Management of Gender Educational Imbalance in Science, Technology, Engineering and Mathematics in Universities in Rivers State

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Abstract

The study examines management of gender educational imbalance in Science, Technology, Engineering and Mathematics in universities in Rivers State which include Rivers State University (RSU) and University of Port Harcourt (UNIPORT). The study employs the descriptive research survey design. The population of study was 13,575 students (RSU = 8,746 and UNIPORT = 4,829) from STEM Faculties and Departments from the study institutions. The sample of the study was 752 STEM students comprising 383 (Male (X_1) = 287; Female (X_2) = 96) from Rivers State University and 369 (Male (X_3) = 238; Female (X_4) = 131) from University of Port Harcourt respectively. Multistage sampling technique was employed in the selection of sample. The instrument for data collection was a self-structured questionnaire tagged "Science Technology Engineering Mathematics Management Questionnaire (STEM-MQ)" which was designed and patterned after four point modified rating scale of agreement. The instrument was validated for face and content validity and a reliability of 0.87 was established using Pearson Product Moment Correlation (PPMC) coefficient. Data collected were amalysed with mean statistics to answered research questions while One Way Analysis of Variance (ANOVA) was used to test the hypotheses at 0.05 level of significance. The study found that gender educational imbalance in STEM is caused by several factors which affects participation of female folks in the society and industry. However, strategies for improvement of female enrolment in STEM were found out. Based on the findings of the study, it was recommended among others that universities should organize guidance and counselling programme in the form of sanitization orientation for females intended students especially at the secondary school level. This will help in reducing the male stereotyped as accorded to STEM by many. Free scholarship should be given by government, philanthropist, and non-governmental agencies to female students in STEM especially on further training that will make to advance technically and technologically. Admission scores and conditions should be reduced for female students seeking admission into STEM courses as this will enhance more enrollment thereby reducing the imbalance.

Keywords: Management, STEM, Gender Imbalance, Socio-economic

Introduction

Education is a right to which every child (male and female) must have access because it is the most potent and valuable instrument for socioeconomic development. It is a vital tool for national development and integration because an educated person can contribute to contribute

socially, economically, and politically to the development of the society. This calls for the importance of education as a patent right to every individual irrespective of sex, religion, race among others. Despite these benefits of education, it seems not clear that education has not been able to achieve its driven goal in Nigeria as the society still suffers from uneducated and non-educational activities. These happens because some attended school without having a focus or reason or been educated thereby having a notion of "do as others are doing". At the end of the training period, there is no impact of education on the activities of such persons.

It is truism that choice of educational discipline are influenced by several factors such as parents decision, child's intention and interest, location of schools, admission conditions, cost of studying the course, the nature of the course and peer influence among others. These factors have contributed to why there are variations in number of students enrolled in a particular discipline as compared to others and hence making some courses preferred to others. In other words, some courses have high preference by some people making others lowly preferred by same persons and the lowly preferred ones by these people are highly prefeed by others and vice-versa. Such of these preferences are practically and clearly demonstrated among male and female preponderance to courses of law, medicine, management, science, engineering, education, humanities and arts and so on. These causes an imbalance in the educational sector as regards to choice of courses offered thereby tilting or skewed positively or negatively high and positively or negatively low. These differences are commonly found in Science, Technology, Engineering and Mathematics (STEM) where majority of students are male to the detriment of female. This shows a positive skewness towards the male and negatively skewed for female. This variations and diversity in studentship according to the context of this study is regarded as gender educational imbalance in STEM. Hence it becomes imperative to examine how STEM can be properly and effectively managed to reduce these gender imbalances in universities in Rivers State.

Statement of the Problem

Science, Technology, Engineering and Mathematics (STEM) is the key driving force in today's economic development. Future success of nations increasingly depends on their scientific and technological capabilities. Unfortunately, women underrepresentation in STEM has persisted over the years, despite efforts to close the gender gap. Elan (2012) opined that the presence of women in the fields of STEM remains significantly lower than that of men, even in some of the world's wealthiest regions. Even where many women receive STEM degrees, the industry is still considered to be male dominated. This is why gender equality in the STEM industry is very necessary in fighting inequality everywhere (Agommuoh & Ndirika, 2017). Although currently as many women and girls as men and boys can be admitted in a school/ university, still fewer women get selected to join the public schools and universities due to their inability to excel in STEM subjects. Reducing the gender gap in Science, Technology, Engineering and Mathematics (STEM) education could help reduce skills gap, increase employment and productivity of women and reduce occupational segregation (National Science Foundation, 2016).

