

Female learners' access to Science, Engineering and Technology (SET) courses: Case of Marine Engineering in Mombasa Technical Training Institute, Kenya

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Abstract

Perceptions and realities associated with male or female -dominated subjects, courses and careers are gradually changing due to socio-economic lifestyle shift. This paper aimed at exploring strategies for enhancing female participation in SET courses with close examination of Marine Engineering students in Mombasa Technical Training Institute. Objectives of the study included: to explore various factors influencing female participation in SET courses; to investigate retention and completion rate of female students in marine engineering students; to establish strategies for enhancing female participation in SET courses; to determine relevance in female students enrolling in SET courses with reference to Marine Engineering students. The study used case study research design and document desk review of relevant research literature. Questionnaires and interview guides were used as instruments of data collection. Resultant data was quantitatively and qualitatively analyzed. Descriptive data analysis was done using measures of central tendencies while content analysis was applied for descriptive data analysis. Findings revealed reluctance by female students to enroll in SET courses due to various factors. There was high dropout rate of female students from marine engineering due to different reasons. However majority of female students who pursued marine engineering maintained the course was relevant for sustainable livelihood. The paper reveals that application of strategies such as advocacy, gender mainstreaming approaches, policy and partnerships would improve access of female learners into SET courses. The paper concludes that adoption certain gender mainstreaming approaches; advocacy, partnerships and ODL within educational institutions policies enhance access and equitable opportunities to relevant education for sustainable development.

Key words: Access, SET, male-dominated, Marine Engineering, Seafarers, Gender-mainstreaming, strategies, equitable opportunities, sustainable development

1.0 INTRODUCTION

1.1 Problem Statement

Previous studies have discussed factors influencing female participation in SET-courses/careers. However little has been done to investigate retention and completion rate; explore strategies for enhancing female participation as well as relevance of SET courses for sustainable development. Sometimes institutions over-focus on enrollment but fail in ensuring effective course-delivery, learner-support systems and learner's benefits from skills acquired.

1.2 Brief Literature Review Summary

According to Ayonmike(2014), factors affecting female participation in Technical Education Programmes were governmental ,school, societal, and parental. Future salary expectations; employment chances; availability of

instructional materials and well-equipped workshops; past performance of science learners; social-economic factors and; family members influenced female enrollment in science-oriented courses. (Wataka,2013).

Retention of learners is a key component of comprehensive enrollment management program and improving quality of learners' life, and a continuing priority for all institutions of higher education (Noel, 2009).Addressing student retention via learning, teaching and curricular developments meets needs of all learners, including the disadvantaged. For equity and diversity legislation, requirement for institutions in UK is to make anticipatory changes, which advance success of all learners. In Australia, mandate is for specialized provision of tailored support for under-represented or disadvantaged groups of learners (Crosling,Heagley & Thomas(2009). ODL and OER is seen as an option to overcoming some of challenges associated with course delivery and learning experiences in TVET(COL,INVEST Africa,2015).

A study on learners' retention and success revealed that institutions ought to make significant improvements through intentional and concerted approaches. A shared student success, focusing on involvement strategy, starting small, building bridges, and using data on meaningful and actionable ways are some of suggested solutions (Chrissy & Katty (2016).

Research on strategies for enhancing females' participation in TVET in Nigeria recommended that wives of state governors should establish women organization in technology to sensitize females on benefits of TVET. Funds should be allocated by government and other stakeholders in TVET to ensure effective running of female-enhanced TVET programme (Adelakun,Oviawe,&Garba (2015). More strategies include: improvement of school conditions, increasing schools facilities, teacher competence, systematic gender-sensitization programmes, introduction of quota system in enrollment; and gender-sensitive environment (Nawe, 2002).

Regarding relevance in female-learners enrolling in SET-courses in TVET, a study from India cites how a National Policy on Skill Development has been formulated by Ministry of Labour and Employment to create empowered workforce with improved skills, knowledge and internationally recognized qualifications to gain access to decent employment and ensure India's competitiveness in dynamic global labour market. It also aims at increasing productivity of workforce both in formal and informal sectors, increased participation of youth, women, and disabled and or disadvantaged groups (Vijay P.G., 2009). TVET in Kenya has been subjected to a paradigm shift from offering conventional knowledge-based training to Competency-Based Training (Mburu, 2016).

