



Assessment of Female Learners in Specific Institutional TVET Programs in Nigeria

Kehinde Olukemi Olorufemi¹, Yusuf S.O², Salami M.A³, Adeoti A.J⁴, Abdullateef Ola Adebayo⁵

^{1,2} Department of Civil Engineering

^{3,4&5} Department of Electrical Engineering

Kwara State Polytechnic, P.M.B 1375, Ilorin, Kwara State, Nigeria

Tel: 08146105390 | Email: olorunfemikenny@gmail.com

Abstract

Education plays a crucial role in tackling gender equity and equality challenges in Africa. Engineering programs have seen limited participation from women, as it is a predominantly male field. Progress and innovations in technology, the incorporation of a gender lens in TVET, and the initiatives by the United Nations (UN) and UNICEF regarding sustainable development goals have positively influenced the enrolment of women in engineering courses. This paper explores the performance assessment of female students in specific institutional TVET programs in Nigeria. The TVET programs analysed include Agricultural and Bio-Environmental, Civil, Electrical/Electronics, and Mechanical Engineering at the Institute of Technology, Kwara State Polytechnic, Ilorin, Kwara State. The research utilized a mixed-method approach. Ten female lecturers and eighty female engineering students were chosen through random sampling. were aimed for verbal interviews and the use of organized questionnaires. National Diploma scores were gathered from four chosen departments through random selection. The information was analysed using Microsoft Excel packages. The results indicate that the enrolment rate is below 20% for all TVET courses, with the exception of Agricultural and Bio-environmental engineering from 2017 to 2023. Additionally, the choice of course impacts enrolment levels, although it does not necessarily correlate with performance. Female students excel, achieving distinction and credit grades across all subjects. The female success rate is higher in Agricultural and Bio Environmental, Civil, and Mechanical fields, but lower in Electrical options compared to males from 2017 to 2023. To maintain the enrolment and success of female students in engineering disciplines, it is essential to establish effective tutorial classes and a group of women technologists among female engineering students in polytechnic institutions. Providing incentives such as scholarships, cash rewards, and job placements can motivate performance, while creating a peer-supportive environment and hosting career discussions facilitated by relevant organizations is crucial.

Keywords: Engineering, Enrolment, Women, Organizational, Technology, TVET Programs.

1.1 Introduction

Education is essential in tackling development challenges and achieving

established goals within a country. It provides individuals with the insights and information necessary to make informed decisions regarding their lives and the



broader society. Incorporating a gender perspective into TVET programs fosters effective governance and aids in enhancing gender mainstreaming. Consequently, the TVET sector will deliver the competencies needed to drive the economic and social objectives of a nation (Felister & Sammy, 2019).

Technical and Vocational Education and Training (TVET) pertains to all varieties of education that equip individuals with knowledge and skills pertinent to careers across different sectors of economic and social activities through formal, non-formal, and experiential learning approaches in both school-based and work-based learning environments. Methods and scientific principles that direct those methods, as well as values and abilities, are acquired, exercised, and perfected over time for output and services. TVET focuses on equipping both youth and adults, preparing them for the workforce. As defined by The United Nations Educational, Scientific and Cultural Organization (UNESCO) and the International Labor Organization (ILO), TVET pertains to the components of the educational system that encompass not only general education but also the examination of technologies and associated sciences, as well as the development of practical skills, mindsets, and comprehension and knowledge relevant to roles in diverse areas of economic and social activities (Yakubu, & AmpMumah, 2003).

Various challenges arise in aligning the education offered with vocational needs. This calls for the reform of educational

systems and a shift towards gender-sensitive approaches at different educational levels in numerous countries globally to equip young people and adults for the labour market. Ngugi (2017) indicated that data regarding the progress and implementation of TVET is typically imprecise for the purposes of achieving, comparing, and consolidating.

1.2 Global Views on Gender Equality

The United Nations (UN) characterizes gender equality as: “A human right and a prerequisite for social justice, where both women and men possess equal access to resources, opportunities, and services, can engage equally in decision-making, and enjoy equivalent rights and freedoms.” The UN also highlights that gender equality encompasses not just women’s rights but is fundamentally a human rights issue and is crucial for realizing sustainable development, peace, and security. It entails a fair allocation of resources, opportunities, and benefits as well as a balanced sharing of responsibilities and burdens among individuals, irrespective of their gender, physical abilities, or age. It ensures that both women and men equally enjoy socially valued goods, opportunities, resources, and rewards.

