



Effect of Target-Task-Model Instructional Strategy on Academic Performance in Geometrical-Construction among Secondary School Students in Zaria Local Government Area Kaduna State, Nigeria

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ABSTRACT

This study investigates the effect of Target-Task Model instructional strategy on students' academic performance in geometrical-construction. The study quasi-experimental of pre-test, post-test non-equivalent control group design which involved group of SS 2 students in their intact class assigned to experimental and control groups. The sample for the study consists of 128 students (66 male and 62 female) in the SS II level randomly selected from the population of 2345 students in thirty (30) Government Senior Secondary schools in Sabon Gari. Two Research questions and two Null hypotheses were formulated to guide the study. Two schools were randomly selected of which one is used for experimental and the other for control group. Geometrical-Construction Performance Test (GCPT) items was used for both pre-test and post-test as the instrument for data collection. The data collected were analyzed using descriptive statistics to answer research questions and t- test analysis was used to analyze hypotheses tested at 0.05 level of significance. The findings revealed that there is significant difference between the performance of students exposed to Target-task-Model Instructional Strategy and their counterpart exposed to Conventional Method in favor of experimental group, so the findings revealed that there is no significant difference between male and female student's performance on Geometrical-Construction using Target-task-Model Instructional Strategy. Hence, researcher recommended the use of Target-task-Model Instructional Strategy be adopted for teaching/learning of Geometrical-Construction in the secondary schools, workshops, seminars and conferences should be organized to focus more on how to use Target-task-Model Instructional Strategy in Teaching Geometrical-Construction, among others.

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INTRODUCTION

Science and Technology have brought a lot of changes in the world today, thus, there is urgent need for a world community of scientifically and technologically literate citizens to sustain the natural environment of the world and to enhance the overall quality of life of its population through quality education. Mathematics has been described as the Queen and servant of all disciplines considering its usefulness to other

subjects and fields of study (Odili, 2016 & Muawiya, (2018). Mathematics importance to human existence cannot be emphasized in view of its application to human everyday life activities. Akwagah, Agashi & Obi (2019) opined that the usefulness of Mathematics has become central to other field of study such as Arts, Social Sciences, Religions, Sciences and Commerce as it is an indispensable tool for effective daily functions.

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Umar and Adams (2020) described Mathematics as an indispensable tool in the study of sciences and humanities. This aligned with Salam (2005) who had earlier described the importance and attention given to Mathematics as stemming from the fact that without mathematics there is no Science, without science, there is no Modern Technology. Without Modern Technology, there is no modern society or digital society. From the above therefore, the teaching and learning of Mathematics has come to the envisaged breakthrough in the world of science, arts and technology. A sound foundation of Mathematics at the secondary school level is a fundamental requirement for achieving the transformation agenda (change mantra) in Nigeria. Mathematics, therefore, plays a vital role in nation building through medicine, health, agricultural, government, economics, entertainment, transport sector, etc.

Mathematics and science are taught as separate subjects at the secondary school level. However, science activities in the classroom have Mathematical implications as solving Mathematics problems has scientific impact and vice versa. The Information Communication Technology of today has transformed the world into a global village. We appreciate the role of Mathematics and science. Mathematics is no longer a classroom discipline only but what everybody needs at any time (Isa, 2016). It is then clear that life without mathematics will not be with living as all the various aspects that make life worthy of living depend on Mathematics. According to Umar (2017), Mathematics is about structure and pattern, logical analysis, deduction and calculation within these patterns can be used to explain and natural happening and situations such as flooding, earthquake, eclipse of the sun moon, rainfall and daily weather conditions. He further stated that, travelling by airplane would not have been possible without the basic knowledge of Mathematics which aided airflow and control systems. Body scanners are expression of applied Mathematics discovered in the 19th century, which makes it possible to construct an image of the inside of an object from information on a number of single X-ray.

Geometrical- construction is a branch of Mathematics that needs to be taught properly because of its relationship between the sides and angles of triangles, quadrilateral and the calculations. Geometrical construction study is carried out through observations, constructions and description of sides and angles. It can be deduced that the study of Geometrical-Construction provides skills in visual, verbal, logical drawing and application to real life situation in our society. These benefits are necessary skills and abilities needed by all for a meaningful and productive life in the modern world of science and technology (Stanley, 2016). Indeed, these Geometrical-Construction skills should be sufficient for all students so that they can function successfully as informed customers, concerned citizens and as competent members of their societies. Geometrical – Construction by its nature and inhere at structure is an important and indispensable branch of mathematics which is the needs to be learnt.

Unfortunately, many secondary school students do not experience the richness, connections or creativity that geometrical construction allows instead they often perceive it as another memory exercise where rules and formulae are learnt by memorization along with methods for working out problems. WAEC, Chief examiners (2023) observed that student's poor performance in geometrical-construction required an effective instructional strategy of teaching (Umar, 2022). In this regard proposed that the Target-Task-Model of instruction is proposed by the researcher to see if it can address the problem of teaching geometrical concept in senior secondary schools. In Zaria Kaduna State

The target-task model according to Odili (2016) states that, a TTM instructional strategy is an adoption of the guided discovery method of science teaching. This TTM model uses inductive method of teaching from a particular principle to general ones as a teaching strategy. Eze (2002) suggests that TTM is a constructive based teaching model because it is a learner-centered. The learner reconstructs its conception view through the process of solving related problems



the clues provided by the teacher helps the comprehensively to the problem.

