

**EFFECT OF TARGET-TASK PROBLEM-SOLVING MODEL ON STUDENTS' ACHIEVEMENT
AND INTEREST IN GEOMETRY IN BOSSO LOCAL GOVERNMENT AREA OF NIGER STATE,
NIGERIA**

BY

**¹HASSAN, A.A (PhD) ²GIMBA R.W, (PhD), ³HASSAN, A.M (PhD), & ⁴BASHIR, A.U (PhD)
^{1,3&4}SCIENCE EDUCATION DEPARTMENT & ²INDUSTRIAL AND TECHNOLOGY
EDUCATION**

FEDERAL UNIVERSITY OF TECHNOLOGY, MINNA

Phone No: 08032853603

Email: ramatu.gimba@futminna.edu.ng

**BEING A PAPER PRESENTED AT 2ND ANNUAL INTERNATIONAL CONFERENCE
ON RESEARCH AND INNOVATION IN EDUCATION, ORGANIZED BY COLLEGE
OF EDUCATION AND EXTERNAL STUDIES (CEES), UNIVERSITY OF NAIROBI,
KENYA**

THEME: RESEARCH AND INNOVATION IN EDUCATION

DATE: 23RD TO 25TH OCTOBER, 2019

EFFECT OF TARGET-TASK PROBLEM-SOLVING MODEL ON STUDENTS' ACHIEVEMENT AND INTEREST IN GEOMETRY IN BOSSO LOCAL GOVERNMENT AREA OF NIGER STATE, NIGERIA

BY

**¹GIMBA R.W, (PhD), ²HASSAN, A.M (PhD), ³HASSAN, A.A (PhD) & ⁴BASHIR, A.U (PhD)
^{1,3&4}SCIENCE EDUCATION DEPARTMENT & ²INDUSTRIAL AND TECHNOLOGY
EDUCATION**

FEDERAL UNIVERSITY OF TECHNOLOGY, MINNA

Phone No: 08032853603

Email: ramatu.gimba@futminna.edu.ng

Abstract

The study investigated the effect of target-task problem-solving model method on students' achievement and interest in geometry. Target-task problem-solving model is a form of active learning where progress is assessed by how well students develop experimental and analytical skills rather than how much knowledge they possess. Target-task model allows students to discover specific information by themselves before they make generalization. Four research questions and four null hypotheses guided the study. Quasi-experimental design was adopted for the study, specifically, non-equivalent control group design. The study was carried out in Bosso local government area of Niger State, Nigeria. The sample for the study comprised of 80 JSSII students from two intact classes in two secondary schools in Bosso local government area of Niger State, Nigeria, the sample was drawn using multi stage sampling techniques. The experimental group were taught using target-task problem-solving model method, while the control group was taught using conventional lecture method. The treatments lasted for four weeks. Two instruments were used for data collection in the study namely; Geometry Achievement Test (GAT) and Geometry Interest Inventory Scale (GIIS). Data collected were analyzed using mean, standard deviation, t-test and Analysis of Variance (ANOVA). The results revealed that target-task problem-solving model instructional method was superior to conventional instructional method in facilitating students' achievement and interest in geometry. There was no significant difference in the mean scores of male and female students in geometry after the treatment, although male students performed slightly better than their female counterpart. Target-task model method was more effective than the conventional method. Based on the findings of the study, it was recommended among others: that science teachers, and educators should adopt target-task problem-solving model instructional method in teaching to enhance students' achievement and interest in geometry.

Keywords: Target-task, problem-solving, geometry, achievement, interest, mathematics

INTRODUCTION

The teaching and learning of geometry has been the subject of considerable international interest, with many questions remaining about appropriate teaching methods and curriculum design, with a view to informing the development of better pedagogical models and instructional strategies in teaching geometry. Geometry conception has been considered as a base for learning mathematics.

