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# Journal

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The journal publishes a broad range of papers from all branches of education relating to childhood, parents and teachers; including but not limited to curriculum, primary and secondary education, higher and adult education, and teacher education.

The Journal of Educational Research on Children, Parents and Teachers is an Interdisciplinary outlet for transformative engagement with research findings that implicate policy and practice within the domain of the educational development of children as well as the impacts of both the parents and teacher practices. For this reason, the journal publishes a broad range of papers from all branches of education relating to childhood to early teens, parents and teachers. Papers that feature curricula developments in the primary, secondary and teacher education are also published by this journal.

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**A study of factors militating against female participation in STEM fields in Nigeria: Implications for counselling**

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**Abstract**

*This study investigated some factors militating against female participation in STEM fields. The study employed a descriptive survey design. A sample of 150 students from STEM fields at University of Ibadan, Southwestern, Nigeria was randomly selected for the study. Instrument used for data collection was a self-designed checklist on factors militating against female participation in STEM fields. Data analysis involved the use of simple percentage. The study employed a combination of both quantitative and qualitative research methods. The study identified lack of interest, masculine image of STEM courses, lack of female role models/mentors, school factors, teacher factors, parental factor, socio-cultural factors and gender stereotype among others as the factors militating against female participation in STEM fields. However, the results revealed that socio-cultural factor had the highest percentage (40%), closely followed by lack of interest (39%) while school factors and teacher factors are at the base (1%) respectively among the factors militating against female participation in STEM. Further comment from the focus group revealed that women run from STEM fields because they perceive it as a man's field and the rigours associated with it. Based on the findings, it was recommended among others that counsellors should develop interventions that would increase girls' self-confidence and feeling of worth in STEM fields.*

**Keywords:** *Counselling. Female participation. Implications. Militating. STEM fields.*

**Introduction**

Science and technology education is becoming very important in the 21st century due to the benefits and challenges of both globalisation and knowledge –based economy. STEM is seen to prevail over every aspect of human life and is a catalyst for the achievement of the 2030 Agenda for sustainable development (UNESCO, 2017). Any nation that wants to grow must prioritize STEM courses (Clement, Orim & Banjo, 2017). Super nations like Japan, China, America, Russia, Germany etc. are what they are today because of their scientific innovations and advancement (OECD, 2016). Increasing opportunities for women in STEM fields is an important step towards realizing this technological innovation and advancement. Female disparity in STEM fields has become a matter of concern to stakeholders in the world globally and in Nigeria in particular. Although the number of jobs in the fields of STEM are increasing rapidly, women still remain under represented in STEM professions (Global Monitoring Report, 2016). Though available records show that women make up for half of the overall population, yet they only account for 25% of the STEM workforce (UNESCO, 2017).

Gender disparity is also seen in the case of boys and girls majoring in STEM courses in tertiary institutions in most nations especially in sub Saharan Africa. Although just as many girls as boys are completing tertiary education and more women graduate from university worldwide than men, women