Gender differences in STEM education participation at the expense of girls are visible as early as in early childhood especially in science- and mathematics related subjects (UN, 2016). Girls according to UN (2016) appear to lose interest in STEM subjects with age, particularly between early and late adolescence. This decreased interest affects participation in advanced studies at secondary level. Gender gaps in STEM education participation become more obvious in higher education where female students represent only 35% of all students enrolled in STEM-related fields of study at this level globally (UN, 2016). According to Barka and Aspray (2006), differences are also observed by disciplines, with female enrollment lowest in engineering, manufacturing and construction, natural science, mathematics and statistics and ICT fields. Women constitute about half (49%) of the Nigerian population (British Council Nigeria, 2012). Their exclusion from the generation and application of scientific knowledge represents a tremendous waste of human potential. It is a neglect of half of potential human capital available in the economy, which will threaten the economic competitiveness and advancement. Also, it is like walking on one leg in the race towards technology driven economy, which will not only be frustrating but may take forever to achieve. It has not been proven that ingenuity is a factor of sex. Men and women alike have hidden potentials that when developed can turn a new page for the world's development. Women participation in STEM has been greatly hampered by the fallacy that they lack the potentials to thrive in this fields. Despite the importance of STEM education, there is currently a low proportion of women studying and graduating in STEM subjects. It is based on these observed scenarios that this study examined the management of gender educational imbalance in science, technology, engineering and mathematics in universities in Rivers State.

Purpose of the Study

The purpose of the study is to examine the management of gender educational imbalance in Science, Technology, Engineering and Mathematics in universities in Rivers State. objectively, the study seeks to find out.

1. Factors that cause gender educational imbalance in in Science, Technology, Engineering and Mathematics in universities in Rivers State.
2. Effect of gender educational imbalance in Science, Technology, Engineering and Mathematics in universities in Rivers State.
3. Strategies adopted to reduce gender educational imbalance in Science, Technology, Engineering and Mathematics in universities in Rivers State.

Research Questions

The following questions were answered to guide the study.

1. What are the factors that causes gender educational imbalance in in Science, Technology, Engineering and Mathematics in universities in Rivers State?

2. What are the effect of gender educational imbalance in Science, Technology, Engineering and Mathematics in universities in Rivers State?
3. What are the strategies adopted to reduce gender educational imbalance in Science, Technology, Engineering and Mathematics in universities in Rivers State?

Hypotheses

The following null hypotheses were formulated and tested at 0.05 level of significance.

1. There is no significant difference between the mean response of male and female students from Rivers State University (RSU) and University of Port Harcourt (UNIPORT) on factors that causes gender educational imbalance in Science, Technology, Engineering and Mathematics in universities in Rivers State.
2. There is no significant difference between the mean response of male and female students from Rivers State University (RSU) and University of Port Harcourt (UNIPORT) on the effect of gender educational imbalance in Science, Technology, Engineering and Mathematics in universities in Rivers State.
3. There is no significant difference between the mean response of male and female students from Rivers State University (RSU) and University of Port Harcourt (UNIPORT) on the strategies adopted to reduce gender educational imbalance in Science, Technology, Engineering and Mathematics in universities in Rivers State.

Contextual Clarification

In order to clearly x-ray the study, the researchers deem it necessary to differentiate variables that forms the study by way of clear definitions and explanations. This was done under the following subheadings.

