

**LECTURERS AND STUDENTS PERCEPTIONS OF ADEQUACY OF
TEACHING AND LEARNING RESOURCES IN ADVENT OF COVID-19 AT
KENYA MEDICAL TRAINING COLLEGE - KENYA**

BY

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**A THESIS SUBMITTED TO THE COLLEGE OF HEALTH SCIENCES, SCHOOL
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PHILOSOPHY DEGREE IN MEDICAL, EDUCATION
MOI UNIVERSITY.**

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DECLARATION

Declaration by the Candidate

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DEDICATION

The study is wholeheartedly dedicated to my parents who have been my source of inspiration and strength; to my wife, son and daughter who continually provide their moral, spiritual, emotional and financial support.

ABSTRACT

Background: Teaching and learning resources are very essential to pedagogy. However, challenges such as lack of adequate human resources, physical facilities, teaching aids, and finances existed due to high students' intake. In the advent of the COVID-19 pandemic, the above challenges were made worse by the health requirements to mitigate against the pandemic.

Objective: The study investigated lecturers and student's perception of the adequacy of human resources, physical facilities, teaching aids, and financial resources, in the advent of COVID-19 at Kenya Medical Training College.

Methods: This was a descriptive cross-sectional study. The study setting was the Eastern Region, selected out of the eight regions of Kenya through simple random sampling. The eastern region has four Campuses offering Medical Laboratory Sciences, namely Machakos, Kitui, Embu, Meru, and all were selected through census sampling. The study population was all 18 lecturers and 220 students proportionately sampled. The data collection instruments were interview guides and self-administered closed and open-ended questionnaires. The data was analyzed using Statistical Package for the Social Sciences for both descriptive statistics (measures of central tendency) and inferential statistics (Spearman's rank test, T-test, and ANOVA). Then presented in percentages, frequency tables, bar charts, pie charts, histograms, and narratives.

Results: The response rate was 100% (18 lecturers, 220 students). The majority of the lecturers and students had a mean age was 38 years and 22 years respectively. The majority of students and lecturers were not satisfied with the adequacy of human resources with a mean of 3.2048 and (std. deviation =1.38616) and a mean of 1.5833 and (std. deviation=.51493) respectively. The majority of students perceived the state of physical facilities to be in a poor state with a mean of 1.76 and (std. deviation =0.413) while the majority of lecturers felt that the physical facilities were inadequate with an average mean of 1.6. and (std. deviation =0.418). The satisfaction level of the majority of students and lecturers on teaching aids was a mean of 3.01 (std. deviation=1.459), representing neutral to very inadequate. All four Heads of departments (100%) indicated that the budget allocation was inadequate. Spearman's rank test showed a very strong correlation between government funds and donor funds, recurrent budget allocation, and development funds with a very strong coefficient correlation of 1.0000. t-test on the satisfaction level of lecturers and students on the adequacy of human resources, physical facilities, and teaching aids was not satisfied, with a p-value of ($p>0.05$) thus there was no significant difference. One-way ANOVA to assess the relationships between study year, age, number of classes, state of facilities, and student satisfaction level yielded a p-value ($P<0.05$), which was statistically significant.

Conclusion: The majority of students and lecturers perceived that there were insufficient teaching and learning resources. All Heads of Departments pointed out there was lack of adequate financial resources in the advent of COVID-19.

Recommendations: There is a need for Kenya Medical Training College to avail adequate teaching and learning resources.

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ACRONYMS AND ABBREVIATIONS

ASHRAE	American Society of Heating, Refrigerating, and Air-Conditioning Engineers
CDC	Centers for Disease Control and Prevention
CEPI	Coalition for Epidemic Preparedness Innovations
COVID-19	Corona Virus Disease
DFID	Department for International Development
EiE	Education in Emergency
GEC	Global Education Cluster
GEFI	Global Education First Initiative
GPE	Global Partnership for Education
HOD	Head of Department
ICT	Information, Communication and Technology
IHR	International Health Regulations
INEE	Inter-agency Network for Education in Emergencies
IREC	Institutional Research Ethics Committee
KASH	Knowledge, Attitude, Skills and Habit
KES	Kenya Shilling
KMLTTB	Kenya Medical Laboratory Technician and Technologist Board
KMTC	Kenya Medical Training College
KNEC	Kenya National Examination Council
LCD	Liquid Crystal Display
ME	Medical Education
MLS	Medical Laboratory Sciences
MOE	Ministry Of Education

MOEST	Ministry of Education Science and Technology
NAACLS	National Accrediting Agency for Clinical Laboratory Science
NACOSTI	National Commission for Science, Technology and Innovation
NGO	Non Governmental Organization
ODA	Official Development Assistance
OECD	Organization for Economic Cooperation and Development
SARS	Severe Acute Respiratory Syndrome
SDG	Sustainable Development Goal
SMLTSA	Society of Medical Laboratory Technology of South Africa
SPICES	Student, Problem, Integrated, Community, Electives, Systematic
SPSS	Statistical Package for Social Sciences
SSA	Sub Saharan Africa
SSA	Sub-Saharan Africa
TLM	Teaching Learning Material
TLR	Teaching Learning Resource
UN	United Nations
UNDP	United Nations Development Program
UNESCO	United Nations Educational, Scientific and Cultural Organization.
UNHCR	United Nations High Commissioner for Refugees
UNICEF	United Nations Children's Fund
WASCE	West Africa School Certificate Examinations
WHO	World Health Organization

OPERATIONAL DEFINITION OF TERMS

Adequacy	- Quantity and quality of teaching and learning resources according to the set standards
Advent	- (From Latin adventus) period of preparation for the current or future occurrence of events or pandemic and epidemic prone diseases like Avian influenza, Cholera, Ebola, Yellow fever, Meningitis, MERS, Influenza, Zika, Rift valley fever, Lassa fever, Coronavirus, Leptospirosis, etc.
Lecturers	- Permanent KMTC teaching staffs heads of MLS Department inclusive
Non-technical staff	- These are the non-teaching staff such as support staff
Teaching staff	- Lecturers in the department of Medical Laboratory Sciences
Students	- Medical Laboratory Sciences Students