Nevertheless, geometry as a branch of mathematics is perceived as difficult by most of the students (Iji & Harbor-Peter, 2005). The researchers suggested that an essential teaching strategy be used by mathematics teachers at Junior Secondary School level to develop students' thinking, particularly in the transition to Geometric Shapes. Students should be given the opportunity to learn about these shapes. This research, therefore intends to consider the teaching of geometry at junior secondary schools' level. The use of manipulative (concrete materials), practical work, and use of technological aids should be part of the learning experiences of the students for effective teaching and learning of geometry.

Geometry starts from what you can see, touch or feel. For any strategy of teaching geometry to be effective and meaningful at the formative stage, the strategy must have those features that will expose the learner to those learning opportunities that geometry as a subject is naturally endowed with. Without this, the teacher will be teaching himself as the common practice in school today.

The trend of students' performance in geometry over the years has been poor; hence the need for an activity-based approach to solving problems in mathematics. Problem-solving models in mathematics are many and they have been found to have different effects on students of varying academic ability. Different research has made use of problem-solving models to solve specific problems in order to improve students' performance (Suleiman, 2010), among the methods used by researchers is the target-task model method.

Target-Task Model is an adaptation of the guided discovery method for teaching mathematics. It involves presentation of a major problem, the solution of which requires the application of rules and principles, with which the students may not be familiar. It is expected that the teacher presents some solutions similar to the target task and guides the students to solve a given problem. Unlike in lecture method where everything is left at the discretion of the teacher.

Lecture teaching method is concerned with the teacher being the controller of the learning environment. Power and responsibilities are held by the teacher and they play the role of instructor (in the form of lectures) and decision makers (in regards to curriculum content and specific outcome) They regard students as having knowledge holes that needs to be filled with information. The traditional teacher view

is that the teacher causes learning to occur (Novac, 2012). According to Awodi, (2011), the lecture method is mainly teacher- centered, with students being constantly passive and contents are constantly taught as absolute knowledge irrespective of the above comments on lecture method of teaching. Lecture method is mostly employed by most teachers because of some of its advantages which include the fact that it can be used to cover a large content area at a time and students are given the same content at the same time. Another major advantage is that it can be used to teach a large class which is a prominent feature in most Nigerian secondary schools. It has been observed that effective teaching may facilitate learning and make it more meaningful. In line with this Sander (2009) stated that effective teaching helps the learner to learn better, while poor teaching would naturally lead to poor learning and consequently poor achievement.

Achievement according to Adeyemi (2012) is the scholastic standing of a student at a given moment. It has to do with the successful accomplishment of goal(s). The purpose of testing an achievement is to help the teacher and the students evaluate and estimate the degree of success attained in learning of a given concept. It is also useful in testing the retention of information and skill. It is equally appropriate in determining the efficiency of instruction. One of the issues at stake in education today is students' achievement measure in relation to teaching and the overall success of learning outcome. Use of target-task problem-solving model teaching method in teaching Area and Volume in Geometry by mathematics teachers may make Geometry lesson objective stimulating and interesting to the students

Interest is an important variable in learning because when one is interested in an activity, one is likely to perform positively. Chukwu (2011) stated that interest can be expressed through simple statement made by individuals of their like and dislikes. Lack of interest according to Chukwu may be caused by uninteresting teaching methods. Obodo (2013) described interest as the attraction which forces or compels a child to respond to a particular stimulus. This shows that interest comes as a result of eagerness to learn not by force (Harbor Peters, 2009). The development of interest in geometry as an objective of the geometry teaching, may likely promote achievement in the course. Target-task problem-solving model method uses the same idea as scientists do when they conduct experiment, thereby making the students become mini scientists irrespective of gender.

An issue of contention in Nigeria today is the issue of gender in our society including the educational system. In recent times educators have expressed diverse views about gender and achievement especially in mathematics. While some are of the view that males do better than females, others disagree with this view, arguing that achievement is a factor dependent on several factors such as socio-economic

background, teaching method among others. In view this, the researcher wishes to investigate the use of target-task problem-solving model and lecture teaching methods on students' achievement and interest in geometry among Junior Secondary School Students in Bosso Local Government Area of Niger State, Nigeria.

