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Effect Of Ethno-Mathematics Using Guided Instruction And Lecture Method On Students' Attitude Towards Mathematics In Delta State

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Abstract: *The study looked at how students' attitudes about mathematics changed as a result of employing guided instruction (EMGI) and the lecture method (LM) in Delta State. The study used a 2x2 factorial control group quasi-experimental design with pre- and post-tests. 19, 978 SSII Mathematics students from public secondary schools in Delta State made up the study's population. The study included 313 SSII students. Data were gathered using the Mathematics Attitude Questionnaire (MAQ). Three experts validated MAQ. Cronbach Alpha reliability coefficients for MAQ were 0.78. Mean, standard deviation and analysis of covariance (ANCOVA) were used to analyze the scores. The findings showed that: there was a significant difference between the Mathematics mean attitude scores of students taught with EMGI and those taught with LM, favouring students who were taught with EMGI; and there was no significant interaction effect between instructional methods and sex on students' attitude toward mathematics. It was concluded that EMGI, more than the LM, facilitates students' positive disposition to learn Mathematics. It was recommended amongst others the adoption of EMGI in teaching Mathematics at the secondary level of education.*

Keywords: EthnoMathematics, guided instruction, attitude

Introduction

Mathematics is the study of numbers, quantity, and space with the goal of solving a wide range of human issues. Mathematics is a rational science that aims to comprehend, explain and even control the world around us. Mathematics is one of the most important courses for raising individual awareness of how to contribute more effectively and meaningfully to nation building. It prepares students for careers in medical, engineering, computer science, and other fields. Mathematics is an inextricably linked component of science. It is a compulsory topic in Nigerian senior secondary schools.

As a tool for understanding science, mathematics has historically had a significant impact on how well people have been able to live on our planet. The fact that mathematics is the language of science and technology is universally understood, as well as other fields like as art and culture, and that it is the key to the country's and humanity's development and progress. Mathematics is the backbone of a student's ability to accomplish and improve reasoning and thinking skills. To increase mental acuity, inventiveness, and originality, the mathematics foundation should be taught in elementary schools (Oyedeji, 2016). It is impossible to exaggerate the importance of mathematics in human undertakings. Mathematics is significant in four ways: as a key to economic development, as a vital life skill, and as a source of Mathematics education (Anibueze, 2015). Due to its significance and application in daily life, mathematics is one of the fundamental and mandatory courses in primary and secondary education, as well as its role as a doorway to future careers in a variety of fields. As a result, Mathematics is widely acknowledged as a subject that must be taught at all levels of school in both developed and developing countries. According to Suleiman & Hammed (2019), Mathematics has a significant impact on the intellect; as a result, studying Mathematics fosters habits of accuracy and precision, preventing a man from being careless and sloppy. It boosts a man's mental alertness and sharpens his intellectual abilities.

Nigeria made mathematics one of the key subject in the secondary curriculum after discovering the many benefits and uses of the discipline in daily life and nation-building. Students continue to perform below standard in external exams like the West African Senior Secondary Certificate Examination (WASSCE) (WAEC Chief Examiner's report, 2016-2020), despite the numerous benefits and importance of mathematics and the elevated position given to mathematics education in Nigeria. This condition necessitates continuing efforts to rectify children' poor mathematics performance. Several factors that contribute to students' low performance and unfavourable attitudes about mathematics have been highlighted in some recent research papers (Suleiman & Hammed, 2019; Ozofor & Onos, 2018). These factors include a lack of skilled mathematics instructors, a lack of use of teaching resources, ineffective teaching techniques, and students' attitudes toward math, among others..

As a result of one's experiences, attitudes are psychological orientations that shape a person's perception of circumstances, objects, and people as well as how to react to them favorably or unfavorably (Mensah, Okyere & Kuranchie, 2013). The way students feel about mathematics influences their decision-making and how they react to their study of the subject. Because they learn to associate happy experiences or events with mathematics, students can grow to have a positive attitude towards it. The way that students feel about mathematics is influenced by a number of things. Students' attitudes toward mathematics are thought to be influenced by the teacher's technique of instruction. Consequently, the research tried to ascertain the effects of ethno-Mathematics using guided instruction (EMGI) and lecture method (LM) on students' attitude towards Mathematics in an attempt to isolate the most effective

teaching method in boosting students' attitude towards Mathematics.