Kulbir (2016) states that, TTM model of teaching involve posing first a difficult problem for students to solve irrespective of whether they will be able to solve the problem immediately or not. The Target-Task-Model in the views of Elay and Norton (2004) shows learner how to do a task using sequential instructions with the end goal of having learners perform the task independently. They further provide examples that enhance teaching and to offer effective hand-on, enquiring-based learning opportunities. The goals of development in both developed and developing countries must be defined in terms of quantitative and qualitative education system. Therefore, this study investigated the effect of Target-Task-Model Instrument – strategy on performance in geometrical – constructions among secondary school students in Mathematics, being one of the concepts identified as difficult.

Stages of Target Task-Model of Instructional Strategy

The Target-based teaching approach is one of the many modern teaching methods that focus on setting a goal for students.

The following are three (3) main steps to enhance the goals of TTM

1. **The pre-target-task;** during this stage, which can take up a whole lesson if needed, the teacher introduces the task to the students and gets them motivated to solve it. Once everyone is engaged, the teacher should explain what is expected for the task, in terms of geometrical construction the teacher outlines;
 - a. the introductions and guidelines,
 - b. the material to be use in good condition and
 - c. Rough sketch and labeling of the questions translation.
2. **The task:** this is the main stage of task-based learning where students start working on the task, usually in groups or in pairs. This stage is done in line with the target concept of how to use the

clue, if they want to solve a task. In construction processes the teacher now:

- a. groups or pairs students according to their learning capability
 - b. declare the actual task for each group to perform, or setting one question for all groups task
 - c. guide them on the timeframe expected to spend in the task
 - d. Ensure accurate arcs and labeling.
3. **The review:** this takes place when students have completed the task and have something to present, or the past task in which the review stage also known as post task. It's a good idea to let students evaluate each other's work and only offer to the teacher review of frequently-made errors during the task. Peer correction could be carried out in the form of comments, feedback, discussions, or a checklist with additional room for free commentary. The review stage offers students the opportunity to reflect on their work and analyze it in order to improve their skills, it can also be used for future activity.

Objectives of the Study

The objective of this study was to investigate the effect of Target – Task – Model of teaching on the students' academic performance in geometrical – construction specifically; the study also set to determines:

1. The difference in academic performance of students when taught geometrical construction using Target-Task-Model instructional strategy of teaching and those exposed to conventional method.
2. The difference of gender on the performance of students when they are taught geometrical-construction using Target-Task-Model Instructional Strategy.



Research Questions

The following research questions were raised for the study.

1. Is there any difference in the academic performance of student's not-taught geometrical construction using Target-Task-Model instructional strategy?
2. Is there be any difference in the students' performance on the basis of gender when they are taught geometrical-construction using Target-Task-Model instructional strategy?

Null Hypotheses

The following Null research hypothesis were postulated in line with the research questions and were tested in the course of the study:

Ho₁: There is no significant difference in the students' academic performance when taught geometrical-construction using Target-Task-Model-construction strategy and those exposed to lecture method of teaching.

Ho₂: There is no significant difference in performance between male and female

students taught geometrical-construction using Target-Task-Model instructional strategy.

METHODOLOGY

The study is quasi-experimental of pretest and posttest non-randomize, non-equivalent, control group. The experimental group was exposed to target-task-model instructional – strategy as the treatment and the control group was exposed to conventional method. (128) SS II students from two (2) co-educational senior secondary schools were randomly selected using simple random sampling techniques. However, intact class was used in the two schools for the study. The experimental group labelled (A) consisted of (66) SS II students while the control group labelled (B) has (62) SS II students. The instrument used to collect data for the study was (4) items, Essay Geometrical-construction performance test GCPT with questions drawn from past Senior Secondary School Certificate Examination conducted by WAEC & NECO 2024 being already validated questions.

Table 1: Summary of the Sample for the Study

Groups	N	M	F	Total
A		45	21	66
B		32	30	62
Total		77	51	128

Source: (Researcher, 2024).

RESULTS

The research questions were raised in this study and they have corresponding hypothesis Mean and Standard Deviation were measures to describe research questions while independent sample t-test statistics was used to analyze the hypotheses.

Research Question 1:

Is there any difference in the academic performance of students' not-taught geometrical construction using Target-Task-Model instructional strategy?

Table 2: Mean and Standard Deviation for Academic Performance of Experimental and Control Groups.

Groups	N	$\bar{x}$	St. Div	M.D
A	66	33.61	4.02	15.44
B	62	18.16	5.33	

Source: (Researcher, 2024)

Table 2 shows that experimental group exposed to Target-task-model instructional

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strategy has ($M = 33.61$, $SD = 4.02$) while control group has ($M = 18.16$, $SD = 5.33$ and $MD = 15.44$). This indicates that the students exposed to Target-Task-Model Instructional Strategy performed higher than those exposed to conventional lecture method.