Statement of Problem

There is high rate of poor achievement of students in Mathematics over the years. This could be as a result of the teachers using ineffective methods and strategies in mathematics teaching which among other factors have contributed to the students' poor achievement in mathematics at secondary schools. Chief Examiners report (2017) revealed students' poor achievement in geometry among other concepts in mathematics. This poor achievement in geometry has necessitated the need for better instructional strategies for better understanding of geometry concept at junior secondary schools' level in order to boost the achievement of students in geometry at SSCE Result. The available literature on methods of teaching in mathematics education suggested the need to employ new and innovative teaching strategy such as target-task problem-solving model method for teaching specific topics in mathematics in order to enhance students' achievement. Therefore, the problem of this study is posed as a question; what is the effect of target-task problem-solving model and lecture teaching methods on junior secondary school students achievement and interest in geometry?

Purpose of the Study

The main purpose of this study is to find out the effect of target-task problem-solving model and lecture methods of teaching on Junior Secondary School Students' achievement and interest in geometry. Specifically, the study determined:

1. The effects of target-task problem-solving model and lecture teaching methods on junior secondary school students' achievement in geometry
2. The effects of target-task problem-solving model and lecture teaching methods on junior secondary school students interest in geometry
3. The influence of gender on junior secondary school students' achievement in geometry
4. The influence of gender on junior secondary school students interest in geometry

Research Questions

The following research questions were posed to guide the study:

1. What is the relative effect of target-task problem-solving model and lecture methods on students' mean achievement scores in geometry?
2. What is the relative effect of target-task problem-solving model and lecture methods on students' mean interest scores in geometry?
3. What is the influence of gender on the mean achievement scores of junior secondary school students taught geometry using target-task problem-solving model?
4. What is the influence of gender on the mean achievement scores of junior secondary school students taught geometry using target-task problem-solving model?

Hypotheses

The following null hypotheses (HO) were formulated and tested at 0.05% level of significance:

- HO₁:** There is no significant difference in the mean achievement scores of junior secondary school students taught geometry using target-task problem-solving model and lecture methods.
- HO₂:** There is no significant difference in the mean interest scores of students taught geometry using target-task problem-solving method and lecture method.
- HO₃:** There is no significant difference in the mean achievement scores of male and female students taught geometry using target-task problem-solving model method.
- HO₄:** There is no significant difference in the mean interest scores of male and female students taught geometry using the target-task problem-solving model method.

METHODOLOGY

The design for the study is quasi-experimental design. The area of the study is Bosso local government area of Niger State, Nigerian. All JSSII students in all secondary schools in Bosso local government area of Niger State form the population of the study. Eighty (80) JSSII students formed the sample for this study. Multi-Stage sampling technique was used in composing the sample. Two instruments, Geometry Achievement Test (GAT) and Geometry Interest Inventory Scale (GIIS) were developed by the researcher to collect data for the study. GAT consists of 20 item questions while GIIS consists of 15 items. The research instruments were validated by three experts. The Geometry achievement test (GAT) and Geometry Interest Inventory Scale (GIIS) were subjected to trial testing. The trial testing was carried

out at Government Secondary School, Chanchaga which is not in the study area. The trial testing was done by administering 20 copies each of the GAT and GIIS to the students using test-retest, the data obtained was used to determine the reliability of the instruments. The reliability coefficient of 0.79 and 0.87 for GAT and GIIS respectively using spearman correlation coefficient and combat alpha. Geometry teachers in the sampled schools helped the research in the data collection. Pretest and posttest were administered to the students before and after the treatment. The scores obtained from the pre and posttest were analyzed using mean and standard deviation to answer the research questions and Analysis of Variance (ANOVA) and t-test were used in testing the hypotheses at 0.05% level of significance.

RESULTS

Research Question 1

What is the relative effect of target-task problem-solving model and lecture method on students' mean achievement scores in Geometry?