CHAPTER ONE

INTRODUCTION

1.0 Background

The education sector has experienced significant evolution, shifting from a teacher- to learner-centered mode. As a result of the former, teachers play an important role as knowledge informants, while learners play a passive role as mere recipients of that knowledge, (Khan et. al, 2021). The coronavirus disease 2019 (COVID-19) pandemic is a global outbreak of coronavirus – an infectious disease caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). This led WHO to declare a Public Health Emergency of International Concern (PHEIC) on 30 January 2020 and to characterize the outbreak as a pandemic on 11 March 2020. More than three years into the pandemic, the disease was by now well established and ongoing. This does not mean the pandemic itself is over, but the global emergency it caused is for now, (WHO, 2020). Coronavirus will not be the last pandemic in our lifetime. Scientists warn the threat posed by zoonoses an infectious disease that jump from animals to humans is on the rise. And the risk of a new pandemic is higher now than ever before. The most likely scenario for the next pandemic is a new strain of influenza like the H7N9 “bird flu” virus, or a newly identified virus such as another novel coronavirus. The COVID-19 pandemic has led to an education emergency of unprecedented global scale. At its peak, over 190 countries closed schools in response to the health emergency, leaving 9 out of 10 enrolled learners around the world out of school. Although previous health emergencies – such as the H1N1 influenza pandemic in 2009 and the Ebola outbreak in 2014-2016 – have caused short- and long-term school closures in several countries, the COVID-19 crisis has caught most of the world’s education systems unprepared, (UNICEF, 2020).

The COVID-19 pandemic affected many aspects of people's lives, majorly impacting sociocultural, economical, as well as educational aspects. These impacts have been experienced by educational institutions around the globe. Students' lives have been impacted by this pandemic from the onset, as all educational institutions had to be closed, with the whole education system shifting to the use of alternative learning platforms. Building on lessons learned from these school closures, they must create comprehensive preparedness plans and develop strong national infrastructure to deliver education through different modalities and monitor its reach and contribution to learning. Vigilance is essential to prevent children's learning from falling through the cracks during this present crisis as well as future ones, (UNICEF, 2020). This may be effective through provision of adequate teaching and learning resources in institutions of the world, Kenya included.

Teaching-learning resources are those resources that teachers use to assist learners to meet the expectations for learning defined by curriculum. We can also define these resources as materials used by a teacher to supplement classroom instruction or to stimulate the interest of learners. (UNICEF,2020) Obviously, teaching/learning resources aid to retain more concepts permanently. Also, learners can learn better when they are motivated properly through different teaching. Learning resource plays a vital role in the teaching-learning process. In education the meaning of resource is any device, object or machine used by a teacher to clarify or enliven a subject. It can also be viewed as material and equipment used in teaching learning process. There are so many aspects of word "resource". At some place, it is taken as a source of supply and support or aid that can be readily drawn upon. This word is also used as to refer to a capability or determination to persevere and in the context of classrooms, resources can be defined as physical demonstration aids, learners' contextual understandings, teacher subject expertise, non-

teaching expertise and structured organization of materials, ideas and activities. Teaching and learning involve all complex processes utilized in active transfer of Knowledge, Skills, Attitude and Habits (KASH) from an instructor to a learner.

The term resources refer not only to teaching methods and materials but also the time available for instruction, the knowledge and skills of teachers acquired through training and experience. Oyugi and Nyaga (2010) noted that teaching and learning resources include; peripatetic services, support staff (sign language interpreters and Braille transcribers), community involvement, regular and special teachers among others. Inadequate trained special education teachers and professional's acts as an obstacle to implementation of inclusive education (Kochung, 2011). Appropriate teaching and learning materials to exercise their rights and responsibilities as citizens, while the community and special education system has functioned to exclude them from both the education process and wider social life. Instructional methods, examination systems and rigid curriculum are some of the barriers to implementation of inclusive education in pre-school centres in Kenya. Implementing successful inclusive education often requires adequate support human resource, teaching and learning resources. Teachers frequently feel there is lack of human resources, teaching and learning facilities; this poses great barriers to implementing successful inclusion (Crawford, et al., 2023).

Adequacy of TLR (Teaching Learning Resource) refers to satisfactory or acceptable quality and quantities of material resources, physical facilities and human resources. Adequacy of instructional materials such as textbooks which is the main instruction material is the most cost effective input affecting student performance. In this context adequate supply is usually assumed to be a minimum of one textbook per three students,

and at primary level enough reading books so that every child has the opportunity to read at least one new book every week.

Adequacy of TLR determines an educational system's efficiency, according to Mutema et.al. (2010). For effective teaching and learning, textbook and resource materials are basic tools, their absence or inadequacy makes teachers handle subjects in an abstract manner, portraying it as dry and non-exciting. It is also important to have appropriate personnel plan for adequate instructional materials and physical facilities to support educational effort. Therefore Scarcity of textbooks, libraries and physical facilities according to Njeru et.al. (2020), will constraint educational system from responding more fully to new demands like technology. In order to raise the quality of education, its efficiency and productivity, better Teaching and Learning Materials (TLM), physical facilities and human resources are needed for better teaching and learning.

Teaching and learning resources comprises basically three components: material resources, physical facilities and human resources among others. Studies done in the past with regard to availability of TLR in education reveal that TLR are not always available in schools. This inadequacy of TLR has been of serious concern to educators. Learning is a complex activity that involves interplay of students' motivation, physical facilities, teaching resources, and skills of teaching and curriculum demands. Availability of TLR therefore enhances the effectiveness of schools as they are the basic resources that bring about good academic performance in the students. The necessary resources that should be available for teaching and learning include material resources, human resource such as teachers and support staff and, physical facilities such as laboratories, libraries and classrooms. TLR help improve access and educational outcomes since students are less likely to be absent from schools that provide interesting, meaningful and relevant

experiences to them. These resources should be provided in quality and quantity in schools for effective teaching-learning process. Several studies have been conducted on the impact of instructional materials on education. Material resources have a significant effect on student's achievement since they facilitate the learning of abstract concepts and ideas and discourage rote-learning.

When teaching and learning resources are inadequate education is compromised and this inevitably is reflected in low academic achievement, high dropout rates, problem behaviors, poor teacher motivation and unmet educational goals. Influence of availability of Teaching and Learning Materials on Learners' Performance Material resources include textbooks, charts, maps, audiovisual and electronic instructional materials such as radio, tape recorder, television and video tape recorder.

