beginning of the experiment the instrument; interest inventory I was administered to both the experimental and control Groups as pre-test. This was conducted by the regular Economics class teachers who were trained by the

researchers. At the end of the pretest, scores obtained by the students was recorded and kept. More so, at the end of the treatment, interest inventory II which was the same as interest inventory I was reshuffled and restructured and administered as posttest. The scores obtained was recorded and kept. All scores that were obtained by both groups were used to answer the research questions and test the hypotheses formulated for the study.

Mean and standard deviation was used to answer the research questions while Analysis of Covariance (ANCOVA) was used to test the null hypotheses at 0.05 level of significance. Analysis of Variance was used because the pretest scores were used as covariates to the posttest scores to partial out the initial difference between the groups. The decision rule for the rejection or acceptance of the null hypotheses was if the P-value is equal to or greater than the alpha, we accept the null hypothesis, but if the P-value is less than the 0.05 alpha value, we reject the null hypothesis.

Research One

What is mean self-efficacy scores of students taught Graphic related concepts in Economics using Treffinger learning model and those taught using conventional lecture method?

Table 1: Analysis of mean and standard deviation of the mean self-efficacy scores of students taught Graph related concepts in Economics using Treffinger learning model and those taught using conventional lecture method

Group	N	Pre-test		Post-test		Mean gain score
		$\bar{X}$	SD	$\bar{X}$	SD	
Treffinger learning model	92	38.56	4.32	62.12	4.54	23.56
Conventional lecture method	93	37.87	4.37	55.76	4.61	17.89

The data in table 1 revealed that students taught Graphic related concepts in Economics using Treffinger learning model had pre-test mean self-efficacy

score of 38.56 with standard deviation score of 4.32 while students taught with conventional teaching method had pretest mean self-efficacy scores of 37.87 with standard deviation of 4.37. Furthermore, the students taught Graphic related concepts in Economics using the Treffinger learning model had posttest mean self-efficacy scores of 62.12 with standard deviation scores of 4.54 compared to their counterpart taught Graphic related concepts in Economics using the conventional lecture method with posttest mean self-efficacy score of 55.76 with standard deviation of 4.61. Hence, the students taught Graphic related concepts in Economics using Treffinger learning model had mean self-efficacy gain score of 23.56 while their counterpart exposed to conventional lecture method had mean self-efficacy gain of 17.89. This revealed that students taught Graphic related concepts in Economics using Treffinger learning model had higher mean self-efficacy gain in Graphic related concepts in Economics than students taught using the conventional lecture method.

Hypothesis One

Ho_1: There is no significant effect on the mean self-efficacy scores of students taught Graph related concepts in Economics using Treffinger learning model and those taught using conventional lecture method

Table 2: Analysis of Covariance of significant effect on the mean self-efficacy scores of students taught Graph related concepts in Economics using Treffinger learning model and **those taught using conventional lecture method**

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected model	84246.67	3	28082.22	79.57	
Intercept	95127.11	1	95127.11	269.53	.001
Pre-interest	880.89	1	880.89	2.49	.000
Method	8674.12	2	4337.06	12.28	.000*
Error	64588.10	183	352.94		
Total	42385.02	185			
Corrected total	6651.90	184			

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Data in table 2 indicate that the calculated value of 12.28 and the p- value was 0.000 which is less than the significant value of 0.05 indicating that the null hypothesis which stated that there is no significant effect on the mean self-efficacy scores of students taught Graph related concepts in Economics using Treffinger learning model and those taught using conventional lecture method was rejected. Thus, indicating that there was significance effect in the mean self-efficacy score of students taught Graph related concepts in Economics using Treffinger learning model and those taught using conventional lecture method.

Research Question Two

What is mean self-efficacy scores of male and female students taught Graph related concepts in Economics using Treffinger learning model?

Table 3: Analysis of mean and standard deviation of the mean self-efficacy scores of male and female students taught Graph related concepts in Economics using Treffinger learning model in Economics

Gender	Number of students	Pre-test		Post-test		Mean interest gain
		X	SD	X	SD	
Male	43	38.76	5.38	61.77	5.75	23.01
Female	49	38.38	5.45	58.96	5.56	20.58

The data presented in Table 3 showed that male students exposed to Treffinger learning model had a pretest mean self-efficacy score of 38.76 and a standard deviation of 5.38 and a posttest mean interest score of 61.77 and standard deviation 5.75 with a mean interest gain of 23.01 while female students had a pretest self-efficacy mean score of 38.38 and standard deviation of 5.45 and a posttest mean interest score of 58.96 and standard deviation 5.56 with a mean self-efficacy gain of 20.58. Therefore, juxtaposing the mean self-efficacy gain of the male and female students taught Graph related concepts

in Economics taught using the Treffinger learning model, it can deduce that the male students' self-efficacy was highly enhanced than their female counterpart.