In the majority of Nigeria's secondary schools, LM is the widely use approach for teaching mathematics. The teacher serves as a role resource in the classroom as part of the learner-controlled and information-centered LM approach. In this approach, only the teacher speaks, while the students merely listen (Ajaja, 2013). As a result, there is no longer any interaction between the teacher and students, which makes the classrooms boring. Additionally, LM does not account for the various cultural backgrounds of students. In order to pique and maintain the learner's attention and aid in the development of a good attitude toward mathematics, it is necessary to try a method like EMGI that does not require foreign or alien teaching content.

EMGI is the application of mathematics as a science in culture (Harbor-Peters, 2001). According to D'Ambrosio's definition from 2007, EMGI is a method of teaching and learning mathematics that draws on the prior knowledge, background, the importance of the student's environment in terms of both content and methodology, and the student's past and present experiences in his immediate environment. Kurumeh (2006) claimed that the EMGI technique is one that is utilized to clarify the reality of the connection between the cultural environment and mathematics when teaching. In order to facilitate meaningful teaching and learning, the EMGI approach adapts foreign or euro-centric mathematics to the learner's background and surroundings. It is believed that EMGI facilitate students' linking of their personal experiences to Mathematics concepts since students learn Mathematics using their cultural practices thereby reducing the abstraction and difficulty attributed to Mathematics concepts. This in turn promotes students' students' development of positive attitude towards Mathematics.

The issue of teaching method interacting with students' sex is becoming a concern to educators. Studies have shown that some teaching methods are sex dependent while others found otherwise. Therefore, it is anticipated that the adoption of EMGI will have an equivalent impact on male and female students' attitudes toward mathematics in this study. In light of this, the purpose of this study was to determine how EMGI and LM affected Delta State students' attitudes about mathematics.

Statement of the Problem

In the West African Senior Secondary Certificate Examination (WASSCE), mathematics students have a tendency to do poorly, according to a review of the WAEC Chief Examiner's Report (2016–2020). Students' poor performance in mathematics continues despite the government's efforts to improve student achievement in the subject, particularly through school renovation, the provision of instructional materials, the hiring of qualified teachers, and regular and prompt payment of teachers, among other measures. The researcher is of the opinion that students' poor performance in Mathematics could be attributed to students' negative attitude towards Mathematics. The researcher is of the belief that students' will performance better in Mathematics if they develop positive attitude towards Mathematics.

The attitude of students towards is influenced by numerous factors. The method of teaching adopted by the teacher is also believed to influence students' attitude towards Mathematics. The study's problem is to ascertain how EMGI and LM affect students' attitudes toward mathematics in an attempt to isolate the most effective teaching method in boosting students' attitude towards Mathematics.

Purpose of the Study

Examining how EMGI and LM affected students' attitudes toward mathematics was the major goal of the study. The study specifically aimed to:

1. compare the difference between students taught with EMGI and those taught with LM in terms of their attitudes toward mathematics;
2. compare the difference between male and female students taught with EMGI in terms of their attitudes toward mathematics; and
3. determine the nature of the interaction between instructional method and sex on students' attitudes toward mathematics.

Research Questions

The study was guided by the following questions:

1. How do students taught with EMGI and those taught with LM differ in terms of their mean attitude scores in mathematics?
2. How do male and female students who were taught mathematics using EMGI differ from one another in terms of their mean attitude scores?

Hypotheses

Three hypotheses further guided the study:

1. The mean attitude scores in mathematics between students taught with EMGI and those taught with LM do not differ significantly.
2. The mean attitude scores in mathematics between male and female students who were taught with EMGI did not differ significantly.
3. There is no significant interaction effect between sex and teaching techniques on students' attitudes toward mathematics.

Methodology

The study's design was a quasi-experimental 2x2 factorial pre-test, post-test control group. Two treatment groups comprise the design (ethno-Mathematics using guided instruction and lecture method) across with sex at two levels (male & female). The instructional method (ethno-Mathematics using guided instruction and lecture method) is the independent variable, sex is the intervening variable, while attitude towards Mathematics is the dependent variable. Table 1 displays the study's design.

