INFLUENCE OF THE MODE OF TRAINING ON THE LEVEL OF SATISFACTION OF MARINE ENGINEERING TECHNICAL AND VOCATIONAL EDUCATION AND TRAINING (TVET) PROGRAMS GRADUATES FROM THE COASTAL REGION OF KENYA

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A THESIS SUBMITTED TO THE SCHOOL OF EDUCATION IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE AWARD OF DEGREE OF MASTER OF EDUCATION IN TECHNOLOGY OF EDUCATION IN THE DEPARTMENT OF TECHNOLOGY EDUCATION (POWER MECHANICS TECHNOLOGY), UNIVERSITY OF ELDORET, KENYA

OCTOBER, 2023

DECLARATION

Declaration by Student

This thesis is my original work and has not been submitted for any other award in this or any other university or institution and shall not be reproduced in part or full or in any format without prior written permission from the author and/or University of Eldoret.

Boniface Omariba

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Declaration by the Supervisors

This thesis is submitted for examination with our approval as the University supervisors.

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DEDICATION

This work is dedicated to my family for their moral and financial support since the first day of my postgraduate studies.

ABSTRACT

The Government of Kenya has instituted rapid and far-reaching reforms in the TVET sector since 2010. Recently, expansion of the marine sector has created a demand for increased manpower in the field of marine engineering. The Government of Kenya has put up training institutes to offer this line of training, mainly in the coastal region of Kenya. Workplace based learning has been made a critical component of any technical training program in Kenya. In terms of exposure to workplace-based learning, there are three competing modes of technical training in Kenya. The apprenticeship, modular and regular programs. This study assessed how each of the three modes of training influences the level of satisfaction of graduates of marine engineering programs from TVET institutes in the coastal region of Kenya. The study was anchored on the Theory of Intuition postulated by the Dreyfus brothers, taking into account Barber's workplace-based learning model. Research design adopted the process of descriptive survey with a quantitative approach. The study area was the coastal region of Kenya. The target population was 425 marine engineering graduates who have spent six months since completing college. Out of these 243 individuals were sampled out for study. The sample determination formula of Krejcie and Morgan was used alongside a process of simple random sampling. The research instrument was a questionnaire. The research instrument was tested for validity through appraisal by research supervisors. Reliability of the instrument was determined by piloting and Cronbach's alpha used in the process. Respondents were categorized by gender and the three modes of training; modular; apprentice and regular programs. Analysis was conducted using a chi-square homogeneity model at five percent level of significance and two degrees of freedom. The model was run on statistical package for social sciences. The hypothesis that all modes of training had an influence on the level of satisfaction of TVET students was proven. The major finding is that students are satisfied with the various modes of training as currently formatted and implemented. There is no need for the government to take extraordinary measures to restructure the programs. However, students universally complained of the poor manner in which colleges provided information on jobs, careers and general counselling and guidance. Further research should be done to establish how best colleges could improve information services on prospective careers.

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ABBREVIATIONS AND ACRONYMNS

CBET – Competence based education and training

D.T.I. - Department of trade and industrialization of the United Kingdom

GoK –Government of Kenya

IET-Institution of Engineering Technologists and Technicians

ILO-International labor Organization

KCNP-Kenya Coast National Polytechnic

KCSE- Kenya certificate of secondary education

KNEC – Kenya National Examinations Council

KNBS – Kenya National Bureau of Standards

KNQA – Kenya National Qualifications Authority

MoE – Ministry of Education

NACOSTI-National Commission for Science and Technology

RPL – Recognition of Prior Learning

STCW- Standards of Training, Certification and Watchkeeping

TTI – Technical Training Institute

TVET – Technical, Vocational Education and Training

UNESCO – United Nations Educational Scientific and Cultural Organization

UOE-University of Eldoret

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CHAPTER ONE

INTRODUCTION

1.1. Introduction

This chapter addresses the background of this study, defines the research problem and sets out the purpose and objectives of the study. It then spells out the research questions together with the hypotheses. It also outlines the justification, significance and scope of the study and discusses its limitations. Further, it curves out a theoretical framework for the study. Finally, it looks at the conceptual framework, and the interaction of variables. The chapter ends with the operational definition of terms used herein and a chapter summary.

1.2. Background

In modern scientific, technical and socio-economic conditions, the main requirements for professional training of a specialist, is to guarantee the formation of a clearly defined level of professional competence (Mazlitdinova *et al*., 2019). Such competence is necessary in securing livelihood in a highly competitive job market (ILO,2012). Many countries consider TVET training as the panacea for economic development and unemployment reduction (MoE, 2013). The United Nations has outlined sustainable development goals (SDG), which must guide the economic endeavors of all member states. Goal number four of the SDGs is on universal quality education and training for decent employment. The SDG 4, reinforces the role of TVET as a critical contributor towards the realization of the wellbeing of a nation, while ensuring that no one is left behind (ILO, 2012; MoE, 2018). The United Nations educational scientific and cultural organization (UNESCO), has outlined a number of steps governments should take in order that TVET training could play a greater role in the realization of SDG 4;

1. Governments should progressively provide free TVET education
2. Governments should ensure accessibility of quality TVET education for all
3. Governments should ensure youth who are either in the formal or informal education system gain competencies relevant to the current workplace and those that will be needed in the workplace in the future.

In order to respond to the call to make TVET programs more relevant to current and future trends in industry, governments all over the world are diversifying their modes of TVET training. The three key TVET training models have taken shape in the past 30 years:

- The regular TVET programs
- The modular programs
- The apprenticeship programs

In the regular TVET program, a student is required to undertake a full course required for the award for a specific vocational qualification. In Kenya, a diploma student in marine engineering would be required to train for three years followed by a single session of industrial attachment towards the end of the program. Under the regular program, all academic units that are required to have been taken to earn acceptance by the relevant professional body, are offered and must be passed. The regular program is considered to confer greater social prestige and opportunities for further education (NCVER, 2002).

In the modular programs, vocational training is split into smaller packages comprising specific skills or competencies. Training for each competency takes a fraction of the time that would be required to attain the full vocational qualification. Under the modular program emphasis is on attaining job readiness in the shortest time possible. A marine engineering trainee in the modular program may enroll for welding and

spend three months to acquire competency in this skill. Such a trainee is then ready to take up employment in the marine workshops as a welder. The student can continue with the rest of the training while under employment. If after many years, the student has undertaken enough modules to earn a diploma in marine engineering, the qualification is awarded by the TVET curriculum development, assessment and certification council (TVET-CDACC) (GoK, 2014).

In the apprenticeship program, trainees are recruited by prospective employers. Training is done on the job; by the process of workplace-based learning (Barber,2003). Trainees are assigned mentors and supervisors in the work environment who should be responsible for imparting skills and relevant knowledge to the apprentice. For any required academic units, trainees are attached to a regular TVET institution where they undertake modular courses in the relevant area (NCVER,2002). Such students are deployed to a TVET institute by the employer to undertake a specific modular course within a specific period and return to the workplace for continued training thereafter. This is the case with the Kenya ports authority, the Kenya navy and the African marine and general engineering company limited (AMGECo LTD).

On the Kenyan scene, Karuru and Nyago (2014) have reported that the introduction of modular system of training has been met with low student enrolment. They argued that while student enrolment in the regular programs remained high, the number of TVET students enlisting for modular programs was below expectation. They attributed this poor enrolment to factors external to the TVET institutes. Some of the factors to blame included; national examination policy; logistics and the structure of modular curricula. They recommended that technical institutes be empowered to examine modular courses and issue certificates, accordingly. They also urged for a

strengthening of the links between the TVET sector and industry to facilitate collaboration in training. This collaboration might prove particularly important for industry workers who need to upgrade their skills through modular training. The latter approach has been successful in more advanced economies such as Australia (NCVER,2002).

A study by the National center for vocational education research (NCVER) of Australia found no difference in employability between modular students and students of the regular program (NCVER,2002). However, modular students were more concerned with the fact that employers found their qualifications difficult to trust, because it did not involve coverage of all requisite academic courses. In the United Kingdom, apprenticeship program graduates have found it difficult to gain acceptance in the relevant professional bodies (Wainaina,1989). This has restricted their employment opportunities to the marine sector employers who have provided them with training. In France, the government had to come up with a blended system of apprenticeship training so as to guarantee local and international professional acceptability for their marine engineers. The blended system ensures students undertake all requisite academic units alongside their workplace-based training (Wainaina,1989).

In Kenya, the mode of technical training has been changed to reflect the increasing premium of workplace-based learning (MoE, 2019). Today, all newly trained college and university graduates in Kenya are encouraged to enroll for internship. The various government employment agencies such as the teachers' service commission (TSC) and the public service commission (PSC) have been in the frontline in providing internship opportunities to fresh graduates. The internship program is supposed to last

at least twelve months. A student who fails to undergo internship is denied registration by their relevant professional body.

In the past, a three-year diploma program, for example, encompassed one term of industrial attachment towards the end of the course. Recently, the government of Kenya has restructured technical training and introduced the modular system of learning. The three-year diploma program has now been split into three one-year modules. Each module comprises two terms of college-based learning and one term of industrial attachment. By the time the student completes their three-year diploma course, they have spent three terms on industrial attachment. A student cannot proceed to the next module unless they have satisfactorily undergone work-based training at their place of attachment.

This expanded workplace -based training initiative has gone side by side with the introduction of competency-based education and training (CBET) mode of technical education in Kenya. The CBET program emphasizes the acquisition of skills or competencies rather than a theoretical knowledge (MoE, 2018). As a program under the overall national TVET initiative, marine engineering has benefited from the policy and legal framework put in place by the Government of Kenya to enhance the quality of technical education. The Kenya national qualifications framework Act No. 22 of 2014 (GoK, 2014), created the Kenya national qualifications framework (KNQF) and set out its objectives. Key objectives of this law included the following:

1. To establish the Kenya national qualifications authority.
2. To establish standards for recognizing qualifications obtained in and outside of Kenya.
3. To develop a system of competence, lifelong learning and attainment of national qualifications.

4. To align the qualifications obtained in Kenya with the global benchmarks in order to promote national and transnational mobility of workers.
5. To strengthen the accreditation, quality assurance, assessment and examination systems for national qualifications.
6. To facilitate mobility and progression within educational, training and career paths.

The KNQF is a learning outcome-based qualifications framework, comprising of all educational and training sectors and all forms of learning; formal, non-formal and informal learning. The KNQF covers all forms, levels and categories of education and training provided by the public and private sectors in Kenya. It is guided by the principle of inclusiveness, targeting all areas of general education and training. It encompasses vocational training, higher education, lifelong and out of school learning or non-formal education. It also covers other forms of learning such as open, distance and e-learning programs. The scope of the KNQK is outlined in the KNQF handbook (KNQF, 2018)

The qualifications recognized in the KNQF are classified based on a number of principles:

1. Categorization according to sector: - schools sector, vocational and technical sector, University education sector.
2. Categorization according to level of qualification; - the levels of qualification such as craft certificate, diploma and degree, are differentiated according to the breadth, depth and complexity of knowledge and skills that are included in the various qualifications.
3. Categorization on the basis of interrelatedness; - all qualifications in the KNQF have a purpose and are interrelated to each other, this provides for

articulation from one qualification to the other by recognition of prior learning.

The purpose of horizontal and diagonal articulation is to facilitate learner mobility and progression along the framework as efficiently as possible. It can also be used to admit into the system those learners who do not meet the full entry of academic qualifications for their target programs. The KNQF is designed to be the space for the recognition of prior learning [RPL] [KNQF, 2018]. Kenya is a regional leader in educational reforms and is supplying human resources to countries in the Eastern African Region [MoE, 2018]. Use of competency-based education and training [CBET] will help improve the competitiveness of Kenya in the regional and international labor markets, thereby contributing to the county's foreign exchange earnings and economic growth.

Marine engineering is rapidly gaining importance in Kenya because of a recent expansion in national and regional maritime activity. Kenya has commissioned a second port in Lamu and expanded the port of Mombasa. The railway system has also been extensively revamped to expedite evacuation of cargo from the ports and create an opportunity for intensified port activity. Like the Mombasa harbor, the Lamu harbor has deep and capable of accommodating large ships with a capacity of up to 17,000 twenty-foot containers. The largest ships in the world carry about 20,000 twenty-foot containers. Lamu port is one of those with such capacity in the east African region. This facility is therefore earmarked to decongest the port of Mombasa in the region. Large ships that are unable to dock in the other ports but with cargo destined for those ports will dock at Lamu, then offload their cargo for onward transfer to their ports of destination. Apart from intensifying marine engineering activity in Kenya, this will do the same for the East African region by increasing the

number of coasting vessels. Coasting vessels are those that ply their trade exclusively along the local or regional coastline. They do not venture into deep sea long distant voyages [Wainaina, 1989]. Such vessels are likely to rely almost exclusively on locally sourced marine engineers and technicians. These developments have resulted in an increased demand for well trained and industry ready marine engineering technicians and engineers.

Globally, the world bank (2002), ILO (2012) and UNESCO (2017) have reiterated that the only way to ensure quality and relevance in technical education is to put emphasis on workplace-based learning. However, it is not clear if the newly instituted workplace-based learning measure are bearing fruit. It must also be noted that prior to the reforms in technical education, there was an apprenticeship system of marine engineering training which was quite effective (Wainaina, 1989). The system was based on the stipulations of the department of trade and industry (DTI) of the United Kingdom. This system of marine engineering training was largely industry centered.

A number of the ship owning companies based in Mombasa, together with the Kenya Ports Authority, the Kenya railways and the Kenya navy owned their own training facilities. These institutions recruited trainees and subject them to an apprenticeship-based training that was intensely workplace based, quite effective and internationally recognized. The industry also worked closely with the national polytechnics in Mombasa and Nairobi where they posted the more academically gifted of their trainees for diploma education in mechanical or electrical engineering. These institutions trained according to their manpower needs hence, there was no wastage of skilled manpower through unemployment.