Research Question 2:

Is there any difference in the students' performance on the basis of gender when they are taught geometrical construction using target-task-model instructional strategy?

Table 3: Mean and Standard Deviation for Academic Performance of Male and Female students exposed to Target-Task-Model of Instructional Strategy.

Gender	N	$\bar{x}$	St. Div.	M.D
Male	45	33.53	3.97	0.229
Female	21	33.76	4.25	

Source: (Researcher, 2024).

The Table 3 revealed that male students exposed to Target-Task-Model Instructional Strategy have ($M = 33.53$, $SD = 3.97$) while female students have ($M = 33.76$, $SD = 4.25$, $MD = 0.229$). This indicates that, there is no significant difference between the academic performance of male and female students exposed to Target-Task-Model Instructional Strategy.

Research Hypothesis 1:

There is no significant difference in the students' academic performance when taught geometrical-construction using target-task-model construction strategy and those exposed to lecture method of teaching.

Table 4: t-test Analysis for Academic Performance of Experimental and Control Groups.

Groups	N	$\bar{x}$	St. Div.	df	t	P
Experimental (A)	66	33.61	4.02	126	-18.58	0.000
Control (B)	62	18.16	5.33			

Source: (Researcher, 2023).

Table 4 result shows that p-value 0.000 is less than the alpha value of 0.05 level of significance at $df = 126$. Since the p-value observed is less than the alpha value, it means that the difference is significant. The null hypothesis which states that there is no significant difference in the academic performance of senior secondary school students taught Geometrical-

Construction using target-task-model instructional strategy and those who were not is hereby rejected.

Research Hypothesis 2:

There is no significant difference in performance between male and female students taught geometrical-construction using target-task-model instructional strategy.

Table 5: t-test analysis for academic performance of male and female students exposed to Target-Task-Model (TTM) Instructional Strategy.

Gender	N	$\bar{x}$	St. Div	df	t	p
Male	45	33.53	3.96	64	-0.213	0.832
Female	21	33.76	4.25			

Source: (Researcher, 2024).

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The result in table 5 revealed that p-value (0.832) is greater than 0.05 level of significance for male and female students, which mean that there is no significant difference in the academic performance between male and female students taught Geometrical-construction using target-task-model Instructional Strategy. Therefore, the Null hypothesis 2 is rejected.

DISCUSSION OF FINDINGS

Based on the result of the study, it was clear that students who were taught using Target-Task-Model Instructional Strategy achieved higher academic performance than their counterparts who were taught using Conventional lecturer method. Result of table 4, also showed significant difference between experimental and control groups, this indicates that SS2 students taught Geometrical-Instructional using target-task-model instructional strategies performed significantly higher than their counterparts. The result agreed with the findings of Tudunkaya & Jamilu (2019), Umar & Adams, (2020) who discovered that students tend to performed better when they are taught new mathematics concepts using activity-based method.

Muawiya (2018) discover that students tend to performed better when concepts is related to real life situation in Biology. The study also determines the effect of gender performance of SS2 students, when taught Geometrical-Construction using target-task-model instructional strategy, the result shows that, both males and females performed almost equally same, that is, no significant difference between their academic performance. Therefore, this Target-Task-Model Instructional Strategy is gender friendly. This finding is in an agreement with Adams (2020), Akwagah, Agashi & Obi (2019) who stated that male and female students tend to performed almost equally when they are exposed to activities-based learning strategy.

The result also is in agreement with the study of Anen, & Salman (2016) which states in his approach that, male and female students tend to performed equally in mathematics proficiency if students-centered methods or strategy is adopted by the teachers.

CONCLUSION

Based on the findings of this study, the researchers concluded that, Target-Task-Model Instructional Strategy enhance students' Academic Performance and also bridge the gap between male and female students if properly utilized. Therefore, use of Target-Task-Model Instructional Strategy is gender friendly and is an important strategy for better achievement in teaching and learning of geometrical-construction concept in Mathematics in Sabon Gari Local Government area of Kaduna State.

RECOMMENDATIONS

Based on the findings of the study, the following recommendations were made, they include:

1. Kaduna state Ministry of Education and Science Secondary School Board should organize workshop for the secondary school teachers on Target-Task-Model Instructional Strategy for effective teaching and learning of Geometrical –Construction concepts in Mathematics.
2. Professional bodies such as Science Teacher's Association of Nigeria (STAN), Mathematical Association of Nigeria (MAN) among others should organize workshops, conferences, and seminars to popularize and sensitize Mathematics teachers on the use of Target-Task-Model instructional strategy and other activity based instructional strategy.
3. Teacher training institution of learning should include the use of TTM instructional strategy as a method of teaching mathematics concepts. This would guarantee that after the teacher training period, they will be equipped on how to teach Mathematics concept effectively.
4. Further research is needed on this strategy to discover larger population in the state and Nigeria at large.
5. Curriculum planners and book publisher should equally inculcate TTM



instructional strategy in their publication of new textbooks and curriculum for Teachers' Education Institution, among others.

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