Table 2: Design for the Study

Group	Pretest	Treatment	Posttest
EMGI (Experimental)	0_1	X_{EGI}	0_2

LM (Control)	0_3	X_L	0_4

Where, 0_1 and 0_3 = Pretest of EMGI and LM group respectively, 0_2 and 0_4 = Posttest EMGI and LM group respectively, X_{EGI} = Treatment with the use of EMGI, and X_L = Treatment with the use of LM.

The population of this study consisted of 19,978 SSII students taking Mathematics in all 473 public secondary schools in Delta State during the 2020–2021 academic year. 313 SSII students made up the study's sample. Using a stratified sample technique, the students were chosen from entire classes at six public secondary schools in Delta State. The Mathematics Attitude Questionnaire (MAQ) was utilized to gather data. Three professionals face validated MAQ. Using Cronbach's alpha, MAQ's reliability coefficient was 0.78.

The researcher adopted Ajaja (2013) treatment procedure. The treatment procedure is discussed under the following stages: The researcher initially asked the principals of the sampled schools for their approval before using the students and teachers there for this study. Thereafter which, the researcher familiarized herself with the Mathematics teachers of the schools and briefed them on the purpose of the study. The second stage was the random assignment of the selected schools into experimental (EMGI) and control (LM) groups. In the third step, the researcher provided five working days of EMGI instruction to the normal Mathematics teachers assigned to the schools in the experimental group. As for the teachers that handled the control group, they were not trained since LM is the conventional method of teaching. Meanwhile, the researcher provided a lesson plan for the teachers to use during treatment. The lesson contained the exact Mathematics concepts as that of the experimental group. The only difference is the instructional procedure.

The students in the two groups were pretested with the MAQ a day to the beginning of actual treatment that lasted for six weeks. Teaching geometry and mensuration to SSII students while utilizing the two teaching techniques is the study's actual treatment (EMGI & LM). MAQ were rearranged and given as a post-test to study participants in the control and experimental groups at the conclusion of the six-week treatment. The data from the experimental and control groups' pretest and posttest was then compared.

Results

- How do students taught with EMGI and those taught with LM differ in terms of their mean attitude scores in mathematics?

Table 2: Mean and Standard Deviation of Students Taught Mathematics Using EMGI and LM's Pretest and Posttest Attitude Scores

Group	N	Mean		MG	MGD	SD	
		Pretest	Posttest			Pretest	Posttest
EMGI	152	15.11	61.86	46.75	7.83	5.66	13.53
LM	161	14.96	52.88	38.92		5.64	13.15

N = Number of Subjects, MG = Mean Gain, MGD = Mean Gain Difference, SD = Standard Deviation

The mean gain for the students in both groups is 46.75 and 38.92, respectively, as shown in table 2. The average gain of the two groups varied by 7.83. This suggests that there is a difference in the mean attitude scores for mathematics students who received instruction from EMGI versus those who received instruction from LM, favoring EMGI.

- The mean attitude scores in mathematics between students taught with EMGI and those taught with LM do not differ significantly.

Table 3: ANCOVA Comparison of Attitude Scores of Students taught Mathematics with EMGI and LM

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	6307.566[a]	2	3153.783	17.674	.000
Intercept	106091.599	1	106091.599	594.561	.000
Pretest	12.111	1	12.111	.068	.795
Methods	6297.289	1	6297.289	35.291	.000
Error	55315.462	310	178.437		
Total	1087128.000	313			
Corrected Total	61623.029	312			

According to table 3, there is a significant difference between students who learned mathematics using EMGI and LM, with F(1, 310) = 35.291, P(0.000) 0.05. This outcome renders Ho1 invalid. Because of this, students taught with EMGI have much higher mean attitude scores in mathematics than those taught with LM, favouring them.

- How do male and female students who were taught mathematics using EMGI differ from one another in terms of their mean attitude scores?

Table 4: Mean and Standard Deviation of Male and Female Students Taught Using EMGI's Attitude Scores

Sex	N	Posttest		Mean Difference
		Mean	SD	
Male	70	62.80	14.27	1.75
Female	87	61.05	12.90	

According to table 4, the mean attitude score for male students in the EMGI group was 62.80, with a standard deviation of 14.27, while the mean attitude score for female students was 61.05, with a standard deviation of 12.90. Male students were favoured by the mean difference between the two groups, which is 1.75.

- The mean attitude scores in mathematics between male and female students who were taught with EMGI did not differ significantly.