Table 1: Mean (X) and Standard Deviation (SD) Scores of Students' Mean Achievement Scores in Geometry

Group	N	Pre-test		Post-test		Mean gain score
		\bar{X}	SD	\bar{X}	SD	
Target-task problem-solving model	47	38.96	11.63	65.72	16.63	26.76
Lecture Method	33	41.79	10.96	52.89	10.51	11.10

Table 1 revealed that students taught Geometry using target-task problem-solving model method had mean score of 65.72 with standard deviation of 16.63 while the mean achievement score of students taught with conventional lecture method was 52.89 with standard deviation of 10.51. Also the target-task problem-solving model group had gain score of 26.76 over the lecture group who had a gain score of 11.10, of Students taught Geometry using target-task problem-solving model method therefore, performed better than students taught using the conventional lecture method.

Research Question 2

What is the relative effect of target-task problem-solving model and lecture methods on students' mean interest scores in geometry?

Table 2: Mean (\bar{X}) and Standard Deviation (SD) of influence of gender on students' mean achievement score in Geometry

Group	N	Pre-test		Post-test		Mean gain score
		\bar{X}	SD	\bar{X}	SD	
Target-task problem-solving model	47	40.08	11.23	68.21	15.58	28.13
Lecture Method	33	39.26	11.57	60.11	13.95	20.85

Table 2 revealed that students taught Geometry using target-task problem-solving model method had mean interest score of 68.21 with standard deviation of 15.58 while the students taught with conventional lecture method had mean interest scores of 60.11 with standard deviation of 13.95. The students taught geometry using target-task problem-solving method had mean gain score of 28.13 while their counterpart taught using conventional method had mean gain score of 20.85. This revealed that students taught geometry using target-task problem-solving model method had higher interest in Geometry than students taught using the conventional lecture method.

Research Question 3 What is the influence of gender on mean achievement scores of students taught geometry using target-task problem-solving model and lecture method?

Hypothesis 3: There is no significant difference in the mean achievement scores of male and female students taught geometry using the target-task problem-solving model method.

Table 3: t-test Analysis on Male and Female Students Achievement in Geometry

Group	N	Mean	SD	df	t-value	p-value	Decision
Male	19	12.95	0.64	46	1.77	0.19	Not Rejected
Female	28	12.42	0.11				

Target-task problem-solving students *Significant at 0.05level

Table 3 above revealed no significant mean effect of gender on students' achievement in geometry with p-value of 0.19 is not significant at 0.05level. Therefore, the null hypothesis was not rejected, indicating

that there was no significant difference in the mean achievement scores of male and female students taught geometry using target-task problem-solving model method.

Research Question 4: What is the influence of gender on the mean interest scores of students taught Geometry using target-task problem-solving model and conventional lecture method?

Hypothesis 4: There is no significant difference in the mean interest scores of male and female students taught geometry using the target-task problem-solving model method.

Table 4: t-test Analysis on Male and Female Students Interest in Geometry

Group	N	Mean	SD	df	t-value	p-value	Decision
Male	19	12.54	0.86	46	1.06	1.98	Not Rejected
Female	28	12.13	0.62				

Target-task problem-solving students *Significant at 0.05level

Table 4 above revealed no significant mean effect of gender on student’s interest in geometry with p-value of 1.98 is not significant at 0.05level. Therefore, the null hypothesis was not rejected, indicating that there was no significant difference in the mean interest scores of male and female students taught geometry using target-task problem-solving model method.

Hypothesis 1: There is no significant difference in the mean achievement scores of students taught geometry using target-task problem-solving model and lecture methods.

Table 5: ANOVA Result of Students’ Achievement in Geometry

Source of variation	Sum of Squares	df	Mean Square	F	P
Between Groups	10.642	1	10.642	1.553	0.000
Within Groups	135.719	79	9.043		
Total	146.361	80			

*Significant at $P < 0.05$

Table 5 showed that there is a significant mean effect for mode of instruction on students achievement in geometry $f(1.55) p < 0.05$. The null hypothesis therefore was rejected, indicating that there was significance difference in the mean achievement score of students taught geometry using target-task problem-solving model method compared to those taught using conventional instructional method.

Hypothesis 2: There is no significant difference in the interest scores of student taught geometry using the two methods.