Concept of Gender

Idyorough (2005) conceives gender as the social construction« of the relations between: male and female in terms of roles in power sharing, decision-making. Division (2011) argue that the word 'gender' is not a code word for 'women' but a concept and female in terms of roles such that certain roles are seen as exclusively females generally applied to the socially constructed roles which we acquire as a result of being born female or male in a particular time, space, class. Gender differentiates men from women and defines the way in which women and men interact with each in any society. Gender can generally be seen as the fact of being male or female. In the African context, there is also extensive debate about each sex's place in the interactions between traditional patterns and the new ideas brought by colonialism and about female and male agency (Odejide, 2011). Gender as argued by Lorber (1994) is an institution that is embedded in all the social processes of everyday life and social organizations. Lorber further argued that gender difference is primarily a means to Justify sexual stratification. Gender is so endemic because unless we see differences, we cannot justify inequality or imbalance. Gender is embedded not only in individuals but throughout social life. Risman (2004) explains that gender structure

differentiates opportunities and constraints based on sex category and thus has consequences on three. dimensions: (1) At the individual level, for the development of gendered selves; (2) during interaction as men and women face different cultural expectations even when they fill the identical structural positions; and (3) in institutional domains where explicit regulations regarding resource distribution and material goods are gender specific.

The gender concept has found prominence in access to education in contemporary times. Gender imbalance is evident when there is the discrimination of a particular gender in terms of access to resources, opportunities, general welfare, or power relations. Disparities are noticeable in gender enrolment at all levels and types off education, as well as across various disciplines and programmes, especially at the tertiary level (Nwajiuba, 2011). Oti (2011) explains that gender related issues in education involve difficulties or problems that limit or restrict the freedom to access resources, opportunities, career progression, expectations and the interpretation of a person based on one's gender/sex. This means that even if opportunities are presented to men/women some responsibilities and factors can prevent them from gaining equal access to opportunities that may be available to them. This is also evident in schooling, family, legal, occupational, political or leadership positions, and so on. For instance, schools may be available to girls and boys but constraints arising from economic, social, cultural, ideological factors may impede their ability to participate in school.

Science, Technology, Engineering and Mathematics

Education is aim at ensuring a technological driven society for the comfort of man and its environment. This implies that education among its function and roles is to ensure that the society is developed through technology. These technological developmental can only be achieve through Science, Technology, Engineering and Mathematics (STEM) education. Education can enhance sustainable development through promoting the development of the knowledge, skills, understanding, values, and actions required by individuals which will in turn ensure environmental protection and conservation, promotes social equity, and encourages economic sustainability. The implication is that the learning process and the outcome of education process should promote critical thinking, problem solving and action which will help in addressing the challenges to sustainable development (UNESCO as cited in Agommuoh & Ndirika, 2017).

Science, Technology, Engineering, and Mathematics (STEM) education is an education that creates critical thinkers, increases science literacy, and empowers the next generation to be innovators. Innovation we know leads to new products and processes that sustain our economy. There is no doubt that innovation and science literacy depend on a solid knowledge base in STEM. According to Ugwuada (2011), STEM is a curriculum based on the idea of educating students in four specific disciplines - science, technology, engineering, and mathematics in an interdisciplinary and applied approach. Explaining further Ugwuada (2011), stressed that rather than teach the four disciplines as separate and discrete subjects, STEM integrates them into a cohesive learning paradigm based on real-world applications. Science, Technology, Engineering,

and Mathematics (STEM) play an increasingly important role in addressing critical needs of society and generating innovation that drives the global economy. STEM is important because it pervades every part of our lives. Science is everywhere in the world around us while technology is continuously expanding into every aspect of our lives.

Engineering in addition to being the basic designs of roads and bridges, tackles the challenges of changing global weather and environmentally friendly changes to our home while mathematics is found in activity in our lives (UNESCO 2016). By exposing students to STEM and giving them opportunities to explore STEM-related concepts, they will develop a passion for it and hopefully pursue a job in a STEM field (National Science Foundation, 2016). According to National Science Foundation (2016), a curriculum that is STEM-based has real-life situations to help the student learn. STEM activities provide hands-on and minds-on lessons for students. According to Danmole (2011), the development of any nation begins from the classroom, therefore, Science, Technology, Engineering and Mathematics (STEM) Education is the instrument for change and national development. It is the driving force of the current world and a major instrument of globalization (Dantani & Baba, 2011).

