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THE EFFECTS OF ROLE MODEL ON FEMALE STUDENTS' ACADEMIC ACHIEVEMENT IN THE SECONDARY SCHOOLS SCIENCE SUBJECTS, DELTA STATE, NIGERIA.

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ABSTRACT

This study focused on the Effects of Female Role Model on students' Academic Achievement in Science Subjects in Delta State Secondary Schools. The stratified random sampling technique was adopted. The instrument used was Female role Model on Science Questionnaire (SAFMSQ) by the researcher after reviewing extensively on the related literature and the records of students Senior School Certificate Examination (SSCE) results from the Post Primary Education Board (PPEB), Asaba Delta State from 2013/2014-2016/2017 academic sessions. The populations for the subjects were 3,400 students in secondary schools. One research question and hypothesis was formulated to guide the study. Data were collected and analyzed using the Statistical Package for the Social Science (SPSS) according to the research objectives of the study. The hypothesis was tested at 0.05 level of significance. Research Hypothesis was analyzed using Linear Regression model. A hypothesis decision was based on the p-values of the model. The homogeneity of the variance is supported by Levene's test for equality of variance. The result show that there was significant difference observed in the research. Based on the findings, it was therefore recommended that Educational experiences should also serve to build confidence among females with regard to application of science knowledge and skills and Teachers should humanize science by developing the right attitude that students will emulates to enhance female participation and performance in science subjects.

Keywords: *Female Role Model, Gender, Science, Academic Achievement.*

Introduction

A **role model** is a person whose *behavior*, example, or success is or can be emulated by others, especially by younger people. The term "role model" is credited to sociologist Robert K. Merton, who coined the phrase during his career. Merton hypothesized that individuals compare themselves with reference groups of people who occupy the social role to which the individual aspires. An example being the way young fans will idolize and imitate professional athletes or entertainment artists.

Role models show significant effects on female students' self-confidence in pursuing careers in Science, Technology, Engineering, and Mathematical (STEM) fields. The gender difference between role models and female students has shown to have no significant effect on student attitudes, whereas perceived dissimilarity with stereotypical role models showed a negative effect on self-confidence in pursuing STEM careers. Perceived similarity with non-stereotypical role models (of either gender) shows a positive effect on self-confidence to succeed in STEM occupations. Parent role models also significantly influence a person's "education and training aspirations, task self-efficacy, and expectancy for an entrepreneurial career".

According to Catherine Amelink (2009), she discovered in the study conducted by Madigan (1997), who used national data on science achievement and transcript reports of science course taking of students from the National Longitudinal Education Studies (NELS) to determine the relationship between student science course taking and the change in student science proficiency level between 8th and 12th grades. Results from the study found overall, 54% of students showed an increase in their science proficiency level, while 35% stayed at the same level and 11% declined. The chances of increasing in science proficiency level varied with the demographic and academic characteristics of students. In particular, male students were more likely than females to increase their science proficiency level between 8th and 12th grades. Gender continued to influence the likelihood of increasing in science proficiency level even after controlling for differences in previous science course taking. Males were more likely to increase in science proficiency than females and they were more likely to have taken physics (31% of males took physics versus 24% of females), but differences in the number of courses taken were not found. His findings suggested that course taking may account for at least some of the observable differences between groups in the likelihood of increasing in science proficiency level. Given the importance of Physics in undergraduate coursework for related science degrees,

studies have examined what influences the achievement in physics courses in particular for males and females. High school physics coursework (content, pedagogy, and assessment) and confidence in physics courses were examined to determine their role in predicting introductory university physics performance. Hazari, Tai, & Saddler, (2007) in their study reveal that high school physics and affective experiences differentially predicted female and male performance. The amount of time spent covering specific topics in physics was a positive predictor for both males and females whereas lack of encouragement at home to pursue a science career had a negative effect on university performance in physics. High school physics courses that required a full understanding of topics seemed to benefit female students' more than male students. Alternatively, university physics courses that required memorization seemed to benefit male students' more than female students. Females who reported doing long-written problems on a weekly basis performed worse than their male counterparts. Finally, they concluded that the performance of females increased if they reported that their father encouraged them.

