# Social Determinants of Female Enrolment in Engineering Courses in Public Technical, Vocational and Education Institution in Kakamega County, Kenya

***Doris Muthoni Nthuku*** and ***Purity Muthima***

***Abstract***

*In the recent years the government and other educational stakeholders have put several initiatives in place in order to increase women participation in Technical, vocational, education and training (TVET) courses. For women to be economically empowered, they need to acquire technical skills for employment. Despite, these efforts underrepresentation of women in TVET engineering courses continues to be a challenge in Kenya. This study sought to establish how social determinants influence enrolment of female students in TVET engineering courses in public TVET institutions in Kakamega County, Kenya. A Target population of 3, registrars, 3559 students, 62 tutors and one County TVET officer was involved in the study. The students and tutors were randomly sampled while purposive sampling was used to get the County officer. A sample size of 20 per cent was determined from the target population for the tutors. Census method was applied for the registrars. The sample size of 371 respondents was determined. This study used questionnaires to get information from students and tutors while interview schedule were used for the registrars and County officer. Descriptive and inferential statistics was used to analyze data. The study revealed that social determinants such as gender stereotypes, societal perceptions, lack of role models and parental factors greatly influence enrolment of female students. The study recommends that the government through the Ministry of Education State department of TVET and other education stakeholders should come up with ways of reducing negative perceptions of female enrolment in engineering courses, increase female role models and provide full sponsorship of female TVET students.*

***Keywords:*** **Female enrolment, social determinants and TVET.**

## 1.0 Introduction

Technical and Vocational Education and Training (TVET) is one of the tools for economic development both globally and nationally. Countries that form the United Nations in 2015 adopted the 2030 Agenda for Sustainable Development which is meant to be a blueprint that comprises 17 goals and 169 targets. Further, Science, Technology, Engineering and Mathematics (STEM) is expected to play a significant role in meeting these goals .To achieve this , both men and women should be equipped with technical skills, to help them become more economically productive thus improving their quality of life as well as poverty alleviation However, most developing countries, science fields such as engineering are characterized by gender disparities in enrolment as shown in the United Nations Educational, Scientific and Cultural Organization (UNESCO, 2015) report

which provides an analysis of the gender gap in science and engineering. The report reveals that women are fairly well represented in health, agriculture and environmental management but are a few in other fields such as energy, engineering, information technology and computing. These fields are important for the actualization of the SDGs.

.

A case study on selected countries carried out by UNESCO (2010) on improving the participation of female students in TVET programmes revealed that, there are fewer female students in TVET in 91 per cent of the countries studied such as Columbia, Japan and Kenya. Although, research studies in many countries that have been done globally indicate that there is an increase in participation of women in general science in the STEM courses, those in engineering still remains low UNESCO (2010). Research conducted by in 2015 (UNESCO, 2015) shows there are regional variations. For example, in some countries women are highly represented in areas such as Southeast Europe (49%), and in the Caribbean, Central Asia and Latin America (44%). Further, in the Arab States women account for (37%), the European Union (33%) and the European Free Trade Association (34%), which are closely followed by sub-Saharan Africa (30%). However, in Africa, numbers are substantially lower, reflecting a gender imbalance in education at all levels. Female graduates at the tertiary level range from more than half in Namibia (58%) and South Africa (60%). Female representation has dropped substantially in Swaziland, from a high of 55% in 2005 to 39% in 2013.In Kenya the situation is not different women are underrepresented in TVET as shown in the economic survey 2022 where a gender gap of 14.4% still exists. This gap raises concerns as women lag behind

Studies have widely shown that engineering skills facilitates social, economic, political and cultural development of any nation. Women, who receive spatial skills from engineering as a profession, benefit them and their families. Provision of Technical skills to women, a country can reduce poverty, improve productivity, slow the population growth, and offer its children a better future (World Bank, 2010). Although benefits of women participating in engineering are known women enrolment in TVET engineering courses is low both in developed and in many developing countries (UNESCO, 2015). For instance, only 9% women are engineers in the United Kingdom workforce, 11% in the USA, 14% in Australia (Cherotich, 2016). Studies in OECD countries have

shown only 15% students commence for engineering courses in tertiary education. This paper sought to establish how social factors have influenced enrolment of female students in TVET engineering courses.