The implication according to Ugwuada (2011), is that no nation can build a solid technological base to produce raw materials, goods and services without the application of mathematical, scientific and technological knowledge. Therefore, it is imperative for STEM to be inclusive and acquire by all especially the female folks as it is an education that lays emphasis on the development of skills, abilities, understandings, attitudes, work-habits and appreciation which encompasses knowledge and information needed by graduates to enter or make progress in field of work in a productive basis.

Educational Imbalance

Gender according to Okeke (2002) refers to many socially and/or culturally constructed characteristics, qualities, behaviours and roles which different societies ascribe to females and males. It is the proportion of a population who have a specific characteristic in each time period. Determining the prevalence of gender imbalance in STEM is necessary to ensure sustainable development of students. Ogunjuyigbe, Ojofeitimi and Akinlo (2006), for instance, observed differences between enrolment of males and females in all levels of education in Nigeria. In addition, Obiadazie (2019) observed that the drop-out rate of girls is higher than boys and participation in Science Technology Engineering, and Mathematics (STEM) classes are lower for girls than boys which create an imbalance in educational pursuit and knowledge between male and female. This clearly shows that STEM discipline skewed positively to male leaving the female folks educationally disadvantage in STEM discipline. Ojo (2002) found that the combined enrolment for primary, secondary, and tertiary schools for females was 57% compared to 71% for males meaning that there are fewer women in certain economic fields as well. More so, Central Bank of Nigeria as cited in Obiadazie (2019) affirmed that the gender gap in literacy rates at the rural level between boys and girls was 18.3% in favour of the boys overall and 3.9% in favour of boys in the age groups 6 – 9 years (primary school) indicating also a gender

dimension to educational attainment and development in Nigeria. Furthermore, UNESCO in Morales, Avilla & Espinosa (2016) reported that in many countries, boys are more active, participative in classroom interactions and get more attention while girls in majority of the countries are better in literary skills than boys. These tendencies continue and cripple to higher levels of learning. This also makes males folks dominating polytechnics and universities where STEM courses are offered leaving women dominating in Colleges of Education and other Arts and Humanities studies.

Often, more men study and work in science fields than women, for instance, UNESCO reported in 2015 that only 28.4% of the workforce in STEM are women; others consist mainly of men. European Commission Ethics and Gender (2013) also noted that in other fields such as the humanities and education, employees are predominantly women. In the UK, women earn an average of 18% less than men. Science education helps students to achieve scientific literacy and promotes the well-being and economic development of any nation. Agommuoh and Ndirika (2017) in support of this assertion stated that a country that educates its citizens (women as well as men) is bound to have great increase in its economic productivity, low maternal and infant mortality and improvement in health and educational sectors. There is need to enhance science education at all levels of education (primary, secondary, and tertiary) because the output of both genders is required in the sustainable development of the nation to avoid partial use of the resources available. Anarfi & Appiah (2012) acknowledged that female students are more inclined towards life skills and commercial courses, which are referred to as less prestigious and less academically demanding whilst the males are more inclined towards sciences, mathematics, technical or masculine subjects and industrial subjects which many females shy away from.

Management

Effective management is a necessary tool for the successful achievement of organizational goals. The coordination and management of resources (human, financial and material) available is adequately required to make for functional and effective implementation of any educational programme that could enhance female participation in STEM. The realization of these objectives particularly lies in the proper implementation of the programme through effective management as reported by Mgbodili (2000), that the problems of Nigeria does not lie with the knowledge and adequate policies but effective management. According to Franklin (2002), management is defined as a distinct process consisting of activities of planning, organizing, directing, coordinating and controlling performance to determine and accomplish stated objectives with the use of resources (human, material, financial and time). It is true that female lagged behind the bar in STEM, and this could be cause by lack of awareness and sensitization. It is important that if female could be integrated into the STEM education, a thorough and effective strategies must be adopted. Such of these strategies was the introduction of Universal Primary Education in 1976 which metamorphosed to the present day Universal Basic Education where every child was allowed to benefit from free education. Despite this and other notable efforts by government, the gender imbalance or gap still exist between male, and female as regards to education especially in STEM. It is the hope of the researchers that if proper management of STEM programme are

used by considering the objectives which this study set to achieve which include the causes of these imbalance, the effects as well as the strategies for reducing the gap, it will go a long way to enhance female involvement in STEM thereby reducing the imbalance. This makes the management of STEM much more important in the context of this study. Effective management involve certain functions such as planning, coordinating, leading, communicating, staffing, controlling, directing, and organizing among others.