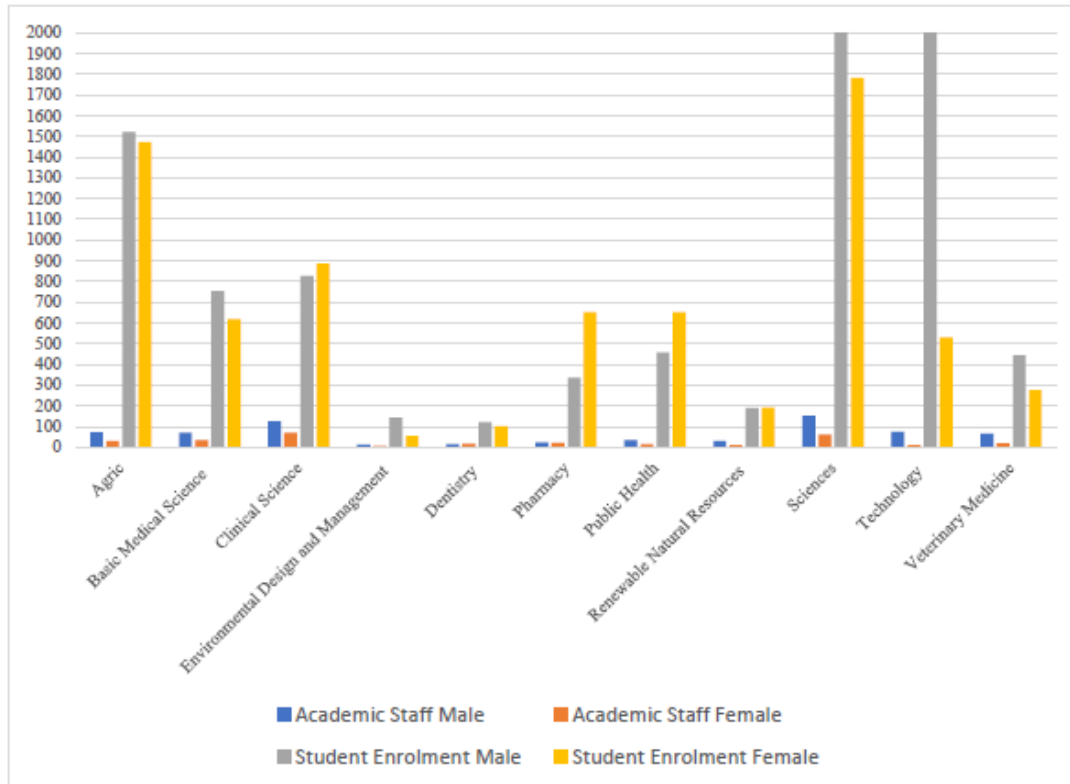
remain a minority in the STEM fields (Global Education Monitoring Report, 2016). In the United States, for example, women earn only about 35 percent of the undergraduate degrees in STEM, a number that remained unchanged for the past decade, even though women account for almost 60 percent of university graduates (Munoz-Boudet & Revenga, 2017; UNESCO, 2010; UNESCO, 2017). Even in places where more women are studying STEM courses at the University, still very few of them end up working in STEM-related careers. For instance in Canada about 65 percent of women fill in for STEM fields but only 23 percent are working in STEM-related careers. To further buttress this, a survey carried out reveals that only 12 percent of full professors STEM in Canada are female thereby providing students with few female mentors (Munoz-Boudet & Revenga, 2017)

The situation is not different in Nigeria, although remarkable improvement has been recorded in women enrolment in education generally as well as significant changes in number of women entering into jobs in areas previously considered to be dominated by men. These changes notwithstanding, there still remains a large gap in the gender ratio of males and females in STEM fields in Nigeria (Onyekwelu, 2019; Okorafor, Kakiri & Okorafor, 2015; Aguele & Agwagah, 2007). Table 1 shows academic staff and students' enrolment in STEM courses in the University of Ibadan, Ibadan, Oyo State, Nigeria 2017/2018 academic year.

**Table 1: University of Ibadan Academic Staff and Students' Enrolment in STEM Course 2017/2018 Academic Year**

		Academic Staff		Student Enrolment	
		Male	Female	Male	Female
1.	Agric	72	31	1521	1472
2.	Basic Medical Science	71	35	754	619
3.	Clinical Science	126	71	826	886
4.	Environmental Design and Management	12	5	144	55
5.	Dentistry	15	17	122	102
6.	Pharmacy	23	22	336	652
7.	Public Health	35	16	456	652
8.	Renewable Natural Resources	31	11	191	192
9.	Sciences	153	62	2923	1784
10.	Technology	76	9	2285	530
11.	Veterinary Medicine	66	18	443	277
	Total	670	297	10,981	6,858
		967		17,839	
	%	69%	31%	62%	38%

