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Impact of Framing and Team-Assisted Individualized Teaching Approaches on Students' Attitude Toward Trigonometry at the Senior Secondary Level in Niger State.

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Abstract

The study investigated the effects of Framing and Team-Assisted Individualized Instructional Strategies on senior secondary school students' attitudes toward trigonometry in Niger State. Specifically, two research questions and two corresponding null hypotheses were formulated to guide the investigation. A quasi-experimental research design was employed, adopting a pre-test, post-test, non-randomized control group design. The study involved a sample of three hundred and sixty-two (362) students, drawn from three intact classes that were randomly assigned to experimental and control groups. The instrument used for data collection was the Attitude Toward Mathematics Inventory (ATMI), which was validated by experts in mathematics education. A pilot study yielded a reliability coefficient of 0.73, confirming its internal consistency. Data obtained from the pre-test and post-test administrations were analyzed using Analysis of Covariance (ANCOVA). The findings revealed that students in the experimental groups significantly outperformed those in the control group, $F(2, 362) = 40.748$, $p < 0.05$, indicating that the use of framing and team-assisted individualized instruction had a positive effect on students' attitudes toward trigonometry. However, no significant gender difference was found in the attitude of male and female students taught using these strategies, $F(2, 359) = 0.458$, $p > 0.05$. Based on these findings, it was recommended, among others, that government and educational stakeholders should organize regular workshops and seminars to train mathematics teachers on the effective application of framing and team-assisted individualized instructional strategies. Such capacity-building initiatives will enhance teachers' instructional practices and foster improved student engagement and attitude toward mathematics.

Keywords

Attitude, Framing, Team-Assisted- Individualized, Trigonometry

INTRODUCTION.

Science and Technology rely on the application of Trigonometry in real life situations which affect the daily lives of people. Trigonometry is an important topic in mathematics. It is the topic that is taught in schools and a basic concept that are also used in other subjects such as geometric, algebraic and graphical ways of thinking (Sarac & Tutak, 2017). It helps students to develop cognitive strategies, such as problem solving through reasoning and proofing capabilities of the students (Phonapichat et al ,2014).

Despite the recognition and importance accorded to Mathematics at all levels of Education, Alhassan, et al (2022) observed that over the past couple of years, there has been a steady increase in the number of students enrolling for Mathematics at both the Primary and Secondary School levels, but a corresponding decline in percentage of passes in Mathematics. Alhassan et al (2022), also observed that most students, especially Secondary school students, exhibit nonchalant attitudes towards Mathematics hence The West African Examinations Council (WAEC) results consistently show a high percentage of student's failing Mathematics. For instance, 2021 WAEC results, only about 35% candidates obtained credits and above in Mathematics. In recent result released for 2025, only 38.32% manage to earn credit and above in minimum of five subjects including both English and Mathematics which are considered core subject.

Chief Examiners report (WAEC, 2015) observed that many students avoid some questions especially those involving Trigonometry and mensuration. This meant

that there were some challenges affecting the learning of trigonometry by students which needs to be urgently addressed.

To enable learners to perform at the highest level in mathematics, learners need to be taught the relevant mathematical knowledge and skills, coupled with effective teaching strategies that can help learners exercise their reasoning powers or imaginations in the mathematics classroom. Mathematics as a body of knowledge embodies problem solving, deductive and inductive reasoning, among other things. Proficiency and competencies in these areas are essential when pursuing studies in science, engineering and technology. Hence, appropriate methods and procedures for developing the skills required for quality teaching and learning of Trigonometry must be sought. Such strategy is Framing (Misky, 1975) and Team Assisted Individualized (Slavin, 1985).

Framing teaching strategies involve creating a structured environment that enhances learning by setting clear expectations, goals, and contexts for students (Brusilovsky & Millán, 2017). This strategy encompasses establishing specific learning goals that help students understand what is expected of them. During instruction using framing teaching strategy, the lessons are related to real-world situations that make learning more relevant and engaging for students. Group work and discussions that enhance understanding and retention of material are equally encouraged, timely and constructive feedback are provided to help students recognize their progress. The framing teaching strategy fosters active involvement in learning through the encouragement of participation and

cooperation. It cultivates critical thinking and problem-solving abilities by prompting students to interact with the content substantively (Alhassan et al 2022). Frame graphics are co-constructed by the teacher and students who simultaneously fill in information on blank copies of the form.