2.0 OBJECTIVES

The main objective of the study was to explore female-learners' access into SET-courses; Case of ME learners in MTTI, Kenya.

Specific objectives included:

1. To explore various factors influencing female participation in SET-courses;
2. To investigate factors influencing retention and completion rate of female-learners in ME courses;
3. To establish strategies for enhancing female participation in SET-courses;
4. To determine relevance in female-learners enrolling in SET-courses with reference to ME courses in MTTI.

3.0 METHODOLOGY

Methodological approach was qualitative-driven mixed methods that adopted a case study research design and document desk review of relevant research literature. A triangulation of data sources engaged questionnaires and interview guides as instruments of data collection. The researcher also employed observation, relevant document and record review as well as participatory experience with respondents as key informants. Resultant data was qualitatively analyzed leading to a crystallization of data.

3.1 Sampling and Response Rate

The quota non-proportionate sampling technique was used to select different categories of respondents as key informants. Target population comprised of learners enrolled in ME and Seafarers Course between 2013 and 2014 (first ME class in MTTI and in Kenya); lecturers in ME; WITED-Members [lecturers involved in voluntary mentoring of female-learners]; and Policy-makers in TVET as key informants. 54% of learners per class from four classes were selected randomly (27 students); 48.1 % (13 learners) of learners answered questions on a semi-structured questionnaire while 51.9% (14 learners) were engaged in key informant interviews. 50% of lecturers' (6 lecturers) selected answered semi-structured questionnaire while 50% were engaged in key informant interviews. 8 personnel from management (some are lecturers in ME) and Ministry of education-TVET (referred to as Policy-makers in this study) also filled questionnaires and participated in interviews.

4.0 DATA PRESENTATION, ANALYSIS AND INTERPRETATION

This section consists of thematic presentation, analysis and interpretation of findings based on objectives of the study.

Explanation for data presentation:

Data presentation mainly shows various responses given by respondents in percentages. Each percentage represents a percentage of total number of respondents under each category of respondents. Categories of respondents include: female-learners; male-learners; lecturers/WITED-members; and Policy-makers as indicated in sampling frame (3.1 above). It is imperative to note that some respondents gave more than one responses, therefore the percentages do not necessarily total to 100%.

4.1 Demographic Characteristics of Respondents

Table 4.1 shows aggregation by gender of all respondents including; all learners, lecturers/ WITED-members and policy-makers selected to respond to questionnaires and interviews. Gender was considered in selecting respondents to reduce bias and a way of moderating female-responses. On the other hand, given that the researcher was more interested in female gender, females were conspicuously dominant.

Table 4.1. Gender Distribution of all respondents

Gender	Frequency	Percentage (%)	Cumulative (%)
Female	27	69.9	100.0
Male	14	34.1	
Total number of all respondents	41	100.0	

From table 4.1 above, out of 41 respondents (total number from all categories) 69.9% were female and 34.1% male. This was attributed to the fact that majority of learners in ME were female and formed largest category of respondents.

Table 4.2 Age Distribution of learners' category

Age (%)	Frequency	Percentage (%)	Cumulative
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20 years and below	2	7.4	100.0
21 to 25 years	21	77.8	
26 to 30 years	3	11.1	
31 years and above	1	3.7	
Total number of learners-			
Respondents	27	100.0	

It is noteworthy that aggregation by age was applied only to learners' category as age of other respondents was not considered relevant to this study. Majority of learners, 77.5% were between 21 and 25 years.

4.2 Factors Influencing Female Participation in SET-courses

4.2.1 Factors influencing choice of ME/Seafarers course

Majority, 90.5% of female-learners' respondents (19 out of 21) said they chose the course simply because they liked it (passion). Other reasons included: course is marketable, 85.7%; to earn a living, 85.7%; got sponsorship, 95.2%; encouragement from WITED-members, 57.1%. Interestingly few said they simply wanted to compete with men and prove their capability in world (of men), 14.2%.