Recent reorganizations instituted by the government of Kenya in the TVET sector, marine engineering training included, may have undermined this highly effective

mode of technical training .This study will seek to determine how the expanded industrial attachment programs put in place as part of the national reorganization initiative are influencing the industry readiness of technical trainees; and, whether it constitutes an adequate substitute for the apprenticeship programs it may replace or compete with.

Although it is accepted that workplace-based learning by itself does not constitute an adequate formal training program, it forms an important constituent of most training regimes. The purpose of any workplace-based learning or industrial attachment, where apprenticeship is not possible, is to provide the learner with practical technical skills. Barber [2003] defined practical technical skills as the ability to use tools effectively and in an efficient manner. It has also been defined as the ability to diagnose a technical problem, prescribe a procedure for solving it and carryout that procedure, resulting in a solution to the defined problem (Anderson *et al*., 1995).

While some may hold that a simulated workplace environment such as a school workshop or laboratory may be adequate to teach practical skills, the process of learning by doing works best in the real workplace environment (Anderson et al., 1995). According to Carl Rodgers (1961; 1983), learning by doing is a powerful method of skill acquisition because it is self-directed and involves experiential learning. Experiential learning has been defined as learning by going through the challenges of the actual work environment. Since industrial attachment is valued as an opportunity for technical trainees to acquire workplace experience during their college education, TVET trainers have an interest in the way learning occurs during this period of placement.

1.3. Statement of the problem

Karuru and Nyago (2014) reported that the newly instituted modular mode of technical training in Kenya has been met with low levels of student enrolment. They blamed the structure of the modular curricula, among other challenges. Other workers have raised concern about the inability of professional engineering bodies to accept graduates who have undergone both modular and apprenticeship training (Wainaina,1989). In other countries such as Australia where modular programs and apprenticeship have been in place for much longer, no significant difference has been noted between the regular, modular and apprenticeship modes, in terms of their level of acceptability to students. Yet, the problem of low enrolment continues to bedevile in modular programs. There is need to find out exactly what is causing the low enrolments in recently introduced modes of TVET training in Kenya. This study will assess the comparative level of satisfaction of TVET graduates with the various modes of training in order to determine if anyone of them is least preferred among student clients during course selection. The government might then be advised on where and how to institute further reforms. Table 1.1 shows the enrollment of marine engineering students for maritime institutions in coastal region, Kenya.

Table 1.1 Marine engineering student enrollments in coastal region institutions

Institution	Level	2018/19	2019/20	2020/21
Technical university of Mombasa	Degree	90	120	120
	Diploma	85	90	170
Kenya coast national polytechnic	Craft	150	120	130
	Artisan	14	10	12
Bandari maritime academy	Diploma	30	27	45
	Craft	22	15	18
TOTAL		391	382	495

Source: Individual institutions 2021

1.4. Purpose of the study

The purpose of this study was to determine how the mode of training influences the level of satisfaction of marine engineering graduates of TVET institutes in the Coastal Region of Kenya.

1.5. Objectives of the study

The main objective of the study was to assess how the mode of training influenced the level of satisfaction of marine engineering graduates with reference to their onset expectations after training.

The specific objectives of the study were:

1) To assess how the modular system of training influences the level of satisfaction of marine engineering graduates of TVET institutes in the coastal region of Kenya.

2) To assess how the regular system of training influences the level of satisfaction of marine engineering graduates of TVET institutes in the coastal region of Kenya.

3) To assess how the apprenticeship mode of training influences the level of satisfaction of marine engineering graduates of TVET institutes in the coastal region of Kenya.

1.6. Research questions

The following are the research questions that guided the study:

1) How does the modular system of training influence the level of satisfaction of marine engineering graduates of TVET institutes in the coastal region of Kenya?

2) How does the regular system of training influence the level of satisfaction of marine engineering graduates of TVET institutes in the coastal region of Kenya?

3) How does the apprenticeship system of training influence the level of satisfaction of marine engineering graduates of TVET institutes in the coastal region of Kenya?

1.7. Null hypothesis

The presumption was that graduates of the three modes of training of both male and female genders were homogenous in so far as their level of satisfaction was concerned.

1.8. Justification of the study

Kenya is presently experiencing a rapid expansion of the marine sector. The construction and commissioning of the new Lamu port and the recent expansion of the Mombasa port have reinvigorated the sector, creating an expanded demand for skilled manpower in the field of marine engineering.

Marine engineering training in Kenya since pre-independence (Wainaina, 1989), but was based on apprenticeship and followed the British department of trade and industry curriculum. This approach was quite effective in delivering industry ready marine engineers and technicians. The government of Kenya is presently

revolutionizing the TVET sector so as to make it more responsive to industry needs both locally and internationally. Emphasis is being shifted to flexibility for inclusivity. However, these efforts have not yielded the response envisaged by the government. Newly introduced modes of training have suffered low levels of enrolment. It was considered important to assess how the various modes of training were influencing student satisfaction and hence relate if the findings are connected to the low enrolment.

1.9. Significance of the study

The purpose of the study was to create knowledge required by policy makers in the TVET sector to realign the training process of marine engineering and trainees to make it more relevant to the needs of job market. It was also meant to provide TVET based training planners with the information they needed to realign their internal marine engineering training processes.

1.10. Scope of the study

This study was focused on the determination of how the mode of training influenced the level of satisfaction of marine engineering TVET students in the coastal region of Kenya. Only the 425 marine engineering graduates that have been out of TVET colleges for the past six months were involved in the study. There are many TVET institutions in the study area which, despite not offering marine engineering, do offer the other more conventional engineering courses such as electrical, electronic and mechanical engineering. The TVET institutions also offer a myriad of other courses.

1.11. Assumptions

The assumption was made on the information given by respondents to be true. It was also assumed that data provided on enrolment by sampled institutions to be accurate.

1.12. Limitations

This study aimed to generate knowledge that was potentially generalizable to reflect the influence of the mode of training on the level of satisfaction of marine engineering graduates of TVET institutions throughout the republic of Kenya. Yet, the study was conducted in just one of the eight regions of Kenya in a very limited number of technical institutions. This could create biases. Furthermore, the target population was fairly small and the institutes were purposively selected. This is a potential recipe for biases. Attempts were made to avoid biases by resorting to as much random sampling as was feasible.

1.13 Theoretical framework

The study is anchored on the theory of intuition postulated by the Dreyfuss brothers in **1980** (Dreyfus, 2004). The duo developed the five-stage model of adult skill acquisition which is relevant to the study of marine engineering education and training in Kenya, today. According to this model, a student enters marine engineering training as a novice. A novice is one who is unskilled and unlearned in a trade. After some course work the novice graduates into an advanced beginner. The advanced beginner has theoretical knowledge but lacks competence in practical skills. The advanced beginner is posted out by the college for industrial attachment where they begin their long journey of work-based learning.

After a period of industrial exposure, the learner acquires competence. A competent marine engineering technician is one who has the capacity to perform a number of skilled tasks based on knowledge acquired through learning from demonstrations. In Kenya, such a worker normally qualifies for the award of Government Trade Test Grade III. This is the equivalent of an Artisan Certificate from the TVET system. Dreyfus postulated that such a technician has the capacity for situational recollection. The worker recalls a procedure they have seen being performed when stimulated by a trigger in the environment. The worker is then able to apply the procedure to solve a similar problem.

If the worker has the requisite intellectual capacity, they will continue with the work-based learning until they acquire proficiency. A proficient marine technician has two fundamental abilities; to recognize an engineering malfunction and to carry out a raft of well recognized procedures for correcting that malfunction. They are not required to carry out problem diagnosis to determine the root cause of a problem. Such technicians qualify for the award of Government Trade Test Grade II. This is also the equivalent of a TVET Craft Certificate. Dreyfus postulated that such a technician has capacity for holistic recognition.

If they have the intellectual capacity and interest, they continue with work based and academic learning to the level of master. A master marine technician is responsible for problem diagnosis and definition and the prescription of a procedure for addressing the problem or malfunction. A master marine technician is usually the frontline coordinator of works either in the marine workshop or on a ship (the “charge hand”). This individual qualifies for the award of a Government Trade Test Grade I. This is also the equivalent of an ordinary TVET diploma. Dreyfus argued that such a worker has the capacity for intuitive decision.

A few, very intellectually gifted learners, are able to continue with training up to the expert level of qualification. Sometimes the malfunction or problem witnessed is of a type that has never been experienced in this setting before. That means there is no ready method of diagnosis and no developed procedure for addressing the problem. A marine engineering expert is uniquely placed to be able to innovate and develop a new analytical tool for such a unique problem. They should also be able to develop procedures of solving such unique and difficult problems. Above all, the expert must train their subordinates on how to apply the new tools they have developed. They must also supervise and oversee the application of all procedures by their juniors. This individual normally holds a University degree in marine engineering and is a Certified Marine Engineering Professional. According to Dreyfus such a worker has absorbed awareness.

Barber (2003) conducted an investigation to determine how learning occurs in the workplace by attaching himself to a mechanics workshop for a period of five weeks. This is similar to an industrial attachment for a college trainee. During his attachment, Barber realized that the learning of technical skills in the work environment occurs in three dominant ways:

1. Repetitive learning
2. Technical rationality
3. Problem defining.

Repetitive learning

This is the most basic form of skill acquisition. It involves learning a skill by observing it carried out by a skilled person. The learner then repeats the procedure as carried out by the skilled person until they have acquired competence. This essentially involves learning by watching a demonstration. This method of learning does not

require the learner to have an in-depth knowledge of the theory surrounding the procedure being learnt. This approach has been used extensively for training persons with limited academic qualifications. In the Kenyan TVET setting, there are students of artisan, craft certificate, diploma and degree levels. Artisan level trainees usually have a fairly low level of education and are not taught in-depth scientific and engineering theory in college. Repetitive learning therefore suits them best.

Craft certificate trainees have certain level of academic qualifications and are offered a reasonable level of theoretical knowledge at the technical college. That is also true with diploma and degree level trainees. Such trainees, a part from learning by the repetitive learning process could benefit from other forms of training.

Technical rationality

This mode of learning requires the trainee to have a working theoretical knowledge of science behind the procedure earmarked for learning. The learner is required to reflect on the problem they wish to solve in such a manner that their theoretical knowledge is applied to recognize why the problem exists. They should then use the theoretical knowledge to come up with a plan on how to solve the technical problem. A person who is able to learn by the process of technical rationality is called a reflective practitioner [Schon, 1983]. Reflective practitioners are in a higher technical capability level than those able to learn only by the repetitive learning method. This type of learning works best for craft certificate holders, technicians at this level are expected to perform two tasks:

1. Prescribe a procedure for solving a problem that has already been diagnosed by a higher-level practitioner;
2. Apply the procedure to solve the problem.

This kind of learning results in technical proficiency [Dreyfus and Dreyfus, 1986].

Problem defining

In this mode of learning, the practitioner applied knowledge to try where the technical problem might lie. The underpinning theoretical knowledge is reflectively applied in a trial and error manner such that the various components of the problem are brought to the forefront, reflected upon then discarded.

As the puzzle is worked through, the knowledge accumulated through the reflective process is added to the available store of knowledge until past experience combines with intuition to suggest a probable cause of the original problem. The whole process incorporates a high operational level of theoretical knowledge combined with experience and intuition. Once the problem has been defined, lower levels of skills acquisition such as technical rationality and repetitive learning are brought to play to finish off the process. This kind of knowledge is called tacit knowledge (Polanyi, 1967; Argyris and Schon, 1978). It is a type of learning restricted to highly knowledgeable practitioners such as ordinary diploma holders.

The learner is supposed to perform three functions;

1. Diagnose the problem
2. Prescribe a procedure for solving the problem
3. Carry out the procedure to solve the problem.

This kind of learning results in technical Mastery (Dreyfus and Dreyfus, 1986).

Patel et al. (1999) argued that this type of learning is dependent on experiential knowledge which is only gained through either extensive scientific training or experience. Both technical rationality and problem defining require in-depth scientific

knowledge, but reflective ability is paramount. People operating at this level are required to think critically in order to diagnose the problems at hand.

Benefits of workplace skill acquisition

Barber (2003) outlined a number of benefits associated with workplace skill acquisition:

1. Skill acquisition strategies are problem based.
2. Technicians and engineers are accorded ample time to practice the process of reflection.
3. The skills acquired are suited to the capabilities and/or limitations of the workshop equipment available.
4. Development of social skills.

1. Skill acquisition strategies are problem based

The technician has a real problem to solve under real work place constraints such as time, customer billing, equipment available in the workshop and production policies of the workplace. Legal and government policy constrains also impact the problem solution process. The worker is also highly motivated to come up with a solution. Again, there is a supporting social environment as the trainee is surrounded by many experienced practitioners and mentors (Reynolds et al., 2002).

2. Ample time for reflection

Work conducted in the workplace often demands a high level of critical thinking and advanced levels of problem-solving strategies. The reflective process is an important aspect of problem solving in two of the three types of learning; scientific rationality and problem defining processes. The reflective process has been pointed out by

researchers as an important step in passing from novice to master (Dreyfus and Dreyfus, 1986).

3. Learned skills suited to capabilities and limitations of the workplace

This makes work faster and easier. It also encouragers the acquisition of specialized knowledge. However, Billet [1994] has argued that there may be a disadvantage to the acquisition of a skill set that is narrowly focused to a particular workplace.

4. Development of social skills

Engestrom and Middlestrom (1996) advanced the concept of communities of practice. People in a given wok environment quickly develop camaraderie and become a team. In these circumstances, a learner is likely to benefit from technical mentorship and skills demonstrations. However, Barber (2003) has reiterated that a student arriving at the workplace or industrial attachment needs to have acquired a certain set of social skills necessary for the trainee to fit in the community of practice. These skills include sensitivity and tolerance to gender, religious and racial differences. Persons with disability should also be tolerated and respected. The learner should also be familiar with the value of reciprocated respect. Self-discipline, a positive attitude towards work, work commitment and pecuniary discipline are also important.

