



Effect of Framing and Team Assisted Individualized Instructional Strategies on Trigonometric Achievement of Senior Secondary School Students in Niger State

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Abstract

The purpose of this study was to determine the effect of framing and team assisted individualized instructional strategies on trigonometric achievement of senior secondary school students in Niger State. Three (3) null hypotheses were formulated. The study adopted quasi-experimental design using pre-test, post-test non-randomized control group design. A sample of three hundred and sixty-five (365) students were used. The instrument for data collection was Trigonometry Achievement Test. A reliability coefficient of 0.96 was obtained using cronbach alpha formula, three expert face validated the instrument. Data are analyzed using statistical software such as SPSS. The findings revealed that experimental group performed better than control group. And there was no significant difference between male and female students taught trigonometry using framing and team assisted individualized instruction. It was recommended among others that the government should organized workshop and seminars to equip the teachers in the use of framing and team assisted individualized instruction.

Keywords: Framing, Team Assisted individualized, Trigonometry, Achievement and Gender

Introduction

A major desire of many African nations today is to be technologically developed. In Nigerian there tends to be an acute shortage of skilled manpower in the field of science, engineering and technology. The fundamental importance of mathematics to humans could be explained in terms of the interrelationship between mathematics and the development of humans to advance the cause of humanity. Science and technology rely on the application of trigonometry in real life situations which affect the daily lives of people. Trigonometry is a very important subject in mathematics. It is a subject 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 and Tutak, 2017). It helps students 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 Mathematics at all levels of education, Dangpe (2012) 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 this subject. The WAEC (2015), chief examiners report, observed that many students avoid some questions especially those involving trigonometry and mensuration's in SSCE/NECO Examination. This meant that there were some factors or

challenges affecting the learning of trigonometry by students which needs to be urgently addressed.

The problem of students' underachievement in mathematics has been attributed to the poor strategies employed by school teachers in the teaching and learning of mathematics, and teachers' lack of appropriate depth in pedagogical content knowledge (Brijlall & Maharaj, 2015). This led to low achievement of students in Mathematics at Senior Secondary Certificate Examination (SSCE) which has become a source of concern to stakeholders in Nigeria. Hence, appropriate methods and procedures for developing the skills required for quality teaching and learning of Trigonometry must be sought. Such strategy is Framing (Awofala and Nneji 2010) and Team Assisted Individualized (Slavin, 1985). Frame was described as a big Picture or Frame work or grid for representing Knowledge, it was introduced into cognitive science by Minsky (1975). It was introduced as a product of spatial learning strategy to describe the mechanism for knowledge and knowing. Frame was also used to promote understanding and recalling the key topic and its essential features. Frame graphics are co-constructed by the teacher and students who simultaneously fill in information on blank copies of the form. Framing Strategy is a visual arrangement that enables a substantial amount of information to be put in a form of grid, framework, spatial or matrix. To support this assertion, Adeneye and Abayomi, (2013) described framing as a cognitive strategy for sequencing and synthesizing

information for the purpose of designs. It is opined that since framing strategy involve making connections of main ideas and the relationship between them, it might aid student's organization and comprehension of structural knowledge and remembering.

In another related development, Team Assisted Individualized (TAI) instructional strategy is another strategy used by the researcher. In individualized programmed instruction, "Instructional materials are arranged in a series of successive frames that lead the learner from a body of known concept to unknown, from simple to complex concept within the same area" (Nneji, 2010). Team Assisted Individualization (TAI) instruction is a cooperative learning strategy where students are assigned into three-member heterogeneous group. Each teammate work 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". Various evaluations of TAI have shown positive effects on mathematics achievement. For examples, Tarim and Akdeniz (2008); Gupta and Pasrija (2011) found supremacy of TAI cooperative learning strategy over traditional method of teaching in achievement and retention.

In order to improve students' academic achievement in Mathematics many studies have equally been conducted using carefully planned instructional strategies. Awofala and Nneji, (2010), conducted a study on Framing and TAI and result showed significant main effect of treatment on achievement in Mathematics. The results indicated that students' academic achievement was greatly improved in general Mathematics when they were exposed to the teaching strategies of framing and team assisted individualized when compared with the conventional teaching method. This finding supports earlier findings of Nneji (2010) which associated improved content learning to the use of framing and TAI strategies in Basic Science classroom in the south-south zone of Nigeria. This is further substantiated considering the views of Awofala and Nneji, (2012) that Framing and TAI Strategies are learner centered teaching strategies make students more reflective and critical thinking when compared with the traditional teaching method which emphasized teacher activity at the expense of pupil involvement.