Table 6: ANOVA Result of Students' Interest in Geometry

Source of variation	Sum of Squares	df	Mean Square	F	P
Between Groups	34.519	1	34.519	9.015	0.000
Within Groups	196.632	79	9.343		
Total	221.151	80			

*Significant at $P < 0.05$

Table 6 revealed significant mean effect on students' interest in geometry $f(9.01)$, $p < 0.05$. The null hypothesis was rejected, indicating that there was significant difference in the mean interest scores of male and female students taught geometry using target-task problem-solving model method.

Discussion of Results

The target-task problem-solving model method of instruction was superior to the conventional method in facilitating students' achievement in geometry. The differences in the achievement might have been because of the fact that the students were required to find out facts for themselves which enabled them to perform better than their counterparts taught geometry using conventional method. When the students generate their own question, analyze and discuss their findings and finally construct their understanding they seemed to understand their own information better than the ones the teachers introduced to them. The target-task problem-solving model method may have been more effective because the instructions were characterized by active students' involvement, thereby capturing the interest of the students and maximizing comprehension of the subject matter.

This is in line with the observations of Nwagbo (2009) and Ibe (2014) who indicated that inquiry approaches prove to improve students' achievement in mathematics more than the traditional instructional methods like lecture and demonstration methods. Also Timothy and Awodi (2011) revealed a significant difference between inquiry and lecture method in improving students' achievement in Biology in favour of the inquiry approach.

The finding is in line with that of Ibe and Nwosu (2014) who carried out a study on the effects of target-task problem-solving model and demonstration methods on science process skills acquisition among secondary school Biology students. Their finding revealed that the students taught through target-task

problem-solving model method performed significantly better than those taught through demonstration and conventional (lecture) methods.

Results obtained from the study showed that students taught with target-task problem-solving model method had high interest in geometry than their counterparts that were taught with conventional method. The finding is in agreement with that of Ezeudu (2012) who found out that students centered instructional approach enhances students' interest in science. Okoro (2011) found out that students' interaction pattern promotes students' interest in Biology than the conventional instructional approach. Students perform better when they work in groups, they share ideas. This increase their interest especially when taught geometry using target-task problem-solving model method

The results of the study showed that male students performed better than their female counterparts in geometry. The finding supports the finding of Nwagbo (2009) who found out that male students performed better than their female counterparts in Biology and the findings of Obiekwe (2008) and Okoro (2011) who also found out that male students achieve higher than their female counterparts in Mathematics. The finding did not support that of Ibe and Nwosu (2014) and others who found that girls achieved more than boys in science subjects, and that female learners show some superiority over male learners. Okeke (2013) and Nzewi (2010), are of the view that females achieve as high as their male counterparts when given equal opportunities. Ibe (2014) reported that there was no significant difference in the achievement of male and female students when target-task problem-solving model and demonstration methods are used on science process skill acquisition among secondary school Biology students.

The gender differences in students' interest could be as a result of the steps involved during the treatment process, given that male students had higher interest than their female counterparts. The result of the study revealed that male students had higher mean interest score in geometry than their female counterparts. The finding is in line with the finding of Obiekwe (2008) that male students had higher mean interest score in Biology than their female counterparts. The finding of the result is that gender was a significant factor in maintaining students' interest in science subjects in schools

Conclusion

From the results obtained in the study it was found out that students taught geometry using target-task problem-solving model method performed better than their counterparts taught geometry using the lecture method. Students taught geometry using target-task problem-solving model method had higher

mean interest score in geometry than their counterparts taught geometry using the lecture method. Gender did not significantly influence students' achievement and interest in geometry, even though the posttest mean scores of male students was slightly higher than that of their female counterparts.

Recommendations

- a. In view of the fact that the target-task problem-solving model method was more effective in teaching geometry and enhancing students' achievement and interest in geometry, the Ministries of Education should ensure that textbook authors incorporate target-task problem-solving model methods in the instructional methods for secondary schools.
- b. Mode of instruction had no differential effects on male and female students' achievement in geometry. Hence, teacher should make teaching and learning of mathematics gender unbiased
- c. Ministry of Education should ensure that their teachers are trained regularly on the use of innovative instructional approaches e.g. target-task problem-solving model method
- d. The curriculum planners should ensure that they incorporate target-task problem-solving model methods in geometry curriculum, as it will help to promote students' achievement and interest in the subject.