**Source: Academic Planning Unit Office of Vice Chancellor (2018), University of Ibadan, Ibadan, Nigeria**



Despite the global realization that STEM underpin the 2030 Agenda for Sustainable Development, provide learners with the knowledge, skills, attitudes and behaviour required for inclusive and sustainable societies, participation of girls and women in STEM fields is still abysmally low. Many factors are attributed to why girls and women are underrepresented in STEM studies and careers. They include lack of interest, passion, masculine image of science, lack of female role models school factors, teacher factors, glass ceiling/ parental factor, socio-cultural factors and gender stereotype among others (Acheampang, 2014; Cotner, Ballen, Brooks & Moore, 2011; Akanwa & Kalu-Uche, 2015; Ojokoh, Oweseni, Akinsowon & Isinkaye, 2015; Akor, Bakar, Hamizah & Rashid, 2015; Munoz-Boudet & Revenga, 2017; Iwu & Azoro, 2017; Okorafor, Kakiri & Okorafor, 2017).

UNESCO (2017) also corroborates the above factors militating against female participation in STEM fields. According to them, they are multiple and overlapping factors which militating against girls' and women participation, achievement and progression in STEM studies and careers. These factors are grouped as individual factors such as cognitive traits and psychological factors such as interest and motivation; family and peer factors such as parental beliefs, parental education and socio-economic status. School factors within the learning environment and societal factors such as social and cultural norms related to gender equality and gender stereotype.



**Statement of the problem**

The rationale behind gender parity in STEM was addressed in the statement of Federico Mayor in 1999, the then Director General of UNESCO, when he said:

*On a worldwide scale, STEM is still a man’s business. This situation is no longer acceptable. It is economically unacceptable because of the waste of human resources that it entails. It is humanly unacceptable since it prevents half of the population from taking part in building the world ... (UNESCO, 2006; p. 34).*

According to British Council Nigeria (2012) women constitute about half of the Nigerian population. This, then calls for serious attention because excluding this population from application of scientific knowledge in this 21st century knowledge-based economy will completely hinder the achievement of Sustainable Development Goal. Against this backdrop, this study therefore investigated some factors militating against female participation in STEM fields in Nigeria and proffer solutions so that these barriers can be eliminated to enable girls and women the opportunity to contribute to and benefit from STEM thereby leading to socio-economic emancipation of the country.

**Research question**

What are the factors militating against female participation in STEM fields in Nigeria?

**Methodology**

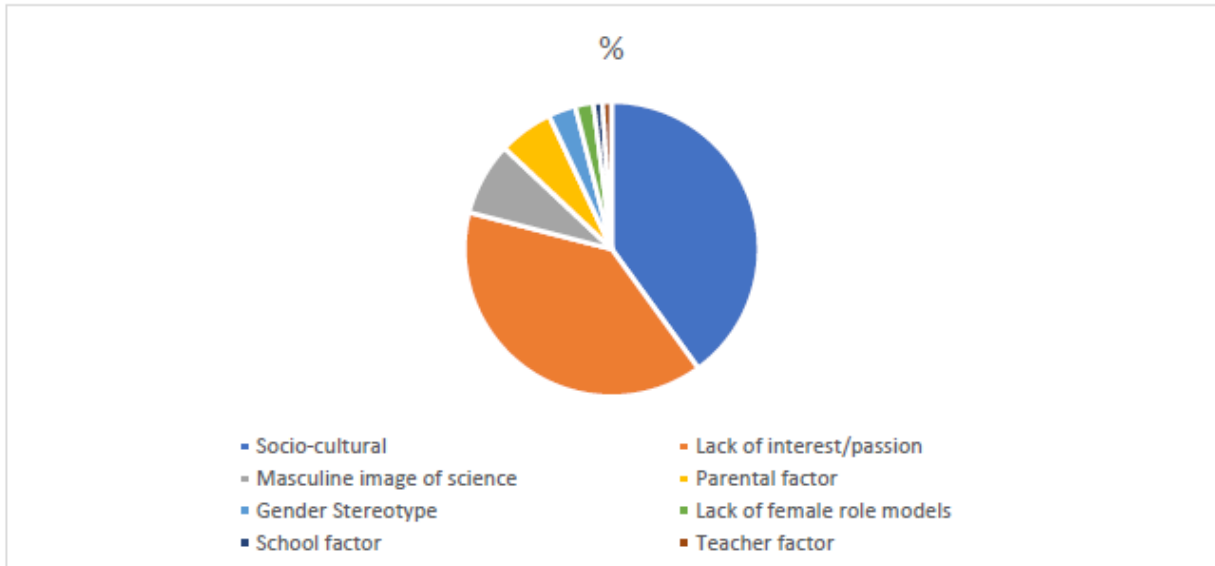
The research design adopted for the study was the descriptive survey research design. The population of the study comprised all undergraduate students in STEM fields in the University in Nigeria. A sample size of 150 students was randomly selected from among undergraduate students studying various STEM courses in the University of Ibadan, Southwestern, Nigeria comprising 110 male students and 40 female students. The age range of participants was between 16 and 35 years respectively. Instrument used for data collection was a self-designed checklist on factors militating against female participation on STEM fields. A total of 170 self-designed checklist questionnaires were given out and 150 were returned properly field. The study employed a combination of both quantitative and qualitative research methods. Face-to-face interviews were organized where focus group discussion took place. The researcher chose to use these two research methods so that diverse points and views could cast more light on the topic. The data collected were analyzed using percentages.