Studies on social factors have been done in countries such as Columbia, Australia, Egypt, Nigeria, USA, Zimbabwe (UNESCO, 2017). Societal perceptions towards engineering as a course for men is confirmed by the Royal academy of engineering in the United States which carried out a research on the perception of the public on engineering and 24% of the respondents indicated that engineering is a profession for men. Nguyen (2000) in the study on Status of Women in Engineering noted that the society expects girls to do better in social skills such as languages and boys in technical skills which involve problem solving skills such mechanical works. These gendered perceptions affect many women who could have pursued courses in TVET engineering. In the recent past many education stakeholders have tried to change this view through campaigns that are creating awareness and affirmative actions but still these fields have attracted few women. Despite the fact that several studies revealed that social factors influence female enrolment in TVET engineering courses, very few have focused on the extent to which they influence, which is the main focus of this paper.

Further, career choices are widely influenced by parental factors such as parent's level of education, cultural beliefs, and socio-economic status among others. An investigation on perceptions of young people on parental influence on their career choices by Otto (2000) revealed that girls and boys rely on their parents on careers choices. Educational level and the occupations of parents is an important factor in career choices. Fielden (2000) in the study women in construction industry: the untapped resource in the United Kingdom noted that parents have great influence on the subject choices and they have a perception that engineering courses are masculine limited to men work and this is confirmed by use of gender biased terms such as foremen. Further, students whose parent's educational level is low may drop out of school or may restrict themselves from choosing some careers (Otto, 2010). This is confirmed by a research done by Mursoi (2013) on assessment of factors that influence secondary school student perception towards enrolment in TVET institutions which revealed that parents' level of education largely shapes the choice of the

courses. Okoye (2016) supports these findings in a study on female participation in technical education in Nigeria who agrees that 80% of female students agreed that parents discourage them from enrolling in engineering courses. Some parents may feel that engineering would be tough for their girls and they may not be able to meet the demanding nature of the subjects. A study by Muhonja (2012) on factors influencing enrolment of female student in science-based courses in tertiary colleges; western province revealed that parental gender bias influenced enrolment. For instance, two thirds of the female students who were the respondents agreed that parents preferred to pay fees to for male students compared to a fifth who believed parents preferred to pay for female students. This study further found out that the income levels of parents influenced enrolment for instance, those parents earning 10,000per month were able to enroll students 100%, and, only 47.8% enrolled their girls in science-based courses.

In sub-Saharan Africa gender stereotypes is one of the main challenges facing women in STEM (UNESCO, 2010). In Ghana, the society for example as noted by Bird (2011) viewed girls who succeeded in sciences as witches. Therefore, girls tend to be alienated and they get contempt from boys if they perform well in sciences. This is further dragged to the world of work, where there is a perception that engineering in Technical Education is viewed as field work and therefore it's not meant for women who should take lighter job like nursing and teaching that allows them to take up family responsibilities.

Okeke (2005), Yakubu (2006), Ayonmike, Chinyire Shirley (2014) agreed that enrolment of women in technical education in Nigeria remained low (20% in 2015) due to social factors such as gender stereotypes, poor societal perceptions of technical education, labour market misconceptions and weak policy frameworks. Matope, (2007) in the study on the factors that influence female engineering female students' career choice a case study of Mutare Polytechnic, Zimbabwe indicates that perception of TVET subjects are strongly influenced by the values students acquire from their respective communities. In addition, there are stereotypes found in some learning materials that portray jobs meant for women and others for Men. For instance, many textbooks show pictures of a woman nurse and a Man doctor. Other societal perceptions are where Engineering in TVET is viewed as a field work that is tough, heavy and dirty and therefore

masculine in nature and since women are viewed by the society as soft, gentle and fragile they do not fit in this kind of a job (Women statistics in Engineering, 2014).