In a similar study, Miriogu (2012) examine the effects of Framing instructional strategy on students' achievement and retention of knowledge

in mole concept. A non-equivalent control group quasi experimental design involving two intact groups was used. One hundred and forty-two SS1 students drawn from four schools (two Urban and two rural) chosen by purposive sampling in Ohafia educational Zone of Abia State were used for the study. The subjects were 47 male and 40 females from urban schools; 31 males and 24 females from rural schools. Results showed that framing instructional strategy was superior to the lecture method in enhancing students' achievement and retention of knowledge in mole concept. Sex and school location had no significant effect on students' academic achievement or retention of knowledge in mole concept. It was therefore concluded that framing instructional strategy enhanced students' achievement and retention in mole concept more than the lecture method.

However, based on knowledge of the researcher no much studies have been conducted on effects of Framing and TAI on students' achievement in Mathematics most especially in trigonometry in Nigeria. Awofala and Nneji in early 2010 conducted the first study on framing and TAI with a focus on attitude towards Mathematics in Oyo state in the south- west zone of Nigeria. Nneji, (2010) later in that same year replicate the study with a focus on achievement in Basic science in River state, in the South-south zone of Nigeria using teachers who were trained in a workshop setting. Results obtained were similar to those obtained by (Awofala and Nneji 2010). The present study is an extension of Awofala and Nneji (2010) to test the hypothesis: Can these instructional strategies will make the same impact in Mathematics of Senior Secondary School students in Niger state? Therefore, the present study aimed at investigating the effects of framing and team assisted individualized instructional strategies on Trigonometry achievement and attitude of senior secondary school students in Niger state.

Specifically, the objectives of the study were to determine:

1. the effect of framing and team assisted individualized instructional strategy on senior secondary school students' achievement in trigonometry
2. the effect of framing instructional strategy on senior secondary school students' achievement in trigonometry base on gender.
3. the effect of team assisted individualized instructional strategy on senior secondary school students' achievement in trigonometry base on gender



Hypotheses

1. There is no significant difference between the achievement scores of students taught Trigonometry using Framing and Team Assisted Individualized instructional strategies and those taught using the Conventional strategies
2. There is no significant difference between the achievement scores of Senior Secondary School students taught Trigonometry using Framing Instructional Strategy based on Gender.
3. There is no significant difference between the achievement scores of Senior Secondary School students taught Trigonometry using Team Assisted Individualized Instructional strategy based on Gender.

Methodology.

The research design for this study was Quasi experimental research design using pre-test, post-test non-randomized control group design. The target population for this study consists of all Senior Secondary two (SSII) students of Niger State which was 53,550 students. The sample for this study

comprises of 210 males and 155 females giving the total of 365 students that was used in the study from the selected schools.

One instrument for data collection, that is, Trigonometry Achievement Test (TAT). The instrument was face validated by experts as follows: Senior Lecturers from Mathematics Education Department and Secondary School Mathematics Teachers from the selected schools. The reliability coefficient was obtained as 0.96.

The entire study covered a period of 8 weeks. The researcher with the help of the teachers (trained research assistants) conducted the administration of the research instruments. This involves the use of framing in experimental group one (1), the use of team assisted individualized in the experimental group two (2) and use of conventional method in the control group all taught the same topics.

The treatment for experimental groups was carried out using the specially designed Instructional Guide (IG) for trigonometry, while the conventional method of teaching was used for the control group. While, the null hypotheses raised was subjected to inferential statistics which was Analysis of Covariance (ANCOVA).

Results

Table 1: Summary of ANCOVA table for testing the significance between mean achievement scores for the experimental and control groups.

Source	Type III sum of square	Df	Mean square	F	Sign.
Corrected model	7198.356 ^a	3	2399.452	11.273	.000
Intercept	123304.305	1	123304.305	579.312	.000
Pretest achiev	192.806	1	192.806	.906	.342
Trtm	7152.992	2	3576.496	16.803	.000
Error	76837.507	361	212.846		
Total	905431.000	365			
Corrected total	84035.863	364			

Table 1 above shows the summary of ANCOVA table for testing the significant difference of mean achievement scores for the experimental and control groups. The result on the table reveals that F-calculated value is 16.803 and the corresponding probability value (p-value) is 0.000. The calculated F-value is significant at 0.05; this is because 0.000 is

less than 0.05, that is (p=0.000; p<0.05). Thus, the null hypothesis was rejected. This implies that there is significant difference in mean achievement scores of students taught trigonometry using Framing and Team Assisted Individualized instructional than those taught using conventional method.

Table 2: Summary of ANCOVA table for testing the significant between the mean achievement score of male and female students taught Trigonometry using Framing strategy.

