



Effects of Target Task Model on Students Performance in Algebra among Senior Secondary School Students in Kaduna State, Nigeria

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ABSTRACT

This study investigated the effect of target task model on performance in algebra among senior secondary school students in Kauru LGA, Kaduna state. Quasi Experimental design was used for the study. The sample consisted of 100 students who were randomly selected from a population of six thousand eight hundred and seventy-eight (6,878) senior secondary two (SS 2) students of Kauru LGA. The experimental group was taught using target task model and the Control Group was taught using Conventional (Lecture) method. The algebra performance test (APT) was the instrument used for data collections. Two research questions and two hypotheses was used in the study. Data collected was analyzed using mean and standard deviation for the research questions and t-test statistics for the null hypotheses. The result of the analysis showed a statistical significant difference in the mean performance score of students in the experimental group (mean =26.47, SD=3.34) as compared to the control group (mean=15.80, SD=3.53), $t(df) = 15.49$ p -value =0.00, $p > 0.5$. It also shows that there was no significant difference in the mean performance score of male and female students' taught geometry using target task model (male =21.87, SD=6.54, female=21.42, SD=6.14) $t(df) = 0.352$, p -value =0.725, $p > 0.5$. Based on the result of the analysis the researchers concluded that target task model is more effective than the conventional approach in students' performance in algebra. Based on the findings it was recommended that mathematics teachers should endeavor to employ Target Task Model in teaching mathematics.

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INTRODUCTION

Mathematics is one of the most important subject that gives fundamental foundation in science and technology. Mathematics is taught as one of the compulsory subject at lower and upper basic levels in Nigeria. Bassej, Joshua, and Asim (2011) described mathematics as a vital tool for the understanding

and application of science and technology and serves as a base for national development and the world at large. It equips the individual with the capacity to be grounded and sound, among others to analyze and relate quantities and ideas. Mathematics is given adequate attention and emphasized in the school curriculum, right from primary through secondary to tertiary institutions.

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Despite the effort of the government, teachers, and other education stakeholders including students, it is regrettable that many students continue to struggle with mathematics and perform low in both school-based and national examinations (Zakariya, Ibrahim, & Adisa 2016).

Given that mathematics is one of the major subjects meant to provide the basic developments needed in technology, its effective teaching and learning are crucial issues for consideration (Jegade & Adedayo, 2013). The teaching of mathematics in secondary schools is intended to produce young mathematicians, who would be able to apply mathematical principles to solve real-world problems and make everyday activities easier and more efficient (Ajayi, 2008, Jegede & Adedayo, 2013). Survey from schools by Ajayi (2007) revealed that one of the factors that negatively affects the effective learning of mathematics in secondary schools is the teacher's method of teaching. Teaching methods which encourage students' involvement in the classroom activities include inquiry method, collaborative learning, target-task model, experiential learning approach, discovery method, and so on. Using these listed methods, students are guided to discover facts and construct their own ideas and understanding of the concepts of the study. However, none of these promising reported efficacies of the innovative teaching and learning strategies focused on Nigerian secondary school students (Ginga & Zakariya, 2020).

Target Task model is the process of teaching some concepts first giving students difficult problem referred to as target task to solve (Ugboduma, 2006). The target task problem may require the application of rule, principle or formula which the students have or have not known after giving hints or clues (Polya, 1999). According to Olaniyan & Omosewo (2015), the target-task model is a teaching approach that involves presenting a challenging problem, the solution of which requires the application of rules and principles that students may not be familiar with. The teacher presents some solutions similar to the target-task and guides the students to solve the problem. This model is an adaptation of the guided-discovery method. The target task model

typically consists of several stages that guide the learning process. While different variations of the model may exist, here is a general outline of the stages commonly associated with the target task model:

1. Task Introduction: The teacher introduces the task or problem that students will work on. This could involve presenting the task, providing relevant background information, and clarifying the goals and expectations.
2. Task Exploration: Students engage in exploring the task, examining its components, and identifying possible strategies or approaches to solve it. This stage encourages critical thinking, problem-solving, and active engagement with the task.
3. Task Engagement: Students actively work on the task, applying their knowledge and skills to find a solution. They may collaborate with peers, experiment with different approaches, and seek feedback or guidance from the teacher as needed.
4. Task Consolidation: Students consolidate their learning by reflecting on their strategies, analyzing their progress, and identifying areas for improvement. This stage emphasizes metacognitive skills and self-assessment.
5. Task Presentation: Students present their solutions, findings, or conclusions to the class or in small groups. This allows for sharing and discussion of different approaches, fostering communication skills and deeper understanding of the task.
6. Task Reflection: Students reflect on their learning experience, discussing challenges faced, insights gained, and lessons learned.

This stage promotes metacognition, self-reflection, and the transfer of learning to other contexts. Throughout these stages, the teacher plays a facilitative role, providing guidance, support, and scaffolding as needed. The target task model aims to enhance students' understanding, problem-solving abilities, and critical thinking skills by engaging them in authentic, meaningful tasks that align with the learning objectives.

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THEORETICAL FRAMEWORK

The theoretical perspectives that contribute to the model is Constructivism. Constructivism is a learning theory that suggests learners actively construct their own understanding of the world through their experiences and interactions. In the target task model, constructivist principles are applied by providing students with authentic and meaningful mathematical tasks that require them to actively engage in problem-solving. By grappling with these tasks, students construct their own mathematical knowledge, develop problem-solving strategies, and make connections between concepts. The model encourages students to reflect on their thinking, share ideas with others, and refine their understanding through collaboration and discourse. By integrating these theoretical framework, the target task model promotes student-centered, active learning experiences in mathematics. It emphasizes the importance of meaningful tasks, problem-solving, collaboration, and reflection, allowing students to construct their own mathematical understanding, develop critical thinking skills, and apply their knowledge to solve real-world problems.

Gender, according to Yang (2010), refers to the social attributes and opportunities associated with being male and female, and the relationships between women and men, girls and boys, as well as the relationships among women and among men. In the study by Habor-Peter (2000), it was reported that there was a significant increase in students' performance in problem-solving techniques using Polya's model strategy, with male students performing better than female students. The issue of poor performance in mathematics is not limited to any specific gender; it affects both males and females. However, it is crucial to examine the extent of failure between males and females in order to identify and address the influence of gender on learning (Aina & Akintunde, 2013).

LITERATURE REVIEW

Mohammed and Iredje (2020) examined the impact of a target task model and experiential learning approach on the performance of senior

secondary school students in physics. The quasi-experimental study involved 159 students from three randomly selected schools. The experimental groups, exposed to the target task model and experiential learning approach, outperformed the control group taught conventionally. The findings suggest that implementing target and experiential teaching approaches can enhance the effectiveness of physics instruction by making it more engaging, enjoyable, and comprehensible.

Ukoh and Okewale (2020) investigated the effects of Context-Based and Target-Task Problem Solving learning strategies on students' attitude towards Physics. A quasi-experimental research design with a 3x2 factorial matrix was employed, examining the moderating effects of school type and gender. The participants were 124 SS II Physics students from both public and private schools in Afijio Local Government Area of Oyo State, Nigeria. Three instruments were utilized: Physics Students' Attitudinal Scale, Teachers' Instructional Guides, and Evaluating Sheet for Assessing Instructors' Performance. The data analysis included Analysis of Covariance, Estimated Marginal Means, and Bonferroni Post-hoc Analysis. The findings indicated that both Context-Based and Target-Task Problem Solving learning strategies significantly enhanced students' attitude towards Physics. Context-Based learning strategy was identified as the most effective in improving students' attitude. These results suggest that Physics teachers in secondary schools should consider incorporating these strategies to foster positive attitudes towards the subject.