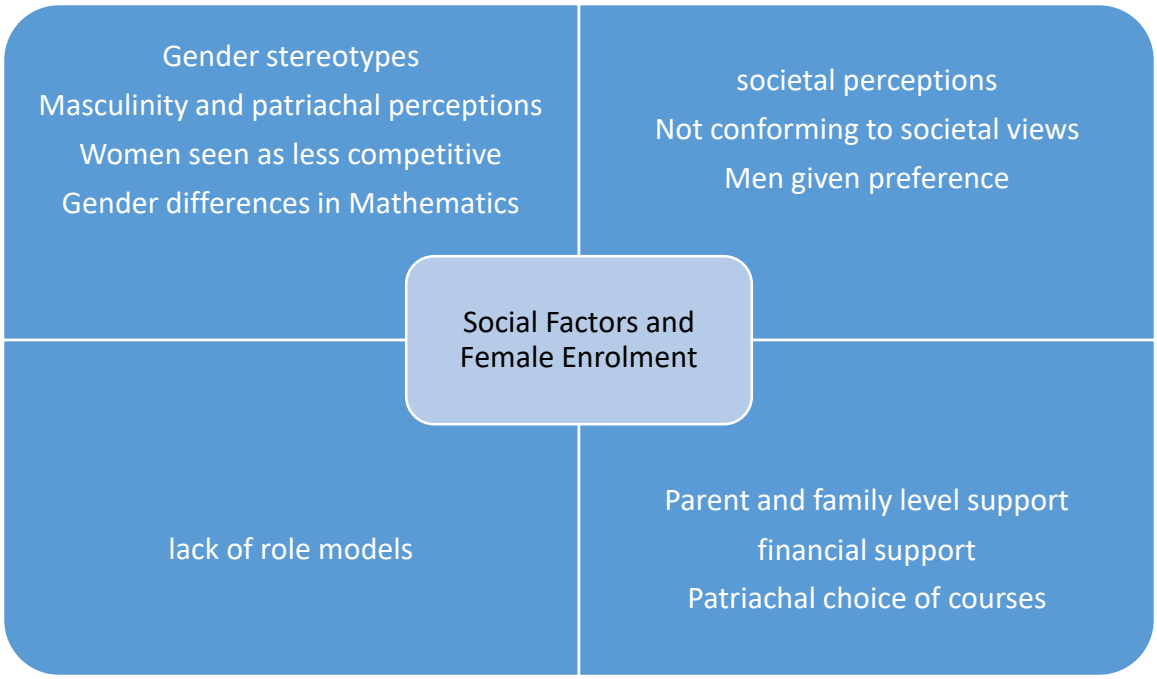
Ofsted (2011) in a research on girl's career aspirations noted that role models shape young women's career choices. The role models can be female engineers outside colleges and those that are tutors in these institutions. Female teachers influence positively girl's perceptions and confidence in engineering. They help to dispel myths about gender-based abilities among boys and they act as role models to girls (Ofsted, 2011). According to Kiwana *et al*, (2011) the research report on an investigation into why UK has the lowest female engineers, revealed that attitudes and perceptions towards STEM and science careers are formed at early ages, by the time girls reach 14 years they have ruled themselves out of an engineering career. Therefore, interventions aimed at influencing young women's career and subject choices should be done early. The study indicates not enough women choose the right subjects at lower levels of their learning due to career guidance that's reinforcing gender stereotypes.

In Kenya, at the secondary school level girls perform poorly in the science subjects that are a prerequisite for enrolling in engineering courses due to the masculine nature given to the subjects by teachers and the society (Ngugi and Muthima, 2017). While the teachers can unconsciously communicate negative attitudes towards engineering, a study done in the Ireland found that 57% of teachers held subconsciously gender stereotypes in relation to STEM subjects. Further, female students have been found to be positively influenced to have interest and good perceptions in engineering by female teachers or engineers. Presence of female role models helps to dispel the sex-based myths of innate abilities among boys and girls (UNESCO, 2017).

Due to the continued low number of female students in TVET engineering in both developing and some industrialized countries, the United Nations came up with policy recommendations of increasing women participation in all sectors of world economies including the STEM sector where engineering courses fall. Policies and legislation can bring sustainable change and institutionalize girl's participation in STEM education and careers through promotion of gender equality and advancement of women (UNESCO, 2017). Despite, the advancement of technology and the many Agendas to empower women the underrepresentation still exists in engineering

courses. This study sought to establish how these social factors have influence enrolment of female students in engineering courses in Kakamega County.