There is a very strong positive significant relationship between instructional resources and academic performance. Schools endowed with more materials performed better than schools that are less endowed. Private schools performed better than public schools because of the availability and adequacy of teaching and learning materials. Students' performance is affected by the quality and quantity of teaching and learning materials. Institutions with adequate facilities such as textbooks stand a better chance of performing well in examination than poorly equipped ones. Therefore, poor performance could be attributed to inadequate teaching and learning materials and equipment (Wandera et al., 2020).

The development and maintenance of physical facilities in educational institutions by communities, parents, and sponsors should continue to be encouraged. This is because lack of such facilities interferes with learning process and the importance of school facilities in relation to quality education. Difference in school facilities would be seen to

account for difference in achievement. Physical facilities include classrooms, lecture theatres, auditoriums, administrative block, libraries, laboratories, workshops, play grounds, assembly halls, and special rooms like clinics, staff quarters, students' hostels, kitchen, cafeteria, and toilet amongst others. Learning experiences are fruitful when there are adequate quantity and quality of physical resources; and that unattractive school buildings, crowded classrooms, non-availability of playing ground and surroundings that have no aesthetic beauty can contribute to poor academic performance. Fonseca et al., (2015), posit that the physical conditions and organization of schools facilitate or inhibit construction of a culture of success. Puri and Abraham (2004) emphasize that classroom need to be colourful, interesting, for learners to feel enthusiastic about learning.

As outlined by Sequeira (2012), learning brings a permanent change in behavior through acquisition of new skills. Teaching, also referred to as instruction is employment of different techniques to impact knowledge, skills and attitude on a learner. Of importance is that information can only be passed to the learner effectively if an instructor utilizes the right materials to present relevant content (American Psychological Association, 2015). Teaching can be defined as engagement with learners to enable their understanding and application of knowledge, concepts and processes. It includes design, content selection, delivery, assessment and reflection. To teach is to engage students in learning; thus teaching consists of getting students involved in the active construction of knowledge. A teacher requires not only knowledge of subject matter, but knowledge of how students learn and how to transform them into active learners. Good teaching, then, requires a commitment to systematic understanding of learning. The aim of teaching is not only to transmit information, but also to transform students from passive recipients of other people's knowledge into active constructors of their own and others' knowledge. The teacher cannot transform without the student's active participation, of course.

Teaching is fundamentally about creating the pedagogical, social, and ethical conditions under which students agree to take charge of their own learning, individually and collectively (Chirdeachin, et, al. 2019). Further learning can be viewed as an activity or process aimed at gaining knowledge or skill by studying, practicing, being taught, or experiencing something. Learning is related to what students are supposed to do.

Teaching and learning resources are therefore potent instructional facilities that must be envisaged by teachers in administration of content of the curriculum. This is evident from the curriculum development in regards to the ten steps that is; According to (Mutema et al 2010) identified ten steps of curriculum development. These are;

- Identification of Need/Problem
- Identification of Professional Roles and Functions/Tasks/ Responsibilities
- Performing Task Analysis
- Developing Educational Objectives
- Developing Content.
- Teaching Methods and Learning Activities
- Instructional resources
- Evaluation and Assessment of Student Performance
- Curriculum Implementation
- Curriculum Evaluation and Change

Further Hardens (2017), in his ten questions of curriculum development has emphasized on the adequacy of environment for effective teaching and learning.

These questions are: (1) What are the needs in relation to the product of the training programme? (2) What are the aims and objectives? (3) What content should be included?

(4) How should the content be organized? (5) What educational strategies should be adopted? (6) What teaching methods should be used? (7) How should assessment be carried out? (8) How should details of the curriculum be communicated? (9) What educational environment or climate should be fostered? (10) How should the process be managed? To be specific and on environment which is question number 9, that environment is known as learner-centered environment in which learners and teachers are learning from each-other. Learner-centered or learner oriented environment proposes a global shift away from instruction that is fundamentally teacher-centered, at times persuasively termed as ‘sage on the stage’ focusing instead on learning outcomes. Education in our middle schools and high schools these days is rapidly changing.

The old notion of a classroom where the learners are sitting quietly and neatly in their seats, while the teacher is up front pouring pearls of wisdom and knowledge into their brains is absurd. Now the teachers are only facilitators and learners are primary operational, so if learners have to perform the key role in teaching-learning process, the environment of this process also should be learner oriented. For making the classroom environment as resource for learning, schools must create learning environments that are as engaging and relevant as the ones that learners incline to outside of school. When learners will be more engaged with learning, automatically they will enjoy this process. It is also a fact that when learners are more engaged and more successful when they can connect to what they are learning, to situations they care about in their community and in the world, so teacher should try to give them chances to gain experiences from the community and the real world.

Financial resources and needs of diverse learner groups are considered in school budget planning and management, and reviewed trends in education equity in relation to school

financing. In addition, while keeping in mind the issue of turning a public good into a commodity, supplementing financial resources with Government, donors and school fees resources can influence the availability and adequacy of teaching and learning resources. Furthermore, teaching and learning outcomes are influenced by financial and budget processes. In considering what is needed and possible in terms of adequacy and how the institution finance process can promote efficiency schooling in education, systematic attention has to be given to specific contexts. Basic information has to be collected regarding the proportion of students accessing, participating in and completing tertiary education.

The notion of Education in Emergencies (EiE) may encompass a wide range of human-made crises and natural events, including global emergencies such as the COVID-19 pandemic. International agencies such as the Inter-agency Network for Education in Emergencies (INEE), the World Bank and the United Nations, typically play a major role in the recovery process, as local governments often lack available resources.

The provision of education in emergencies is premised on the universal right to education for all persons (UN, 2020), as well as several international law provisions which guarantee the right to education in crises (Anderson et al. 2011). Emergency situations intensify the challenges of providing quality education and often exacerbate existing inequalities for vulnerable groups, including girls, the economically disadvantaged, rural communities, refugees, and those with disabilities. Teaching and learning are the primary business of the education system. They are the core determinants of educational attainments. In education, there has been a massive disruption of schools, together with teaching and learning. While temporary school closures as a result of health and other crises were not new unfortunately, the global scale and speed of the educational

disruption was unparalleled and, if prolonged, could threaten the right to education in the advent of COVID 19 pandemic. Therefore, the relevant international organizations advocated that the governments and institutions must ensure the continuity of teaching and learning by online and other means during the pandemic (UNESCO, 2020). According to Quinn and Hughes (2007), teaching and learning resources can be divided into human resource and learning resources. Teaching and learning resources can also be defined as the instruments of presentation such as online platforms such as e-Learning (Rona, 2013). However, additionally, the physical learning facilities such as classrooms, libraries and financial resources are also considered pivotal teaching and learning resources.