Table 5: ANCOVA Comparison of Attitude Scores of Male and Female Mathematical Students Taught Using EMGI

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	171.957[a]	2	85.979	.467	.628
Intercept	58090.585	1	58090.585	315.194	.000
Pretest	56.146	1	56.146	.305	.582
EMGI	122.496	1	122.496	.665	.416
Error	27460.859	149	184.301		
Total	609196.000	152			
Corrected Total	27632.816	151			

F(1, 149) = 0.665, P(0.416) > 0.05 in table 5 demonstrates that there is no statistically significant difference between the posttest mean attitude scores of male and female students who were taught mathematics with EMGI. Ho2 is therefore not rejected. As a result, there is no discernible difference in the mean achievement scores in mathematics between male and female students who received EMGI instruction.

- There is no significant interaction effect between sex and teaching techniques on students' attitudes toward mathematics.

Table 6: ANCOVA Summary on the Effect of Instructional Approaches and Sex on Attitude Toward Mathematics

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	7322.843[a]	4	1830.711	10.384	.000
Intercept	103952.044	1	103952.044	589.634	.000
Prestest	38.645	1	38.645	.219	.640
Methods	6356.379	1	6356.379	36.054	.000
Sex	822.733	1	822.733	4.667	.032
Methods * Sex	170.004	1	170.004	.964	.327
Error	54300.186	308	176.299		
Total	1087128.000	313			
Corrected Total	61623.029	312			

According to students' mean attitude scores in mathematics, F(1, 308) = 0.964, P(0.327) > 0.05, there is no statistically significant interaction between instructional approaches and sex. Ho7 is therefore not rejected. As a result, there is no discernible interaction between teaching strategies and sex on students' attitudes about mathematics.

Discussion

The study found that students who were taught using EMGI significantly outperformed those who were taught with LM in terms of their mean attitude scores in mathematics. This observation could be explained by the fact that the EMGI group's students' interest in the learning process was perhaps more aroused, maintained and engrossed than that of the LM group's students. Also, the learning process of the EMGI grouped was tailored on the cultural identity of the students. In the course of learning, the students' explored varieties of cultural hands-on activities in order easily comprehend the Mathematics concepts taught. This may have facilitated the development of positive attitude towards Mathematics since the students learnt by doing. This may account for the superiority of the EMGI over the LM in which facts are transmitted to the students in the finite form. This finding gives credence to that of Milambo and Sakala (2019) who reported that EMGI substantially improved students' attitude in functions more than the conventional LM.

Additionally, the study found no appreciable difference in the average attitude ratings in mathematics between male and female students who were taught with EMGI. In other words, EMGI improved the mean attitude scores of students similarly for both genders. This may be explained by the possibility that both male and female students were equally engaged and interested by EMGI. This result supports Sofian, Maulida, Fadhillah and Sihite's (2017) assertion that there was no discernible difference between the attitudes of male and female students toward science.

Once more, the study found no discernible interaction between sex and teaching strategies and students' attitudes toward mathematics. This suggests that students' sex has no bearing on their attitude scores in mathematics when compared to the teaching strategy. This study supports the findings of Ubana, Abiam, and Enum (2017), who found no statistically significant interaction between sex and students' performance in geometry. This result confirms the findings of Ozofor and Onos (2018), whose research found a gender-method interaction impact to be important in terms of interest.

Conclusion

The study's findings led to the conclusion that EMGI, as opposed to LM, encourages students to have a positive attitude toward mathematics. In both male and female students, EMGI promotes the development of a favourable attitude toward mathematics.

Recommendation

The following suggestions were made by the researcher:

i. The implementation of EMGI in secondary school Mathematics instruction.
ii. In addition, Mathematics teachers should incorporate students' cultural backgrounds and customs into the teaching and learning process to help students acquire a positive attitude toward Mathematics.
iii. When utilizing ethno-Mathematics with guided instructions, Mathematics teachers should guarantee

that students' diverse cultural practices are accommodated by using a variety of cultural practices.

Contribution to Knowledge

This following are the contributions of this study to knowledge.

i. The study again established that EMGI is a superior instructional method than LM in enhancing students' attitude towards Mathematics.

ii. The study further established that EMGI did not significantly interact with students' sex to influence their attitude towards Mathematics.

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