Source	Type III sum of square	df	Mean square	F	Sign.
Corrected model	209.659 ^a	2	104.830	.429	.652
Intercept	41148.566	1	41148.566	168.363	.000
Pretest frm gender	202.133	1	202.133	.827	.365
Gender	8.340	1	8.340	.034	.854
Error	29572.889	121	244.404		

Total	330060.000	124
Corrected total	29782.548	123

From the table 2 above, the table reveals that the F-value is 0.034 and the probability value (p-value) is 0.854. The F-value is not significant at 0.05; this is because 0.854 is greater than 0.05, that is (P=0.854;

P>0.05). Thus, the null hypothesis is upheld. This implies that there is no significant difference in mean achievement score of male and female students taught trigonometry using framing strategy.

Table 3: Summary of ANCOVA table for testing the significant difference between the mean achievement score of male and female students taught trigonometry using team assisted individualize instructional strategy.

Source	Type III sum of square	df	Mean square	F	Sign.
Corrected model	855.945 ^a	2	427.973	1.718	.184
Intercept	56636.552	1	56636.552	227.289	.000
Pretest TAI gender	81.734	1	81.734	.328	.568
Gender 2	786.526	1	786.526	3.156	.078
Error	29652.711	119	249.182		
Total	355630.000	122			
Corrected total	30508.656	121			

From table 3, the result shows the ANCOVA table for testing the significant difference of mean achievement scores of male and female students taught trigonometry using Team Assisted Individualize instructional strategy. The table reveals that the F-calculated value of 3.156 and the corresponding probability value (p-value) is 0.078. Therefore, the value of F-calculated is not significant at 0.05, this is because 0.078 is greater than 0.05, that is (P = 0.078, P > 0.05), hence, the hypothesis is accepted, that is, conclude that there is no significant difference in the mean achievement scores of males and female students taught trigonometry using team assisted individualize instructional strategy.

Discussion

There was significant difference in achievement of students taught trigonometry using framing and TAI strategies performed better than those taught with conventional method. The result indicated that treatment using Framing and TAI produce significant difference on student’s achievement in trigonometry. This agreed with the finding reported by Nneji, (2010), Siregar et al (2018) and few other researches. The different submission above pointed out that framing and TAI if effectively employed, would improve student’s achievement in different given tasks.

There was no significant difference in achievement of male and female students taught trigonometry using framing strategy. This is indication that framing strategy minimized gender differences.

This is contradiction to some research findings in Nigeria showed that boys performed better than girls. Others have it that the girls do better than boys in mathematics generally despite the fact that they are put under the same classroom situation (Adeneye, et al 2013).

There was no significant difference in achievement of male and female students taught trigonometry using TAI. This indicates that TAI strategy minimized gender difference. The result agreed with the finding of Adeneye, *et al* (2013) conducted a research on effect of framing and TAI on student’s achievement, revealed no significant difference This is contrarily to the finding of Nnamani and Oyibe (2016) who found that female students performed better than the male students when taught with TAI strategy.

Conclusion

The following conclusions were made based on the findings of this study. The result of this study provide empirical evidence that the use of Framing and TAI strategies enhance student’s achievement in trigonometry more than the use of conventional teaching strategy.

In addition, students taught trigonometry using Framing and TAI (experimental groups) performed better than their counterparts taught trigonometry using the conventional teaching strategy. There was no significant difference on gender achievement of student taught trigonometry with framing and TAI. This implies that gender has no significant effect on

achievement of students in trigonometry. Therefore, the use of Framing and TAI strategies enhances the teaching and learning of trigonometry.

Teaching strategies from this finding has the potential to make students' achievement in Trigonometry. Framing and TAI strategies are found to improve students' achievement in trigonometry and mathematics generally than conventional teaching strategy.

Furthermore, Framing and TAI strategies help to bridge gaps between male and female students as this was seen in its gender friendliness. One can therefore conclude that the study suggested that the adoption of Framing and TAI strategies as an alternative to the conventional strategy of teaching mathematics in the schools would improve higher achievement in mathematics.

Recommendations

The following recommendations were made based on the findings of this study:

1. Since the use of framing and TAI strategies enhance achievement and attitude of student in mathematics, the mathematics teachers should use it as one of the strategies to be employed in classroom teaching and learning.
2. Workshops and seminars should be constantly be organized by government for mathematics teachers to enable them learn how to develop the habit of framing and TAI and proper implementation of the guides provided for in the secondary school curriculum.
3. Mathematics teachers should re-assess their classroom instructional practice because there is a need for a shift from instructional practice, which makes learners passive listeners to the practice that engages learners actively in the instructional processes.

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