The Sustainable Development Goal 5 (SDG 5) seeks to attain gender equality and empower all females, by terminating all types of discrimination against women and girls, guaranteeing equal access to education, healthcare, and economic opportunities, enhancing the representation



of women in leadership and decision-making roles, and eradicating all forms of violence against women and girls.

Where disparities in gender exist, women consistently face obstacles in obtaining social or economic resources. Globally, women have been recognized as a demographic that requires integration into the private and public benefits that higher education can provide. Women have the right to exist with dignity, safety, and security. The World Declaration on Higher Education emphasized that equitable involvement of women is an immediate priority for the sector (Anyanwu & Obi, 2021).

1.3 Women's participation in TVET

Morley and Lugg, (2009) noted that the identity of an academy is frequently shaped and expressed through disciplinary selections and settings; the gendering of these disciplinary choices in TVET helps channel students towards various occupations and social hierarchies, thereby perpetuating gender disparities in society. In spite of the global push for gender equality and fairness in higher education, research conducted in multiple countries continues to reveal that women are significantly under-represented in TVET institutions as students, faculty, and administrators. Moreover, women's involvement in TVET education as students varies significantly across nations, disciplines, and institutions in both developed and developing regions. Felister & Sammy, (2022).

1.4 Women's Involvement and Achievements in the Engineering Field

Guaranteeing that girls and women receive equal opportunities in Science, Technology, Engineering, and Mathematics (STEM) education and, ultimately, STEM careers is essential from the viewpoints of human rights, scientific advancement, and development. (Al-Nashif, 2021; Wang et al., 2023). Chinonso(2024) who conducted a study on the rise of female representation in STEM in Nigeria through an analysis of enrollment and their accomplishments in polytechnics and technical institutes from 2013-2020 concluded that, despite the prospects of STEM for economic advancement and development, Nigeria has not yet fully harnessed the capabilities of this sector. She recommended the implementation of gender-sensitive teaching methods in STEM education across different academic disciplines to engage more female students. Alsoto foster a gender-inclusive workplace among educators to motivate STEM engagement to inspire female students to aspire to be like their instructors.

Engineering is one of the fields predominantly occupied by men in both educational institutions and the workforce. The American Engineers' Council for Professional Development (ECPD) defines engineering as a profession that applies knowledge of mathematical and natural sciences acquired through study, experience, and practice to create methods for harnessing natural materials and forces for the betterment of humanity (ECPD,



2021). Morley & Lussier (2009) noted that although the enrollment of women in Engineering programs is on the rise at the University of Dar es Salaam (URT, 2006), there remains a prevalent liberal feminist perspective that gender equality merely involves permitting women into traditionally male-dominated fields and/or extending men's educational opportunities to women. In many accounts, women appear to have a contentious relationship with the STEM subjects they are engaging in. There is frequently a clash between the standards governing the expression of femininity and the expectations linked to achieving success in STEM academic pursuits.

In Nigeria, recent data reveals that the number of women pursuing engineering degrees is still quite disappointing. The Global Gender Gap (2023) noted that women are significantly lacking in representation within the STEM workforce in Nigeria. While women account for nearly half (49.3%) of total employment in non-STEM fields, they represent only 29.2% of all STEM professionals. This will ultimately contribute to a scarcity of female educators for STEM subjects. It was also mentioned that there is a gap in enrollment among every skill category, particularly for technology skills like technological literacy (43.7% parity). He observed that across various skill categories, the gender disparities tend to grow as proficiency levels rise. However, when women do enroll, they usually reach higher proficiency levels in various skill areas examined in a shorter period than men.

Women face greater obstacles compared to their male peers in the realms of politics, science, and education (Abogunrin, 2003). The limited representation of Nigerian women in the engineering field can be linked to the discovery of Cheryan & Markus (2020) that women are distinct from men and that this distinction is viewed as a shortcoming in their ability to fulfil; their mindset, characteristics, behaviors, and social interaction. He additionally noted that they encounter prejudice and discrimination from the dominant group and underscored systemic and structural discrimination in organizational policies and practices, which impact the treatment of women and their progression (Smith and Walker 1988).

Due to the previously mentioned obstacles encountered by women in engineering in Nigeria, the Association of Professional Women Engineers in Nigeria (APWEN) was established in 1983 as a branch under the Nigerian Society of Engineers (NSE), while still being associated with other divisions. This has been producing more positive outcomes in motivating young girls to pursue engineering in various forms. With the recent growth in student enrollment in Nigeria's higher education institutions, the number of female students in science-oriented programs is also rising steadily (NUCVIHEP, 2004).