From the literature reviewed, main reasons of why women are few in TVET engineering courses are summarized in the Figure 1. The main issues are gender stereotypes, societal perceptions, lack of role models and parental and financial support that the study unearthed as to what extent the influence TVET enrolment for women in Kenya, specifically in Kakamega County.




Further, Table 1.1 shows that there has been total increase in enrolment in TVET. However, **d**espite the fact that the enrolments have been increasing, male students are still at a higher level of 57.1 % by 202021 while female students were at 42.9%. A gender gap of 14, 1% is great concern.

*Table 1.1: Total Enrolment in TVET by Sex from year 2012-2022 in Kenya*

| **Year** | **2012** | **2013** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** | **2021** |
|---|---|---|---|---|---|---|---|---|---|---|

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Male | 77360 | 88064 | 89765 | 90772 | 113963 | 154581 | 205142 | 246476 | 207958 | 228982 |
| % | 60.58 | 59.49 | 60.59 | 58.49 | 56 | 56 | 56 | 57.2 | 57.1 | 57.1 |
| Female | 50431 | 59945 | 58377 | 63404 | 88593 | 120558 | 158,742 | 184112 | 156132 | 172107 |
| % | 39.42 | 40.51 | 39.41 | 41.51 | 44 | 43 | 44 | 42.8 | 42.9 | 42.9 |
| Gender gap | 26829 | 28119 | 31388 | 27368 | 16776 | 34023 | 46400 | 62364 | 51826 | 56875 |
| % | (21.01) | (19) | (21.19) | (17.63) | (8) | (13) | (12) | 14.4 | 14.2 | 14.1 |
| **Total** | **127691** | **148009** | **148142** | **155176** | **202556** | **275139** | **363884** | **430 588** | **364090** | **401089** |

**Source:** Kenya Economic Survey (2022)

Table 1, 2 shows the gender gap between male and female of engineering courses in Kakamega Public Technical Institutions in the County 2021. It indicates that the gender gaps in electrical and electronic, mechanical and automotive and civil and building were at 81.7%, 88.6 % and 70.4% respectively. The question therefore, is what the cause of the disparities is.

*Table 1.2: Engineering Student Enrolment in Technical Institutions Kakamega County by June 2021*

| **Institutions/Courses** | **Electrical and electronic** | | **Mechanical and automotive** | | **Civil and building** | |
|---|---|---|---|---|---|---|
| | M | F | M | F | M | F |
| Shamberere TTI | 110 | 09 | 274 | 37 | 266 | 27 |
| Sigalagala National Polytechnic | 719 | 110 | 677 | 34 | 1054 | 316 |
| Bushiangala | 264 | 02 | 269 | 06 | 383 | 04 |
| Mumias West | 13 | 09 | 03 | 03 | - | - |
| Butere | 160 | 14 | 156 | 11 | 137 | 08 |
| Friends Kaimosi College | 190 | 02 | 147 | 01 | 206 | 0 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Total | 1456 | 146 | 1526 | 92 | 2046 | 355 |
| **Total /gender gap%** | **1602(81.7%)** | | **1618(88.6%** | | **2401(70.4%** | |

**Source:** Kakamega County TVET Office (June 2021)

### 1.2 Statement of the problem

The Kenyan government and the United Nations, in the recent years have put concerted effort to revamp and re-brand TVET sector, to attract more female students especially in STEM related courses. This has been seen as a tool for socio economic development in realization of sustainable development goals and vision 2030. Despite the tremendous interventions by the government the gender gap of 14.1% still exists in TVET in Kenya as shown in the economic survey 2022. Although factors and challenges affecting TVET sector has been studied in general, there was a need to study the extent to which social factors have influenced enrolment of female students in Kakamega County. Kenya