83.3% of male-learners (6) responded that it was prestigious to be marine-engineers; 100% had passion for the course; dream career since primary school, 66.7%; desire for new experience at sea and cruises, working in ships, ship construction and repairs, 66.7%; enticed by interesting stories they heard about ships, admired those already in marine-industry; opportunity to explore the world, 50%.

Lecturers/WITED-members(6 respondents) stated following reasons : desire to venture into male-dominated courses;50%; females thought they could do better than males in ME perceived as 'easier, compared to other SET-courses, 16.7%; female-learners were enlightened by WITED, 83.3%; had sponsorship,83.3%; encouragement from female-professionals, 83.3%.They identified the following as factors influencing female participation in SET-courses: lack of job opportunities in female-dominated careers, 16.7%; cultural beliefs, 50%; attitude, 50%; lack of role-models and encouragement from female-professionals, 66.7%.

Policy-makers said they did not know actual ratio of female: male marine learners in MTTI and SET-courses in TVET- Kenya respectively. They identified similar factors influencing female participation in SET-courses as above.

4.2.2. Challenges prior to joining college

61.2% (13) of female-learners respondents (21) said they could not pay college fees .57.1 %(12) could not afford accommodation, commuters fee and basic course requirements.52.4% said that their parents and family had not approved their career choices because profession was 'not suitable' for women.

Male-learners (6), 33.3% encountered only financial problems. 50% of this category said had no financial support from their parents/families, thus difficult to balance between working and college. All confessed nobody opposed their career-choice.

Lecturers/WITED identified challenges encountered by female-learners as: lack of finances to join colleges; social-cultural factors- early pregnancies/marriages; balancing pressure from different sources of life.

4.2.3. Fears or worries associated with the course prior to joining college

90.5 % female-learners admitted they were scared because they initially thought that Marine-course was only based at sea. 81% feared failing in examinations or not excelling in course. 71.4% feared hazards associated with marine jobs. 76.2% had phobia of drowning since they were not good swimmers.76.2% worried that even though they started they would not complete course due to financial problems. 57.1% worried about what people would think of a woman-engineer and confessed that as a Muslim girl/woman it would be challenging since Muslim girls/women were expected to dress and behave in a particular way. Neither was she expected to go to sea with men. If she married what would happen to her family while she was away for cruises?" 47.6% worried about not getting jobs due to discrimination against women. 81% feared working with men (dominate marine-industry) likely to harass them sexually.

Male-learners(6) only worried about how they would pay college fees and sustain themselves financially in college and about getting a job after completion of course. Few, 16.7% had phobia of being at sea.

4.3 Factors Influencing Retention and Completion Rate of Female-learners in Courses

4.3.1 Nature of course in relation to complexity or simplicity

4.8% female-learners said marine-course was very easy, 4.8 % easy, 75.9% relatively easy, while 19.1 % said it was difficult. Male-learners, 100% stated course was relatively easy. None of respondents said course was very difficult.

4.3.2 Gender Perception about SET-courses

Majority, 66.7% of male-learners (6) said there were no specific subjects/courses/careers designed for girls/women or boys/men. Few, 33.3%, named ICT, Communication Skills (subjects); Business Management, Hospitality (courses); and Air hostess (careers) for girls/women since they were easy and less tiresome. Some respondents said that more technical subjects/courses/ careers in marine and other SET-courses were for boys/ men.

Only, 4.8% of female-learners said there were subjects/courses/careers specifically for boys/men. Interestingly some female-learners said they could handle more technical subjects/courses/careers while male-learners venture into welding and fabrication (masculine); Arts, Home science ("why not"); navigation ("men are better navigators"); Food and Beverage, Fashion and Design(marketable) courses. The researcher observed this was a perception or assertiveness by female-learners that men/boys should do what women /girls were doing and vice versa. Lecturers emphasized on attitude as a major reason for subject preferences.

4.3.3 Course delivery

47.6% female-learners said course was well delivered while 52.4% said it was not well delivered.50% male-learners said it was not well delivered. Lecturers interviewed revealed that some subjects were not adequately taught.

Learners suggested areas of improvement: more practical work; more swimming lessons; competent and committed teachers; increased industrial-trips and exposure to marine-environment; well-equipped ME workshop; all teachers to use power-point-presentation and not dictate notes or give print-scripts to read; teachers can upload notes on internet[OER] for learners to access anytime, anywhere; theory subjects sometimes be taught online; notes, assignments sent via mobile phones or 'Whatsapp' to save on transport and time, and avoid absenteeism.