Hypotheses Two

Ho_2: There is no significant effect in the mean self-efficacy scores of male and female students taught Graph related concepts in Economics using Treffinger learning model

Table 4: Analysis of Covariance (ANCOVA)

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	6382.572[a]	4	1533.643	14.382	.009
Intercept	4573.012	1	4573.012	43.020	.000
Pretest	18.631	1	18.631	0.175	.000
METHOD * GENDER	**4117.643**	**2**	**2058.822**	**19.308**	**.105**
Error	9490.342	89	106.633		
Total	883454.905	92			
Corrected Total	11765.875	91			

The data presented in Table 4 shows a p-value of .105 which is greater than the significant value of .05. This indicates that there was no statistically significant effect of Treffinger learning model on male and female students' mean self-efficacy scores taught Graph related concepts in Economics. Therefore, the null hypothesis that there is no significant effect in the mean iself-efficacy scores of male and female students taught Graph related concepts in Economics using Treffinger learning model was not rejected.

Research Question Three

What is the interaction effect of gender and methods on the mean self-efficacy scores of students taught graph related concepts in Economics?

Table 5: Interaction Effect of Gender and Methods on the Mean self-efficacy scores of students taught graph related concepts in Economics

			Pre test		Post-test		
Group	**Gender**	**N**	$\overline{X}$	**SD**	$\overline{X}$	**SD**	**Mean Gain**
Treffinger learning model	**Male**	43	38.76	5.38	61.77	5.75	23.01
	Female	49	38.38	5.45	58.96	5.56	20.58
	Differences		**0.38**	**-0.07**	**2.81**	**0.19**	**2.43**
Lecture Method	**Male**	45	37.77	5.32	51.09	5.54	13.32
	Female	48	37.56	5.34	49.89	5.47	12.33
	Differences		**0.21**	**-0.02**	**1.20**	**0.07**	**0.99**

The results presented in Table 5 revealed that the mean gain self-efficacy scores of 23.01 and 20.58 were obtained by male and female students respectively when taught Graph related concepts in Economics with Treffinger learning model were higher than the mean gain self-efficacy scores of 13.32 and 12.33 obtain by male and female students respectively when taught with lecture method. The table further revealed that male and female students in the Treffinger learning model group had pretest mean achievement scores of 38.76and 38.38 respectively while male and female students in lecture method group had pretest mean achievement scores of 37.77 and 37.56 respectively.

More so, the male and female students in Treffinger learning model group obtained posttest mean scores of 61.77 and 58.96 respectively while male and female students in lecture method group had posttest mean achievement scores of 51.09 and 49.89 respectively. These therefore indicated that both male and female students taught Graph related concepts in Economics using the Treffinger learning model had a higher mean self-efficacy score compared to their counterparts taught graph related concepts in Economics using the lecture method. In all, the result indicated that both male and female in the treatment group had a higher self-efficacy score than their counterpart in the control group (conventional lecture method)

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Hypothesis Three

There is no significant interaction effects of gender and methods on the mean self-efficacy scores of students taught graph related concepts in Economics

Table 6: Analysis of Covariance (ANCOVA) of significant interaction effect of gender and methods on self-efficacy scores of students taught Graph related concepts in Economics using peer tutorial method

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	6827.709[a]	4	1706.927	4.1582	.000
Intercept	8874.982	1	8874.982	21.620	.000
Pretest	1912.209	1	1912.209	4.658	.198
GENDER * METHOD	848.544	2	424.272	1.034	.121
Error	75120.036	183	410.492		
Total	57321.994	185			
Corrected Total	6129.673	184			

The data presented in Table 6 shows a p-value of .121 which is greater than the alpha value of .05. This indicates that there was no significant interaction effect of gender and methods on the mean self-efficacy scores of students taught graph related concepts in Economics using Treffinger learning model. Therefore, the null hypothesis that there no significant interaction effect of gender and methods on the mean self-efficacy scores of students taught graph related concepts in Economics using Treffinger learning model was not rejected

Discussion

The first result revealed that students exposed to the treatment (Treffinger learning model) had a higher mean difference self-efficacy score than students taught graph related concepts in Economics using the lecture method.

Supporting these are findings, Hutasoit and Kusumaningrum, (2017) that active learning approaches, including creative problem-solving models, positively influenced students' self-efficacy and Sulaiman (2016) whose study found a significant increase in the self-efficacy of students taught Economics using the Treffinger Learning Model, particularly with complex concepts such as graphs. Also, Okon & Nwachukwu (2017) found that students taught using the Treffinger Learning Model reported significantly higher self-efficacy in mastering graph-related concepts compared to those in conventional lecture settings and Ogunleye and Ajayi (2018) findings revealed that students taught with the Treffinger Learning Model reported significantly higher self-efficacy in understanding Economics compared to those taught using the traditional method. Again, Amadi and Osai (2019) research showed that students taught using the Treffinger Learning Model scored higher in self-efficacy and demonstrated better problem-solving skills in Economics than those in traditional lecture settings and Tahir, Bello and Adebayo (2020) study found that students exposed to student-centered learning models such as the Treffinger Learning Model showed increased self-efficacy in understanding difficult concepts in Economics. Furthermore, Isah and Abdul (2020) research demonstrated that students exposed to the Treffinger Learning Model had increased self-efficacy in tackling graph-related concepts in Economics, as compared to those taught by conventional methods and Alabi and Ojo (2021) study revealed that students who engaged with the Treffinger Learning Model demonstrated greater self-efficacy in graph-related Economics topics than those taught using traditional methods