According to Barber (2003), where a student lacks the necessary social skills they may be locked out of the Community of Practice and denied an essential opportunity for on the job learning by peers and mentors.

In the context of this study, learners were assumed to be likely to experience a high level of dissatisfaction with their mode of training if it turned out that their technical capabilities were below expectation of prospective employers.

1.14. Conceptual framework

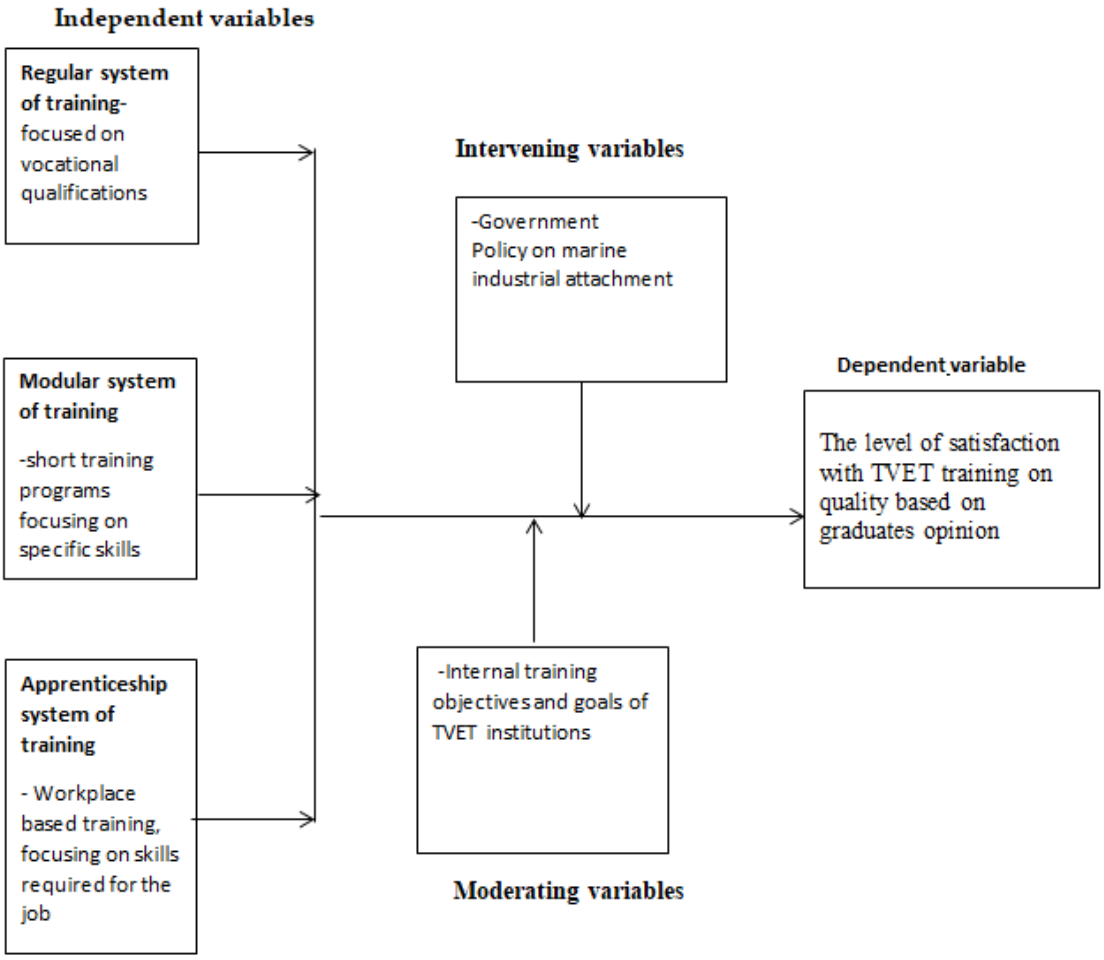

Figure 1. Conceptual Framework

Source: Researcher 2022

1.14. Interaction of variables

There are four cadres of variables in any inquiry. These are:-independent variables, dependent variable, moderating variables and intervening variables.

1.14.1 Independent variables

These are the variables that affect and explain the dependent variable directly.

In a formal study, independent variables are constructed in line with the research questions the researcher seeks to answer.

1.14.2 Dependent variable

A study usually seeks to establish if and how the independent variables impact upon the dependent variable. The dependent variable is the phenomenon whose cause or dynamics the researcher seeks to understand. The dependent variable is usually closely linked to the purpose of the study.

1.14.3 Moderating variables

A moderating variable influences how the independent variable impacts upon the dependent variable of any study. The influence is however non-compulsating.

1.14.4 Intervening variables

These are intermediate variables that stand between the independent and dependent variables. Unlike moderating variables, intervening variables have a strong, compulsating effect on the relationship between the independent and dependent variables.

In this study all the four categories of variable were present.

Level of satisfaction of marine engineering students of TVET institutes in the Coastal Region of Kenya was the dependent variable.

The study had 3 objectives, 3 research questions and 3 independent variables. The independent variables revolved around the mode of training; whether regular, modular or apprenticeship based. The independent variables were anchored on the five-stage model of adult skill acquisition developed by the Dreyfus brothers in 1980 (Dreyfus, 2004) as guided by Barber's (2003) three mechanisms of acquiring practical technical skills in a workplace scenario.

Government policies and the legal framework surrounding TVET sector activity in Kenya constituted the intervening variables.

The internal institutional factors that affect the level of student satisfaction constituted the moderating variables. Even though these factors are important they can be varied and managed internally, unlike the government policy and legal framework variables which are external to the institution and must be complied with. Karuru and Nyago (2014), argued that student satisfaction was mostly influenced by factors external to the institution.

1.15. Operational definition of terms

Marine Training- this a training in which its career path is regulated by maritime sector.

Maritime Organizations-in the context of this study, these are organizations in the maritime sector which have internal apprenticeship training programs

Industrial Attachment –the specified period a trainee is assigned to learn in the field within a fixed training schedule.

Technical Training-the process of conferring skills of a scientific and practical nature to trainees

National Polytechnic- the highest ranked middle level institution in technical training.

Modular System-the mode of training where a program is split into a stand alone modules

Regular System-the system of training where students undergo one term of industrial attachment at the end of their training program

Apprenticeship Mode of Training-workplace based technical training commonly carried out by businesses in the maritime sector to address their manpower needs.

1.16. Summary

This study addressed the problem of limited enrolment by TVET students in modular programs across Kenya. The purpose of this study is to determine how the mode of training influences the level of satisfaction of marine engineering TVET institution graduates the coastal region of Kenya. The objectives of this study were; to assess how the modular system; the regular system; and, the apprenticeship mode of training influence the level of satisfaction of marine engineering graduates of TVET institutes in the Coastal Region of Kenya.

It was considered important to assess how the various modes of training were influencing student satisfaction and thereby determining if relationship existed with concerns of low enrolment into different programs. The information generated in the study should help policy makers both at the institutions and national government level to find mechanisms for making TVET training more responsive to the needs of students. The study was limited to marine engineering students and institutes in the Coastal Region of Kenya, creating a recipe for biases. Randomization of data collection was done to minimize biases during sampling. The study was anchored on the theory of intuition by the Dreyfus brothers. The dependent variable was the level of satisfaction exhibited by marine engineering students. The three independent variables included regular mode of training; modular training and apprenticeship training. Internal factors to the TVET institutions constituted moderating variables while external factors such as government policy and regulations made up the intervening variables.

CHAPTER TWO

LITERATURE REVIEW

2.1. Introduction

This chapter examines the literature associated with the influence of the mode of training on the level of satisfaction of marine engineering TVET graduates with their TVET training. It examines the conceptual, contextual and empirical literature. The literature review is organized in line with the three objectives of the study.

2.2. Modular system of marine engineering training

In 2014, the government of Kenya introduced the Kenya national qualifications Act No. 22 of 2014 (GoK,2014). This act brought with it a new national framework for qualifications, the Kenya national qualification framework (KNQF). This framework was meant to be a learning outcome-based qualifications framework. It encompasses all forms of learning; formal, non-formal and informal learning. This framework is guided by the principle of inclusivity, targeting persons involved in all modes of education and training; including regular, modular and apprenticeship modes of technical training (KNQF Handbook,2018). The KNQF was designed to build flexibility into a system that would otherwise remain too rigid and too crude to accommodate the great diversity of programs and qualifications already being offered across the higher education and technical bands in Kenya. It was also meant to facilitate admission into the system those learners who did not meet the full admission requirements for vocations of their choice (MoE,2019; MoE,2020). It was further, designed for both diagonal and horizontal articulation between existing systems so as to facilitate learner mobility and progression along the framework as efficiently as possible. However, the modular aspects of technical training under this framework has met with implementational challenges.

It has been found that in order to introduce flexibility in TVET training and reduce the number of mature students who fail to complete their vocational training, a modular approach should be adopted (ILO,2012). Under a modular training system, vocational programs are split into smaller units or modules that address specific skills requirements. A module takes between three to twelve months to complete. Upon the completion of a given module, a TVET trainee is ready to apply the skills acquired in self or formal employment. The remaining units required to make up the complete vocational training program can be undertaken while the trainee is under employment. The modular program therefore saves time, introduces the flexibility needed by mature students , reduces the load of work a student must face at any time and brings the element of early employability of skills in the economy (ILO,2012;World Bank, 2010; NCVER, 2002, Karuru and Nyago, 2014). Many countries across the world introduced modular training programs in their TVET systems soon after the formulation of the sustainable Development Goals (SDGs) by the United Nations (UNDP,1992). Goal number four of the SDGs is on universal quality education and training for decent employment.

Mazlitdinova *et al*. (2019), argued that in modern scientific, technical and socioeconomic conditions, the main requirements for professional and technical training is to guarantee the formation of a clearly defined level of professional or technical competence. The concept of clear definition of the level of professional or technical competence has been understood by prospective employers and professional bodies to mean possession of a vocational certificate from a reputational examination body (Wainaina,1989). A vocational certificate can only be issued after a trainee has completed the entire professional or technical program. For example, a marine engineering degree certificate can only be issued to a trainee who has undergone the

full five-year degree program (in Kenya). This notion has created fundamental challenges for modular programs which involve piece meal training. A modular student of marine engineering may have just covered marine architecture in their module and is ready for entry into the job market, but cannot be accepted into the relevant professional body; neither can they be accepted by employers who ascribe to Mazlitdinova's postulation of professional qualification.

The twin challenges of professional bodies and employer acceptance might have discouraged enrolment into modular programs in Kenya (Karuru and Nyago, 2014). This problem has also been reported in the United Kingdom (Wainaina,1989). However, in Australia, despite slightly lower self-esteem reported in module program graduates as compared to those of regular programs, no significant difference in employment acceptability has been noted (NCVER,2002).

Most studies in Kenya have been based on the situation at the training institute level where challenges of enrolment were noted (Karuru and Nyago, 2014; Gacheru, 2020). However, very few studies have followed modular program graduates into the job market. This study involved the interview of modular program graduates of TVET institutes in the coastal region of Kenya on their level of satisfaction with their TVET training, six months after completion. The six months was considered appropriate due communication links as some used parents/guardians contacts during registration.

2.3. Regular system of marine engineering training

The Government of Kenya views a strong TVET system as an enabler of the big four agenda and vision 2030, the realization of the sustainable development goals of the United Nations, and agenda 63 of the African Union (MoE, 2019). The drastic changes in technology and innovation have created the need to prepare both workers and trainees for dual and lifelong learning. In addition to technical skills, trainees also

need to learn other skills such as employability, adaptability, entrepreneurial skills, learning to learn, environmental protection and soft skills. All these are necessary to prepare them for the future job market and enable them to cope with technological changes (MoE,2018, MoE,2019).

While Kenya has been experiencing increasing unemployment among the youth, the government has been banking on the TVET system to provide solutions to the problem of escalating unemployment. As a result, a wide diversity of regular TVET programs have been introduced in over 300 technical institutes across the country. In a regular program, the trainee undertakes the full training required for the award of a given vocational qualification in one piece. A diploma seeking marine engineering student, for example, would be required to study for three years. A university degree seeking student of marine engineering, in Kenya, would be required to study for five years (Waunaina,1989).

The regular program has been praised by researchers as having two fundamental advantages over the modular and apprenticeship programs; the qualifications are easily recognized by professional bodies and, the qualifications are trusted by employers. There is also the added value of international acceptability. However, a number of shortcomings have bedeviled the regular mode of training, in a large number of countries across the globe (World Bank, 2002).

Kenya's sessional paper No.1 of 2019 (MoE, 2019), identified several challenges that continued to frustrate the utility of regular TVET training as an employment creator within the economy. There were challenges of quality assurance, the manner in which the curriculum was designed, the manner in which the curriculum was delivered, the lack of harmonization and poor linkage with industry (MoE, 2019; ILO, 2012; World Bank,2002). Gacheru (2020), reported that university level learners had poor

perception of technical courses being offered to them. Wahungu (2020), argued that stakeholders, including prospective employers had difficulties understanding some of the new training approaches and qualifications in the TVET system. Research has shown that the rapid expansion of the TVET sector in Kenya is affecting the quality of training since the government has not been able to cope with infrastructure needs (MoE, 2018). Hiring of TVET trainers has also continued to lag behind the expanding rate of enrolment (MoE, 2019).

These challenges may be affecting the level of satisfaction of graduates of regular programs from TVET institutes. This study was designed to engage regular TVET marine engineering program graduates who had been in the job market for six months in order to determine how their choice of mode of training had influenced their level of satisfaction with TVET training in Kenya.

