



## Survey of Factors Affecting Engagement of Female Students in Science and Technology-Related Courses – A Case Study of The Federal Polytechnic, Ilaro

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### Abstract

One hundred randomly selected Federal Polytechnic, Ilaro female students currently enrolled in the National Diploma courses were used in a descriptive approach to survey the factors affecting engagement of female students in science-technology related courses in the polytechnic. A structured questionnaire, having reliability coefficient (Cronbach alpha) of 0.805 was administered to elicit the opinions of the selected students (respondents) on the factors influencing the engagement of the female students in the science technology-related fields of study in the polytechnic. Research data were subjected to descriptive statistical analysis and subsequently, Relative Importance Indexes (RII) were calculated to ascertain the order of importance of the discouraging and the inspiring factors. Results showed that difficulty and too much academic workload and Lack of interest/background knowledge were the most constraint factors in deciding to engage in science and technology-related courses, whereas physical disability was the least important challenge. On the other hand, self-confidence and the influence of counselors/mentor-student relationship motivated their desire to enroll in science and technology-related courses. They were the least inspired by family and friends influence, job prospect and Government support. It is recommended, therefore that the teaching of science and technology subjects in secondary schools should be improved such that it may arouse the interest students. Role models in accomplished female scientists, and engineering, medical, and other science and technology-related professions give career talks regularly in secondary schools as part of the Guidance and Counseling Unit activities. Excursions to specific workplaces where the role models are in action can be added.

**Keywords:** Technical education; Polytechnic; Female student; Science and Technology courses.

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### 1. Introduction

Science and technology remain the pivot of economic development and industrialization of a nation hence the training in science, technology, engineering and mathematics (STEM) at the Higher Education (HE) become an imperative (Okorafor et al. 2015). It presupposes, therefore that the school-aged or the HE-aged youth of both genders who should form the bedrock of the economy of the nation must be adequately motivated to take to science and technology-related courses. Unfortunately, the participation of female gender in STEM education is low in Nigeria for several reasons including low self-confidence, lack of motivation and encouragement (Okorafor et al., 2015). Also, Okeze and Ajetumobi (2019) noted that although the World's population indicated that more women partake in most societies, they featureless in the field of engineering and technology. Developing countries including Nigeria appear to be more affected where low participation of females in sciences cuts across every level of education (Ndirika and Agommuoh, 2017). Furthermore, the institutional setting for technical and vocational

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education has suffered many challenges ranging from lack of training materials, poor technical staff/personnel training, inadequate funding, unnecessary policies, gender imbalance which has been the consequence of discriminating attitude (Usoro, 2011).

Unfortunately, low technical skills of the female gender due to lack of interest in STEM training, among others have limited their opportunities for accessing jobs in the technology-driven economy. Also, it makes them disadvantaged compared to their male counterparts in engineering and technical occupations (Samira, 2017; Melak and Singh 2018; Ong et al., 2018). It has been suggested that STEM training represent the fastest and potent route to ward off or minimizing consequences of joblessness because it would lead to capacity building in technical and vocational education required for the empowerment of young women with the entrepreneurial skill (Melak and Singh 2018). Therefore, this paper aimed at surveying factors affecting engagement of the female students in the science-related field of study in the polytechnic using the Federal Polytechnic, Ilaro as a case study.

## 2. Methodology

**Study Area:** The Federal Polytechnic, Ilaro constituted the study area. Established by the Federal Polytechnic Decree 33 (1979), the Polytechnic has the mandate of running full-time and part-time ND and HND courses in applied science, technology, management and commerce. Thus, it produces technically skilled manpower for the development of Nigeria in the areas of industrial and agricultural production, among others. The Polytechnic has about 10,000 students spread across science and technology-based and management-based courses in 5 faculties – Pure & Applied Sciences, Engineering, Environmental Studies, Information & Communication Technology, and Management.

**Research Subjects (Respondents):** One hundred Federal Polytechnic, Ilaro female students were used for the study. Seventy of them were pursuing various academic programmes in science and technology-related, while the remaining thirty students were registered in business or management-related courses at the National Diploma levels. All of the subjects were randomly selected for the study. The Higher National Diploma students were excluded from this study because they are matured and already have their minds made-up on their career path. Otherwise, they would not have abandoned science and technology-based courses after completing the National Diploma.