On the other hand, Team Assisted Individualized is an approach combines element of cooperative learning and individualized instruction. Students work in mixed-ability team, but each student also has an individualized learning plan based on their specific needs and progress. Team Assisted Individualization (TAI) instruction is a cooperative learning strategy where students were assigned into three-member heterogeneous group. Each teammate works individually and cooperatively. They were given the same material but worked at their own pace. Teammate assists one another to understand the material and perform the task collectively. They must help one another for the team to succeed, "they either swim or sink together".

In order to improve students' attitude towards trigonometry many studies have equally been conducted using carefully planned instructional strategies. Adeneye and Abayomi (2013) conducted a study on Framing and TAI and result showed significant main effect of treatment and gender on student attitude toward Mathematics. The result indicated that student's attitudes were greatly improved when they were exposed to the teaching strategies of framing and team assisted individualized when compared with the traditional method.

Attitudes are more cognitive than emotions but less cognitive than beliefs. Leong and Alexander (2014) indicated that attitudes may involve positive or negative feelings "of moderate intensity and reasonable stability". Cooke (2015) added a fourth dimension to the affective domain of learning, namely dispositions, which are not the same as emotions, attitudes or beliefs. The enjoyment of mathematics could be regarded as a positive learning disposition, as it contains built-in elements such as the "desire, enthusiasm, confidence, and willingness.

Some researchers concluded that a positive attitude towards mathematics leads students towards success in Mathematics. Among these was the study of Emerso and Diosa (2019) whom asserted that attitude could also be gender related. There are numerous who hold the view that young men improve in Mathematics than young ladies. This conviction will in general influence the disposition of young ladies towards Mathematics. It is then discovered that there was no noteworthy contrast in the certainty of male and female understudies towards Mathematics at the auxiliary school level. They instead found that students' success in Mathematics depended on attitude towards the subject.

However, Gender was included as a moderating variable of interest in this study, because past studies in Nigeria had indicated gender as one of the most important variables in Mathematics Education with inconclusive report findings (Alhassan Eta el 2022). Perekeme, (2024), observed no significant effect of gender on students' achievement and attitudes toward Mathematics, thus concluding that gender

differences in attitudes and achievement might be disappearing.

In the same vein, Karjanto (2017) also conducted a study on the student's attitude towards mathematics. The result indicates a positive correlation between earlier high achievement in Mathematics and favorable attitude towards it. There was no significant difference based on gender of students in terms of their attitude towards mathematics.

Conclusively, gender issues are yet inconclusive, gender implication especially as it affects students' achievement and attitude towards Trigonometry need more verification. However, the use of Framing and Team Assisted Individualized Instruction in teaching and learning of Mathematics in Niger state is inadequate particularly in Trigonometry. This was what prompted the researcher to determine the effects of Framing and Team Assisted Individualized Instructional Strategies on Attitude towards Trigonometry among senior secondary students in Niger State.

Objectives of the study:

1. The effects of Framing and Team Assisted Individualized Instructional Strategy on Senior Secondary School Students' Attitude towards learning of Trigonometry.
2. The interaction effects of Treatment and Gender on senior secondary school students' Attitude towards Trigonometry.

Research Hypotheses

The following null hypotheses were formulated to guide the study and each was tested at 0.05 level of significance.

HO₁: There is no significant difference in the Attitude scores of students taught Trigonometry using Framing and Team Assisted Individualized Instructional Strategies and those taught using lecture method.

HO₂: There is significant interaction effect of Treatment and Gender on senior secondary school student's Attitude towards Trigonometry

MATERIALS AND METHOD

The research design for this study was Quasi experimental research design of the pre-test, post-test non-randomized control group design. The target population for this study consists of all Senior Secondary two (SSII) students in Niger State. The population for this study was 53,200 senior secondary two (SSII) students for 2022/2023 session. The sample for this study comprises of 210 males and 155 females gave the total of 362 students that were used in the study from the selected schools. The sample size was obtained using the Morgan's Table. Attitudes Towards Trigonometric Inventory (ATTI) was the instrument for data collection which was developed by the researcher and made up of 40 items on Students' Attitude towards Trigonometric to be answered using 4-point Scale responses. Adapted from Tapia and Marsh (2004). The scale ranging from Strongly Agree (SA) - 4, Agree (A) - 3, Disagree (D) - 2, and Strongly Disagree (SD) - 1. The ATTI was validated by experts. The reliability of ATMI was established using Cronbach alpha

coefficient. The coefficient was obtained to be 0.73 and this indicate that instrument is reliable for the study. The following statistical techniques were used in the study to analyze the data collected from Analysis of Variance (ANOVA) and Analysis of Covariance (ANCOVA).