Human resource is as significant as all other resources; but very cardinal in Medical Education. It entails knowledge, skills, creativity, experience and health that enable humans attain ability to impact in an institution. Any learning institution endeavors to have adequate human resources in administration of its services. Although the ultimate goal of human resource management is to achieve desired results, organizations need to invest in human capita.

However, institutions deploy different tactics to maximize human resources while also reducing costs (Rafiei & Davari, 2015). In Medical Education, Medical Colleges are directed to invest in instructors as outlined in set standards by the regulatory bodies. For example, Medical Laboratory Sciences in Kenya is regulated by Kenya Medical Laboratory Technicians and Technologists Board (KMLTTB). Additionally, instructors in these institutions are required to utilize technology based learning to augment face to face teaching and learning sessions. According to Wynter et al (2019) many medical institutions worldwide are yet to fully embrace technology during facilitation of learning;

which is of paramount importance during the time of COVID-19. Learning resources are artifacts which a teacher can use to convey learning information to learners (Barber & Moushed, 2007). According to a Prince Edward Island Publication (2008) the learning resources can be in form of print or non-print materials. Any instructor should be conversant with use of such instructional materials. To add on this, teachers should ensure the materials are appropriate for the learners, subject, age of the learner, learning styles as well as social development of the learner. Print materials include; textbooks, newsletters, newspapers handouts and magazines. Non print materials on the other hand include; television, radios and internet or websites. The physical environment which surrounds the student as teaching and learning process is rolled out is very crucial. There are several important concepts in the physical environment for a medical student; presence of a library, classroom setting, skills lab, computer laboratories and diagnostic laboratories.

The physical ambience where learning occurs is fundamental and influences the outcome of learning. According to Warfield (2016), creating a cooperative learning environment has a positive social and environmental impact on learners.

Physical environment refers to the classroom set up, lighting, ventilation, space, fittings, equipment and facilities such as libraries (Warfield, 2016). The attractive feature about physical environment is that it can be adjusted from time to time to suit the needs of learners. For example, students continually take delight in physical resources such as internet when it is readily available. There is therefore a plethora of evidence suggesting that physical conditions during teaching and learning have effects on cognitive and behavioral development of a learner (Ellis, 2022).

Kenya Medical Training College (KMTC) is a state corporation managed by board of directors and was established in 1927 and is one of the oldest Medical Colleges in Kenya. Initially, KMTC trained pharmacy students only but later on started training other disciplines such as Medical Laboratory Sciences. From 1975, discussions emerged on the need to change the name to more directly reflect the mandate of training health professionals. The name, College of Health Professionals (CoHP), was subsequently adopted in 1987. However, this name was later contested by the University of Nairobi. The College dropped the name and reverted to MTC. In 1990, the College became a State Corporation in the Parastatal Categorization (PC 2), and its name changed to Kenya Medical Training College with the enactment of the KMTC Act, Cap. 261 of the Laws of Kenya. The Act expanded the institution's mandate to include training of health professionals, research, and consultancy services. The Act was reviewed in 2019 following the re-categorization of the College in 2017 to a higher category as a training and research institution PC4A.

The College is the largest middle-level medical training institution in Kenya and within the East, Central, and Southern African (ECSA) region. It has seven (7) faculties, 18 departments, 74 campuses namely, Mombasa, Port Reitz, Kwale, Msambweni, Kilifi, Tana River, Lamu, Taveta, Voi, Garissa, Wajir, Mandera, Isiolo, Meru (Maua satellite), Imenti, Chuka, Embu, Kitui (Mutomo satellite), Mwingi, Machakos, Manza, Kangundo, Makueni (Mbuvo and Mutyambua satellites), Makindu, Mbooni, Nyandarua (Kinangop satellite), Nyeri, Othaya, Murang'a, Thika, Karuri, Gatundu (Mutunguru satellite), Lodwar, Kapenguria, Kitale, Eldoret, Iten, Kaptumo, Mosoriot, Kabarnet, Chemolingot, Nyahururu, Nakuru, Molo, Transmara, Loitokitok, Kapkatet, Sigowet, Bomet, Kakamega (Shianda Mumias & Navakholo satellites), Lugari, Vihiga, Bungoma, Chwele, Webuye, Busia, Teso, Siaya (Ugunja satellite), Rera, Bondo (Masita satellite),

Ugenya, Kisumu, Lake Victoria, Kombewa, Homa Bay (Ndhiwa satellite), Rachuonyo, Migori (Awendo satellite), Kuria, Kisii, Nyamache, Nyamira, Nairobi, Karen, Mathari.

KMTC with 62,807 students as at June 2023 and offers a large portfolio of curricula over its 96-year history. The number of graduates has grown tremendously with 15,915 graduating in 2022. KMTC alumni are absorbed by the public and private sector thus contributing to 85 percent of Kenya's healthcare workforce with a number of them working abroad, (KMTC, 2020). The state corporation commenced training of Medical Laboratory Sciences in 1940's and was entrusted with the task of training Certificate and Diploma programs. At first, Medical Laboratory Sciences professionals were trained as Medical Assistants in 1945 but as time progressed, certificate, diploma and higher diploma programs started. Being a tertiary level public institution offering expertise medical training has vastly expanded over the past few years. Numerous graduates have qualified from the faculty of Medical Laboratory Sciences from various KMTC Campuses; Machakos, Meru, Nakuru, Nairobi, Kakamega, Embu, Lake Victoria, Kitui, Nyeri, Port Reitz, Kisii and Kombewa.

The Medical Laboratory Sciences course at KMTC was initiated in 1945. Whereas only medical laboratory assistants were trained initially, certificate, diploma and higher diploma programs eloped much later. KMTC Machakos Campus was opened in 1959 and is situated next to Machakos level 5 hospital; with a total population of 900 students. KMTC Kitui was opened in 2004 and has a total population of 1,000 students; while KMTC Embu was opened in 1975 and has a student population of 750. KMTC Meru was opened in 1979 and has a student population of 824. Medical Laboratory Scientists are critical to the diagnosis and analysis of disease. A Medical Laboratory Scientist's

education consists of a carefully curated curriculum. The purpose of the curriculum is to inform future laboratory workers of the information needed to conduct the quality control and monitoring of diagnostic tests (including waived, moderate, and high complexity testing), patient progression, disease surveillance, and more (Ibeh et al., 2020).