4.3.4. Challenges during Industrial Attachment/Internship

All learners undertook industrial attachment [internship] assisted by institution's Industrial Liaison Office and management.

Female-learners admitted; being overworked; prejudice, stigma; commuting challenges; financial challenges (lack of money for transport, accommodation, and food); discrimination; abusive language and “too many jokes” (“workshop language”); working overtime. Lecturers/WITED added there was negative attitude from industry players and uncooperative trainers. Male-learners did not encounter peculiar challenges.

4.3.5. Performance in Industrial Attachment/Internship

Learners were assessed by supervisors at industry, Industrial Liaison Officers and teachers. General report indicated that performance was exemplary. Initially people in industry looked down on them as ‘just girls’, but later noticed they were as good as boys if not better.

4.3.6. Performance in examinations

Records from registry, examinations and mechanical department indicated that learners enrolled for Craft in ME and Seafarers courses, and registered for module1 examination, there was 9% and 12% pass respectively. This was below departmental pass which was 28% and 25% respectively. Module1 results for subsequent classes were 9% and 50% for Craft in ME and AS courses respectively.

Table 4.7: KNEC Module1 Examination Results for first intake of Marine-Learners

Class /Course	Total number examined	Gender	Distinction	Credit	Pass	One refer	2 refers	Fail
Craft in Marine Engineering	15	Male	0	1	0	3	6	5
	16	female	0	3	0	6	2	5
Artisan in Seafarers course	1	Male	0	0	0	0	0	0
	32	Female	0	3	0	5	10	13

An interview with their teachers revealed the following on course completion per module shown on table 4.8.

Table 4.8: Course Completion

Course	Gender	Learners enrolled	Learners completed module1	Learners proceeded to module2	Learners completed Module-2
Craft in Marine Engineering	Male	15	15	4	4
	Female	16	16	10	10
Artisan in Seafarers	Male	3	1	0	0
	Female	29	28	9	4

4.3.7. Reasons for good/poor performance

Learners who had passed attributed their success to passion for course; hard work, teachers’ commitment, internet research [OER]; attending classes; support from WITED. Learners who failed attributed failure to; fear of theory

subjects; negative attitude; uncooperative parents; lack of basic requirements like transport to school- absenteeism; uncommitted teachers.

Lecturers/WITED attributed good performance to self-discovery and hard work; trainer's devotion; excellent environment; good learners-teachers relationship; encouragement from WITED; management support; promise of better life and gaps in industry. They attributed failure to negative attitude; fear of theory subjects; uncooperative parents; lack of course requirements; and absenteeism.

4.3.8. Strategies to improve retention and completion rate

Lecturers/WITED suggested these strategies: female-learners to get sponsorship; closely monitored and encouraged to re-do referrals; mentorship programmes; absorbed by industry immediately after completion; introduce short courses; WITED-initiatives. Policy-makers suggested: mentorship; sponsorship (bursaries); scholarship; sensitization to families and community.

4.4 Strategies for enhancing female participation in SET-courses

Female-learners suggested following strategies; Motivational/inspirational talks; visiting girls in high school; careers talks; scholarships; awareness campaigns; debates, conferences and congresses for female-learners; and heart to heart talks. Male respondents suggested: females should be given equal opportunities to male without forcing; creating awareness in community, schools, and religious setups.

Lecturers/WITED suggested: collaboration amongst TVET Institutions, Industry and WITED Chapters to continue campaigning and spearheading females towards SET-courses; incentives to females who performed well in their studies; mentorship programmes; governments and organizations should allocate funding to female-learners; WITED initiatives.

Policy-makers suggested: formalized mentorship programmes starting from high school; sponsorship; guidance and counseling; advocacy; affirmative action; scholarships.

4.5 Relevance in female-learners enrolling in SET-courses with reference to ME

4.5.1 Need to encourage female-learners in Marine-Courses

All respondents said they would encourage other female-learners to join Marine-Courses with reasons; courses were interesting though challenging; new and varied experience; difficult but manageable; marketable; flexible; country would have enough marine-engineers and technologists instead of depending on foreigners; career prospects in marine-industry for females; understaffed water-industry.