Methodology

The study adopted the descriptive research survey design and was carried out in universities in Rivers State which include Rivers State University (RSU) and University of Port Harcourt (UNIPORT). These two institutions are used for the study because of the availability of STEM courses. The population of study was 13,575 students (RSU = 8,746 and UNIPORT = 4,829) from STEM Faculties and Departments from the study institutions. The sample of the study was 752 STEM students comprising 383 (Male (X_1) = 287; Female (X_2) = 96) from Rivers State University and 369 (Male (X_3) = 238; Female (X_4) = 131) from University of Port Harcourt respectively. Multistage sampling technique was employed in the selection of sample. Stage 1 was the use of Taro Yamen to determine the sample size for each institution and gender while stage 2 was the use of stratified random sampling technique to select sample across all the Departments that form STEM and between year 2 to final year students in the selected institutions based on gender. At stage 3, accidental sampling technique was adopted to select the students from various Faculties, Departments and levels to ensure effective representation. The instrument for data collection was a self-structured questionnaire tagged "Science Technology Engineering Mathematics Management Questionnaire (STEM-MQ)" which was designed and patterned after four point modified rating scale of agreement.

The instrument was validated for face and content validity by three experts: two in STEM from Rivers State University, Port Harcourt and one in Measurement and Evaluation from University of Port Harcourt. The instrument was tested for reliability using test-retest method. The first and the second test were administered to 12 collected and analysed using Pearson Product Moment Correlation (PPMC) coefficient (r) which a coefficient of 0.87 was established which was considered high enough and used for the study. The instrument was administered to the respondents directly by the researchers with the help of two research assistants who were instructed on how to administer the instrument. A total copy of 597 (RSU; Male = 252 and Female = 76) while (UNIPORT; Male = 171 and Female = 98) of the instrument were completely filled and successfully retrieved and used for the analysis. Data collected were amalysed with mean statistics to answered research questions while One Way Analysis of Variance (ANOVA) was used to test the hypotheses at 0.05 level of significance. For research questions, item with mean value greater than 2.50 was "agree" while mean value less than 2.50 was "disagree". For hypothesis, if the calculated value of f (Fcal) is less than the critical value of f (Fcrit) at degree of freedom, the null hypothesis was taken as "Not Significant" but if the calculated value of f (Fcal) is greater than the critical value of f (Fcrit) at degree of freedom, the null hypothesis was taken as "Significant".

Result

The result of the study was presented below.

Research Question 1: What are the factors that causes gender educational imbalance in in Science, Technology, Engineering and Mathematics in universities in Rivers State?

Table 1: Response of Male and Female Students from RSU and UNIPORT on Factors that Causes Gender Educational Imbalance in STEM in Universities in Rivers State

S/N	Factors that Cause Gender Educational Imbalance in STEM Include:	RSU		UNIPORT		XAve.	RMK
		$\bar{X}_1$	$\bar{X}_2$	$\bar{X}_3$	x4		
1	Lack of confidence in the girl-child among the males	3.17	3.13	3.03	3.41	3.19	**A**
2	Technical fields require physical strength	3.60	3.72	3.41	2.97	3.43	**A**
3	Women are always timid and cannot compete with males	3.11	3.61	2.42	3.09	3.06	**A**
4	Lack of family and peers support	3.05	3.57	3.17	3.38	3.29	**A**
5	Lack of mentoring/counselling	3.40	3.53	3.42	3.41	3.44	**A**
	Average Mean	**3.27**	**3.51**	**3.09**	**3.25**	**3.28**	**A**

Source: ***Researchers' Field Result; 2023.*** **A – Agree; D – Disagree**

The result in Table 1 shows the mean response of male and female students at Rivers State University and University of Port Harcourt on factors that causes gender educational imbalance in in Science, Technology, Engineering and Mathematics in universities in Rivers State as well as their level of decision on a particular item. The result as shown in Table 1 revealed that male and female students from both institutions agree that all the item listed are causes of gender educational imbalance in Science, Technology, Engineering and Mathematics in universities in Rivers State. This was shown in the response of the respondents with an average mean value 3.27, 3.51, 3.09 and 3.25 respectively for male and female students form RSU and UNIPORT. The result further show that the respondents had a grand average mean of 3.28 which is higher than the cut-off mark of 2.50.