### 1.3 Thematic area and objectives of the study

The thematic area of this study was *education, mentoring, skilling and innovation for Women Economic Empowerment. The general objective of this study was to establish the extent to which social factors have influenced enrolment of women on TVET engineering programs in Kakamega County. The specific variables of concern in the study include parental factors, perceptions and female role models of female students in TVET engineering courses. The findings may help women to understand the issues that bar them from enrolling in engineering programs and come up with solutions in their career choices. If women enroll in the well paid formal or self-employed jobs, income disparities between them and men are likely to decrease and they would be more economically empowered to contribute appropriately to the Kenya's economy.*

### *2.0 Theoretical framework*

The theoretical framework of this study is Ruth Pearson's (1992) theory on gender relations. According to this theory, the society views all activities that are carried out to be based on social roles and interactions of men and women as indicated by (Orodho, 2012). The framework views gender roles and activities as having strong ideological content and that policy reflects prescribed

versions of female and male roles rather than activities actually practiced by women and men. In addition, this theory is based on ideologies and development policy that the society seems to have ultimate authority on the precise nature of what women and men can do. Further, there are real contributions to production which turns out to be biased against women. Due to these biases, the performance and participation of women is affected in all spheres of life. This theory was found appropriate to this study because career and course choices are influenced by gender roles.

### *3.0 Methodology*

This study adopted a descriptive survey research design which is commonly aimed at describing current characteristics of variables in a situation which was appropriate for this study. The independent variable for this study included parental factors, negative perceptions and presence of role models and the dependent variable was female enrolment in TVET engineering courses. The study was carried out in Kakamega County, Kenya. The target population of this study constituted 3 registrars; 62 tutors students; 3 559 students in engineering department and one County TVET Officer in Kakamega County. The source of the information was from Kakamega County TVET Director's Office for 2020 .This study used both probability (to allow generalization) and non-probability sampling methods. Morgan and Krejcie (1970) table for sample size determination were used to establish 351 sample size for student while for the case of tutors, 20% of the target population as recommended by the Gay (1992) was used to arrive at the sample size of 12.Census was employed for registrars. Questionnaire and interview Schedule were used as the instruments for data collection. A sample size of 1% of the sample frame was used in piloting. Reliability of the instruments was established through alpha method and a coefficient of 0.679 that existed between variables of the study using SPSS package version 23 was determined. Data analysis employed both qualitative and quantitative methods. Data was presented in texts, tables and figures

## 4.0 KEY FINDINGS

The researcher sought responses from engineering students, engineering tutors and interviewed registrars. Students were asked to indicate the extent to which they agreed or disagreed that social

determinants affected girls' decisions to enrol in engineering courses in public technical training institutions in Kakamega County. The results are given in Table 4.1

*Table 4.1 Responses on the extent to which Social Determinants influence Enrolment of Female Students in Engineering Courses*

| No | Item statement | Strongly Disagree | Disagree | | Not sure | Agree | Strongly Agree |
|---|---|---|---|---|---|---|---|
| 1 | Girls have a negative attitude towards engineering | 24 (7.9%) | 15 (4.9%) | | 25 (8.2%) | 128 (42.0%) | 113 (37.0%) |
| 2 | There is negative societal attitude towards female engineers | 25 (8.2%) | 47 (15.4%) | | 44 (14.4%) | 139 (45.6%) | 50 (16.4%) |
| 3 | TVET engineering is viewed as inferior to university graduates | 34 (11.1%) | 95 (31.1%) | | 59 (19.3%) | 69 (22.6%) | 48 (15.7%) |
| 4 | Does non-availability of role models contribute to enrolment of female students | 10 (3.3%) | 24 (7.9%) | | 20 (6.6%) | 159 (52.1%) | 92 (30.2%) |
| 5 | Is there discrimination against female TVET engineers in the labour market | 52 (17.0%) | 77 (25.2%) | | 69 (22.6%) | 83 (27.9%) | 24 (7.9%) |

Results in table 4.1 show the extent to which various social determinants influence enrolment of female students in engineering. As far as girls negative attitudes are concerned, the results revealed that almost all the majority 241(79%) of the students who respondents agreed and strongly agreed that girls have negative attitude towards pursuing engineering courses. The result implies that respondents agreed that girls tend to develop a negative attitude towards pursuing engineering courses and this prevents them from applying the programme.