To promote a rise in women's involvement in engineering, the Presidential Implementation Committee on Technology Transfer and the National Agency for Science Engineering



Infrastructure, NASENI initiated a "Developing Engineering Leader through HER initiative to support creative and marketable concepts in engineering and technology put forward by women" (DELT-HER) to bridge the gender disparity in the engineering domain within the next five years, noting that merely 1 in 20 Nigerian engineers is a woman. The initiative aspires to tackle the gender imbalance in Nigeria's engineering industry by increasing the number of female engineers in the nation over the next five years, beginning at the secondary school stage when girls are making decisions about their career paths. Also to financially support young women and, crucially, to raise and nurture public consciousness about the necessity of training and mentoring more women in the engineering field.

The Ibadan Electricity Distribution Company, Ibadan, Nigeria (IBEDC) in 2016, implemented initiatives to enhance talent acquisition aimed at increasing the representation of women within the organization and motivating girls to pursue degrees in engineering. In 2021, these efforts were also stage sat the universities & polytechnics referred to as DISCO (Developing Interest in Science, Technology, Engineering and Opportunities).

Kwara State Polytechnic is a distinguished polytechnic founded approximately 50 years ago in 1972. The institution consists of six institutes: the Institute of Applied Sciences, the Institute of Finance and Management Studies, the Institute of

General Studies, the Institute of Environmental Studies, the Institute of Communication Technology, and the Institute of Technology (IOT), which is the original institute, established alongside the polytechnic itself. The aim was to prepare skilled personnel.

The institution's vision is to become the leading provider of technological and entrepreneurial capabilities by educating, influencing the utmost level of intellectual growth, and offering services to society through the investigation of accessible scientific and research techniques. Throughout the years, the polytechnic has established its presence in various technological fields, positioning itself as the top indigenous higher education institution with the largest enrolment of Kwara indigenes and non-indigenes.

3.0 Methodology

The research utilized a mixed-method approach. An oral interview was carried out with Female lecturers (10) (including heads of academic departments & examination officers, along with lecturers). Female engineering students (80) chosen through random sampling were the focus for the distribution of structured questionnaires. National Diploma (ND) results for second-year students were gathered from four selected highly frequented departments out of 8 through random sampling throughout the institute. The TVET departments analyzed are Agricultural and Bio-Environmental Engineering, Civil Engineering, Electrical/Electronic Engineering, and Mechanical Engineering.

The data were analyzed utilizing Microsoft Excel software.

4.0 Research Results 4.1 Women in engineering students 'enrolment status in IOT.

The number of female students enrolling in the technology institute is notably low across all the four TVET departments relative to their male equivalents. Figure 1.0 illustrates the overall enrolment of National Diploma students in Engineering. The disparity between genders is quite significant across all departments from 2017 to 2023.

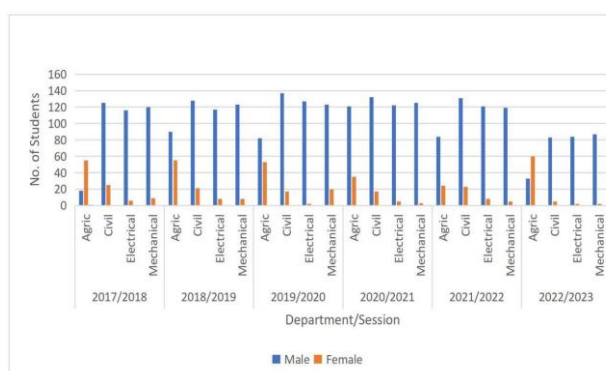


Figure 1.0: Female Enrolment in TVET programs at IOT by gender 2017-2023

It was noted that the Agricultural and Bio-Environmental and Civil Engineering departments experienced the highest enrolment from 2017 to 2023, with female enrolment surpassing that of male students in Agricultural and Bio-Environmental Engineering during the 2017/2018 and 2022/2023 academic years. This view was shared by several students who felt that

Table 1.0: Comparative analysis of student performance in IOT from 2017 - 2023

Department	Agric/Bio	Civil	Electrical	Mechanical
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courses related to agriculture and construction are more accessible for girls compared to mechanical and electrical courses. According to the verbal interviews and surveys, 81% of participants indicated they were not compelled to pursue their chosen field but had prior familiarity with it. Furthermore, 97% expressed satisfaction with their academic program and are enjoying their studies. This indicates that the respondents are genuinely interested in studying engineering and are willing to invest significant effort (55.5%) into their personal development to excel. Figure 1.0 also indicates that the percentage of enrolment is below 20% in three departments, except for the Agricultural and Bio-Environmental Engineering departments from 2017 to 2023.