Research Question 2: What are the effects of gender educational imbalance in Science, Technology, Engineering and Mathematics in universities in Rivers State?

Table 2: Response of Male and Female Students from RSU and UNIPORT on Effect of Gender Educational Imbalance in STEM in Universities in Rivers State

S/N	Effect of Gender Educational Imbalance in STEM Include:	RSU		UNIPORT		XAve.	RMK
		$\bar{X}_1$	$\bar{X}_2$	$\bar{X}_3$	x4		
6	It causes women inferiority stereotyping	3.31	3.19	3.87	3.11	3.37	**A**
7	It reduces women level in labour market	3.06	2.97	3.98	3.02	3.26	**A**
8	It reduces technology know-how.	3.73	3.03	3.51	3.07	3.34	**A**
9	It encourages male dominance.	3.51	3.11	3.26	3.41	3.32	**A**
10	It affects professional competitiveness.	3.05	3.54	3.17	3.05	3.20	**A**
	Average Mean	**3.33**	**3.17**	**3.56**	**3.13**	**3.30**	**A**

Source: ***Researchers' Field Result; 2023.*** **A – Agree; D – Disagree**

The result in Table 2 shows the mean response of male and female students at Rivers State University and University of Port Harcourt on the effect of gender educational imbalance in Science, Technology, Engineering and Mathematics in universities in Rivers State as well as their level of decision on a particular item. The result as shown in Table 2 revealed that male and female students from both institutions agree that all the item listed are effect of gender educational imbalance in Science, Technology, Engineering and Mathematics in universities in Rivers State. This was shown in the mean response of the respondents with an average mean value 3.33, 3.17, 3.56 and 3.13 respectively for male and female students form RSU and UNIPORT. The result further show that the respondents had a grand average mean of 3.30 which is higher than the cut-off mark of 2.50.

Research Question 3: What are the strategies adopted to reduce gender educational imbalance in Science, Technology, Engineering and Mathematics in universities in Rivers State?

Table 3: Response of Male and Female Students from RSU and UNIPORT on Effect of Gender Educational Imbalance in STEM in Universities in Rivers State

S/N	Strategies for Reducing Gender Educational Imbalance in STEM Include:	RSU		UNIPORT		XAve.	RMK
		$\bar{X}_1$	$\bar{X}_2$	$\bar{X}_3$	$\bar{X}_4$		
11	Automatic employment to female STEM students by the school or government.	3.72	3.53	3.64	3.31	3.55	**A**
12	Giving of scholarship to interested female STEM students.	3.13	3.52	3.81	3.61	3.52	**A**
13	Preferential admission process to the female candidates in STEM.	3.91	3.33	3.87	3.52	3.66	**A**
14	Readmitting female students that has dropout in STEM.	3.20	3.87	3.56	3.62	3.56	**A**
15	Given special award to best graduating female STEM student.	3.18	3.18	3.77	3.67	3.45	**A**
16	Presence of female STEM instructors in the schools as role models	3.33	3.70	3.68	3.21	3.48	**A**
17	Reducing admission cut-off point for female students in STEM.	3.13	3.19	3.40	3.89	3.40	**A**
18	Provision of special accommodation to all female STEM students,	3.08	3.11	3.08	3.09	3.09	**A**
19	Payment of bursary to female STEM students.	3.08	3.83	3.41	3.61	3.48	**A**
20	Provision of childcare facilities for nursing mothers.	3.42	3.41	3.64	3.00	3.37	**A**
	Average Mean	**3.32**	**3.47**	**3.59**	**3.45**	**3.46**	**A**

Source: ***Researchers' Field Result; 2023.*** **A – Agree; D – Disagree**

The result in Table 3 shows the mean response of male and female students at Rivers State University and University of Port Harcourt on the strategies adopted to reduce gender educational imbalance in Science, Technology, Engineering and Mathematics in universities in Rivers State as well as their level of decision on a particular item. The result as shown in Table 3 revealed that male and female students from both institutions agree that all the item listed are

strategies adopted to reduce gender educational imbalance in Science, Technology, Engineering and Mathematics in universities in Rivers State. This was shown in the mean response of the respondents with an average mean value 3.32, 3.47, 3.59 and 3.45 respectively for male and female students form RSU and UNIPORT. The result further show that the respondents had a grand average mean of 3.46 which is higher than the cut-off mark of 2.50.