When asked about whether the society has a negative attitude towards female engineers, majority189 (63%) of the students respondents agreed and strongly agreed that negative societal attitude towards girls who are engineers makes prospective ones to avoid enrolling for such

courses. This finding agrees with other studies conducted by (Okeke, 2005: Yakubu, 2006: Matope, 2007) that revealed negative attitude contributes to enrolment of female students in TVET engineering courses.

Respondents were also asked whether TVET engineering is viewed as inferior to university graduates. On this, students had a divided opinion on whether TVET engineering is viewed as inferior to university graduates. Majority 117 (50 %) of the respondents did not agreed with this statement, therefore the results disagrees with Matope (2007) who notes that the graduates from Universities are more valued in the society than TVET engineers this is probably due to the recent awareness and support that TVET has received globally and from the Kenya government.

Further, respondents were asked if the non-availability of role models contribute to enrolment of female students. Most of the students 251(82, 3%) agreed that lack of role models inhibits girl's admission to engineering courses in public technical training institutions. This means that girls do not have someone to look up to (in terms of profession) that could motivate them to apply for engineering courses since it appears to be male dominated. Lack of role models, therefore remains a challenge in encouraging female enrolment as noted by other researchers such as (Ofsted, 2011).

When asked about whether there was discrimination against female TVET engineers in the labour market 128 (42.2%) strongly disagreed and disagreed, 69 (22.6%) were undecided and 107 (35.8%) agreed and strongly agreed. This means that respondents are divided as 42.2% appear to disagree while only 35.8% agreed. This means that since they are students they may not be aware of the labour market discrimination. In addition, a study by Muthima (2015) revealed that there was no discrimination in earnings for men and women in manufacturing industries in Thika. This implies, that the gender equality campaigns might have borne fruits since a study done by UNESCO in 2000 indicated discrimination rate was high in labour market for women.

**Table 4.2 Responses on Parental Factors Influencing Enrolment of Female Students in Engineering Courses**

| No | Item statement | Strongly Disagree | Disagree | Not sure | Agree | Strongly Agree |
|---|---|---|---|---|---|---|
| 1 | Parents religious belief and social cultural traditions do not allow girls to pursue engineering career paths | 76 (24.9%) | 74 (24.3%) | 29 (9.5%) | 87 (28.5%) | 39 (12.8%) |
| 2 | Parent education level affects girls decision to join engineering course | 33 (10.8%) | 65 (21.3%) | 20 (6.6%) | 133 (43.6%) | 54 (17.7%) |
| 3 | Parents view of technical engineering courses as inferior | 38 (12.5%) | 44 (14.4%) | 41 (13.4%) | 118 (38.7%) | 64 (21.0%) |
| 4 | High poverty levels affect parents' capacity to support their girls in engineering programmes | 20 (6.6%) | 22 (7.2%) | 13 (4.3%) | 172 (56.4%) | 78 (25.6%) |
| 5 | Lack of awareness by parents on engineering courses affects girl child enrolment | 29 (9.5%) | 5 (1.6%) | 23 (7.5%) | 182 (59.7%) | 66 (21.6%) |

Finding in table 4.2 indicates that students had different opinion on the capacity of parents to bear the cost of educating female child in engineering course. Few students agreed that some parents are unwilling. These findings agree with the research done by (Khaguya, 2014) in Bungoma County where 38% of the respondents agreed that some parents are unwilling to pay fees for their girls in science-based courses. In addition, interview response from Registrar (No. 2) remarked that:

> *Parents influence choice of courses for girls where some personally choose the course they are to undertake. Some parents do not allow their girls to change courses to SET.*

This means that some parents decide on what their children would do and hence ending up doing different courses from the ones that they preferred.