2.4. Apprenticeship system of marine engineering training

The training of marine engineering in Kenya has in the past been industry based and apprenticeship oriented, but with access to government of Kenya owned national polytechnics for any academic back up. According to Wainaina (1989), the key players in the industry generally had their own training programs which served their human resource development purposes. Surplus manpower was made available to the smaller players in the industry who could not train their own marine technicians. Training of higher-level professional personnel had to be carried out abroad, usually in the United Kingdom. The following technical skills were given priority in the training of marine artisans and technicians:

1. Diesel fitter
2. Machinist
3. Electrician

4. Radio technician
5. Carpenter
6. Platter
7. Welder
8. Plumber

Industry players such as the Kenya ports authority, the Kenya navy, the Kenya railways, African marine and general engineering company limited and the southern marine engineering company limited recruited apprentices for on the job training within their facilities. Recruits were required to have completed secondary education and earned a third division or the equivalent of present day, K.C.S. E (C-). The apprenticeship programs proceeded in stages similar to those propounded in Dreyfus' five stage skill acquisition model for adult learners (Dreyfus, 2004).

The recruits were required to have obtained at least a credit in mathematics, english and one science subject. They were taken for a twelve-months theory course that focused on mathematics, sciences (physics and chemistry), english and basic engineering concepts. Usually, the best two trainees who demonstrated a special acumen for engineering training were sponsored by the training organization to pursue an ordinary diploma in engineering at the then Mombasa polytechnic or Kenya polytechnic. The rest of the trainees were subjected to an elaborate apprenticeship program aimed at producing skilled artisans.

The trainees were first divided into two groups based on their individual interests; marine afloat and marine dockyard groups. The marine afloat group was trained to work in the floating craft [ships] in various capacities. They became the operational group who engaged in running the marine engines in all floating craft.

The marine dockyard group was trained to work in the marine workshops which provided support for ship and boat operations. The workshop staff engaged in both planned and breakdown maintenance of all marine craft. This group carried out maintenance of both hull and engine.

2.4.1 Work based training of the marine afloat group

Recruits joining the marine afloat group were taken in as greasers and learned the operations of the engine, on the job, for one year. After this first year of practical training, they were allowed to sit the junior engine room assistant examinations.

This qualification was equal to the Kenya government trade test grade III certificate. In the modern TTI model, this level is equivalent to the Kenya National Examination Council (KNEC) artisan certificate.

Those who passed this examination were promoted to the position of junior engine room assistant. They served in this position for two years as they underwent on the job skills training by their superiors.

After the two years they were subjected to the engine room assistant examination. those who passed this examination became engine room assistants. This level of qualification was equivalent to the government trade test grade II certificate. In modern TTI based training this level is equivalent to the KNEC craft certificate.

They were required to serve in this position for a further two years before being allowed to sit examinations and acquire the third class [foreign going] certificate. This was the highest achievement under the apprenticeship program. It was equivalent to government trade test grade I or the ordinary diploma in Marine Engineering.

The third class [foreign going] Certificate allowed them to serve in the capacity of senior engine room assistant or assistant foreman.

2.4.2 Work based training of the marine workshop group

Meanwhile, the group that joined marine workshop training went through the following process:

They joined the marine workshops for a one year, on the job training program. This allowed them to take the government trade test grade III in their respective specialties [welding, carpentry, plumbing among others.] This qualification was equivalent to the TTI model's Artisan Certificate.

Those who passed the examination were promoted to the position of Assistant Artisan. They served in this position for another two years before being allowed to take the government trade test grade II examinations. This qualification was equivalent to the Craft Certificate under the TTI model. Those successful were promoted to the position of skilled artisan.

After another two years of on the job training, these artisans were allowed to take the government trade test grade I examinations. This was equivalent to the ordinary diploma in marine engineering in the TTI model. This qualification allowed them to serve in the position of assistant foreman or the "charge hand". This is the person in-charge of a particular trade in the marine workshop. They may be responsible for welding, plumbing, electrical works etc.

Meanwhile the top two students who had been sponsored to undertake ordinary diploma level training at the polytechnics returned to the workshop as assistant foreman or in the shipping services as the third-class foreign going engineer.

A foreign going engineer is allowed to serve in a ship involved in deep sea voyages which may include service in some very large ships.

A few intellectually gifted among these qualificants then began their journey towards becoming the certified marine engineer.

2.4.3 Education and training of seafaring marine engineers for Kenya

Seafaring means the ships the officer is qualified to operate can be involved in deep sea voyages associated with international trade. The training program of such officers for Kenya was based on the British system. It generally followed two systems:

Recruits had to have undergone twelve years of education ("O" levels education) and passed with a 1st or 2nd division (the equivalent of K.C.S.E. C+ grade attainment). The applicants were required to have distinctions and credits in at least six subjects in which Mathematics, Physics, Chemistry and English were mandatory. Alternatively, an "A" level qualification with at least one principle pass in Mathematics or any Science subject and two subsidiary passes was necessary. Training was done in the United Kingdom in one of several British Marine Engineering Institutes. Such institutes included the South shields marine and technical college in England and the Glasgow college of nautical studies in Scotland.

Training of the professional marine engineers occurred in three stages very much like the training of professional Accountants.

Phase I

College entrance examinations had to be done and passed, even by those who had attained ordinary diploma qualifications in the Kenyan system. The students had to pass English, Mathematics as well as oral and medical examinations. In phase I, training occurred in the college setting. The program took twelve months and involved both theory and practical. At the end of these first twelve months, the cadets were awarded a Department of Trade and Industry (D.T.I.) of the United Kingdom recognized ordinary diploma in marine engineering. This individual had the same qualifications as a junior engineer (Third Engineer in a foreign going ship or a Fourth Engineer in a very large seafaring vessel).

Phase II

This training phase was conducted at sea and the cadet had to spend at least 10 of the 12 months on a foreign going commercial ship with a propulsive engine power of 3000KW and above. These are very large ships. This training phase was characterized by a cadet's record book. In this book various tasks of definite significance to marine engineering were listed down and had to be countersigned by the chief engineer upon their satisfaction that the cadet had performed the functions satisfactorily. The phase also encompassed a correspondence course which was posted to the cadet from their previous college. The course covered three key areas; engineering knowledge, electro-technology and naval architecture. The correspondence course was sent to the cadets in units and questions were enclosed at the end of each study unit.

The cadet was to try and answer the questions on their own. Where great difficulty was experienced in answering the questions, the second engineer or chief engineer would try to help the cadet understand the course material, but not to provide them with answers to the questions. The final answers to the correspondence material were discussed by the second and chief engineer before being passed on to the ship captain for posting to the college.

The corrected papers and the next course material, arriving from the college, were posted together through the ship's captain and then the chief engineer to the cadet. Once again, the second engineer or the chief engineer took time to discuss the assessments with the cadet and help them plan the course of study for the next unit. The cadet who successfully completed Phase II qualified to rise up to the level of a second engineer if they passed the second engineer's parts A and B examinations of the department of trade and industry of the United Kingdom.

Phase III

The cadet, having completed the mandatory twelve months in a large foreign going ship, transferred to a suitable marine workshop for the next phase of workplace-based learning. Such a marine workshop had to have dry docks. In this workshop, the cadet spent the next six months. Next, the cadet had to spend another twelve months on marine academics to polish any unclear theory studied by correspondence while at sea. Alternatively, the twelve-month period was spent simultaneously on practical workshop training and college academics. This model was only possible if the college was suitably equipped for marine engineering workshop training. A third alternative existed where a sandwich program was worked out. The sandwich course required two days a week in class for theory and three days at the marine or heavy-duty mechanical engineering workshop for practical training.

In all cases, the greater emphasis was given to practical aspects of the training. A cadet who successfully completed phase III qualified to serve as a chief engineer if they sat and passed the parts A and B of the chief engineer's examination of the British department of trade and industry (D.T.I)

What comes out of this discourse is that the training program for marine engineering technicians and professionals had a set of characteristics:

1. A strong practical orientation.
2. Close articulation between training institutes and the maritime industry.
3. Policy and legal obligations of industry personnel to train interns.
4. Training for available positions.
5. Strict compliance with international standards.
6. High and strict minimum entry requirements.
7. An elaborate apprenticeship structures.

8. An elaborate qualifications and grading framework.

Despite such an elaborate structure, researchers have reported that the apprenticeship program has faced challenges surrounding the acceptance of qualificants by the various professional engineering bodies (Wainaina,1989).This has prompted some authors to recommend that the marine sector players accepting students for apprenticeship should admit holders of regular program qualifications from TVET and University institutions. Such persons are already suited for acceptance into the professional bodies, except that their practical knowledge and experience is limited. Wainaina (1989) advised that shipping companies seeking to train marine engineers through apprenticeship should admit holders of university degrees in mechanical and electrical engineering, then take them through an apprenticeship program to gain the necessary practical skills. For Universities offering marine engineering degrees such as JKUAT, students would enter marine engineering apprenticeship at a higher level.

Because apprenticeship trainees are usually under employment or expecting employment with designated agencies, it is hypothesized that they would perceive their mode of training as highly satisfying. However, some studies have shown that TVET trainees who undergo modular training as part of their apprenticeship programs while already under employment, have a lower level of satisfaction compared to graduates of the regular program (NCVER, 2002). This is because they do not expect the training to cause any significant change in their status.

This study assessed the level of satisfaction of graduates of marine engineering apprentice programs from various maritime organizations in the coastal region of Kenya.

2.5. Summary

This chapter has looked at the nature of marine engineering training under the modular, regular and apprenticeship programs. It has outlined the various challenges faced by each mode of training, which might impact the level of satisfaction expressed by graduates of such programs, six months after completion of training. It has found that despite extremely high standards of training witnessed in the apprenticeship program, professional acceptability of qualificants remained a challenge. It has identified the twin challenges of employer mistrust of qualification certificates and inability to join the professional bodies as the big problems facing the modular system. Finally, it has identified lack of adequate training staff and poor infrastructure, as among the key challenges of regular programs that might impact the perception of qualificants.

CHAPTER THREE

METHODOLOGY

3.1. Introduction

The chapter emphasizes on the research design, study area, target population, sampling techniques, sample size, research instruments, validity and reliability of research instruments, administration of research instruments, data analysis and ethical considerations of the study.

3.2 Research design

The study adopted a descriptive survey design approach. Researchers have reported that males and females have different objectives for TVET training and different perceptions of their TVET training a few months after completion (NCVER, 2002). This study therefore sought to determine if there was a different perception of the level of satisfaction between male and female graduates of modular, regular and apprenticeship programs. A chi-square homogeneity test model was used to test the twin hypotheses that the mode of training influenced the level of satisfaction and if gender factor played a role as well. This approach demanded quantitative analysis. It is recommended [Sarvela and Mc Dermott, 1993; Isaac and Michael, 1990] the survey approach be used in studies that involve the exposition of the nature and extent of a specified data set. A survey design is also able to describe what exists, in what amount and in what context (Isaac and Michael, 1990). Where economic considerations are important so that data must be collected rapidly and from a small part of the population, Oso and Onen (2005) have that the reiterated survey approach works best.

The approach is versatile and has been used in works ranging from physical counts and frequencies to the assessment of attitudes and opinions. In this study, opinions of graduates of the three modes of training as differentiated by gender were sort on their level of satisfaction with their mode of training in so far as it had impacted their livelihoods six months after graduation. The respondents were sourced from among graduates of TVET programs in institutes within the coastal region of Kenya. A descriptive survey design was found appropriate for this study.

3.3. The study area

The study area was Kenya's coastal region. The region has two of Kenya's most important ports. A large portion of marine sector activity in Kenya occurs along the coast. The region has one of the largest ports in east and central Africa, at Mombasa. Therefore, its economy is driven by maritime activities including fishing, port services, and marine tourism. Due to the strategic location of the region, the few TVET institutions in the country offering marine engineering courses are based in that region.

The coastal region of Kenya has six counties namely; Mombasa, Kilifi, Lamu, Tana River, Kwale and Taita Taveta. However, most of the marine engineering training activity is based in Mombasa county.

3.4. Target population

The target population of the study was 425 graduates who according to statistics had completed TVET courses in the various modes of training six months before October, 2022; These graduates took their various examinations in March,2022. This number included; 94 apprenticeship program graduates; 251 regular program graduates; and 80 modular program graduates. The target institutions included all those offering marine engineering TVET programs and marine engineering firms in the coastal

region. TVET institutions included the Kenya coast national polytechnic, the bandari maritime academy and technical university of Mombasa while engineering firms included African general engineering company (AMGECo LTD) and The Southern engineering company LTD.A comprehensive list of maritime operators and TVET institutions turning trainees in one mode or the other is attached in appendix XI. The study population is shown in table 3.1 below.

Table 3.1 Target population

Respondents	**Target population(n)**
1.Modular program graduates	80
2.Regular program graduates	251
3.Apprenticeship program graduates	94
Total	425

3.5. Sampling techniques and sample size

3.5.1 Sampling techniques

The sample size determination formula of Krejcie and Morgan (1970) was applied to arrive at the calculated sample size. This was followed by a simple random sampling process to arrive at the actual list of respondents. The college registration numbers of the graduates or their employment numbers as obtained from the TVET institutes and apprenticeship centers respectively, were written on a piece of paper. The pieces of paper were then folded and placed in a bowl. This was followed by thorough shuffling of the contents of the bowl. The researcher then picked a piece of paper at a time, without replacement, followed by further shuffling, until 66, 75 and 152 registration numbers had been picked for modular, apprenticeship and regular programs, respectively. Names of gradu whose registration numbers were picked formed the list of respondents.

3.5.2 Sample size determination

The target population of marine engineering students was large enough to justify sampling. The sample size determination formula was therefore only applied on the 80 modular, 94 apprenticeship and 251 regular program graduates, respectively.