Statistical Test of Hypotheses

The following null hypotheses were formulated and tested at 0.05 level of significance.

HO_1: There is no significant difference between the mean response of male and female students from Rivers State University (RSU) and University of Port Harcourt (UNIPORT) on factors that causes gender educational imbalance in Science, Technology, Engineering and Mathematics in universities in Rivers State.

Table 4: Summary of ANOVA on Causes of Gender Educational Imbalance in STEM

Source of Variation	Sum of Squares (SS)	Degree of Freedom (df)	Mean of Square (MS)	F-cal	F-crit	Remark
Between Groups	117.03	3	39.01	2.37	2.60	Not Sig.
Within Groups	9756.07	593	16.45			
Total	**9873.10**	**596**				

Source: ***Researcher's Field Data;*** **2023 Significant at .05, df = 3 and 593**

From the F-distribution table, the critical value of F with 3 and 593 degrees of freedom at 0.05 level of significance is 2.60. Since the computed F-value of 2.37 is less than the critical value of F (2.67), the null hypothesis was not significant thereby the null hypothesis was accepted. This implies that there is no significant difference between the mean response of male and female students from Rivers State University (RSU) and University of Port Harcourt (UNIPORT) on factors that causes gender educational imbalance in Science, Technology, Engineering and Mathematics in universities in Rivers State.

HO_2: There is no significant difference between the mean response of male and female students from Rivers State University (RSU) and University of Port Harcourt (UNIPORT) on the effect of gender educational imbalance in Science, Technology, Engineering and Mathematics in universities in Rivers State.

Table 5: Summary of ANOVA on Effect of Gender Educational Imbalance in STEM

Source of Variation	Sum of Squares (SS)	Degree of Freedom (df)	Mean of Square (MS)	F-cal	F-crit	Remark
Between Groups	236.17	3	78.72	6.52	2.60	Sig.
Within Groups	7157.03	593	12.07			
Total	**9873.10**	**596**				

Source: *Researcher's Field Data;* 2023 Significant at .05, df = 3 and 593

From the F-distribution table, the critical value of F with 3 and 593 degrees of freedom at 0.05 level of significance is 2.60. Since the computed F-value of 6.52 is greater than the critical value of F (2.67), the null hypothesis was significant thereby the null hypothesis was rejected. This implies that there is a significant difference between the mean response of male and female students from Rivers State University (RSU) and University of Port Harcourt (UNIPORT) on the effect of gender educational imbalance in Science, Technology, Engineering and Mathematics in universities in Rivers State.

The table below shows the result of Scheffe's multiple comparisons test to determine pair-wise difference among the groups.

Table 6: Scheffe's Post Hoc Multiple Comparison Test

Compared Groups	Paired Groups	F-crit	Absolute F-Values	Remark
$\bar{X}_1 - \bar{X}_2$	Male RSU Vs Female RSU		2.07	Not Sig.
$\bar{X}_1 - \bar{X}_3$	Male RSU Vs Male UNIPORT		2.80	Not Sig.
$\bar{X}_1 - x_4$	Male RSU Vs Female UNIPORT		3.01	Sig.
$X_2 - x_3$	Female RSU Vs Male UNIPORT	2.67	3.97	Sig.
$X_2 - x_4$	Female RSU Vs Female UNIPORT		1.63	Not Sig.
$X_3 - x_4$	Male UNIPORT Vs Female UNIPORT		2.31	Not Sig.

Source: *Researcher's Field Data;* 2023

Result from Table 6 revealed that significant difference exists between male RSU and female UNIPORT students as well as female RSU and male UNIPORT students. Hence the Post-Hoc Multiple Comparison Test was significant with values of 3.01 and 3.97 which are greater than the F-critical value of 2.67 at degree of freedom 3 and 593.