Majority (126) of the respondents also disagreed that parents' religious, social and cultural beliefs do not allow girls to pursue engineering courses or careers while few tended to agree with this statement. The outcome from Table 4.2 shows that some parents still hold religious, social and cultural beliefs against their girls' undertaking engineering career paths. Hence; parental factors contribute to their low enrolment levels in public technical training institutions. Research result indicated that respondents agreed that parent(s) level of education is a determinant on whether their girl(s) would make an application of joining an engineering programme in public technical training institutions. Otto (2010) in his research on parental factors influencing choice of career, findings showed that most girls rely on their parents for career choice and the parent's level of education is key in determining the course to be learnt. This is confirmed by a study done in Nigeria (Okoye, 2016) where 54% of respondents agreed that parents in engineering field will tend to encourage their girls to take engineering courses in Nigeria. Registrar No. 3 commented that:

> *There is negative attitude towards female enrolment since most parents do not think that girls can perform in engineering*

Further, the research revealed that 59% of the respondents agreed that parents view of technical engineering courses as inferior and therefore may not advice their girls to pursue the career. In agreement with the result, Registrar No. 3 also said that some parents consider TVET programmes to be of students who failed in their KCSE examinations as remarked below:

> *TVET is for failures this lowers interest of female students to join SET. Labelling courses as male/female also is a contributing factor where SET courses are labelled as 'male' courses. The emphasis on getting a degree by parents is also a factor.*

This observation agrees with (Okoye, 2016) in a study that revealed that 80% of students and 77% lecturers agreed that parents discourage students from pursuing TVET courses.

## 5.0 Summary and Conclusions

This study established the extent to which social determinants influence female enrolment in engineering courses in public technical institutions, in Kakamega County, Kenya. The study revealed that, negative attitude towards engineering by girls at the community level discourages

them from applying for engineering course due to societal perception that engineering courses are masculine. Further, lack of female engineers to act as a role model for girls affected their decision to enrol for engineering courses in public technical training institutions in Kakamega County. Parental factors were found to be influencing enrolment. For instance, high poverty levels situation among families limit the number of prospective girls from being admitted in engineering programmes since the parent are unable to raise college fees such as examination and internship. Lack of awareness on engineering programmes being offered in public technical training institutions also affects enrolment. This study in conclusion, found out that to a large extent social factors influence women enrolment in TVET engineering courses.

## 6.0 **Recommendation. The study recommends that**

1. The need for the ministry of education through TVETA to do an extensive public education campaign to the communities on opportunities provided for female students undertaking engineering programs. This may be done in collaborations with religious institutions and County government to reduce and eradicate negative societal perceptions and gender stereotypes.
2. The government through the ministry of Gender and education to develop deliberate policies that will finance fully female students TVET education to reduce burden to parents/
3. Deliberate efforts to develop a pool of mentors and motivate them financially to mentor the young girls who wish to do engineering courses.

**References**

Abraka, Ayonmike., & Chinyere, Shirley. (2014). Factors Affecting Female Participation in Technical Education Programme: A Study of Delta State University. Journal of education and human development .ISSN2334-296X (Print) 2334-2978(Online) DOI: 10.15640/jehd

Ayonmike, S. C. (2010). Skill training in Nigerian technical colleges: Benefits and challenges. Journal of Qualitative education 6(1), 75-86.

Bird, S. (2011). Unsettling universities incongruous, gendered bureaucratic structures: A case-study approach. *Gender, Work and Organization, 18*(2), 202-230

Fielden, S. L., Davison, M.J., Gale, A.W., & Davey, C.L. (2000). Women in Construction: the-untapped resource. Construction Management and Economics, 18(1), 113-121.

Gay, L. R., & Diehl, P. (1992). Research Methods for Business and Management. In Hill, R. (1998) (Ed.), What Sample Size Is "Enough' in Internet Survey Research"? Interpersonal Computing and Technology: An Electronic Journal for the 21st Century. http://www.emoderators.com/ipct-j/1998/n3-4/hill.hmtl

Khaguya, L., (2014). Factors influencing female students' enrollment in technical courses: a case of Matili technical training institute, Kenya. Nairobi: University of Nairobi

Kiwana, L., Kumar, A., & Randerson, N. (2011). An investigation into why the UK has the lowest proportion of female engineers in the EU: A summary of the key issues, London: Engineering UK. http://www.nationalstemcentre.org.uk/ res/documents/page/1uuftczGmVogqeQoW.pdf

Krejcie, Robert., & Morgan, Daryle (1970). Determining Sample Size for Research Activities .Educational And Psychological Measurement 1970, 30, 607-610.