Odukwe (2021) investigate the impact of Target-Task Instructional Strategy on secondary school students' interest in Biology. A quasi-experimental design was employed, involving 411 students from four intact senior secondary classes in Anambra State, Nigeria. The findings revealed that students exposed to the Target-Task Instructional Strategy exhibited higher interest in Biology compared to those taught using the lecture method. Additionally, male students displayed significantly greater interest in Biology than female students. The study recommends that



teachers incorporate the Target-Task teaching strategy to enhance student interest and encourage further study of Biology at higher educational levels.

According to a study by Sunday, Akanmu, and Fajemidagba (2014), the utilization of target task mode of teaching was found to have a positive effect on students' performance in geometrical construction. The study also highlighted that the use of target task mode of teaching resulted in improved performance for both male and female students, with no significant differences in performance based on gender. Furthermore, the study indicated that the implementation of target task mode of teaching particularly benefited students with medium and low proficiency levels, leading to enhanced performance in geometrical construction within the field of mathematics.

The in the existing literature there need for comprehensive research on the combined effects of the target task model and experiential learning in physics, mathematics and other subjects exploration of the long-term effects of Context-Based and Target-Task Problem Solving strategies on students' attitudes towards Physics, investigation of the applicability of the Target-Task Instructional Strategy to other science subjects, and examination of the influence of individual learner characteristics on the effectiveness of the target task model.

Therefore, this study investigated the effects of target task model on senior secondary students' performance in Algebra.

Objectives of the study

The primary objective of this study is to examine the impact of the target task model on the performance of senior secondary students in Algebra. The specific aims of the study are as follows:

1. To determine whether there is a significant difference in the mean performance score of students before receiving the treatment.
2. To assess whether there is a significant effect of the target task model on male

and female students' performance in Algebra.

Research Questions:

1. Is there a significant difference in the mean performance score of students taught Algebra using TTM and those taught using conventional method?
2. What is the difference in mean scores of male and female students taught algebra using TTM?

Hypotheses

H01: There is no significant difference in the mean performance score of students taught Algebra using TTM and those taught using conventional method?

H02: There is no significant difference in mean scores of male and female students taught algebra using TTM

METHODOLOGY

This study adopted the quasi-experimental design. Specifically, the study was a non – equivalent control group design. A sample of 100 SS 2 students 55 male and 45 female participated in the study. A purposeful sampling technique was employed to sample two (2) co-educational schools from the Kauru local government area in Kaduna state. Out of the two schools sampled, one school was randomly assigned to be experimental, and the other was assigned to be control. In each school, simple random sampling techniques was used to sampled an intact class. The experimental group was exposed to a Target Task Model, while the control group was taught the conventional method. The instrument used for data collection was Algebra Performance Test (APT) adopted from Ginga e.tal (2022) and modified to suit the present study. The modified instrument consisted of thirty objectives questions with four options (A-D) and it was validated by some expert in the area of mathematics and mathematics education. The instrument was pilot tested using test retest and the result was used to determine the reliability of instrument. The coefficient which was determine



using Pearson Product Moment Correlation (PPMC) was found to be 0.87. In this study, the experimental group was taught using Target Task Model for the period of six weeks, while the control group received instruction through the use of conventional method. Mathematics teachers served as research assistants during the experiment. Prior to the experiment, ten schools were pre-tested to determine the two schools that are homogenous. Two schools that are homogenous were choosing to save as experimental and control groups. The experiment took place during regular school hours according to the school timetable. After a duration of six weeks, a post-test was administered to both groups. The scripts were marked by the

researchers and the scores were analyzed using descriptive and inferential statistics. Mean and Standard deviation were used to answer the research questions while t-test statistics was used to test the null hypothesis.

RESULTS

The data obtained was used to answer the research questions and test the null hypotheses.

Research Question 1: Is there a significant difference in the mean performance score of students taught Algebra using TTM and those taught using conventional method?

Table 1: Mean and Standard Deviation of Experimental (TTM) and Control (lecture) group in Algebra Performance Test (APT)

Variable	N	Mean	SD	MD
Experimental	55	26.47	3.34	
Control	45	15.80	3.53	10.67

Table 1 shows that the experimental group (EG) had a higher mean score of 26.47 against that of control group (CG) of 15.80. Theses result indicated that, there is a difference in mean performance scores between the two groups in favour of the experimental group.