The Medical Laboratory Sciences curriculum indicate stricter personnel education requirements for higher difficulty levels of testing. For example, a test that requires interpretation and judgment of the pre-analytical, analytical, and post-analytical processes of a test will be deemed high complexity. This test will require test personnel to have special knowledge and skills of the material being tested (KMLTTB (2002)). The curriculum of the Medical Laboratory Sciences program at the Kenya Medical Training College prepares students for the ability to process, perform, and interpret results at a high complexity level. Some examples of the required Medical Laboratory Sciences subjects include bacteriology, immunohematology, hematology, clinical chemistry, and immunology.

With additional upcoming Campuses, resources for teaching in Medical Laboratory Sciences will slowly become scarce. Additionally, with the evolution of COVID-19, it is hypothesized that TLR will be more constrained. Consequently, learning in many of these Campuses may become depleted and this may deter KMTC from achieving its mission (to be a model institution in the training and development of competent health professionals) and vision (To produce competent health professionals through training and research, and provide consultancy services).

During the post-COVID era, learners and lecturers in different institutions may possess different perceptions towards teaching and learning materials and resources. Emergence of new diseases therefore has an influence on the perceptions of teachers especially

because new teaching methods of Department and resources must be invented to meet rising demand (Chari, 2012). This study assessed the perceptions of lecturers and students towards resources availability for teaching and learning at KMTC during this era of COVID-19.

1.1 Statement of the Problem

The KMTC as a tertiary institution must avail adequate resources for training to ensure efficient teaching and learning. In the dawn of COVID-19, teaching and learning resources were greatly affected, thus in return the standards of teaching and learning might have been greatly compromised. Teachers will always depend on different resources during teaching and learning. COVID-19 however, has brought a challenge to KMTC to explore even better avenues of teaching and in provision of adequate resources for teaching. The availability/adequacy of resources for teaching and learning in the event of pandemics needs to be explored for better preparedness and continued learning processes.

The COVID-19 pandemic has had a significant impact on teaching and learning resources, which may have compromised the quality of education. With over 100,000 students spread across 71 Campuses, Kenya Medical Training College (KMTC) is facing an increasing demand for teaching resources. In particular, the need for diagnostic courses like Medical Laboratory Sciences has grown, but COVID-19 has presented unprecedented challenges such as a shortage of laboratory equipment, physical facilities, teaching aids and human resources for teaching and learning. This has led to limited resources being shared, which compromises the level of training. The study explored how both lecturers and students perceived the adequacy of teaching and learning resources before and onset of covid-19, which shed light on the preparedness of availability of

teaching and learning resources for continued teaching and learning. Further the study identified gaps in resource provision in the onset of covid-19.

The study identified the perceived situational preparedness of lecturers and students in transitioning from normal classroom settings to learning environments in the advent of COVID-19 pandemic. This identified areas where additional support and training are needed to ensure a smooth transitioning and enhance the overall preparedness for future disruptions.

By examining the perception of both lecturers and students with the available teaching and learning resources, the study identified factors that contribute to positive learning experiences, noting that the shift to learning environments during the pandemic exacerbated existing inequalities in access to educational resources. Moreover noting that students or lecturers are likely to be faced with greater challenges in adapting to the learning environment. While KMTC has produced numerous graduates in Medical Laboratory Sciences, it remains to be seen whether all Campuses offering the Medical Laboratory Sciences course had adequate resources in the advent of COVID -19, especially with an increasing demand for laboratory technicians and emergence of pandemics like COVID-19 among others. Kenya Medical Training College requires to put in place both academic and non-academic staff, physical facilities, teaching aids, crucial equipment and reagents for teaching and learning in preparedness of any eventualities.

Kerima (2023), suggests that as the focus now shifts from Covid-19, it is imperative for global community not to rest on its laurel, instead strive to strengthen the existing health systems to manage emerging and re-emerging infectious diseases, not forgetting teaching and learning institutions. Preparedness for future pandemics should continue to be a top

agenda in public health policy-making engagements. KMLTTB (2002) recommends the ratio of teacher to student, should be 1:10, where else the COVID-19 pandemic has strained teaching and learning resource provision in institutions of learning. Given the drastic effects of COVID-19 on adequacy of teaching and learning resources, it is crucial to explore the perception of learners for better preparedness and continued learning process (Curran, 2020). A useful step would be to carry out research on adequacy of teaching and learning resource in the advent of covid-19 in the department of Laboratory sciences at Kenya Medical Training College.

1.2 Justification of the Study

Teaching and learning resources comprises basically three components: material resources, physical facilities and human resources among others. Studies done in the past with regard to availability of TLR in education reveal that TLR are not always available in schools. This inadequacy of TLR has been of serious concern to educators. Learning is a complex activity that involves interplay of students' motivation, physical facilities, teaching resources, and skills of teaching and curriculum demands. Availability of TLR therefore enhances the effectiveness of schools as they are the basic resources that bring about good academic performance in the students.

The necessary resources that should be available for teaching and learning include material resources, human resource such as teachers and support staff and, physical facilities such as laboratories, libraries and classrooms. TLR help improve access and educational outcomes since students are less likely to be absent from schools that provide interesting, meaningful and relevant experiences to them. These resources should be provided in quality and quantity in schools for effective teaching-learning process. Several studies have been conducted on the impact of instructional materials on

education. Material resources have a significant effect on student's achievement since they facilitate the learning of abstract concepts and ideas and discourage rote-learning. When teaching and learning resources are inadequate education is compromised and this inevitably is reflected in low academic achievement, high dropout rates, problem behaviors, poor teacher motivation and unmet educational goals. Influence of availability of Teaching and Learning Materials on Learners' Performance Material resources include textbooks, charts, maps, audiovisual and electronic instructional materials such as radio, tape recorder, television and video tape recorder.