Matope, S. (2007). A study into the factors that influence engineering female students' career choice: a Case study of Mutare Polytechnic, Zimbabwe', *Scientific Research and Essay*, 2(6), 211 – 216.

Muhonja, E. (2011). Factors influencing low female student's enrolment in science-based courses institutions in Western Province, Kenya. University of Nairobi:

Mursoi J. W. (2013). Assessment of factors that influence secondary school students' perceptions towards TVET in Eldoret West district.

Muthima, P. (2015). Private rate of returns to Technical Education. A Case of Manufacturing Industries. Kenyatta University Library: Unpublished Thesis.

Ngugi & Muthima, P., (2017). Female Participation in Technical, Vocational Education and Training Institutions (TVET) Subsector': The Kenyan Experience. ISSN 2224-5731(Paper) ISSN 2225-0972(Online) Vol.7, No.4, 2017

Nguyen, D. (2000).The Status of Women in Engineering Education. International Journal of Engineering. Great Britain: Int. J. Engng Ed. Vol. 16, No. 4, pp. 286±291, 2000 0949-149X/91 $3.00+0.00. https://www.ijee.ie/articles/Vol16-4/IJEE1160.pdf

Ofted (2011). Girls' career aspirations. Royal Exchange Buildings St Ann's Square Manchester M2 7LA

Okeke, B.C. (2005). Enhancing enrollment in vocational programmes in colleges of education in Delta State: perception of academic staff. International Journal of Educational Research and Development. 1 (1).

Okoye, K. & Ekon, G. (2016).Reasons for low female enrolment in technical colleges in Akwa IBOM State.Nigeria. ISSN: 2456-1851

Orodho, A. (2012). Elements of Educational and Social Science Research Methods (2nd ed.). Kenezja Publisher

Otto, L. (2000). Youth perspective on parental career influence. '*Journal of Career Development.* Vol.27, No.2, PP.111-118.

Otto, Luther. B. (2010). Youth Perspectives on Parental Career Influence. Volume 27, Issue 2 https://journals.sagepub.com/doi/10.1177/089484530002700205

Republic of Kenya, (2005*). Sessional paper No. 1 of 2005: A policy Framework on education training and research for the 21st century*. Nairobi: Government printer.

Republic of Kenya, (2022). *Kenya Economic Survey.* Nairobi: Government Printer.

*Pearson, Ruth. (1992).*Gender issues in industrialization. https://books.google.co.ke/books?hl=en&lr=&id=WvdiDgAAQBAJ&oi=fnd&pg=PT138&dq=ruth+pearson+(1992)+theory+on+gender+relation

Starovoytova, Diana and Cherotich, Sharon (2016). Challenges Faced by Female-Students in Engineering-Education. Journal of Education and Practice www.iiste.orgISSN 2222-1735 (Paper) ISSN 2222-288X (Online)Vol.7, No.25, 2016. https://www.researchgate.net/publication/308784710_Challenges

UNESCO International Bureau of Education (2017) .A Resource pack for gender-responsive STEM education. IBE/2017/OP/CD/01264 p., illus. https://unesdoc.unesco.org/ark:/48223/pf0000250567?posInSet=

UNESCO, (2000). The right to education; towards education for all throughout life. World education report. https://unesdoc.unesco.org/ark:/48223/pf0000119720

UNESCO, (2015). Girls and Women in Science, Technology, Engineering and Mathematics in Asia. South Korea.: Korean Women's Development Institute (KWDI

UNESCO, Women in Science (2018).Fact sheet no 51 FS/2018/SC/51. UNESCO-UNEVOC International centre for technical and vocational education and training. Volume: 01, Issue: 05 Women in Science and Engineering [WISE] and Royal Academy of Engineering [RAE], (2014) *University Technical Colleges: Opening up New Opportunities for Girls*, Bradford.

Yakubu, N. U. (2006). New approaches to technical and vocational education. A paper presented at ETF zonal sanitation workshop on the importance of Technical and vocational education in Nigeria.