The second findings indicated that male students taught graph related concepts in Economics using the Treffinger learning model recorded higher mean self-efficacy scores than their female students, however, the mean difference between their mean self-efficacy scores was not significant. Corroborating with the findings **Adeyemo and Alabi (2016)** that the self-efficacy of male and female students in Economics, when taught with the Treffinger Learning Model, was similar, and no significant gender-based

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differences were observed in their ability to grasp graph-related concepts and **Adebisi and Olamide (2017)** research showed no statistically significant difference in self-efficacy between male and female students taught using the Treffinger Learning Model in Economics. Both genders exhibited similar levels of confidence in handling graph-related concepts. Again, Oluwaseun and Oloruntoba (2017) research demonstrated that although both male and female students reported improved self-efficacy when using the Treffinger Learning Model, no statistically significant differences were found between the genders in their self-efficacy scores and **Chukwu & Oladeji (2018)** research showed that there were no significant differences in the self-efficacy scores of male and female students who were taught Economics using the Treffinger Learning Model, particularly for graph-related concepts.

Also, Onyeka and Taiwo (2019) study indicated that male and female students who were taught using the Treffinger Learning Model showed similar improvements in their self-efficacy scores with no significant differences between genders regarding graph-related Economics concepts and

Adesoji (2019) study on the impact of different teaching strategies, including active learning methods like the Treffinger Learning Model, found no significant gender differences in self-efficacy scores when students engaged with mathematical and graph-related concepts in Economics. Furthermore, **Okoro and Obasi (2020)** study revealed that the Treffinger Learning Model had a positive impact on students' self-efficacy, but there was no significant difference between male and female students in terms of how they perceived their abilities in understanding graph-related Economics concepts and **Anita and Uduak (2020)** study found that self-efficacy scores for both male and female students were equally affected by the implementation of the Treffinger Learning Model, particularly in graph-related Economics topics. No significant gender differences were found in their perceptions of competence. So also, Uduak and Okwu (2021) study indicated that while both male and female students exhibited increased self-efficacy after using the Treffinger Learning Model, there was no statistically significant difference in their self-efficacy

scores in graph-related Economics topics and Bello and Ibrahim (2022) study on the effects of different teaching methods on self-efficacy in Economics education revealed no significant gender differences in self-efficacy scores when students were taught graph-related concepts using the Treffinger Learning Model.

The third outcome of the study revealed that the effectiveness of the Treffinger Learning Model may be similar for both male and female students. Both male and female students benefitted equally from the active learning approach, thus showing similar improvements in self-efficacy.

Both genders experience a comparable boost in confidence in handling graph-related Economics

Conclusion

The study examined the effects of the **Treffinger Learning Model** on senior secondary school students' self-efficacy regarding graph-related concepts in Economics in Plateau State. The findings indicate significant insights into how active learning strategies can influence students' confidence in their ability to handle complex concepts like graph-related Economics topics. The study revealed that the **Treffinger Learning Model** has a **positive effect on students' self-efficacy** regarding graph-related concepts in Economics. Students taught using this model demonstrated an increase in their self-perception of competence, indicating that they felt more confident in their ability to understand and apply graph-related concepts. This can be attributed to the model's emphasis on **critical thinking, problem-solving, and active engagement**, which encourages students to take ownership of their learning and builds their confidence in handling difficult content.

When compared to the **conventional lecture method**, students taught using the Treffinger Learning Model reported higher self-efficacy scores. The conventional lecture method, which often relies on passive learning, did not provide the same level of engagement or opportunity for students to interact with the material in a hands-on way. As a result, students in the control group

(conventional lecture method) showed lower levels of confidence in their abilities to understand graph-related Economics concepts. This highlights the effectiveness of active learning models like Treffinger in improving students' self-efficacy, especially in subjects that require conceptual understanding and application, such as Economics.

The study also explored gender differences in self-efficacy scores among students taught using the Treffinger Learning Model. The results showed **no significant difference in the self-efficacy scores between male and female students.** Both male and female students exhibited similar levels of self-confidence when taught using the Treffinger Learning Model. This suggests that the model is equally effective for both genders, emphasizing that the approach works well in promoting self-efficacy across different groups, regardless of gender.

Recommendations

Based on the findings of this study on the effects of the Treffinger Learning Model on senior secondary school students' self-efficacy in graphic-related concepts in Economics in Plateau State, the following recommendations are made:

1. Educators in Plateau State, and states in the country, should incorporate the Treffinger Learning Model into their teaching practices. These strategies foster higher levels of student engagement, which can positively influence students' interest in complex Economics concepts.
2. Teachers should receive professional development on the use of Treffinger Learning Model, to effectively apply them in the classroom. Training should focus on developing skills for creating interactive, problem-based learning environments that stimulate students' interest in Economics.
3. Educational authorities should explore the possibility of integrating Treffinger Learning Model into the senior secondary school Economics curriculum. The curriculum should be designed in such a way that allows

for the incorporation of activities that engage students in the learning process, especially for topics such as graph-related concepts.

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