National Research Council, (2006) reported that stereotypical views held by female students as well as parents that science is a male-dominated field may prevent women from seeing benefits related to pursuing a career in science disciplines. Among those who do enroll in Science, Technology, Engineering and Mathematics (STEM) disciplines, stereotypes of science being a male-dominated field are perpetrated as females see few female role models in the STEM careers. Furthermore, the report revealed that females who choose to pursue careers in Science, Technology, Engineering and Mathematics (STEM) fields are the minority and find themselves isolated in a male dominated environment. With regard to post-secondary education, reports suggest that women who enter science majors are likely to have strong family support, high expectations, self-confidence, and appropriate academic preparation. However, Brainard & Carlin, (1998); Society of Women Engineers, (2008) observed that following enrollment a variety of environmental factors works to lower confidence and impact the scientific achievement of females negatively. According to Xie & Shauman, (2003) these factors result in women undergraduates having less interest, lower expectations for success, and decreased confidence in science related fields than males, ultimately impacting persistence to degree attainment. The manner in which subject matter is covered has been highlighted as an important factor affecting the science achievement of females. One meta-analysis found several strategies that had a positive impact on science achievement among students, including females. Schroeder,

Scott, Huang, Tolson, & Lee, (2007) added that these strategies include relating learning to students' previous experiences, collaborative learning, varying the level and type of questions asked during lessons, using inquiry based approaches that allow for hands-on manipulation of science material, employing a variety of assessment methods, and incorporating instructional technology into lessons. In addition, females tend to perform better on areas of standardized science assessments that address the human application of science such as life sciences. In addition, Ingels & Dalton, (2008); NAEP, (2005) found that females tend to enroll in advanced coursework and pursue degrees in science fields that have a direct application to improving the human condition. These trends according to Green, (2009) suggest that females may be turned off from studying Science, Technology, Engineering and Mathematics (STEM) subject matter and pursuing careers in STEM fields due to stereotypes that such fields have little or no impact on the human condition. More women than men pursue a postsecondary degree in the United State., however fewer females pursue an undergraduate degree in science and therefore do not enter into Science, Technology, Engineering, and Mathematics (STEM) related careers at the same rate as males. Females have demonstrated that they are equally capable as their male counterparts of learning and mastering science concepts and knowledge. Green, (2009); Ingels & Dalton, (2008); National Science Foundation, (2005) Views that female's hold in relation to science and its application to solve real-world problems; courses that females are advised to enroll in during high school; and support from parents, teachers, and other role models related to pursuing a career in Science, Technology, Engineering and Mathematics (STEM) disciplines are factors that provide additional insight into gender differences in science achievement.

The absence of female role model is another factor that affects female students' performance in science. Much research has argued for the value of female role models in Science, Technology, Engineering and Mathematics (STEM) fields. For example, Farland-Smith (2009), observed that middle-school girls exposed to female scientist role models developed more positive attitudes towards careers in science, and Kim, (2009) drew survey data to demonstrate that women pursuing computer science at the college level can gain from exposure to women successfully balancing STEM careers and family responsibilities. They argue that such role models can support students' confidence and provide counterfactuals to negative stereotypes (ibid). Likewise, Lockwood (2005) examined the effects of gender-matched and mismatched career role models by having college students read about a successful graduate of their university who

majored in the same field as them. She found that while the gender of role models did not bear on male-participants' self-perceptions of their success-related traits, female college students were more inspired by outstanding role models who were women (as opposed to men). One particularly methodologically strong study (from Carrel, 2009) took advantage of the random assignment of students and faculty into Science, Technology, Engineering and Mathematics (STEM) classes at the Air Force Academy (Price 2010). This study found "that high ability female students who have their introductory STEM courses taught by a female instructor perform better in these and additional courses and are more likely to receive a degree in a STEM field". When students see successful women working in a wide variety of technology fields and enjoying those fields, they begin to understand who they can become and how STEM can help them get there. Having a mentor also can increase female interest and success…[In alignment with this thinking,]. A series of studies have a more nuanced light on instances in which female role models may make a particular difference. While female role models have been shown to support women's performance and persistence in Science, Technology, Engineering and Mathematics (STEM) fields, research has not generally found female role models to be as important for recruiting women into STEM. This is an important distinction. For example, Canes and Rosen, (1995) demonstrated that increases in female Science, Technology, Engineering and Mathematics (STEM) faculty at a diverse set of four-year colleges were not followed by increases in female majors in those fields. While many of the studies cited above demonstrate a valuable role for female role models in supporting women's continuing STEM pursuits, Canes and Rosen observed that increasing female role models did not draw more women into Science, Technology, Engineering and Mathematics (STEM) majors in schools.

Statement of the Problem

The absence of female role models in science is a factor that influences female students' performance in Science, Technology, Engineering, and Mathematics (STEM) fields. It has been observed that women have been neglected at National, State and Local levels of appointments, as key positions were given to the men neglecting the female involvement in the national development. For example, Farland-Smith (2009), observed that middle-school girls exposed to female scientist role models developed more positive attitudes towards careers in science, and Kim, (2009) drew on survey data to demonstrate that women pursuing computer science at the

college level can gain from exposure to women successfully balancing Science, Technology, Engineering and Mathematics (STEM) careers with national, state and family responsibilities. He argued that such role models can support students' confidence and provide counterfactuals to negative stereotype.