RESULTS AND DISCUSSION

Table 1 Summary of Analysis of Variance (ANOVA) Table for testing the Significance between Mean Attitude Score for Experimental and Control groups.

	Sum of square	df	Mean square	F	Sign.
Between groups	14357.299	2	7178.650	40.748	.000
Within group	63774.849	362	176.174		
Total	78132.148	364			

Significant

The result on the table revealed that calculated F-value was significant at 0.05, that is $F(2,362) = 40.748; P < 0.05$. Thus, the null hypothesis was rejected. Result revealed that the attitude of experimental and control groups differs significantly. The result revealed that treatment using framing and TAI produce significant difference on student's attitude in trigonometry. This agreed with the submissions by Okigbo and Perekeme, (2024), Van Eck (2015) and Chong (2014) they investigated on student attitude and reported positive attitude toward mathematics. The result was also in support of Adeneye and Abayomi (2013) who carried out research on effect of Framing and TAI

HO₁: There is no significant difference in the attitude score of students taught Trigonometry using Framing and Team Assisted Individualized instructional strategies and those taught using lecture method.

on senior secondary student's attitude towards mathematics and result shows positive effect on student's attitude. Contrary to study of Karjanto (2017) conducted research on Attitude toward mathematics among the students at Nazarbayev University Foundation Year Programme. There was no significant difference between male and female students in terms of their attitude toward mathematics

HO₂: There is no significant interaction effect of treatment and gender on senior secondary school student's attitude in trigonometry.

Table 2 Summary of Analysis of Covariant (ANCOVA) Table for testing the Significance of Interaction effect of Treatment and Gender on the Mean Attitude Scores of Students taught Trigonometry using Framing and TAI strategies.

Source	Type III sum of square	df	Mean square	F	Sign.
Corrected model	14520.301	5	2904.060	16.389	.000
Intercept	963055.997	1	963055.997	5435.106	.000
Trtm	14493.408	2	7246.704	40.898	.000
Gender	.928	1	.928	.005	.942
Trtm * gender	162.304	2	81.152	.458	.633
Error	63611.847	359	177.192		
Total	1067798.000	365			
Corrected total	78132.148	364			
Not Significant					

Table 2 table revealed that the F-calculated value of 0.458 and the corresponding probability value (P-value) is 0.633, that is F (2, 359 = 0.458, $P > 0.05$). Hence, the hypothesis two (2) was accepted. The result also shows that there was no significant interaction effect of treatment and gender on the mean attitude scores of students taught Trigonometry using Framing and TAI strategies. This agreed with findings of Hassan et al (2019) carried out on Effects of van Hiele's phase-based teaching strategy and gender on pre-service Mathematics teachers' attitude towards geometry in Niger State, Nigeria. The result indicates that there were no statistically significant differences in both male and female attitude toward Mathematics as well as in their Pre-Calculus achievement. This also agree with the findings of Karjanto (2017) observed that, there was no significant

difference based on gender of students in terms of their attitude towards mathematics

Conclusion

Based on the findings of this study, the following conclusions were drawn: The results provide empirical evidence that the use of Framing and Team Assisted Individualized (TAI) instructional strategies significantly enhance students' attitudes toward trigonometry compared to the conventional lecture method. Furthermore, the study revealed no significant gender differences in students' achievement and attitude when taught trigonometry using Framing and TAI strategies.

It can therefore be concluded that adopting Framing and TAI strategies in the teaching of trigonometry, and mathematics generally, has the potential to foster more positive student attitudes and improve overall achievement. Consequently, these approaches are

recommended as effective alternatives to the conventional lecture method commonly used in schools.

Recommendations

In light of the study's findings, the following recommendations are made:

1. Adoption in Classroom Practice: Mathematics teachers should incorporate Framing and TAI strategies as part of their instructional approaches to improve students' attitudes and performance in mathematics.
2. Teacher Capacity Development: Attitudinal training workshops and professional development seminars should be organized for mathematics teachers to equip them with the skills and right dispositions necessary for effectively applying these strategies. Such training will also help teachers overcome negative instructional attitudes that often impede students' mathematics achievement.

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