The formula of Krejcie and Morgan (1970) is given as:

$$n = \frac{X^2 * N * P(1-P)}{\left(ME^2 * (N-1)\right) + (X^2 * P * (1-P))}$$

Where

n=Sample size

X^2=the table value of chi-square for 1degree of freedom at the confidence level (95%) =3.841

N=Population size (80 modular, 94 apprenticeship, 251 regular program graduates, respectively).

P=Population proportion (50 in the table)

ME=Desired margin of error (expressed as a proportion=0.05)

n=3.841xNx0.5 (1-0.5)/ **[**0.05x0.05 (N-1) +3.841x0.5 (1-0.5)**]**

n= modular, apprenticeship and regular graduate respondents to be sampled for the study.

Table 3.2 Sample size table

Mode of training	Number of the graduates	
	Population	Sample
Modular	80	66
Regular	251	152
Apprenticeship	94	75
Total	425	293

3.6 Data collection instruments

The study employed one type of data collection instrument: a questionnaire. A questionnaire is easy to administer and reduces biases in data collection. Both open ended and closed ended questions were used in the questionnaire. The questionnaire

was applied to gather data from the graduates of modular, apprenticeship and regular programs who had left TVET institutions six months earlier.

3.7 Validity of the instrument

Validity is the extent to which an instrument measures what it is supposed to measure and performs as expected. The process by which the validity of an instrument is determined is called validation. Validation involves collecting and analyzing data to assess the accuracy of the instrument. Validation of quantitative instruments usually involves pilot testing of the said instruments.

In piloting, a smaller but representative sample of the targeted respondent group is issued with the instrument and made to respond to the questions as they would if they were the actual respondents. Piloting is usually done in a similar but different point from where the actual study is to be conducted. The validation process requires that the researcher has the expected outcome or expected responses at hand. The correlation between the piloting responses and the expected responses is then determined. According to Creswell [2005], a correlation coefficient of 0.7 or above will indicate a significant, positive relationship and is therefore acceptable. Cronbach's alpha is a commonly used measure in instrument validation exercises**.** According to Benson and Clark [1982], there are three types of validity:

1. Content Validity
2. Criterion-related Validity
3. Construct Validity

3.7.1 Content validity

This is the extent to which the questions in an instrument are representative of the questions that could be asked to assess a particular construct. Many

researchers determine content validity by seeking the opinion of peers and supervisors/experts. Content validity of the instruments used in this study shall be determined by seeking the opinion of research supervisors.

3.7.2 Criterion-related validity

This is applicable when the researcher seeks to determine if the scores generated by an instrument are a good prediction of some expected outcome. In this case the researcher must first outline the expected outcome. A correlation coefficient of 0.7 between the pilot results and the expected outcome is considered sufficient [Creswell, 2005].

In this study the researcher developed and used answers to the question, *'what is your understanding of question number q in the questionnaire you are provided with?'* When the instrument is properly constructed, there should be a high positive correlation between the researcher's expected responses with those obtained from the pilot respondents.

Questions were assessed one by one in a systematic manner for their validity. Any questions that could have led to a correlation coefficient of less than 0.7 had to be deleted or restructured

This process continued until the overall Cronbach's alpha of the instrument cannot be improved by the deletion or restructuring of any further questions.

3.7.3 Construct validity

This was established by determining whether the scores recorded by an instrument are meaningful, significant, useful and have a purpose.

According to Bhandari (2022) a construct is a theoretical concept, theme or idea based on empirical observations. It is a variable that is not directly measurable. Examples of constructs include inability, reliability, academic motivation and

social anxiety. All these are concepts which cannot be measured directly, neither can they be observed easily. To measure them, one must investigate a collection of indicators to test hypotheses on these constructs. A construct can be simple or complex. Simple constructs are easy to assess. Complex constructs demand much more intricate measurement. Simple constructs are narrowly defined. However, complex constructs tend to be multidimensional. The dimensions are the different parts of a construct that are coherently linked to make up a whole. Social anxiety, for example, is a complex construct. It has three dimensions. In a patient, it can take the psychological form; the physiological form or the behavioral form. A patient of social anxiety will exhibit different symptoms depending on the dimension involved.

Construct validity concerns the extent to which a test or measure accurately assesses what it is supposed to. In research, it is important to operationalize constructs into concrete and measurable characteristics based on one's idea of the construct and its dimensions. This is why operational definition of terms is demanded of researchers. One must be clear on how they define their construct and how the dimensions of that construct relate to each other before they collect or analyze any data.

When designing or evaluating a measure, it is important to consider whether it really targets the construct of interest or whether it assesses a separate but related construct. It is critical to separate one's construct from related constructs and ensure that every aspect of the measurement technique is solely focused on the specific construct of interest.

There are two types of construct validity:

Convergent validity; - this is the extent to which measures of the same or similar constructs actually correspond to each other. The correlation between the two measures should be high or positive. If two groups of people, for example, have their test scores measured, those who score highly in one measure should also score highly in the other measure.

Discriminant validity; -this is the extent to which measures of two unrelated constructs are actually divergent from each other. For example, the correlation of the two measures should be as low as possible or negative. If two groups of students have their test scores measured, those who score highly in one measure should score poorly in the other measure. One checks for both discriminant validity and convergent validity by comparing results from different measures and assessing whether they correlate or how they correlate.

One may distribute two sets of questionnaires on two constructs that are known to be different in attributes to the same stock of respondents. Because the two constructs are theoretically different, one should obtain negative or very weak correlation upon analysis of data from the two questionnaires. This should demonstrate that the questionnaires being used have construct validity. A measure of Cronbach's alpha is commonly used to test construct validity. An alpha value of 0.7 and above should confirm construct validity.

In this study research supervisors were relied upon to help restructure the instruments until those instruments to showed construct validity.

3.8 Reliability of the instruments

Reliability is the consistency of an instrument; the capacity of the instrument to consistently measure what it is supposed to measure.

There are four general estimators of reliability:

1. Observer reliability
2. Test-retest reliability
3. Parallel –forms reliability
4. Internal consistency reliability

Observer reliability is the degree to which different respondents/observers give consistent answers to an instrument question. Test-retest reliability is the consistency of a measure evaluated across time. Parallel –forms reliability is the reliability of two tests constructed in the same way. Internal consistency reliability is the consistency of results across items and is often measured using Cronbach's alpha. In the case of this study only observer reliability and internal consistency reliability were determined because they were considered more relevant to the study at hand.

Questionnaires and other research instruments were piloted in advance and necessary readjustments made to ensure validity and reliability. Piloting was done at the Jomo Kenyatta University of Agriculture and Technology (JKUAT) marine engineering,main campus. A sample comprising 10 percent of the actual sample size was involved in the piloting process. A Cronbach's alpha evaluation of the pilot data yielded a value of 0.751 for the questionnaire. This indicated that the instruments were sufficiently reliable.

3.9. Administration of the instruments

First, permit documents from the national commission for science, technology and innovation [NACOSTI] were sought and obtained. The researcher then approached the county director of technical education in Mombasa county for permission to operate in their area of jurisdiction. This permission was granted. The researcher then

visited the study institutions to meet the various institution managers in order to present the permission documents.

After the presentation of documents, the researcher briefed the institution manager on the intended study and booked an appointment for the data collection process. On the appointed date the researcher sampled out the trainees to obtain the list of respondents. This was done with the help of the head of department. The graduate respondents for modular and regular modes were then sent their questionnaires through email and whatsapp using details obtained from the institutions. They were to fill their questionnaires and return them through email or whatsapp. Most respondents in this category returned their filled questionnaires via WhatsApp. For apprentice mode,they physically filled questionnaires since they were easily reached at their areas of work.

3.10 Data analysis

Collected data was edited and coded to reduce the errors in the research. The data was quantitative in nature. This data was coded and fitted onto the statistical package for social sciences (SPSS) software. Descriptive statistics was used to describe demographic data of the respondents. Data inform of absolute numbers of respondents was fitted into a chi-square homogeneity test model for analysis.

The chi-square homogeneity test evaluates the proposition that the several populations [modular; apprenticeship; and, regular graduate respondents] are homogeneous with regard to a defined attribute. For the purposes of this study, the presumption was that graduates of the three modes of training of both male and female genders were homogenous in so far as their level of satisfaction was concerned.

Scores comprised the absolute number of respondents reporting their acceptance that they were satisfied with the way their mode of TVET training had prepared them

ready for the job market. The following procedure was followed in carrying out the chi-squared homogeneity test.

The null hypothesis and alternate hypotheses were as follows:

H_{01}: Graduates of the three modes of training of both male and female gender are homogenous in so far as their level of satisfaction is concerned.

H_{11}: Graduates of the three modes of training of both male and female gender are not homogenous in so far as their level of satisfaction is concerned.

Under H_0 an expected frequency E corresponding to each cell in the contingency table was found by using the formula:

E = [R* C] / n;

Where R = a row total;

C = a column total; and, n = number of positive responses [sample size] for the category.

Based upon the observed values and corresponding expected frequencies, the X^2

Statistic was obtained using the formula:

$$Chi - square = \sum \{[O - E][O - E]\}/E$$

The observed values **O** were obtained by processing the research instruments to obtain data as described above.

The characteristics of this distribution are defined by the number of degrees of freedom [D.F] which is given by:

D.F = [r-1] [c-1]

Where **r** is the number of rows of the contingency table and **c** is the corresponding number of columns of the contingency table.

In this study the degrees of freedom D.F. =2.

The proposed level of significance was 0.05.

The critical value was read on the chi-square tables as the tabulated value for the specified degrees of freedom [2] at the chosen level of significance [0.05].

The calculated value of X^2 was compared to the tabulated value. If the calculated X^2 value was less than the tabulated value, the null hypothesis [H_0] was to be accepted. Otherwise the alternate hypothesis held.

3.11 Ethical considerations

The study was conducted professionally and ethical principles that govern research were strictly adhered to. The research proposal was submitted to University of Eldoret ethics review committee (ERC) for assessment of plagiarism and ethical issues. The researcher further sought permission for conducting the study from the following authorities; national commission for science, technology and innovation (NACOSTI) and county directorates of technical education in each of the six counties in the coast region. The researcher also visited and obtained consent from the heads of institution to seek permission for data collection. The respondents' identities and information shared was treated with utmost confidentiality by use of imaginary names and codes. The participants were given the option of choosing whether to take part in the study or not without any coercion.

All referenced sources were duly acknowledged. All text and data that were borrowed from other sources, including the internet, were specifically accredited and references cited using the APA system and in accordance with anti-plagiarism regulations.

3.10 Summary

The study adopted the descriptive survey design approach. The proposed study area was the coastal region of Kenya. The target population was made of 425 marine engineering graduates of modular, regular and apprenticeship training programs from

TVET institutes. Sampling was done by the method of simple random sampling. The sample size determination formula of Krejcie and Morgan was used to arrive at the proposed sample size of 293 individuals. The research instrument was a questionnaire, Instrument validity of was determined through the process of expert review. Reliability of instruments was assessed through piloting and Cronbach's alpha determined for the pilot data. Cronbach's alpha value was above 0.7 for the instrument. Permission was sought from NACOSTI and the county directors of technical education in the six counties in the coastal region, for the administration of instruments. Analysis of data was conducted using a Chi-square homogeneity test model at 95 percent level of confidence and 2 degrees of freedom. The model was run on SPSS. All requisite ethical considerations were adhered to.

CHAPTER FOUR

RESULTS

4.1. Introduction

This chapter examines the data obtained, the analytical findings and the hypothesis testing procedure. The collected questionnaires were checked to ensure that they were adequately and appropriately filled. This was done to minimize chances of non-responses and extreme outliers. Extreme outliers are responses that appear to be out of context. Descriptive data analysis was done first, then followed by inferential analysis in an attempt to test the prescribed hypothesis. Chi-square homogeneity test analysis was used for this purpose. Hypothesis testing was done at 95 percent confidence level. The raw data was then coded and analyzed with the statistical package for social sciences [SPSS] software. The aim of this approach was to be able to describe the opinions of the respondents regarding the various constructs in the study. The results are detailed below.

4.2. Results

4.2.1. Data presentation and analysis

4.2.1.1. Distribution of respondents

Of the 293 respondents, 57 out of 66, 70 out of 75; and, 129 out of 152 students of modular, apprenticeship and regular programs returned their filled in questionnaires. In terms of percentage, 86 percent of modular program graduates returned their questionnaires; 93 percent of the apprenticeship program graduates returned their questionnaires; while, 85 percent of the regular program graduates returned their questionnaires. In average,88%returned filled questionnaires.The table 4.1 shows how questionnaires were issued and returned by mode of training.

Table 4.1: Return rate of the questionnaires by mode of training

Training mode	Questionnaires		
	Issued	Returned	Return rate (%)
Modular	66	57	86
Apprenticeship	75	70	93
Regular	152	129	85
Totals	293	256	88

Source: Researcher 2022

4.2.1.2. Returned and accepted questionnaires

However, some questionnaires were not sufficiently and appropriately filled and could not provide meaningful data. In this category, 3 out of 57; 4 out of 70; and 6 out of 129 questionnaires from modular, apprenticeship and regular programs respectively were recorded. Any poorly filled in questionnaires were set aside and therefore, not included in the final dataset. In terms of percentage therefore, 95 percent of the returned modular program questionnaires were accepted and used. Total of 99 percent of the returned apprenticeship program questionnaires were accepted and 93 percent of the returned regular program questionnaires were accepted. On average 95.67 percent of the returned questionnaires were acceptable. Finally, data was extracted from the following number of questionnaires; modular respondents, 54; apprenticeship respondents, 66; and regular program respondents, 123. The table 4.2 below shows the acceptance rate of returned questionnaires.