Pandemics the world over have brought about disruptions in all spheres of life including education. According to UNESCO (2020), more recently COVID-19 pandemic created the largest disruption of education systems in history, affecting more than 1.6 billion learners in more than 190 Countries and all continents.

The COVID-19 pandemic has led to significant changes in the education sector, with institutions adopting online learning as the primary mode of teaching. The shift to online learning has led to challenges for both lecturers and students, including a lack of access to technology, inadequate resources, and limited interaction with each other. Institutions need to provide additional support and resources to ensure that lecturers and students can access online learning effectively. Adequate training, technical support, and additional resources, such as laptops and internet access, are essential to ensuring that online learning is effective. Had there been proper mitigation before the pandemic, learning crisis would have been prevented. This is because education is not only fundamental right, it's an enabling right with direct impact on realization of all other human rights. It is a global common good and primary driver of progress across all 17 sustainable development goals as a bedrock of just, equal inclusive peaceful societies. When

education system collapse, peace, prosperous and productive societies cannot be sustained. The future appears highly uncertain. Nevertheless, the pandemic has underscored our vulnerability to crises and shed light on the fragility and interconnectedness of the economies we have constructed. Disruptions on the magnitude witnessed recently are not exclusive to pandemics; they may also stem from natural, political, economic, and environmental upheavals. Our ability to respond effectively and swiftly in the future will depend on governments' foresight, readiness, and preparedness. Education systems, by cultivating the competencies and skills essential for the society of tomorrow, must be central to this strategic planning. This entails reassessing how the economy should evolve to withstand adversity and delineating the skills, education, and training necessary to bolster it. It also involves close collaboration with other governmental sectors and the private sector to enhance the appeal and labor-market prospects of specific professions, especially those deemed crucial for the collective well-being.

Over the past few years there has been an upsurge in the number of students applying for medical courses at Kenya Medical Training College. This has been driven largely by the increased demand for health care as outlined in Sustainable Development Goal (SDG) 3 and 4; better health for all. According to World Health Organization (2020) all Countries aim to end epidemics by 2030; a task too big for developing Countries.

Some of the strategies that have been set up to achieve SDG 3 and 4 in developing Countries like Kenya are through expansion of the health work force. Institutions such as KMTC have therefore been handed the errand to train more laboratory technologist and technicians to assist in diagnosis of ailments. This mandate reveals the enormous duty that KMTC plays.

Therefore, the tertiary institutions need to provide enough resources for training during and after pandemics. In the dawn of COVID-19, KMTC was tasked to ensure adequate teaching and learning resources for Medical Laboratory Sciences students. Lack of such resources compromises the standards for teaching and learning.

The achievement of vision 2030 may therefore be impracticable for Kenya. When teaching and learning resources in Medical Education are constrained, unavailable and overstretched, it is impossible to attain learning outcomes. Teachers are forced to utilize harmonized teaching to teach large number of students. Even so, the space for teaching such a large number of students is not available. This is very evident during teaching of students who undertake Medical Laboratory Sciences at KMTC. Additionally, there is less time for practicum; therefore, much emphasis is diverted to theory; a factor that may compromise learning. The COVID-19 pandemic has led to significant changes in the education sector. The use of online learning platforms has become widespread as many institutions had to switch to online learning due to lockdowns and social distancing measures. This shift in education delivery has led to concerns about the adequacy of teaching and learning resources.

This study examined lecturers and students' perceptions of the adequacy of teaching and learning resources in the advent of COVID-19 at Kenya Medical Training College.

By virtue of this study, the researcher determined from the lecturers and students the perceptions of resource availability for teaching and learning in the department of Medical Laboratory Sciences at various KMTC Campuses under the study. This study therefore adds to the pool of academic and scientific knowledge in this field of study. Moreover, the study may provoke thought in other researchers who may in future carryout further studies that may prevent learning crises in case of a pandemic.

1.3 Purpose of the study

The purpose of this study was to determine the perception of the lecturers and students of teaching and learning resources in the advent of COVID-19 in the department of Medical Laboratory Sciences at KMTC.

1.4 Objectives of the study

To determine perceived adequacy of teaching and learning resources in the advent of COVID-19 by lecturers and students in the department of Medical Laboratory Sciences of Kenya Medical Training College. The study was guided by the following objectives;

- i. To establish the perceived adequacy of human resources by the lecturers and students in Medical Laboratory Sciences department of Kenya Medical Training college.
- ii. To ascertain the perceived adequacy of physical facilities by the lecturers and students in Medical Laboratory Sciences department of Kenya Medical Training college.
- iii. To determine perceived adequacy of projected and non-projected teaching aids by the lecturers and students in Medical Laboratory Sciences department of Kenya Medical Training College.
- iv. To explore the perceived adequacy of financial resources for teaching and learning by lecturers in Medical Laboratory Sciences department of Kenya Medical Training college.

1.5 Research Questions

The study sought to answer the following research questions

- i. What is perceived adequacy of human resources by the lecturers and students in Medical Laboratory Sciences department of Kenya Medical Training College?
- ii. What is the perceived adequacy of physical facilities by the lecturers and students in Medical Laboratory Sciences department of Kenya Medical Training College?
- iii. What is the perceived adequacy of projected and non-projected teaching aids by the lecturers and students in Medical Laboratory Sciences department of Kenya Medical Training College?
- iv. What is perceived adequacy of financial resources for teaching and learning by lecturers in Medical Laboratory Sciences department of Kenya Medical Training College?

1.6 Limitations of the study

Limitations are the unforeseen factors that are likely to hinder the investigator from carrying out a study as planned. Such factors include change in weather conditions, change in political climate of a Country, escalating chaos (Wambungu, et. al, 2015). This resonates with (Matula, et al., 2018), who reported that limitations are constraints or drawbacks, that the researcher may encounter when conducting a study, which he may have little or no control, for example the inability of the respondents to express themselves freely during data collection. In this study, respondents had reservations in sharing of information with regard to adequacy of teaching and learning resources in their Campuses since they mistook the researcher to be on faultfinding mission. However, the researcher physically visited the Campuses during data collection and explained to the

respondents that the study's aim was for academic purposes and improvement as far as teaching and learning resources are concerned.

This study was carried out in four Campuses in the department of Medical Laboratory Sciences of KMTC namely Meru, Embu, Kitui and Machakos.