4.5.3 Course relevance to Industry/job market

Lecturers/WITED gave following reasons: courses entail skills useful in employment and self-employment, and non-formal sector; unexploited marine industry; upcoming seaports –a major employer. Policy-makers said course was relevant to job market because learners integrated well during industrial attachment; Blue economy was growing; not many trained marine professionals in Kenya.

4.5.4 Course relevance to future career

All female-learners said course was relevant to their future careers because it pays well; marketable; recognizable internationally; role-models to other girls; new Seaport a boost to marine-industry. Some comments by male-learners: "I want to be a chief engineer preferably in a cruise ship"; "to explore Marine-industry"; "Upgrade my skills"; "I expect to get good pay in future". Lecturers/WITED added: one could venture into salaried or self-employment; untapped marine-industry was a lucrative business.

4.5.5 How their careers would improve their livelihoods

All female-learner respondents believed that marine-careers would improve their livelihoods. 90.4% hoped to get jobs, help orphans and needy in society; 90.4%; to further their studies; 95.2%; 9.5% to pursue STCW, then start a business. Male respondents had similar responses: get industrial attachment to gain more experience, 50%; get 18 months sea time, 66.7%; get a job after doing STCW, 66.7%; 100% said they needed jobs.

4.5.6 Present situation in their career path

50% Female-learners were searching for jobs, 25% in temporary employment; 25% would do any job available; 100% said they were seen as role-models- and were sharing with community experiences gained throughout their learning life.

Male-learners intended to get jobs after doing STCW, 66.7%; 33.3%, alleged they were struggling to earn a living in temporary employment. Lecturers/WITED added that female-learners who failed Module-1 examinations could not continue and were venturing into temporary employment. 2 learners had worked in 2 reputable marine-related companies. Policy-makers were not certain of actual current situation regarding retention, completion or employment rate of ME female-learners.

5.0 SUMMARY OF FINDINGS, DISCUSSION, CONCLUSION AND RECOMMENDATIONS

Summary of findings is based on presentation, analysis and interpretation of findings in previous sections, leading to conclusions and recommendations.

5.1 Factors Influencing Female Participation in SET-courses (ME)

Personal Preferences:- Female-learners simply liked course ('out of passion'). Females, just like male-learners might have an inclination for SET-courses but this preference was influenced by intervening and extraneous factors.

Job guarantee:- They hoped to get jobs after completion, earn a living and have better life.

Job appeal:- The course was also described as interesting, adventurous and prestigious.

Desire to venture into male-dominated careers:- Some female-learners merely wanted to showcase their capability to world (of men).

Financial:- Many lacked money for college fees, transport, accommodation and basic course requirements. Some female-learners chose course because they were awarded sponsorship.

Social-Cultural:- Lack of support from family; Early pregnancies/marriages; balancing pressure from different sources of life militated females from focusing on education.

Religion:- Some female-learners confessed that it would be challenging since as Muslim girls/women they were expected to dress and behave in a certain way.

Mentorship and role-modeling:- Inspiration by WITED-Members, female-professionals as role-models; mentorship and affirmative action.

Attitude and perception:- ME was perceived as easier of SET-courses.

Phobia:- three types of phobia were identified: **Sea-phobia, tech-phobia and exam-phobia.**

Bigotry:- Some females were discouraged by friends/relatives while others worried about not getting employed due to discrimination against women, and working with men (dominate marine-industry) likely to harass them sexually.

Awareness:-Female-learners lacked awareness in career-choices.

5.2 Factors Influencing Retention and Completion Rate of Female-learners in ME

Perception about course complexity/simplicity:-Practical-oriented subjects were preferred to theory.

Course delivery:-Learners suggested areas of improvement.

Industrial Attachment/Internship challenges:- Female-learners faced challenges.

Industrial Attachment Performance:- Female-learners performed excellently.

Performance in examinations:-Female-learners performed better than male-learners in Craft ME, while in seafarers' course females' performance was poor- attributed to lower entry points. Reasons for passing or failing were indicated in findings.