**Results**

**Table 3: Factors militating against female participation in STEM fields**

Responses	%
Socio-cultural	40
Lack of interest/passion	39
Masculine image of science	08
Parental factor	06
Gender Stereotype	03
Lack of female role models	02
School factor	01
Teacher factor	01
	100%





**Pie chart showing the responses of the respondents on the factors militating against the female participation in STEM fields**

Table 3 and Figure 1 reveal that socio-cultural factor ranked highest with 40% of the respondents indicating that socio-cultural factor militating against female participation in STEM fields, followed closely by lack of interest or passion with 39%. 8% of the respondents indicated that the masculine image of science is responsible for not involvement of girls and women in STEM fields; 6% indicated glass ceiling; 3% indicated gender stereotype; 2% indicated lack of female role model while 1% indicated school and teacher factors respectively.

### Focus group discussion

The following are some of the comments that came from the students on the factors militating against female participation in STEM fields in Nigeria.

*“I think that one of the factors militating against female participation in STEM fields is that the females perceive STEM fields generally as a ‘man’s field and the rigours associated with it which is not unconnected with the societal belief that STEM courses are male-dominated courses which are not meant for females.*

On further interrogation, the students had this to say:

“Many female students see STEM fields as difficult courses especially in courses like engineering, computer science and physics that involve calculation. Instead they prefer to go to Arts, Humanities, and Education where they don’t have to deal with figures.

To further buttress the findings of this study. Some students have the following to say:

“Engineering as a course requires a lot of hard work. It is indeed stressful. No wonder very few female students come in for it.”

On further interrogation, a female STEM student had this say:

“It is not easy to be interested in a course where there are no role models to associate with”

### **Discussion of results**

Data analysis showed that socio-cultural factor ranked highest (40%) among the factors militating against female participation in STEM fields. This is line with the findings of Alade (2012), Akanwa & Kalu-Uche (2015), Ojokoh, Oweseni, Akinsowon & Isinkaye (2015), Iwu and Azoro (2017), Clement, Orim and Banjo (2017), Okorafor, Kakiri & Okorafor (2017) and UNESCO (2017). According to them, socio-cultural factor is a major factor associated with low participation of women in STEM fields. The analysis also showed that lack of interest (39%) accounted for the reason why female participation is low in STEM fields. This finding is in agreement with Udeani (2012), Ndirika and Agommuoh (2017), Akinsowon and Osisanwo (2014), Abe (2012) and UNESCO (2017). According to them, more males than females have interest in academic disciplines that require mathematical abilities rather the females concentrate in the so-called “female traditional subject areas” of liberal arts hence the low participation of women in STEM fields.