It is against this background that this study seeks to examine the effectiveness of the above factors to ensure gender equity in science education in improving female students' interest, participation and performance in secondary school science subjects.

Research Questions

Will the absence of female role models affects the achievements of female students on science subjects?

Research Hypotheses

There is no significant relationship between the absence of female role models and the achievement of female students in science subjects.

Purpose of the Study

To examine the effects of female role model on students' academic achievements in science subjects.

Results and Discussion

The results of the present study are presented in table 1 and 2

Research Question 1: **Does the absence of female role models affects' the performance of female students in science subjects?**

Table 1: Frequency Analysis of students' response on the effects of the absence of female role models on student's achievements on science subjects.

Options	Code	No. of Responses	Percentage
Strongly Disagreed	**2**	**5**	**5.0**
Disagreed	**3**	**8**	**8.0**
Agreed	**4**	**26**	**26.0**
Strongly Agreed	**5**	**61**	**61.0**
Total		**100**	**100**

From table 1.1 above, 61 respondents representing 61% of the total response Strongly Agreed that the absence of female role model affects' the achievements of female students' achievements in science subjects, 26 respondents representing 26% of the total response Agreed with the claim while 8 respondents representing 8% Disagreed and respondents representing 5% strongly disagreed with the claim that the absence of female role model affects' the achievements of female students' achievements in science subjects. Therefore, the absence of female role models in science subjects affects the female students' achievements in secondary schools teaching and learning of science subjects.

Research Hypothesis 1: There is no significant relationship between the absence of female role models and the achievements of female students in science subjects.

Table 2: Linear Regression Analysis showing the relationship between the Absence of female role models and female students' Achievements on Science subjects.

Independent Variables	B	Std. Error	Beta	T	Sig.	R	R^2	Adj. R^2	F-stat	P-value
Constant	9.292	1.194	0.425	7.779	0.000	0.425	0.181	0.172	21.63	0.000
				4.657	0.000					
R2	1.253	0.269								

From table 1.3, R-value (0.425) has an adjusted R^2 (0.172) which implies that 17.2% variation in performance is accounted for by changes in the Independent variable the Absence and presence of female role model. The beta values 0.425 for female role model with P-Value of 0.000 less than the Alpha (α). Since P (0.000) < 0.05, we therefore Reject the Null hypothesis and Accept the Alternative that there is significant relationship between the Absence of female role model and the achievements of female students on Science subjects.

Discussion of Findings

The result of the t-test on students' academic achievement in science subjects found a significant relationship between the Absence of female role models and the academic achievement of female students' in science subjects. This finding agreed with the study of Cheryan, (2011) who found that women can be successful in Science, Technology, Engineering and Mathematics (STEM) role models and gender may be less important than the extent to which role models embody current STEM stereotypes". This suggests that the most salient stereotypes for women considering entering Science, Technology, Engineering and Mathematics (STEM) fields may not be gendered stereotypes, but rather stereotypes about the culture of given STEM fields or the kinds of personalities that tend to thrive in given fields. Price, (2010) in his study found significant relationship between female role model and female students' performance in science subjects. Those high ability female students who have their introductory Science, Technology, Engineering and Mathematics (STEM) courses taught by a female instructor perform better in science subjects, which indicates that Absence of female role model affect female students achievements on science subjects.

Summary

The focus of this study was to determine the influence of female Role Model on female students' achievements in science subjects in secondary schools. A review of the existing literature was conducted in order to develop understanding on the effects of female role model on female students' achievements in science subjects.

Data were collected and analyzed using the Statistical Package for the Social Science (SPSS) according to the research objectives of the study. The hypotheses were tested at 0.05 level of significance. Research Hypotheses were analyzed using Linear Regression model. The homogeneity of the variance is supported by Levene's test for equality of variance. The results of the hypotheses show significant difference in the academic achievement of students.

Conclusion

In Conclusion, this study brought to light the Effects of female role model on female student's achievement in science subjects in secondary schools in Delta State. The study revealed that

there is significant relationship between the absence of female role model and female students' achievements on science subjects.

Recommendations

Based on the findings of this study, the following recommendations are made:

1. To improve the interest, participation and achievements of female students' in science subjects, learners should be encouraged by the subject teachers, principals of various schools, educational bodies, parents and government in ensuring that the factors that influences and determine academic achievement of female students are positive enough to enhance teaching and learning in the school system.
2. School curriculum developers should make a reform based on upon balanced consideration of all the important variables that relates to female students' academic achievement in the sciences.
3. Educational experiences should also serve to build confidence among females with regard to application of science knowledge and skills.

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