Table 4.2: Accepted rate of returned questionnaires

Training mode	Questionnaires		
	Returned	Accepted	Percentage (%)
Modular	57	54	98
Apprenticeship	70	66	94
Regular	129	123	95
Totals	256	243	96

4.2.1.3. Distribution of respondents by gender

In terms of percentage, the modular group had 39 percent female and 61 percent male. The apprenticeship group had 27 percent female and 73 percent male. The regular group was comprised of 38 percent female and 62 percent male. Overall, males comprised 65 percent of respondents while females comprised 35 percent. For the final list of respondents, the gender distribution was as shown in the table 4.3 below.

Table 4.3. The distribution of final respondents by gender

Gender Modular		Apprenticeship	Regular	Total	Percentage (%)
Male	33	48	76	157	65
Female	21	18	47	86	36
Total	54	66	123	243	100

4.2.1.4. Distribution of respondents by age

A majority of the respondents were aged between 20 and 30 years (68 percent). Very few respondents were below 20 years (3 percent). The proportion of respondents appeared to decline with increasing age. Only 11 percent of the respondents were above 40 years. The table 4.4 below shows the distribution of the respondents by age.

Table 4.4: Percentage distribution of respondents by age

Age Group	Frequency	Percentage
Below 20 years	08	03
20 - 25	84	35
25 - 30	79	33
30 - 35	27	11
35 - 40	18	07
40 - 45	11	05
45 - 50	08	03
Above 50 years	08	100
Total	243	100

4.2.1.5 Distribution of Respondents by age and gender

There were more females than males in the higher age brackets (above 45 years). Females between 45 and 50 years comprised 62 percent of the total. Women above 50 years comprised 87 percent of the total. A disproportionately large number of respondents between 25 and 40 years were males with 79 percent of the respondents. The Figure 2 shows the distribution in terms of age and gender.

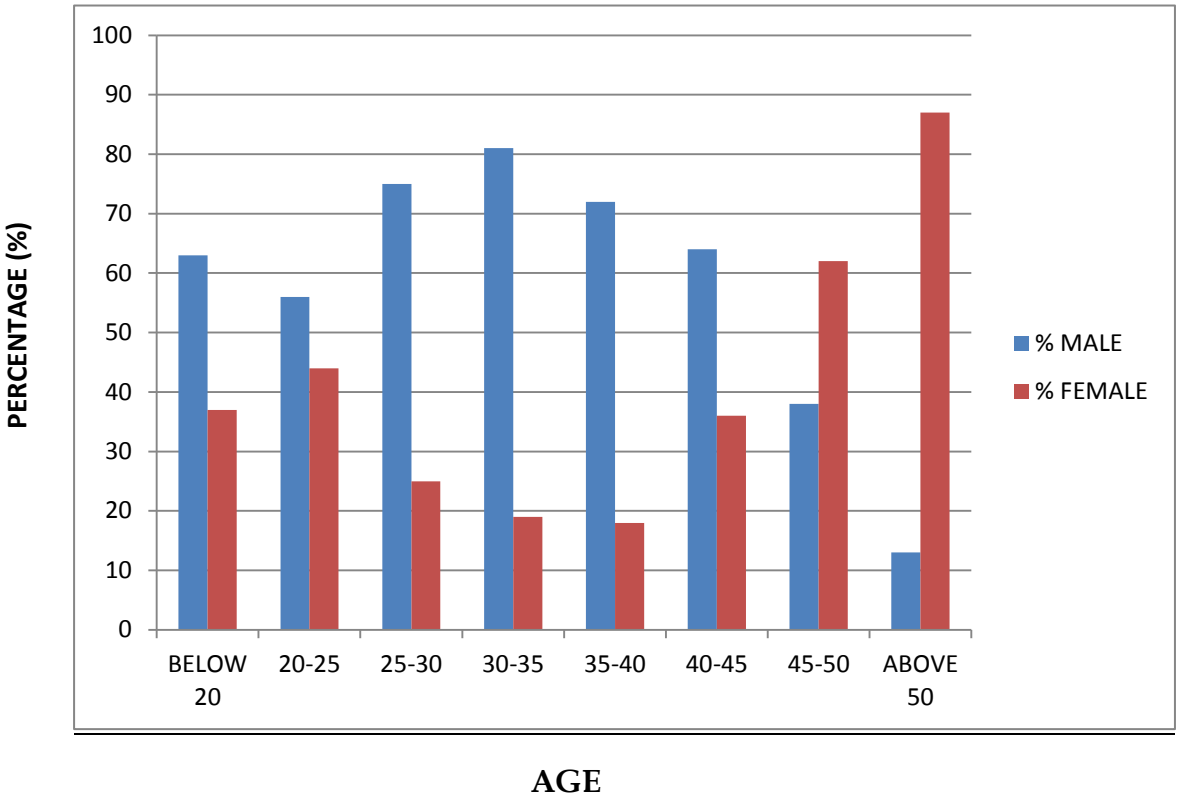

Figure 2: Distribution of respondents by age and gender

4.2.2. Descriptive data analysis

4.2.2.1. Effectiveness of TVET programs in helping graduates attain their goals

Data was collected on the effectiveness of TVET training programs in helping graduates attain their vocational goals. Basically, students make several considerations before pursuing preferred TVET programs. Consequently, the mode of training is primarily given a key concern for convenience purposes. Some of the reasons that trigger one to pursue any given program include: job/business opportunities, changing careers, desire to get promotions, job requirements and personal extra mile to add extra skills for the current job. For those who had hoped to use their TVET training to get a job or start a business, only 49 percent had attained their goals. For those who hoped that their training would help them change careers, only 42 percent said they had attained their goals. Of those who had hoped to better

their job performance or earn a promotion,56 percent said they had achieved their aims. About 89 percent of those who had enrolled for TVET training because their current employment demanded it reported that they had attained their goals. An estimated 87 percent of those who had enrolled to acquire extra skills for the current job said they had attained their goals. All the respondents were involved in the study six months after graduation. The table 4.5 below shows the responses for effectiveness of TVET in helping graduates attain their goals.

Table 4.5: Effectiveness of TVET programs in helping graduates attain their goals

What was your vocational reason for Joining TVET?	Did you attain your goal?			
	Yes(%)	No(%)	Not Sure(%)	Total(%)
1.To get a job/or my business	49.3	35.8	14.9	100
2.To try a different career	41.5	34.8	23.7	100
3.To better my job or earn promotion	55.7	28.6	15.7	100
4.It was a requirement of my job	88.7	7.9	3.6	100
5.I wanted extra skills for my job	87.1	7.2	5.7	100
Average	64.46	22.86	12.72	100

4.2.2.2 Effectiveness of TVET programs in helping graduates attain goals by gender

Slightly more men (53 percent) than women (47 percent), reported that TVET training had helped them attain their goals. A larger proportion of females (58 percent), said they had managed to get jobs or start business. However, a disproportionately larger proportion of females (60 percent) reported they had managed to change their careers. 56 percent of females reported achievement was based on job promotions compared

to males at 54 percent. On the other hand, a disproportionately large proportion of men (71 percent) reported TVET training had enabled them fulfil the requirements of their current job. Again, a larger proportion of males who had hoped to gain extra skills for their current job said they had succeeded. Of those who felt their TVET training had helped them attain their goals, the gender distribution was as shown in Table 4.6 below.

Table 4.6: Effectiveness of TVET programs in helping graduates attain their goals by gender

What was your vocational reason for Joining TVET?	Did you attain your goal?			
	Yes(%)	Males(%)	Females(%)	Total(%)
1.To get a job/or my business	49.3	41.6	58.4	100
2.To try a different career	41.5	39.8	60.2	100
3.To better my job or earn promotion	55.7	54.2	45.8	100
4.It was a requirement of my job	88.7	71.3	28.7	100
5.I wanted extra skills for my job	87.1	60.5	39.5	100
Average	64.46	53.48	46.52	100

4.2.2.3. TVET Programs Graduates' Level of Satisfaction by modes of training

Respondents were asked if they were satisfied with a number of services usually offered by TVET institutes to trainees. Questions were framed to assess their level of satisfaction with the following services:

1. Teaching and inspection - mastery of the subject content, balance between class work and practical and clarity on assessment methods.

2. The training processes - way subject reflects industry practice and trainer presentation
3. Equipment and resources available for training - quality and quantity aspect, access to library and other resources.
4. Accessibility of training venues -convenience to venue and class time.
5. Efficiency of administration and information services - career guidance and administrative roles such as enrolment
6. Effectiveness of student support services - on jobs updates and counseling services
7. Their general opinions on the overall quality of training- usefulness of the training, relevance of qualifications as regarded by the employers, value of money spent and quality aspect.

These attributes guided the graduate respondents to highlight their opinions with respect to the entire process in training delivery, utilization of resources, administrative evaluation and value of quality aspect.

4.2.2.3.1 Level of satisfaction on training, resources and administrative services

On the whole, apprenticeship graduates showed the highest level of satisfaction (69 percent), followed by regular graduates at 67 percent. Modular graduates had the least satisfaction rate at 63 percent. Respondents were happiest with the way trainers had mastered subject content. Apprenticeship group came first with 76 percent satisfaction, followed by modular with 73 percent and regular with 72 percent. Respondents were most unhappy with the way student support services were provided by their colleges. Availability of information about jobs and careers at 38 percent for all the three modes of training and guidance and counselling services at 36 percent for

modular,38 percent for regular and 37 percent for apprenticeship graduates, respectively. The responses provided are summarized in the tables 4.6.

Table 4.7. TVET programs graduates' level of satisfaction by modes of training

How they were satisfied with	Modular (%)				Regular (%)				Apprentice (%)			
	Yes	No	Not Sure	Total	Yes	No	Not Sure	Total	Yes	No	Not Sure	Total
Teaching/inspection	62.4	4.1	33.5	100	62.2	2.5	35.3	100	65.3	4.5	30.2	100
The training	55.7	4.4	39.9	100	55.2	4.6	40.2	100	48.4	3.5	48.1	100
The equipment and resources	59.6	5.4	35.0	100	55.0	5.4	39.6	100	57.6	5.1	37.3	100
Access to training avenues	59.4	5.2	35.4	100	60.3	3.8	35.9	100	64.8	3.8	31.4	100
Administration and information	44.3	7.9	47.8	100	48.9	6.8	44.3	100	49.0	5.5	45.5	100
Student support and services	36.6	14.6	48.8	100	37.5	11.3	51.2	100	37.5	9.5	53.0	100

4.2.2.3.2. Level of satisfaction on modes of training on overall opinion

Overall opinion examined the extent to which satisfaction was felt on usefulness of the training with regard to job prospects. Apprentice took lead by nearly 64% on level of satisfaction. In addition, relevance of qualifications as perceived by employers showed that regular and apprentice nearly tied at 58% on level of satisfaction. Opinion on the value of money spent on training also featured in responses where apprentice felt most satisfied by 63%.All the three modes of training attained over 60% of the respondents on overall opinion perceived to matters of quality as shown in table 4.8

Table 4.8: Overall opinion response on level of satisfaction by modes of training

How they were satisfied with	Modular (%)				Regular (%)				Apprentice (%)			
	Yes	No	Not Sure	Total	Yes	No	Not Sure	Total	Yes	No	Not Sure	Total
Usefulness of training for job prospect	51.7	6.8	41.5	100	60.5	4.7	34.8	100	63.5	7.7	28.8	100
Relevancy of qualifications to empoyers	48.4	6.7	44.9	100	57.7	4.2	38.1	100	58.2	6.5	35.3	100
Money value spent on the training program	55.9	7.3	36.8	100	60.7	4.6	34.7	100	63.0	5.4	31.6	100
Overall quality of the training program	62.8	4.1	33.1	100	66.7	2.3	31.0	100	69.3	3.3	27.4	100

Table 4.9. Comparison on overall opinion on level of satisfaction by modes of training

Are you satisfied with your mode of training, in terms of :-	Modular (%)	Apprentice (%)	Regular (%)	Total (%)
1. The usefulness of the training for job prospects	51.7	63.5	60.5	58.6
2. The relevance of the qualification in terms of how it is regarded by employers?	48.4	58.2	57.7	54.8
3. The value for money of the training program	55.9	63.0	60.7	59.9
4. The overall quality of the training program?	62.8	69.3	66.7	66.3
Average	54.7	63.5	61.4	59.9

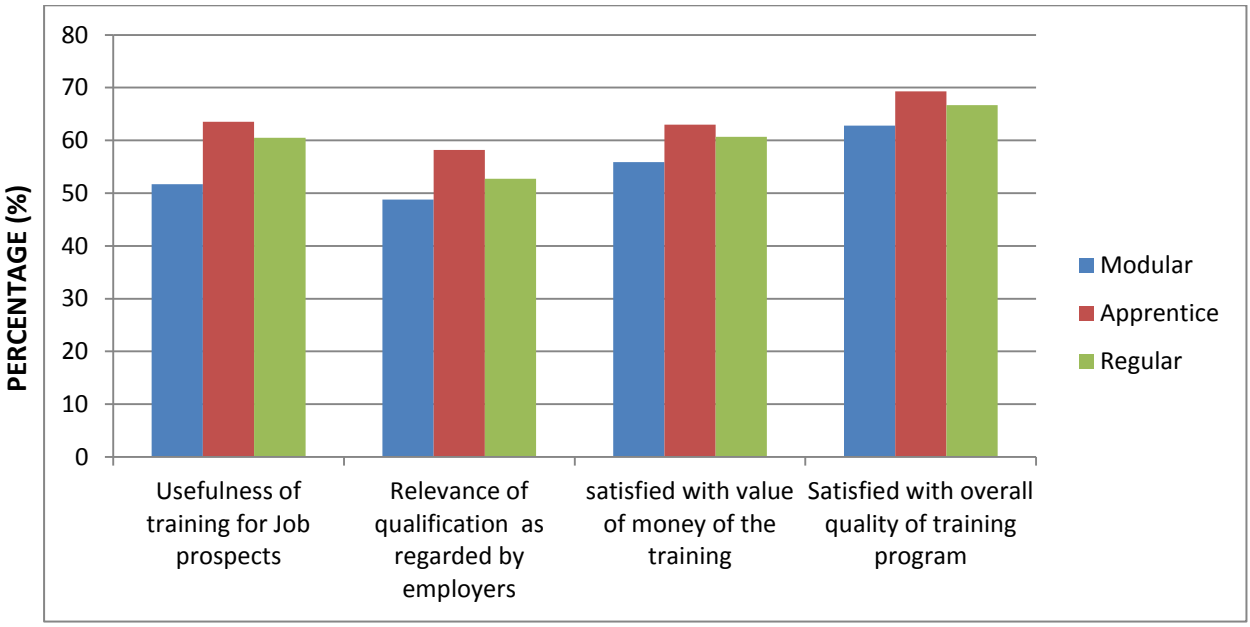

Figure 3: Comparison on overall opinion on level of satisfaction on mode of training by gender

4.2.3 Inferential data analysis

The data was then organized in a chi-square contingency table to facilitate inferential analysis through the chi-square homogeneity test model.