REFERENCES

- Adeyemi, T. O. (2012). Predicting Student's Performance in Junior Secondary Certificate Examination in Ondo State, Nigeria. *Humanity and Social Sciences Journal* 3(1); 26-36.
- Awodi, S. And Timothy, J. (2011) The Relative Effects of Inquiry Lecture Methods; the Performance of high and low Achievers in Junior Secondary School Biology. *Journal of Science Teachers Association of Nigeria (STAN)* 82 (12); 59-64.
- Chukwu, J.O. (2011). Effect of Selected Games on Primary School Pupils' Achievement and Interest in Subtraction Operation *Unpublished Ph .D Thesis* Faculty of Education U.N.N.
- Ezeudu, F.O. (2012) Effect of Concept Map on Achievement Interest and Retention in Selected units of Organic Chemistry. *Unpublished Phd Thesis*, U.N.N. Science Education
- Harbor Peters, U.F.A. (2009). *'Unmasking some Aversive Aspect of School Mathematics and Strategies for Averting Them, an inaugural Lecture* Presented in U.N.N, Niger, Snaap press Ltd.
- Ibe, E. and Nwosu, A. A. (2014). Effect of Target-Task Problem-Solving Model and Demonstration on Science Process Skills Acquisition among Biology Students in Secondary School. *Journal of the Science Teachers Association of Nigeria(STAN)* 36(2), 58-63

- Ibe, E. (2014). Effect of Target-Task Problem-Solving Model and Demonstration on Sciences Process Skills acquisition among Biology Secondary School Students. *Unpublished M.ED Thesis*. Faculty of Education. University of Nigeria Minna
- Novac, W. (2012). Theories of Development Concepts and Applications; (3rd ed) New Engle wood cliffs New Jessey; prentice hall inc.
- Nwagbo, C. R. (2009). Effect of Guided- Discovery Expository Teaching Methods on the Attitude towards Biology Students of different Levels of Scientific Literacy, *Journal of Science Teachers Association of Nigeria (STAN)* 34 (1and 2); 66-73
- Nzewi, U.M. (2010). It's all in the Brain of Gender and Achievement in Science and Technology Education. *51st Inaugural Lecture of the University of Nigeria Minna*. p18-32.
- Obiekwe, O.F. (2008). Effect of Constructivist-Based Instructional Model on Senior Secondary Students Achievement in Biology. *STAN Proceeding of the 50th Anniversary Conference*.
- Obodo, H. (2013). Relationship between Teacher Effectiveness and Group Discussions in SS Practical Agricultural Science in Imo state. *Unpublished M.E.D Thesis*, Imo state University, Owerri.
- Okeke, E. A. (2013) Making Science Education Accessible to all *23rd Inaugural Lecture of the University of Nigeria Nsukka*. 327
- Okoro, A U. (2011). Effect of Interaction on Achievement and Interest in Biology among Secondary School Students in Niger State, Nigeria. *Unpublished M.ed. Project*, University of Nigeria, Nsukka. Science Education.
- Okwor, F. A. (2014). Effect of Guided Discovery and Target-task problem-solving model Teaching Methods On Students' Achievement in Agricultural Science. *Unpublished PGDE Project* University of Nigeria, Nsukka. Education foundation
- Sander, D. (2009). Mathematics and Science Achievement: Effects of Motivation, Interest and Academic Engagement. *Journal of Educational Research*. <http://www.findarticles.com>
- Iji C.O & Harbor-Peter V.F.A (2015).Effect of Logo and Basic Programs on the Achievement in Geometry of Junior Secondary School Students *ABACUS* 30 (1),67-77
- Suleiman, B., (2010). *Effect of Polya, Gick and Bransford and Stein Problem Solving Models on Students' Performance in Statistics Word Problems*. Unpublished Ph.D. thesis, Department of Science Education, University of Ilorin, Ilorin, Nigeria *Science Teaching*, Retrieved August 12, 2010 from <http://www.ed.vive.evu/EPSPes/ea/92/doc/mathat>