HO_3: There is no significant difference between the mean response of male and female students from Rivers State University (RSU) and University of Port Harcourt (UNIPORT) on the strategies adopted to reduce gender educational imbalance in Science, Technology, Engineering and Mathematics in universities in Rivers State.

Table 7: Summary of ANOVA on Strategies of Gender Educational Imbalance in STEM

Source of Variation	Sum of Squares (SS)	Degree of Freedom (df)	Mean of Square (MS)	F-cal	F-crit	Remark
Between Groups	104.30	3	35.77	2.16	2.60	Not Sig.
Within Groups	9807.21	593	16.53			
Total	**9873.10**	**596**				

Source: ***Researcher's Field Data;*** **2023 Significant at .05, df = 3 and 593**

From the F-distribution table, the critical value of F with 3 and 593 degrees of freedom at 0.05 level of significance is 2.60. Since the computed F-value of 2.16 is less than the critical value of F (2.67), the null hypothesis was not significant thereby the null hypothesis was accepted. This implies that there is no significant difference between the mean response of male and female students from Rivers State University (RSU) and University of Port Harcourt (UNIPORT) on the strategies adopted to reduce gender educational imbalance in Science, Technology, Engineering and Mathematics in universities in Rivers State.

Discussion of Findings

Result from Table 1 revealed that gender educational imbalance is caused by several factors which include lack of confidence in the girl-child among the males, strength is require in technical profession, women are always timid and cannot compete with males, lack of family and peer support and lack of proper mentoring and counselling. This finding agrees with that Akinwumi and Unaeze (2020) as stated that factors responsible for gender imbalance among university undergraduate students from south-east Nigeria include long period of university education, lack of mentoring and counselling, quest for money for male and interest for business thereby affecting male enrollment.

Result from Table 2 revealed that the effect of gender educational imbalance in Science, Technology, Engineering and Mathematics in universities in Rivers State include causing women inferiority stereotyping, it reduces women level in labour market, it reduces technology know-how, it encourages male dominance, and it affects professional competitiveness. This finding corroborates with National Bureau of Statistics (NBS, 2014) which states that there are fewer female teachers in STEM which further strengthens the belief that science is not for girls and affects the number of female enrollments. These observations are underpinned by society's cultural belief and socialization pattern, which holds that boys should be tough, active and brave while girls are soft. Consequently, this has negative influence on girls' attitude and performance in STEM subjects.

Result from Table 3 revealed the strategies adopted to reduce gender educational imbalance in Science, Technology, Engineering and Mathematics in universities in Rivers State include

automatic employment to female STEM students by the school or government, giving of scholarship to interested female STEM students, preferential admission process to the female candidates in STEM, readmitting female students that has dropout in STEM, provision of childcare facilities for nursing mothers, presence of female STEM instructors in the schools as role models and reducing admission cut-off point for female students in STEM among others. This finding is in line with Agommuoh and Ndirika (2017) as found that strategies for improving female participation in STEM include fostering collaboration between STEM students and STEM Departments in Universities, promoting opportunities for peer networking, providing role models and mentorship for women, conducting blind review of applicants (both males and females) and other work products, and fostering an inclusive climate in STEM Departments.

Conclusion

The study examined the management of gender educational imbalance in Science, Technology, Engineering, and Mathematics in universities in Rivers State. The study found that gender imbalance in STEM are caused by several factors such as lack of confidence in the girl child and that STEM fields requires much of physical strengths. It was also revealed in the study that despite these factors that caused low participation of women in STEM, there are effects of gender imbalance on the society and hence a drastic strategy for improvement were also identified in the study as a way forward.

Recommendations

Based on the findings of the study, the following recommendations were made.

1. Universities should organize guidance and counselling programme in the form of sanitization orientation for females intended students especially at the secondary school level. This will help in reducing the male stereotyped as accorded to STEM by many.
2. Free scholarship should be given by government, philanthropist, and non-governmental agencies to female students in STEM especially on further training that will make to advance technically and technologically.
3. Admission scores and conditions should be reduced for female students seeking admission into STEM courses as this will enhance more enrollment thereby reducing the imbalance.

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