The absolute numbers of respondents providing affirmative answers to the question, "*Are you satisfied with your overall opinion on your mode of TVET training*?" were used to construct a contingency table. Table 4.10 below shows the chi-square contingency table for the data.

Table 4.10. Chi-square contingency table

NO OF AGREEMENTS[n]	MODULAR	REGULAR	APPRENTICE	TOTAL
MALE	19	51	31	101
FEMALE	11	28	10	49
TOTAL	30	79	41	150

From the table 4.10, values of expected frequencies shown in table 4.9 were generated.

Table 4.11. Expected frequencies

S/N	O	E	$[O-E]^2$	$[O-E]^2/E$
1	19	20.20	1.44	0.0713
2	51	53.19	4.7961	0.0902
3	31	27.61	11.4921	0.4162
4	11	9.8	1.44	0.1469
5	28	25.81	4.7961	0.1858
6	10	13.39	11.4921	0.8583
Total				**1.7687**

0.05 level of significance * $\alpha = 0.751$

Calculated X^2=**1.7687**

D.F = [2 – 1] [3 – 1] = 2

At 0.05 level of significance and 2 degrees of freedom, the tabulated value is X^2 = 5.99. The calculated value at 1.7687 which less than the tabulated value; the null hypothesis is accepted. Graduates of the three modes of training of both male and female gender (are homogeneous) in so far as their level of satisfaction is concerned. They are all satisfied with their various modes of training.

4.3 Discussion

4.3.1. Social demographic information

Respondents of all age category were represented. The oldest age bracket was perceived to accommodate those who significantly opted to enroll TVET programs so as to secure promotions. At this age category, female dominated over men which may have implied gender sensitivity campaigns to encourage young female students to equally compete with their male colleagues.

4.3.2 Effectiveness of TVET programs

49.3% of the respondents admitted that TVET training had helped them to get jobs or start businesses. For any expectation of any enrolled trainee is to achieve the best after the training. This is a significant query peers seek the graduates before making a decision on a particular course enrollment.

41.5% of the respondents expressed their hope of trying different career for better expectations. In contrast,34.8% admitted that they had not attained their goal hence an indication that change of career could not guarantee automatic job placement.

Moreover,55.7% of the respondents felt satisfied in attaining their goals with respect to job promotions. Most industries are perceived to sponsor or encourage their workers to upgrade their skills.Similarly,88.7% acknowledged their satisfaction of achieving their goals since it was a job requirement. This indicated clear concern to avoid lay-offs on ground of incompetency.

Additionally,87.1% of the respondents attained their goals that defined their aim of seeking extra skills. Skill upgrading may be perceived as away of enhancing conformity to global technological changes. Similarly, global best practices should be incorporated to provide models for benchmarking for local standards and practice and make the training globally competitive (Katam & Otieno, 2021)

In average,64.5% of the respondents their respective goals where male respondents indicated 53.5% and females 46.5%.

4.3.3. Influence of the modular system on satisfaction level

Over 50 percent of the modular respondents reported that they were satisfied with their mode of training. However, the graduates felt satisfied with the mastery of subject content by their tutors. 55% of respondents felt satisfied with content relevance with respect to industry practice.

Indeed, the combination of lack of human resources and teaching resources has a magnifying effect, as effective teaching of large classes to a large extent depends on audio-visual and other equipment in classrooms, and other forms of virtual learning and library facility to ensure individual and group learning outside of formal classes (Allais 2014).

For this mode of training,51.7% of the respondents reported that the training was useful for job prospects.55.9% of the respondents in this category reported satisfaction on the value of money used on training program.

On the other hand, respondents were dissatisfied with the manner in which student support services were provided. They singled out information on jobs and career and general guidance and counselling as being of very unsatisfactory quality. Modular respondents were on average in terms of satisfaction level and ranked second among the three groups of program graduates.

4.3.4. Influence of the regular system on satisfaction levels

Just like their modular colleagues, over 50 percent of the regular respondents reported that they were satisfied with their mode of training. Similarly, 72.2% of the respondents reported that the level of satisfaction with the mastery of subject content

by their tutors.49.7% of the respondents which is less than 50% indicated their satisfaction on quality of equipment available for practical skills.The action to date has been largely in the realm of ‘quality assurance’ as opposed to ‘quality enhancement’ (Brewis & McCowan 2016; Odhiambo 2014)

On the other hand, respondents were dissatisfied with the manner in which student support services were provided. They singled out information on jobs and career and general guidance and counselling as being of very unsatisfactory quality. Regular respondents were on average, second to the apprenticeship group in their level of satisfaction.

4.3.5. Influence of the apprenticeship system on satisfaction levels

Apprenticeship programs were found to induce a much higher level of satisfaction than any of the other two modes of training. Alongside other graduates,75.8% of the respondents reported satisfaction with the mastery of subject content by their tutors. Consequently, respondents acknowledged methods of training balance between classwork and practicals projected satisfaction by 63.0% and 58.1% respectfully. As viewed by Schendel (2016), it is not enough for academic departments to adopt progressive pedagogical reforms, without a deeper process of transformation of lecturers’ understandings and cultures of practice. This implies that students should have confidence on their trainers based on practical experience.

On the other hand, they showed dissatisfaction with the manner in which student support services were provided. They singled out information on jobs, career, general guidance and counselling as being of very unsatisfactory quality.

4.3.6. Hypothesis testing on the influence of modes of training on satisfaction

A chi-square homogeneity model was used to test the hypothesis that all the three modes of training had significant influence on the level of satisfaction experienced by TVET graduates. At 95 percent confidence level and 2 degrees of freedom, the calculated chi-square value was less than the tabulated value. The null hypothesis was therefore accepted. This implies that the respondents were homogeneous in their satisfaction with all the three modes of training.

The main research problem was to understand the cause of low student enrolment in certain newly introduced programs, particularly modular programs. It was presumed that if the level of satisfaction with the modular program was low, then it should explain the poor response by students. The homogeneity of satisfaction among graduates of these programs reflect a lack of course discrimination among graduates, in terms of quality and relevance. This implies that what is causing the low enrolment rates is not perceived quality or relevance of the modular programs.Further,there was a general feeling by students across all modes of training that colleges had not been able to effectively relay information to the students regarding career prospects of their chosen modes of training. Graduate respondents also complained that proper guidance was not provided at the time of course selection, so many tended to land in programs they hardly knew anything about. It may be perceived that the low levels of enrolment are associated with inadequate information regarding newly introduced modes of TVET training. More research needs to be done on the mechanisms the colleges and the government could use so as to be able to deliver career and course information more effectively to clients (students).

4.4 Summary

Questionnaires were provided to graduates of modular, regular and apprenticeship programs who had spent six months since leaving college. A proportion of the respondents did not return the filled in questionnaires. Of the returned questionnaires, some were found to be poorly filled in and were rejected. Questionnaires were sorted and grouped according to gender, age and mode of study. Most program graduates were in the age bracket 20 to 30. Female respondents were fewer than males in the age brackets (45 to 50 years and above 50-year age groups). A high proportion of respondents of all categories expressed a high level of satisfaction. Modular respondents ranked third on level of satisfaction among the three modes of training. Regular respondents ranked second on level of satisfaction. Apprenticeship graduates were the most satisfied. Respondents were homogeneous in their satisfaction with all the three modes of training.

CHAPTER FIVE

SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter presents the conclusions, recommendations and suggestions for further research.

5.2 Summary of findings

5.2.1 Effectiveness of TVET programs

Most of the respondents admitted that TVET training had helped them to get jobs or start businesses. For any expectation of any enrolled trainee is to achieve the best after the training. This is a significant query peers seek from the graduates before making a decision on a particular course enrollment. Consequently, it was clearly indicated that some felt satisfied with prime hope of trying different career for better expectations.Similarly,the majority felt satisfied in attaining their goals with respect to job promotions, skills upgrade or personal desire to obtain extra skills. This indicated clear concern to avoid lay-offs on ground of incompetency. Skills upgrading may be perceived as away of enhancing conformity to global technological changes. Indeed, the global best practices should be incorporated to provide models for benchmarking for local standards and practice and make the training globally competitive (Katam & Otieno, 2021)

5.2.2. Influence of the modular system on satisfaction level

Most of the graduate respondents of modular system felt satisfied with the mastery of subject content by their tutors. Similar response showed that the level of satisfaction in terms of content relevance towards industry practices. On the same basis, the

majority of the respondents reported that the training was useful for job prospects and value of money used reflected the real cost of the training program. On the other hand, respondents were quite dissatisfied with the manner in which student support services were provided. They singled out information on jobs and career and general guidance and counseling as being of very unsatisfactory quality. Modular respondents were on average in terms of satisfaction level and ranked second among the three groups of program graduates.

5.2.3. Influence of the regular system on satisfaction levels

Just like their modular colleagues, most of the regular respondents reported that they were satisfied with their mode of training according to the mastery of subject content, but quality of equipment available for practical skills was ranked below average. The action to date has been largely in the realm of 'quality assurance' as opposed to 'quality enhancement' (Brewis & McCowan 2016; Odhiambo 2014). On the other hand, respondents were dissatisfied with the manner in which student support services were provided. They singled out information on jobs and career and general guidance and counseling as being of very unsatisfactory quality. Regular respondents were ranked average, second to the apprenticeship group in their level of satisfaction.

5.2.4. Influence of the apprenticeship system on satisfaction levels

Apprenticeship programs were found to induce a much higher level of satisfaction than any of the other two modes of training with respondents reporting satisfaction in the mastery of subject content alongside methods of training that provide balance between classwork and practicals.As viewed by Schendel (2016), it is not enough for academic departments to adopt progressive pedagogical reforms, without a deeper process of transformation of lecturers' understandings and cultures of practice. This

implies that students should have confidence on their trainers based on practical experience. On the other hand, they showed dissatisfaction with the manner in which student support services were provided. They singled out information on jobs, career, general guidance and counseling as being of very unsatisfactory quality.

5.2.5. Hypothesis testing on the influence of modes of training on satisfaction

A chi-square homogeneity model was also involved to test the hypothesis that all the three modes of training had significant influence on the level of satisfaction experienced by TVET graduates. Through this particular test, the null hypothesis was arrived at. This implies that the respondents were homogeneous in their satisfaction with all the three modes of training. No mode of training that was discriminately pointed out as level of satisfaction is concerned.

5.3 Conclusions

1. Kenya has seen tremendous reforms in the TVET sector since 2010 aimed at improving the industry preparedness of manpower coming out of the TVET institutes. In the maritime sector, the traditional apprenticeship-based training of marine engineers is in the process of being beefed-up with a college-based training regime. The college-based training initiative was largely aimed at putting marine engineering training at par with that in the other branches of engineering to enhance acceptability by the relevant professional bodies such as IET. Previously, despite some of the most effective training programs anywhere, Kenyan marine engineers trained under the British Department of Trade and Industry curriculum were not accepted into the College of Engineers in both Kenya and the United Kingdom. This created a necessity for a

restructuring of the training program to make marine engineering graduates admissible by their professional bodies (Wainaina, 1989).

2. However, this has meant making the training program more academic and less workplace based, with the consequence that a dilution has occurred in the practical aspects of marine engineering training in Kenya (MoE, 2018). Traditionally, marine engineering training was industry driven and workplace based. The linkages with industry necessary for the teaching of practical skills were excellent. This is because training occurred in the marine workshops and in the ships. Initially, studies on challenges facing graduates from technical educations by renown scholars and education practitioners have revealed that inadequate supply of instructional materials(Dismani,2011), inadequate training facilities, weak linkages for hands-on-experience(Woyo,2013)
3. Training has now been largely accredited to the institutions some of which are far removed from the sea and cannot provide requisite facilities for practical activity. Whereas the apprenticeship based training was conducted by trainers who were actual practitioners in the maritime industry, the new college based model of training has put students in the hands of trainers, many of whom have no practical maritime experience (UNESCO, 2016).This means training has become more theoretical in character and less practical.
4. In order to create a balance between a practical oriented apprenticeship strategy and a highly academic college-based training, the government has introduced modular programs. These programs have introduced an element of flexibility in the TVET programs such that work-based students could easily fit into the TVET system. The modular program has also made it possible for learners to gather specific competencies within a short time and make themselves

employable. This was meant to make TVET programs more attractive particularly to older students and those already under employment.