4.2 Assessment of the Scholarly Achievement of Female Learners in TVET Engineering Courses in IOT.

The findings resulting from the assessment of student performance in TVET Engineering courses in IOT are presented below. Academic performance records (results) for the National Diploma were gathered from the four TVET departments. Table 1.0 displays the results with achievable grades in accordance with the grading system adopted by the institution, as authorized by the National Board for Tertiary Education (NBTE), detailed in Appendix A.



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ISSN No. 2992 - 3522



Year	Participation Female (%)	Male(%)	Female(%)	Male(%)	Female(%)	Male(%)	Female(%)	Male(%)	Female(%)
2017-	No. of Success	14	49	86	20	87	4	74	6
	No. of Failure	4	6	39	5	29	2	46	3
	Total Number	18 (25)	55 (75)	125 (83)	25 (17)	116 (95)	6 (5)	120 (93)	9 (7)
2018	No. of	0	0	1	0	2	0	3	0
	Distinction								
	No. of Upper	5	15	17	8	16	1	23	2
	No. of Lower	7	29	50	9	55	3	41	2
2019	No. of Pass	2	5	18	3	14	0	7	2
	Total Number	90 (62)	55 (38)	128 (86)	21 (14)	117 (94)	8 (6)	123 (94)	8 (6)
2020	No. of Failure	9	3	16	2	26	1	24	0
	No. of	1	1	2	0	2	1	5	1
	Distinction								
	No. of Upper	14	23	17	2	18	1	20	2
2021	No. of Lower	62	27	76	12	59	4	63	2
	No. of Pass	4	1	17	5	12	1	11	3
	No. of Success	81	52	112	19	91	7	99	8
2022	Total Number	82 (61)	53 (39)	137 (89)	17 (11)	127 (98)	2 (2)	123 (86)	20 (14)
	No. of	1	0	1	0	2	0	2	0
	Distinction								
2023	No. of Upper	12	8	17	2	18	0	19	4
	No. of Lower	51	33	70	9	61	1	75	13
	No. of Pass	7	3	16	4	17	0	22	2
	No. of Success	71	44	104	15	98	1	118	19
2024	No. of Failure	11	9	33	2	29	1	5	1
	Total Number	121 (78)	35 (22)	132 (89)	17 (11)	122 (96)	5 (4)	125 (98)	3 (2)



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NIGERIAN JOURNAL FOR TECHNICAL EDUCATION
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No. of Failure	No. of Distinction	0	0	1	0	2	0	4	1
	No. of Upper	25	9	9	0	11	0	29	0
	No. of Lower	77	19	57	13	66	3	77	1
	No. of Pass	11	1	30	1	17	1	9	0
	No. of Success	113	29	97	14	96	4	119	2
		8	6	35	3	26	1	6	1
2021-	Total Number	84 (78)	24 (22)	131 (85)	23 (15)	121 (94)	8 (6)	119 (96)	5 (4)
2022	No. of Distinction	6	1	3	0	4	0	4	0
	No. of Upper	11	3	25	4	21	3	23	2
	No. of Lower	51	12	52	11	53	3	52	3
	No. of Pass	8	3	7	2	7	0	4	0
	No. of Success	76	19	87	17	85	6	83	5
	No. of Failure	8	5	44	6	36	2	36	0
2022-	Total Number	33 (35)	60 (65)	83 (94)	5 (6)	84 (98)	2 (2)	87 (98)	2 (2)
2023	No. of Distinction	1	0	0	0	0	1	0	0
	No. of Upper	7	31	14	2	20	0	19	1
	No. of Lower	14	22	39	3	37	0	34	1
	No. of Pass	4	2	9	0	15	0	8	0
	No. of Success	26	55	62	5	72	1	61	2
		7	5	21	0	12	1	26	0

(%) = percentage enrolment

Table 1.0 indicates that female students have excelled in the TVET courses throughout the years. There are female students achieving distinctions and upper credits, competing effectively alongside their male peers. This

demonstrates that none of the TVET courses are off-limits for females. 78% of the student respondents concurred that they can compete successfully with their male counterparts,

overcoming any intimidation from male lecturers and students.