Research Question 2: What is the difference in mean scores of male and female students taught algebra using TTM?

Table 2: Post-test Mean and Standard Deviation of Male and Female Students of the Experimental group (TTM) in Algebra Performance Test (APT)

Variable	N	Mean	SD	MD
Male	55	21.87	6.54	
Female	45	21.42	6.14	0.451

Table 2 shows that male students had a little bit higher mean score of 21.87 against that of female students of 21.42 and the mean difference is 0.451

H₀1: There is no significant difference in the mean performance score of students taught Algebra using TTM and those taught using conventional method

Table 3: T-test analysis of Performance score of Student in Experimental and Control groups.

Variable	N	Mean	SD	df	t _{cal}	P-value
Experimental	55	26.47	3.34			
Control	45	15.80	3.53	98	15.49	0.000

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Table 3 revealed that calculated t value is 15.49 and the P-value 0.000. Therefore, P-value of 0.000 is less than alpha value of 0.05. Based on this evidence, the null hypothesis was rejected. This implies that there was significant difference between the mean performance scores of students taught Algebra using TTM and those

taught using conventional method in favour of the TTM group.

H0₂: There is no significant difference in mean scores of male and female students taught algebra using TTM

Table 4: T-test analysis of Students' Performance score of Male and Female Students taught Algebra using TTM

Variable	N	Mean	SD	df	t	p-value
Male	55	21.87	6.54	98	.352	.725
Female	45	21.42	6.14			

Table 4 revealed that the value of calculated t is .352 and the P-value is 0.725. This indicates that P-value of 0.735 is greater than 0.05 alpha - value. Based on this evidence, the null hypothesis was retained. This implies that there was no significant difference in the mean performance scores of male and female students in taught algebra using TTM. Hence the TTM is gender

performance of males and females exposed to TTM, although the mean performance score of males was higher than that of the females. The findings showed that both males and females taught by TTM performed equally as no significant difference was found in their mean performance score. This result is in line with those of Yakubu and Bolaji (2019), as well as Ginga and Zakariya (2020) who showed that gender had no effect on academic performance of students in co-operative learning. This result indicates that TTM favored both males and females in algebra aspect of mathematics and the strategy is more effective in enhancing both male and female students' performance in Mathematics.

DISCUSSIONS OF FINDINGS

The study indicated the existence of significant difference between the performance of students taught using Target Task Model and those taught using conventional lecture method in favour of those exposed to Target Task Model, as shown in Table 3. This implies that TTM was more effective than conventional lecture method in teaching and learning algebra. This result further suggests that TTM could help to enhance students' understanding of algebra concepts in mathematics more than the conventional lecture method. This finding agreed with the results of Mohammed and Iredje (2020) as well as Olaniyan and Omosewo (2015) that TTM improved students' performance in physics. The superiority of TTM over the conventional lecture method can be due to the fact that it is a strategy that helps each student to learn and helps his group members to learn by providing opportunity for dialogue and free debate on a task, which is not obtained in the conventional lecture method.

CONCLUSION

The following conclusions were drawn from the findings of this study:

1. Target Task Model could effectively enhance and improve students' academic performance in algebra aspect of mathematics more than the conventional lecture method.
2. Gender was not a factor in learning algebra when Target Task Model is employed. Therefore, the strategy is gender- friendly and could be used to bridge the gap in mathematics performance between boys and girls.

The results of this study also revealed that there was no significant difference in the

RECOMMENDATIONS

The following recommendations were made:

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1. Mathematics teachers should endeavor to employ teaching strategies that are learner-centered like Target Task Model in their classrooms.
2. Mathematics educators, professional associations in mathematics as well as mathematics textbook developers should incorporate Target Task Model procedures in their future publications for enhanced students' academic performance in mathematics concepts.

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