5. Researchers have however reported that the introduction of modular programs has been met with low enrolment. Apparently, students are unsure of the quality and relevance of the modular programs. However, this study has shown that the structure and implementation of the modular programs are not responsible for the registered low enrolment. The problem experienced is linked to lack of career and course information.
6. The number of students being trained has arisen sharply (MoE, 2019). In the previous apprenticeship-based model, prospective employers only trained the numbers they required to sustain their services. Presently, more students are being admitted by the TVET institutes than required by the industry. Unemployment is beginning to crop in, reducing the motivation level of trainees (ILO, 2012). However,40 percent of the module graduates reported that they have been able to either find employment or start their own businesses, six months after leaving college. This is comparable to what has been experienced in other jurisdictions (NCVER,2002).
7. This study has revealed that students are generally satisfied with the way trainers are able to deliver subject content. However, they are less satisfied with the quality and availability of practical equipment. Students have expressed a great dissatisfaction with the manner in which colleges handle information on careers and jobs. Again, they feel guidance and counselling is badly handled by the colleges.
8. This study was tailored on the presumption that there are fundamental differences in the quality and manner of delivery of the different modes of

training such that prospective students are responding by keeping away from certain programs. It was found out that modular, regular and apprenticeship programs, generally induce a high level of satisfaction.

9. There is no need for government to take extraordinary measures aimed at restructuring the various modes of training to encourage student enrolment. The courses are acceptable to students as structure and implemented. What is required is better information services by colleges and government.

5.4 Recommendations

Based on the findings of the study, it is recommended that:

1. The government should provide services associated with career guidance. This can be done to enable students make appropriate choices on course selection with informed expectations.
2. The government should consider Marine engineering as one of key area of blue economy and mobilize adequate and relevant resources. This is due to the fact that marine engineering training is college-based under TVET programs.
3. The government should promote the establishment of TVET linked marine engineering industries across the country provide job opportunities to graduates.
4. The of education and experience of the trainers should match the requirements of TVET guidelines in line with marine sector. This can be done through establishment of centres of excellence that will train competent marine trainers to steer best practices in marine engineering and other activities in the sector.

5.5 Suggestions for further research

The study suggests the following:

1. It recommends that more research be done to determine how best to improve college services associated with guidance, employment opportunity and career information and general guidance and counseling.
2. It also recommends that future studies on related study to widen scope and involve larger samples.

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APPENDICES

Appendix I: Letter of Introduction to Respondents

Boniface Omariba, DATE……..
University of Eldoret,
P.O. Box 1125-30100,
Eldoret.

Dear Respondent,

RE: REQUEST TO RESPOND TO THE STUDY QUESTIONNAIRE

I am a student at the University of Eldoret pursuing a Master of Education Degree in Technology Education (Power Mechanics Technology). As part of the requirements for the award of this degree, I am undertaking a research on, "**influence of the mode of training on the level of satisfaction of marine engineering graduates of TVET institutes from the Coastal Region of Kenya**".

You have been selected to be one of the respondents in this research. I therefore humbly request for your assistance in responding to the questions attached herein. The responses provided by you shall be treated with absolute confidentiality and only used for purposes of research.

Yours faithfully,

Boniface Omariba

Appendix II: Questionnaire –For Trainees

N/B. Put a tick (to mark you answer

1. What is your gender? [a] Female ( ) [b] Male ( )

2. What is your age bracket? [a] 18-20 years [b] 21 -25 years [c] 26- 30 years [d] 31 -35 years [e] 36-40 years [f]41- 45 years [g] 46-50 years [h]over 50 years

3. Were you enrolled for a marine engineering course in a TVET? [a] Yes [b] No

4. What was your mode of training?

[a] Modular program ( )

[b]Apprenticeship program ( )

[c] Regular program ( )

5. For how long have you been in the job market since completing your TVET training?

[a] less than 6 months ( )

[b] six months ( )

[c] Over six months ( )

6. Why did you enroll for TVET training

[a] To get a job/or start my business ( )

[d] To try a different career ( )

[c] To better my job or earn promotion ( )

[d] It was a requirement of my job ( )

[e] I wanted extra skills for my job ( )

7. Do you believe you achieved your aim for your TVET training

[a] Yes ( ) [b] No ( ) [c] Not sure ( )

8. Are you satisfied with the following aspects of your mode of training?

[a] Teaching/inspection?

[i] Your trainers 'mastery of subject content? Yes( ) No( ) Not sure ( )

[ii] Your trainers' ability to relate to students? Yes ( ) No( ) Not sure ( )

[iii] The balance between class work and practical training? Yes ( ) No ( ) Not sure ( )

[iv] The way methods of assessment were made clear to you? Yes ( ) No ( ) Not sure ( )

[b]The training?

[i] The way subject content reflects industry practice? Yes ( ) No ( ) Not sure ( )

[ii]The way the subject content was presented by the trainers? Yes ( ) No ( ) Not sure ( )

[c]The equipment and resources?

[i]The quality of equipment provided for you to practice your skills?

Yes ( ) No ( ) Not sure ( )

[ii] The quantity of equipment available for you to practice your skills?

Yes ( ) No ( ) Not sure ( )

[iii] Access to the library and other learning resources?

Yes ( ) No ( ) Not sure ( )

[d] Access to Training Venues?

[i] The convenience of both venue and class times?

Yes ( ) No ( ) Not sure ( )

[e] Administration and information?

[i] The information you received when choosing your mode of training?

Yes ( ) No ( ) Not sure ( )

[ii] The way college administration handled enquiries, enrolment, fee payment and examination results?

Yes ( ) No ( ) Not sure ( )

[f] Student support services?

[i] The way information about careers and jobs was availed to you by your college?
Yes ( ) No ( ) Not sure ( )

[ii]The way student counselling services were provided in your college?
Yes ( ) No ( ) Not sure ( )

[g] The overall opinions?

[i] The usefulness of the training for your job prospects?
Yes ( ) No ( ) Not sure ( )

[ii] The relevance of the qualification in terms of how it is regarded by employers?
Yes ( ) No ( ) Not sure ( )

[iii] The value for money of the training program?

Yes ( ) No ( ) Not sure ( )

[h] Overall quality?

[i] The overall quality of the training program?

Yes ( ) No ( ) Not sure ( )

9. Are you satisfied with TVET training regarding the following:-

[a] The usefulness of the training for your job prospects?

Yes ( ) No ( ) Not sure ( )

[b]The relevance of the qualification in terms of how it is regarded by employers?

Yes ( ) No ( ) Not sure ( )

[c] The value for money of the training program?

Yes ( ) No ( ) Not sure ( )

[d] The overall quality of the training program?

Yes ( ) No ( ) Not sure ( )

10. Is there any additional information you would like to provide regarding how the mode of training you went through [modular, regular, apprenticeship] has influenced your level of satisfaction with TVET training in Kenya?

……

……

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……

……

……

……

THE END

Thank you for finding time to respond to the questions in this questionnaire

Appendix III: List of Licensed Shipping Lines in Kenya, 2021

SHIPPING LINES

1. Emirates shipping line [dmcest]
2. United africa feeder line[uafl]
3. Evergreen marine [singapore] pte ltd.
4. Sea consortium pte, ltd
5. Ignazio messina & c.s.p.a
6. Hyundai glovis
7. W.e.c lines b.v
8. Sarjak container lines pvt limited
9. Emkay lines [pvt]limited
10. Eukor car carriers inc
11. Hapag lloyd aktiengesellschaft
12. Mitsui o.s.k lines limited
13. Pacific international lines [private]limited
14. Cosco shipping lines company limited
15. Kenya national shipping line
16. Safmarine container lines
17. Maersk line limited
18. Maersk line a/s
19. Orient overseas container lines[oocl]
20. Mediterranean shipping company s.a

Source: the Kenya Maritime Authority

Appendix IV: List of duly Licensed Maritime Service providers in Kenya, 2021

1. Mapset services limited
2. Lcl logistix [Kenya] limited
3. Helma freight limited
4. Green link cargo and logistics limited
5. Jihan shipping limited
6. Milan freight services [k] limited
7. A k l international limited
8. Freight forwarders Kenya limited
9. Simpet global logistics limited
10. Trevart express limited
11. Saco shipping Kenya limited
12. Rapia kate services [freight] limited
13. Boldline shipping and logistics services limited
14. Rhs freight services [k] limited
15. Overseas consolidation services [e.a] limited
16. Global express line limited
17. Afriasia global logistics limited
18. Ecu shipping logistics [k] limited
19. Bollore transport &logistics Kenya limited
20. Famo logistics limited
21. Emirates logistics [e.a] limited
22. Africa freight systems [Kenya] limited
23. Cargo log freight limited
24. Seven stars limited
25. Sovereign logistics limited
26. Genuine freight services limited
27. Steja general agencies company limited
28. Standcare maritime limited
29. Consoline global limited
30. East African consolidators limited
31. Logwin air &ocean Kenya limited
32. Seaglory shipping services limited
33. Stanmore holdings limited

34. East African commercial and shipping company limited
35. Ecu worldwide [Kenya]limited

Source: the Kenya maritime authority

Appendix V: Marine Engineering and Maritime Technology Training Institutions in Kenya-2021

MOMBASA

1. Bandari Maritime Academy (Diploma in Marine Engineering, Diploma in Nautical Science, Craft in Marine Engineering, Craft in Nautical science, Basic STCW courses, BTECH Marine engineering)
2. Kenya Coast National Polytechnic (Artisan Seafarers course and Craft in marine)
3. Technical University of Mombasa (Diploma in Marine Engineering, Diploma in Nautical Science)

NAIROBI

1. Jomo Kenyatta University of Agriculture and Technology (Bachelor of Science in Marine Engineering)
2. Pioneer University (Basic STCW courses)

KISUMU

1. Kisumu Maritime centre (Basic STCW courses, Artisan seafarers' course, Coxswain Courses)
2. Railway Training Institute (Coxswain Courses)

WATAMU

1. Indian ocean Maritime training centre (Basic STCW courses, Coxswain Courses)

Appendix VI: Ship Building, Repair and Maintenance Industries and Agencies in Kenya

MOMBASA

1) Southern Engineering Company Ltd
2) Comarco Private company Ltd
3) African Marine & General Engineering Company Ltd
4) Kenya Shipyard Limited

5. Kenya Ports Authority

6. Kenya Ferry Services under KPA management

KISUMU

1. Kenya Shipyard Limited
2. Globology Limited

Appendix VII: Kenya County Map Showing Mombasa County

Appendix VIII: Research Permit

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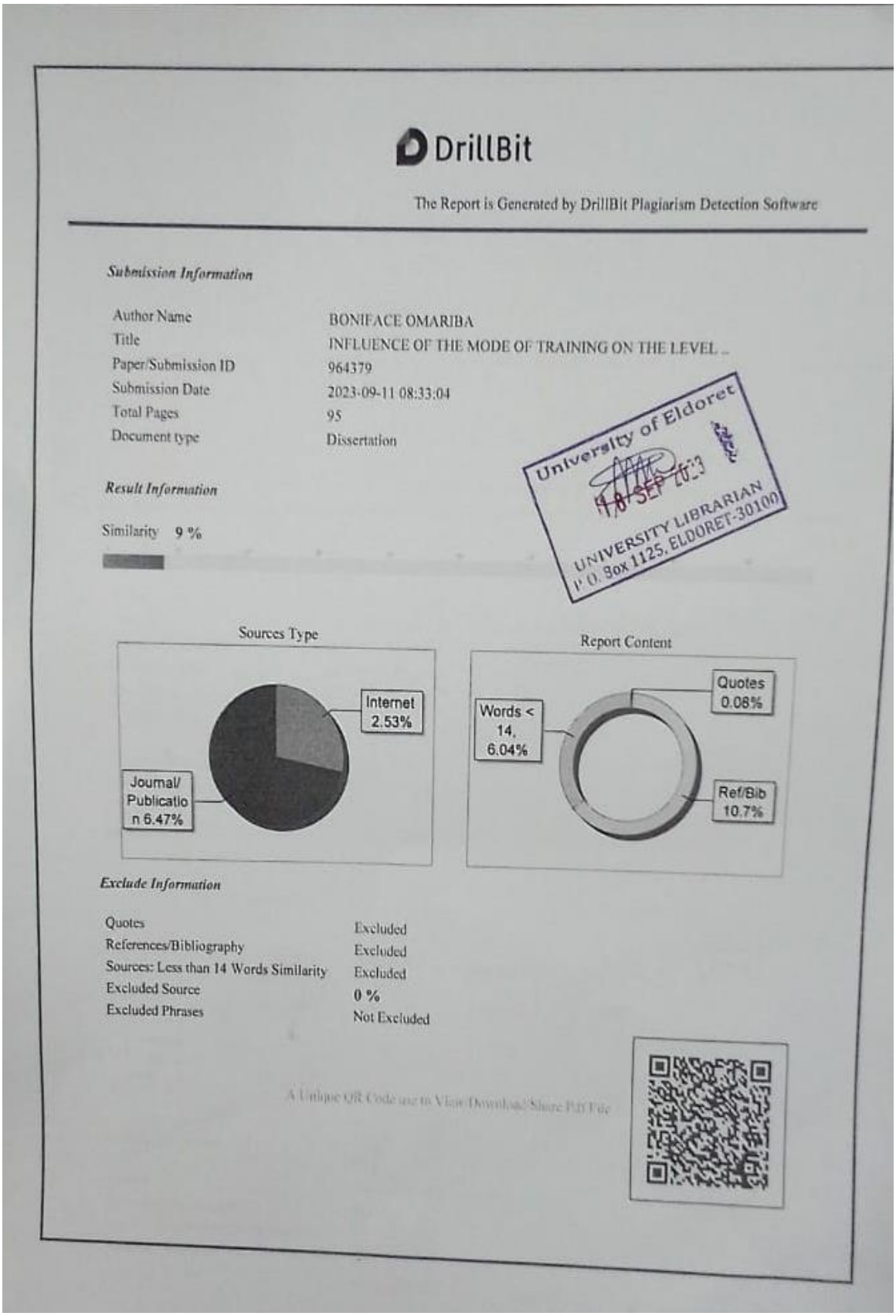

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