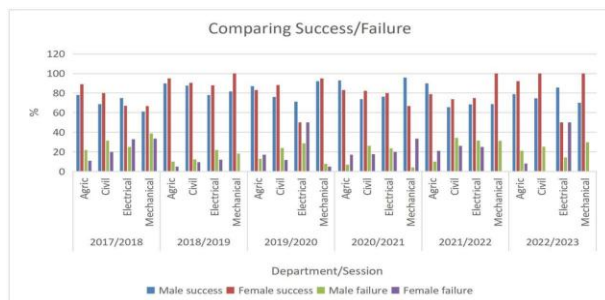


Figure 2.0: Rate of Success/ Rate of Failure by Gender in the TVET Courses in IOT.

The success rate was determined by dividing the number of male/female students who scored 40 marks or higher by the total number of male/female students who enrolled in the program independently, while the failure rate was derived by dividing the number of male/female students who scored below 40 marks by the total number of male/female students who registered for the program independently, as illustrated in Figure 2.0. Female students exhibit a higher success rate in the Agricultural, Civil, and Mechanical engineering departments compared to their male peers, although they perform lower in electrical options (2017/2018, 2019/2020 & 2022/2023) from 2017 to 2023. This could be attributed to male students being often sidetracked by social media, online enterprises, and similar distractions, leading many to become less serious. In contrast,

female students opting for engineering disciplines are aware of their challenges and, embracing optimism, are prepared to tackle them with determination.

4.3 Obstacles encountered by female learners and the solutions available.

The research employed a mixed-methods approach. Aimed at female lecturers (10) and female engineering students (80), who were chosen through random sampling, the study utilized oral interviews and structured questionnaires for data collection. Ultimately, 72 questionnaires were completed and returned by female engineering students, with 58 from the agricultural and bio-environmental & civil departments and 14 from the electrical and mechanical engineering departments.

The verbal interview was carried out with 2 female department heads and 8 additional female engineering instructors.

The rate of response is shown in Table 3.0

Table 3.0: Response rates

Respondent	Target	Sample	Response rate
Students	80	72	90
Lecturers	8	8	100
Female heads	2	2	100

The data collected pertained to employment history and its connection to gender.

The third and fourth goals aimed to identify the difficulties faced and propose methods to enhance the academic success of female students in TVET engineering programs provided by the institute. The researcher requested feedback from female engineering instructors and students. The students were instructed to record their answers in Appendix A2

From the verbal interviews, the participants indicated that establishing efficient tutorial sessions and launching a group of women technologists in polytechnics (a sector in NATE) will significantly enhance academic achievement. Additionally, raising awareness through the creation of a supportive peer atmosphere and facilitating career discussions by relevant societies and associations is also recommended.

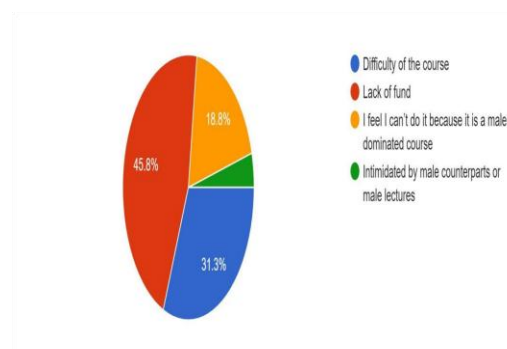


Figure 3.0: Pie chart illustrating the obstacles encountered by female engineering students

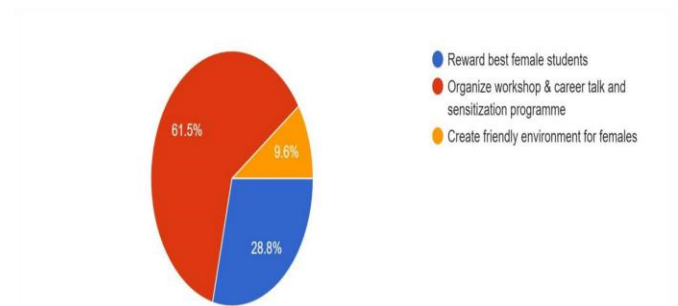


Figure 4.0: Pie chart showing what the school can do to encourage female students patronage in engineering