**Experimental Design:** The perceptions of respondents on challenges militating against their engagement in science and technology-related courses and factors that motivate or drive their engagement in those courses were captured with a structured questionnaire. The five-point Likert scale was used to elicit the level of agreement or disagreement with the factors militating against/inspiring engagement in science and technology-related courses. That is Strongly Agree (SA) = 5, Agree (A) = 4, Neutral (N) = 3, Disagree (D) = 2 and Strongly Disagreed (SD) = 1. The questionnaire was validated before use for the study. The reliability coefficient (Cronbach alpha) was 0.805.

**Statistical Analysis:** Data obtained from the study were analyzed using descriptive statistics and factors were ranked in the order of importance (i.e. Relative Importance Index) using SPSS Version 20 (2016) and Microsoft Excel applications on HP personal computer.

## 3. Results and Discussion

The characteristics of respondents in this study are shown in Table 1. Majority of the student respondents (62%) were 17 to 20 years old, while 33% were between 21 and 24 years of age. Students above 24 years old constituted the least. The distribution is expected because the minimum age required for admission into the Polytechnic for National Diploma courses is 17. The respondents in the science and technology-related courses were limited to the National Board for Technical Education (NBTE)-accredited courses in the Polytechnic. They include Civil

Engineering, Computer Engineering, Electrical Engineering, Mechanical Engineering, Agricultural Bioenvironmental Engineering, Science Laboratory Technology, Food Technology, Computer Science, Mathematics & Statistics, Nutrition & Dietetics, Hospitality Management, Leisure & Tourism, Agricultural Technology, Architectural Technology, Building Technology, Surveying & Geoinformatics, Urban & Regional Planning, Transportation Planning & Management, Mass Communication, Library & Information Science, and Office Technology Management. The non-technology-related courses include Accountancy, Banking & Finance, Taxation, Insurance, Marketing, Business Management, and Public Administration.

**Table 1. Distribution of the respondents according to age and discipline**

S/N	Field of study	Age (yrs)			Total
		17 - 20	21 - 24	25+	
1	Engineering	25	12	3	40%
2	Applied Science	21	9	0	30%
3	Environmental studies	4	5	0	9%
4	Info. & Comm. Tech.	7	6	1	14%
5	Business Management	5	1	1	7%

While responding to the questions on the challenges respondents faced for deciding on engagement in science and technology-related courses, the majority either disagreed or strongly disagreed with the notion that Physical disability (77%), Poor learning environment (73%), Discouragement from the parents (70%), Limited lecturer to student interaction (68%), Poor practical ability (74%), and I do not like science subject (75%). A majority (53%) could not say emphatically that Physical harassment due to gender difference deterred them from studying science and technology-related course. They were undecided. However, 18% of the respondent considered the factor as a non-issue. On the other hand, majority of the respondents either agreed or strongly agreed that Difficulty and too much academic workload (80%) and Lack of interest/background knowledge (77%) were their constraints in deciding to engage in science and technology-related courses. Indeed, results presented in Table 3 showed that while Difficulty and too much academic workload was a major and most important (RII, 0.828), physical disability (RII, 0.398) was the least important challenge militating the desire of the female students to engage in science and technology-related courses.

The current finding supports findings of earlier studies where Yeshimebrat et al. (2013) and Melak and Singh (2018) observed that the low academic performance of female students in science subjects due to the poor High School academic background was non-engagement in science-technology-related subjects. Hence, the female students tended not to opt for science subjects that may require laboratory/workshop/studio practical sessions and demanding extra hours. The poor background might be responsible for their lacking in confidence and underrating of self-ability to cope with the rigor of learning science-technology courses in the Polytechnic and the attendant increased workload compared to the management-related courses.