1.7 Significance of the Study

The primary beneficiaries of this study are KMTC lecturers and students especially those in Medical Laboratory Sciences. The study pointed out any gaps in teaching and learning resources in the advent of COVID-19. KMTC as an institution and the Ministry of Health was able to know the status of the adequacy of teaching and learning resources and may explore better pandemic preparedness and come up with innovative strategies and mitigation to avail these resources where and when necessary for continuity of education. The study findings may further catalyze KMTC management formulate better policies on teaching and learning resource management and improvement across all KMTC Campuses offering Medical Laboratory Sciences. After publishing, the findings from this study may also benefit other researchers since there will be areas of further research.

1.8 Assumptions of the Study

In the study all the five KMTC Campuses had similar learning environments for the research to be conducted. In addition, the respondents in all the five Campuses had similar needs at the time of the study.

1.9 Philosophical World View

There are four major philosophical approaches to the process of how to teach namely: - post positivism, constructivism, and advocacy or participatory and pragmatism as opined

by Creswell (2017). They explain the various approaches curriculum developers adopt when choosing a particular method to use.

One, the post positivists view represents a group of individuals whose view is after positivism; they hold a deterministic view that human beings decide their own issues and that their causes probably determine effect or outcome. Groups who hold this view approach research with an already determined set of mind hence they do research to prove their view; because to them what is being observed determines their world view. Hence their view that knowledge is better understood by describing the phenomena that one is experiencing. What a particular individual is going through forms and shapes one's world view. Two, the social constructivist view assume that people develop a subjective meaning of their world or environment. Since community is shaped by culture and environment, researchers should focus to get meaning from the view of the community. For the researcher to understand individuals, they rely on the way research participants view their world or environment which has been influenced by culture.

It means that decisions made are not individualistic but are to advance the interests of the community; since knowledge is constructed through interaction with others. So, knowledge is generated from the community as people interact when doing their day today activities as opined by Ernest (2013).

Three, advocacy or participatory view opine that research cannot be done without taking into consideration the people's political agenda. When a researcher is conducting research, one has to intertwine it with the existing political agenda of the research participants. It is so because of being the only way a researcher will get meaning in participants' statements. Every research must contribute change to the society and so it starts with the needs of the community as argued by Kemmis and Wilkinson (2014). This

view is what propelled the birth of action research aimed at giving solutions to community problems as argued by Fay (2014). Action research is one of the innovative methods of teaching and learning, it uses the team work approach whereby participants from diverse professions come together to seek for solutions to community problems as opined by Reason and Bradbury (2008).

The fourth view and last view is the pragmatic view whereby holders of this view approach research with a research problem, then seek for a solution to it. They are seeking a solution to a community problem as argued by Rorty (2015).

When solutions are identified; the said solutions come with various challenges whose solutions have to be researched further and this forms a spire of action research as opined by Reason and Bradbury (2008). In conducting research using this view, it allows for a mixed method approach to benefit from both quantitative and qualitative data. This enables the researcher secure an in-depth answer to the problem as opined by Morgan (2007).

This research adopted pragmatism paradigm research paradigm to guide in research method, Saunders, Lewis and Thornhill (2015). A paradigm in research refers to philosophical world view that guide the actions of a researcher (Lincoln *et al*, 2011). Pragmatism is a form of research paradigms that involves both qualitative and quantitative methods.

The pragmatism paradigm emphasizes that the best research methods are those that help a researcher answer research questions. According to Ryan (2018) there are three commonly used philosophical research paradigms in pragmatism; positivism, interpretivism and critical theory. Pragmatism combines both interpretivism and positivism. Positivists value objectivity while interpretivist value subjectivity. In

positivism, emphasis is on quantitative research methods of data which adhere to factual information gathered through structured questionnaires (Mackey and Gass, 2015).

According to Mackey and Gass (2015), positivists concentrate on surveys that determine the current trends. The focus here is on facts that must be proven through measurement (Ryan, 2018). On the other hand, interpretivist has an argument that truth and knowledge are subjective based on peoples' understanding of occurrences. Additionally, researchers have ideas of their own beliefs which guide them on the methods of data to use during data collection and analysis (Ryan, 2018). The worldviews have continually evolved over time and even more so during times of pandemics like COVID-19. This is an argument in critical theory which acknowledges that; the evolution of mankind is complex to investigate (Howell, 2013). Pragmatism is a philosophical and research paradigm that emphasizes the practical consequences and usefulness of ideas, theories, and knowledge.

According to pragmatism, the value and meaning of concepts and beliefs lie in their practical application and usefulness in solving real-world problems and improving human experience.

In research, pragmatism often involves combining multiple research methods, both qualitative and quantitative, to address a research question or problem. Researchers who adopt a pragmatic approach typically focus on developing practical solutions to real-world problems and use a variety of research methods and sources to gather information, including surveys, interviews, case studies, experiments, and observations.

One of the key features of pragmatism is its emphasis on the importance of context in understanding human experience and behavior.

According to pragmatists, knowledge is always situated and context-dependent, and researchers must take into account the specific context in which knowledge is produced and applied. Pragmatism is commonly used in a range of fields, including education, psychology, sociology, and business, where researchers seek to address practical problems and make a positive impact on people's lives. It can be contrasted with more theoretical and abstract philosophical and research paradigms, such as idealism or positivism.

In this study, critical theory was crucial because the subjects are people being questioned on perception of adequacy of teaching and learning resources in Medical Education. The researcher is also part of the study because the research may demand critical thinking of the outcomes of the study. This research study employed the paradigm of pragmatism; as it forms a basis for argument. In this instance, the researcher used the argument, employed different qualitative and quantitative methods of data analysis to answer the following research questions;

- i. What is perceived adequacy of human resources by the lecturers and students in Medical Laboratory Sciences department of Kenya Medical Training college?
- ii. What is the perceived adequacy of physical facilities by the lecturers and students in Medical Laboratory Sciences department of Kenya Medical Training college?
- iii. What is the perceived adequacy of projected and non-projected teaching aids by the lecturers and students in Medical Laboratory Sciences department of Kenya Medical Training college?

- iv. What is perceived adequacy of financial resources for teaching and learning by lecturers in Medical Laboratory Sciences department of Kenya Medical Training college?