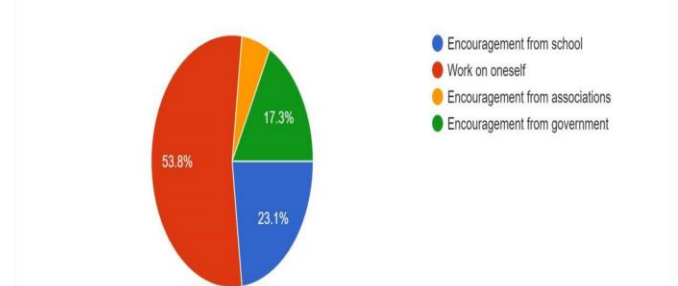


Figure 5.0: Pie chart indicating how female engineering students can improve performance and professionalism.

The challenges faced by female students in TVET departments are enumerated as follows based

on the administered questionnaires; insufficient funding, challenging subjects, intimidation from male lecturers and peers, etc. 45.8% of the participants indicated that the lack of funding poses a significant issue. Many parents tend to prioritize the education of male children when resources are limited, believing that a female child will ultimately be married off rather than educated. Raising awareness about gender equality among parents is crucial to shift this mindset. 31.3% of participants acknowledged that TVET courses are perceived as tough and masculine, which makes it hard for them to



grasp the mathematical subjects easily, while 4.1% noted that they often feel intimidated by their male peers due to their smaller numbers (Fig 3.0). Thus, facilitating tutorials for all students and including female lecturers will foster a more gender-sensitive atmosphere to enhance the performance of female students.

61.5% of female educators and learners additionally proposed that holding awareness discussions, career guidance sessions, etc., and providing incentives such as scholarships, prize gifts, etc. could significantly enhance performance (Fig 5.0).

5.0 Conclusion

Based on this study aimed at assessing the performance of female students in chosen institutional TVET programs within the most frequented departments of the Institute of Technology, Kwara State Polytechnic Ilorin, the following statements are provided.

- i. The participation of female students in TVET programs is below 20% for civil, electrical/electronic, and mechanical engineering, yet it is greater in agricultural and bio-enrolment in environmental engineering from 2017 to 2023 remains considerably low in comparison to male enrolment.
- ii. The characteristics of the course influence the enrolment figures, although they do not directly affect

performance. Female learners tend to choose Agricultural engineering, crop production & processing, or animal husbandry over mechanical-related fields such as fabrication and machining.

- iii. The achievement rate of females is greater in Agricultural and Bio Environmental, Civil, and Mechanical fields, but lower in Electrical options compared to their male counterparts from 2017 to 2023.
- iv. Certain female students excel remarkably, demonstrating that the engineering sector is a domain where female students can compete effectively alongside their male peers.
- v. Goals for gender equality and equity remain unattained despite numerous policies, yet there is advancement, particularly through various initiatives such as career discussions, conferences, and partnerships involving SAGA, APWEN, NASENI, IBEDC, and others.

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APPENDIX

Appendix A1: Grading System of the Institution Approved by the NBTE.

Class grade	Marks	Grade point
Distinction	75-100	4
Upper credit	60-74.99	3
Lower credit	50-59.99	2
Pass	40-49.99	1

Failed and Others	Below 40	0
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Appendix A2: Questionnaires

Questionnaires
Email*.....
1. What course are you studying? Agriculture and Bio-environmental Engineering () Civil Engineering () Electrical Engineering () Mechanical Engineering () Metallurgical Engineering () Mineral & Petroleum Engineering ()
2. Did you have prior knowledge about the course you are studying presently? Yes () No ()
3. Who asked you to study the course? I liked it () Parent () I saw someone who studied it ()
4. Are you enjoying the course? Yes () No ()
5. What are the challenges you are facing as a female engineering student? Difficulty of the course () Lack of fund () I feel I can't do it because it is a male-dominated course ()



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Intimidated by male counterparts or male lectures ()
6. Are you intimidated?

Yes () No ()

7. If yes by whom?

Male student mates () Male lecturers ()

8. Why do you want to study the course?

Just to have a certificate ()

Want to practice ()

Love to be unique ()

9. Do you think you can perform like your male counterparts?

Yes () No ()

10. Advise on how you can prove your performance and professionalism

Encouragement from school ()

Work on oneself ()

Encouragement from associations ()

Encouragement from government ()

11. What do you think the school can do to encourage female students' patronage of engineering?

Reward best female students ()

Organize workshops & career talks and sensitization programs ()

Create a friendly environment for females ()