Progression and drop-out:- This was affected by performance in examinations among other factors.

5.3 Strategies for Enhancing Female Participation in SET-Courses

The following were suggested as strategies to improve retention and completion rate geared towards strategies for enhancing female participation in SET-courses;

Financial initiatives

1. Governments should allocate funds for projects geared towards females in SET-courses
2. Governments, NGOs, COL, Industry and stakeholders to offer sponsorship, Scholarships and stipends to assist female-learners.

Curriculum-based initiatives

3. Close monitoring of learners' performance; Arrangements for learners who fail in certain subjects re-do instead of dropping out.
4. Increase course appeal through dynamic, learner-centered and flexible-contemporary teaching/ learning pedagogies[ODL and OER]
5. Practical-oriented short courses tailored for learners talented in psycho-motor activities to avoid mass failure
6. Teacher competence and commitment
7. Conducive learning-environment and well-equipped workshops
8. ODL and OER for learners challenged by time, finances and distance

Learner support strategies

9. Formalized Mentorship Programmes and Customized Learner-Support Systems
10. Sensitization and creating awareness in communities, schools and religious setups
11. Policy-makers involvement and commitment

Intervention initiatives

12. Awareness forums; motivational/inspirational and careers talks on relevance of SET-courses to school girls.
13. Equitable opportunities to female-and male-learners; encourage without forcing them

14. WITED initiatives
15. Guidance and counseling: Females require career, social, moral, and psychological guidance

Collaborative initiatives

16. TVET collaborate with Industry in curriculum development, industrial attachment, job placement and staff training.
17. Collaborative Advocacy and affirmative action by government, TVET Institutions, COL, Industry and WITED Chapters

5.4 Relevance in Female-learners enrolling in SET-Courses with Reference to ME-Learners

5.4.1 Indicators that female in Marine-Courses were relevant to job market

1. Female-learners would become role-models to other girls
2. Female-learners excelled during Industrial Attachment
3. Blue economy is growing; unexploited marine-industry; upcoming seaports; not many female marine professionals in Kenya.

5.4.2 Indicators that Marine-Courses were relevant to future career

1. Marketable and Employable Skills- recognizable internationally; applicable in employment, self-employment, and non-formal sector;
2. Job guarantee ; Upcoming Seaports-a boost to marine-industry
3. Career growth: Respondents said they aspired to upgrade their skills.

5.4.3 How their careers would improve their livelihoods

1. After getting jobs they would sustain themselves, their home/family and community
2. With financial stability they could support less-privileged in society
3. Improved family's living standards.

RECOMMENDATIONS

1. Formulation of WITED clubs for peer support
2. ODL and OER in course-delivery to cater for teacher shortage, broad curriculum, learners who cannot be in college all time.
3. More practical-oriented, Competency-based curriculum
4. Short courses for psychomotor-oriented learners interested in specific skills.
5. Career guidance – To avoid being misled by other incentives (like financial support, sponsorship, scholarships).
6. Financial support for those willing but cannot afford
7. Formalized Mentorship Programmes- Multi-pronged approaches to encompass many learner-support programmes
8. Deliberate gender-mainstreaming strategies to improve participation, retention and completion
9. Monitoring and evaluation, and use of data to guide decision-making, policy-formulation and implementation.
10. Tracer studies to determine course relevance and curriculum review

11. Further research on male-dominated and female-dominated courses/careers
12. Policy-makers and Management involvement and commitment

CONCLUSION

Strategies to enhancement of female access to SET courses should a four-pronged approach aimed at (1) attracting them in, (2) keeping-maintaining them in, (3) escorting them out, and (4) welcoming them back. Firstly there should be strategies to ensure females enroll in SET courses; secondly, strategies for retention and completion; thirdly, strategies to ensure they are absorbed by job-market; and fourthly to integrate them back for career progression and as role-models to prospective female learners for sustainability.

ABBREVIATIONS

ME:	Mechanical Engineering
MTTI:	Mombasa Technical Training Institute
SA:	Seafarers Artisan
STWC:	Standards of Training, Certification and Watch Keeping for Seafarers
SET:	Science Engineering and Technology
WITED:	Women in Technical Education and Development

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