**Table 2 Percentage frequencies of respondents' responses to the questions in the questionnaire**

Causative factors	Frequency (%)				
	Strongly agree	Agree	Undecided	Disagree	Strongly disagree

**Factors militating against student's**

**engagement in science and technology-based courses:**

Physical disability	3.0	5.0	14.0	44.0	34.0
Poor learning environment	5.0	8.0	14.0	39.0	34.0
Discouragement from parent	7.0	12.0	11.0	40.0	30.0
Physical harassment due to gender difference	10.0	18.0	53.0	15.0	4.0
Difficulty and too much academic workload	45.0	35.0	10.0	9.0	1.0
Lack of interest/background knowledge	39.0	38.0	13.0	7.0	3.0
Limited lecturer to student interaction	8.0	9.0	15.0	39.0	29.0
Underrated self-ability and hard work	40.0	32.0	17.0	6.0	5.0
Poor practical ability	4.0	8.0	14.0	43.0	31.0
I do not like science subject	4.0	9.0	12.0	44.0	31.0

**Motivational factors for student's engagement in science and technology-based courses:**

Self-confidence	37.0	36.0	14.0	5.0	7.0
Friends and family	6.0	7.0	15.0	39.0	33.0
Counselors / Mentors	33.0	45.0	8.0	13.0	1.0
Job prospect	7.0	7.0	12.0	45.0	29.0
Government support	3.0	7.0	14.0	42.0	34.0

**Table 3. Ranking of factors militating against or motivating students interest in science and technology-based courses in the Polytechnic in order of relative importance**

Causative factors	Relative Importance Index
Difficulty and too much academic workload	0.828
Lack of interest/background knowledge	0.806
Underrated self-ability and hard work	0.792
Physical harassment due to gender difference	0.630
Limited lecturer to student interaction	0.456
Discouragement from parents	0.452
Poor learning environment	0.422
Poor practical ability	0.422
I do not like science subject	0.422
Physical disability	0.398

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**Motivational factors for student’s engagement in science and technology-based courses:**

Counselors/Mentors	0.792
Self-confidence	0.776
Job prospect	0.436
Friends and family influence	0.428
Government support	0.406

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On the other hand, the majority of respondents either strongly agreed or agreed that self-confidence (73%) and counselors/mentors (78%) were the major factors that were inspirational to their engagement in science-technology-related courses. Also, the majority of the respondents either strongly disagreed or disagreed that family and friends’ influence (72%), job prospect (74%) and government support (76%) were not the influential factors that motivated their engagement in science and technology-related courses. In the order importance shown in Table 3, the influence of counselors/mentors on the choice of career appeared to be the most important motivational factors (RII, 0.792), while Government support (RII, 0.406) was the least. However, there appeared to be a very little difference in the influence exerted by counselors/mentors and self-confidence; and among Government support, Friends and family, and Job prospects as factors motivating the desire of the female students to engage in science and technology-related courses.

Indeed, Amelink (2008) noted that the mentor/role-model relationship could help female students improve on the handling techniques for the feelings of isolation among women in STEM fields, especially engineering. Furthermore, the author observed low female engineers in academia in Nigerian universities that could serve as mentors in STEM fields and consequently, guidance was insufficient because of the uneven gender ratio. Amelink (2008) concluded that most of the female students that performed excellently in mathematics and sciences did not study engineering because of the lack of engineering awareness in pre-tertiary levels of education. Therefore, without drawing inspiration from mentors and role models, young girls with low self-confidence and with the belief that they could not cope with the workload associated with science-technology-related courses would prefer to engage in management-related courses. However, the majority of those who would go for engineering programmes tend to experience difficulties adjusting to engineering academic life.

#### **4. Conclusion and Recommendation**

It may be concluded that female students encounter several challenges, which influenced their decision to enroll in science and technology-related courses in the Polytechnic. Poor background, lack of interest in science subjects, and workload associated with those courses were the most challenging factors, while physical disability posed the least challenge. On the other hand, the most inspiring factors were their self-confidence and the influence of counselors/mentor-student relationship. Unfortunately, they were the least inspired by family and friends influence, job prospect and Government support. It is recommended, therefore that the teaching of science and technology



subjects in secondary schools should be improved such that it may arouse the interest students. Role models in accomplished female scientists, and engineering, medical, and other science and technology-related professions should be invited to the secondary school for career talks to complement the efforts of the Guidance and Counseling Unit of the schools.

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