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IMPACT OF GENDER-RESPONSIVE TEACHING INTERVENTION ON SECONDARY SCHOOL GIRLS' ACHIEVEMENT IN MATHEMATICS IN ODEDA LGA, OGUN STATE, NIGERIA

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1.0 ABSTRACT

Persistent gender disparities in mathematics achievement continue to restrict female participation in science, technology, engineering and mathematics (STEM) education globally and particularly within sub-Saharan Africa. This study investigated the impact of a gender-responsive teaching intervention on secondary school girls' achievement in mathematics in Ogun State, Nigeria using a quasi-experimental pre-test/post-test control group design involving three experimental schools and one control school (N = 91). Students in the experimental schools received structured instructional support across six curriculum topics: Set Theory, Bearing, Construction, Graph, Probability, and Trigonometry. Data were analysed using descriptive statistics, paired-sample t-tests and analysis of variance (ANOVA). Results showed large and statistically significant achievement gains in two intervention schools—NUD Obantoko (mean gain = 10.00, $t = 9.31$, $p < .001$) and Salawu Secondary School (mean gain = 8.35, $t = 10.93$, $p < .001$)—while MHS Isolu recorded a smaller non-significant improvement (mean gain = 1.76, $p > .05$) and the control school showed a decline in performance (mean gain = −1.45). ANOVA results further confirmed a significant difference among schools ($F = 31.28$, $p < .001$). The findings demonstrate that gender-responsive instructional strategies significantly enhance mathematics learning outcomes among secondary school girls and support improved participation in STEM pathways.

1.1 INTRODUCTION

Mathematics achievement plays a central role in determining students' access to Science, Technology, Engineering and Mathematics (STEM) education pathways. Despite improvements in female participation in selected scientific disciplines, women remain underrepresented in mathematics-intensive fields such as engineering and technology (UNESCO, 2019; Encinas-Martin, 2020). In Nigeria, gender disparities in STEM education persist at both secondary and tertiary levels due partly to weak achievement in mathematics during foundational schooling years (Ihuoma, 2024; Nigerian Bureau of Statistics,2022). Research attributes gender differences in mathematics achievement to instructional practices, classroom participation structures, teacher expectations and socio-cultural stereotypes (Sadker & Zittleman, 2009; Amoah, 2024). Gender-responsive teaching intervention therefore represents an important strategy for improving participation and performance among female learners. However, empirical intervention-based studies within Nigerian public secondary school contexts remain limited. This study therefore examined the impact of a structured gender-responsive instructional intervention on secondary school girls' achievement in mathematics in Ogun State, Nigeria.

1.2 Statement of the Problem

Evidence from public secondary schools in Odeda Local Government Area of Ogun State indicates persistently low pass rates in mathematics at the Senior Secondary Certificate Examination level, with some schools recording failure rates exceeding 80 percent. Such outcomes restrict female students' access to tertiary STEM programmes and reinforce gender disparities in scientific professions. There is therefore a need for empirical evaluation of intervention-based strategies capable of improving girls' mathematics achievement in Nigerian secondary schools.

1.3 Purpose of the Study

The purpose of this study was to determine the impact of gender-responsive teaching intervention on secondary school girls' achievement in mathematics.

1.4 Research Hypothesis

There is no significant difference between the mathematics achievement scores of students exposed to gender-responsive instructional intervention and those taught using conventional instructional methods.

1.5 METHODOLOGY

A quasi-experimental pre-test/post-test control group design was adopted. Four secondary schools participated in the study: three experimental schools (MHS Isolu n=21; NUD Obantoko n=27; Salawu Secondary School n=23) and one control school (Egba-Odeda n=20). Students in experimental schools received structured gender-responsive instructional support across six mathematics curriculum topics, while the control school received conventional instruction. Achievement tests were administered before and after the intervention. Data were analysed using descriptive statistics, paired-sample t-tests and analysis of variance (ANOVA).

1.6 RESULTS

Pre-test and post-test scores were analysed for one control school (Egba-Odeda) and three experimental schools (MHS Isolu, NUD Obantoko, and Salawu). Paired-samples t-tests were used to assess within-school improvements, while ANOVA was conducted on gain scores Table 1).

Results in the control group showed a decline in performance (Mean Gain = -1.45), which was not statistically significant ($p > 0.05$). MHS Isolu showed a modest improvement, but this was also not statistically significant**.** NUD Obantoko and Salawu schools recorded very large and statistically significant gains ($p < 0.001$). The ANOVA result confirms a highly significant difference across schools**,** indicating that the intervention effect varied strongly between groups.

Table 1. Impact of teaching intervention as reflected in pre- and post-test performances of the students.

School	N	Pre-Test Mean	Post-Test Mean	Mean Gain	t-value	p-value
Control (Egba-Odeda)	20	7.20	5.75	-1.45	-1.70	0.106
MHS Isolu	21	5.90	7.67	+1.76	1.69	0.106
NUD Obantoko	27	7.41	17.41	+10.00	9.31	<0.001
Salawu	23	6.87	15.22	+8.35	10.93	<0.001

Table 2. ANOVA on Gain Scores.

Source	F	p-value
School	31.28	<0.001

Results indicated that students in the control school recorded a decline in achievement (mean gain = −1.45), which was not statistically significant. MHS Isolu recorded a modest but non-significant improvement (mean gain = 1.76). In contrast, NUD Obantoko (mean gain = 10.00, $p < .001$) and Salawu Secondary School (mean gain = 8.35, $p < .001$) recorded substantial statistically significant gains following exposure to the intervention. ANOVA results confirmed a significant difference among gain scores across schools ($F = 31.28$, $p < .001$), indicating that improvements were attributable to the instructional intervention.

1.7 DISCUSSION

The findings provide strong empirical support for the effectiveness of gender-responsive teaching intervention in improving mathematics achievement among secondary school girls. The absence of improvement in the control school strengthens the internal validity of the study by demonstrating that observed gains in experimental schools were attributable to the intervention rather than testing effects or maturation. The large improvements recorded in NUD Obantoko and Salawu Secondary School suggest that structured instructional support enhanced conceptual understanding and learner engagement.

These findings align with Social Learning Theory (Bandura, 1977), which emphasizes modelling and guided interaction as mechanisms for skill acquisition, and Constructivist Learning Theory (Vygotsky, 1978), which highlights scaffolding as a critical factor in cognitive development. Variation observed across experimental schools further suggests that implementation fidelity and classroom interaction dynamics influence the magnitude of intervention outcomes.

1.8 CONCLUSION

This study provides clear empirical evidence that gender-responsive teaching intervention significantly improves secondary school girls' achievement in mathematics. Two of the three intervention schools recorded large and statistically significant achievement gains, while the control school showed no improvement. These findings demonstrate that structured instructional support enhances students' conceptual understanding, engagement and confidence in mathematics learning.

The results therefore confirm that gender-responsive instructional strategies represent an effective and practical approach for strengthening girls' readiness for participation in STEM-related educational pathways. Implementation of such interventions within secondary school

mathematics classrooms can contribute meaningfully to reducing gender disparities in STEM participation in Nigeria.

1.9 RECOMMENDATIONS

Gender-responsive instructional strategies should be integrated into secondary school mathematics teaching practice. Teacher professional development programmes should emphasise structured scaffolding techniques and inclusive classroom interaction patterns that support female learners' participation. Education policymakers should support the adoption of intervention-based instructional models as part of broader efforts to improve girls' achievement in mathematics and expand their participation in STEM education.

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