Masculine image of science ranked third (8%). This finding corroborates the findings of Iwu and Azoro (2017), Ndirika and Agommuoh (2017), Abe (2012) and Kerger, Martin and Brunner (2011). In a study by Kerger, Martin and Brunner (2011), it was found that girls become much more interested in science subjects when they were introduced in a feminine context as opposed to a masculine context.

The analysis also showed that parental factor ranked fourth (6%) in accounting for low female participation in STEM fields. This finding is supported by findings of Okorafor, Kakiri & Okorafor (2017), UNESCO (2017) and Ojokoh and Afolayan (2015) that opined that parental factor pose a great deal of influence on female participation in STEM fields.

Gender stereotype ranked the fifth in STEM fields (3%) among the factors militating against female participation. This finding corroborates the findings of Ekine and Abay (2013), Alade (2012), Fegbasan (2010) who reported that gender stereotype is one compelling explanation that is behind the low participation of women in STEM fields.

Lack of female role models ranked the sixth (2%). This is in agreement with the studies of Harry (2014), Atuahene and Owusu-Ansah (2013), Akor, Bakar, Hamzah and Rashid (2015) and UNESCO (2017) who observed that lack of female mentors and role models make careers in STEM fields unappealing to many young women.

School and teacher’s factors ranked the least (1%) respectively among factors responsible for low enrolment and participation of women in STEM fields. This is finding is in line with the findings of Udeani (2012), Ekine and Abay (2013), UNESCO (2017) and Ndirika & Agommuoh (2017) who reported that

perception and attitude of science teachers can make girls drop out of science classes. This is because according to them the quality of teachers is considered to be the single most important in-school factor.

### **Conclusion**

The findings of this study have shown that factors militating against female participation in STEM fields include lack of interest/passion, masculine image of science, lack of female role model, sociocultural factors, gender stereotype to mention but a few. This therefore calls for holistic and integrated interventions by all stakeholders to remove barriers by strengthening capacity and investments that will spark girls' interest and motivate them to aspire to pursue STEM studies and ultimately STEM careers. This as a matter of urgency, needs to be made a top priority if Nigeria really aspires for socio-economic emancipation.

### **Implications for Counselling**

- i) This study has noteworthy implications for career counsellors and guidance counsellors. In order to help increase girls' motivation and engagement in STEM, the following recommendations are put forward.
- ii) STEM career development should start early, at primary school before girls lose interest and disengage. This can be achieved by making girls comfortable in STEM subjects at tender ages because it will inform their decisions to pursue careers in STEM fields later in life. This therefore calls for recruitment of more guidance and counsellors in order for every primary school to have at least one.
- iii) Counsellors should collaborate with those that have a strong influence on girls' decisions to pursue or not to pursue STEM courses. Such as parents, siblings, peers and teachers.
- iv) Counsellors should develop interventions that would increase girls' self-confidence and feeling of worth in the STEM field.
- v) Career counselling gender-responsive strategies should be put in place.
- vi) Counsellors should provide diverse images of STEM professionals, for example, on career posters, in publications and online resources to disabuse the stereotype of the male scientist.
- vii) Role models and mentors who have valuable experience and lessons should be used to develop in-school programmes so as to keep the girls in contact with practicing female STEM professionals.
- viii) Work experience and out-of-school programmes such as internship should be targeted.
- ix) Campaigns to enlighten parents and families on the importance of preparing their daughters for STEM professions should be mounted. Such campaigns would reduce the sexist stereotyping of children at a very young age and thus create a stable background for positive socialization of females. With positive socialization, more and more girls would naturally be attracted to STEM fields.
- x) Change in male-dominated workplaces should be advocated so that they can attract more women.

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