Which were in line with the specific study objective as below stated;

- i. To establish the perceived adequacy of human resources by the lecturers and students in Medical Laboratory Sciences department of Kenya Medical Training college.
- ii. To ascertain the perceived adequacy of physical facilities by the lecturers and students in Medical Laboratory Sciences department of Kenya Medical Training college.
- iii. To determine perceived adequacy of projected and non-projected teaching aids by the lecturers and students in Medical Laboratory Sciences department of Kenya Medical Training College.
- iv. To explore the perceived adequacy of financial resources for teaching and learning by lecturers in Medical Laboratory Sciences department of Kenya Medical Training college.

The goals of this research was to find out perception of teaching and learning resources in the advent of covid-19. The users who happened to be students and lecturers had their own perception and meaning towards the adequacy of teaching and learning resources. When answering questionnaires, they are presenting their world view about the adequacy of teaching and learning resources in the advent of covid-19 in Kenya Medical Training College. In finding out the lecturers and students perception on teaching and learning resources, the view of the participant reveals the real situation.

In this research, their perception about adequacy of teaching and learning resources formed the way they conceptualize the adequacy of teaching and learning resources. Participants' perception matters because it projects the real situation of adequacy of teaching and learning resources at KMTC during covid-19 pandemic.

2.0 Conclusion

This chapter has presented the background of the study, the statement of the problem, the objectives and the research question. It has also stated the justification of the study, the significance of the study and the assumptions that were considered for the study. These sections of the study were key concepts which introduced the study.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

A literature review is a survey of scholarly sources on a specific topic. It provides an overview of current knowledge, allowing the researcher to identify relevant theories, methods, and gaps in the existing research that can later be applied to a paper, thesis, or dissertation topic, (McCombes, 2023). According to (Mugenda, 2019), the review of literature involves a systematic identification, location and analysis of documents containing information related to the problem being investigated.

In this part, the researcher examined additional literature relevant to this study at Kenya Medical Training College. KMTC, founded in 1927, is one of the oldest medical colleges in Kenya, managed by a board of directors as a state corporation.

Initially, KMTC trained pharmacy students only but later on started training other disciplines such as Medical Laboratory Sciences. From 1975, discussions emerged on the need to change the name to more directly reflect the mandate of training health professionals. The name, College of Health Professionals (CoHP), was subsequently adopted in 1987. However, this name was later contested by the University of Nairobi. The institution changed its name back to MTC. In 1990, it transitioned into a State Corporation under the Parastatal Categorization (PC 2) and was renamed Kenya Medical Training College following the enactment of the KMTC Act, Cap. 261 of the Laws of Kenya. The Act expanded the institution's mandate to include training of health professionals, research, and consultancy services. The Act was reviewed in 2019 following the re-categorization of the College in 2017 to a higher category as a training and research institution PC4A. The College is the largest middle-level medical training

institution in Kenya and within the East, Central, and Southern African (ECSA) region. It has seven (7) faculties, 18 departments, 74 campuses namely, Mombasa, Port Reitz, Kwale, Msambweni, Kilifi, Tana River, Lamu, Taveta, Voi, Garissa, Wajir, Mandera, Isiolo, Meru (Maua satellite), Imenti, Chuka, Embu, Kitui (Mutomo satellite), Mwingi, Machakos, Manza, Kangundo, Makueni (Mbuvo and Mutyambua satellites), Makindu, Mbooni, Nyandarua (Kinangop satellite), Nyeri, Othaya, Murang'a, Thika, Karuri, Gatundu (Mutunguru satellite), Lodwar, Kapenguria, Kitale, Eldoret, Iten, Kaptumo, Mosoriot, Kabarnet, Chemolingot, Nyahururu, Nakuru, Molo, Transmara, Loitokitok, Kapkatet, Sigowet, Bomet, Kakamega (Shianda Mumias & Navakholo satellites), Lugari, Vihiga, Bungoma, Chwele, Webuye, Busia, Teso, Siaya (Ugunja satellite), Rera, Bondo (Masita satellite), Ugenya, Kisumu, Lake Victoria, Kombewa, Homa Bay (Ndhiwa satellite), Rachuonyo, Migori (Awendo satellite), Kuria, Kisii, Nyamache, Nyamira, Nairobi, Karen, Mathari.

With 62,807 students as at June 2023 and offers a large portfolio of curricula over its 96-year history. The number of graduates has grown tremendously with 15,915 graduating in 2022. KMTC alumni are absorbed by the public and private sector thus contributing to 85 percent of Kenya's healthcare workforce with a number of them working abroad, (KMTC, 2020). The state corporation commenced training of Medical Laboratory Sciences in 1940's and was entrusted with the task of training Certificate and Diploma programs. At first, Medical Laboratory Sciences professionals were trained as Medical Assistants in 1945 but as time progressed, certificate, diploma and higher diploma programs started. Being a tertiary level public institution offering expertise medical training has vastly expanded over the past few years. Numerous graduates have qualified from the faculty of Medical Laboratory Sciences from various KMTC Campuses; Machakos, Meru, Nakuru, Nairobi, Kakamega, Embu, Lake Victoria, Kitui, Nyeri, Port

Reitz, Kisii and Kombewa. The Medical Laboratory Sciences course at KMTC was initiated in 1945. Whereas only medical laboratory assistants were trained initially, certificate, diploma and higher diploma programs eloped much later. KMTC Machakos Campus was opened in 1959 and is situated next to Machakos level 5 hospital; with a total population of 900 students. KMTC Kitui was opened in 2004 and has a total population of 1,000 students; while KMTC Embu was opened in 1975 and has a student population of 750. KMTC Meru was opened in 1979 and has a student population of 824. Therefore, the literature reviews mainly comprised of reviewing other researchers' work with regards to perception of the adequacy of the human resource, physical facilities for teaching and learning in Medical Colleges, state of teaching and learning materials and financial resources in Medical Colleges.

Teaching and learning resources are tools that teachers utilize to help students meet the learning objectives set by the curriculum. These resources can include materials that supplement classroom instruction or engage students' interest. Utilizing such resources can enhance students' ability to retain concepts long-term. Moreover, students tend to learn more effectively when properly motivated through various teaching aids, which play a crucial role in the teaching-learning process. In education, a resource can refer to any device, object, or machine used by a teacher to clarify or enhance a subject, as well as the materials and equipment used in the teaching-learning process. The term "resource" can also denote a source of supply, support, or aid that is readily available. Additionally, it can refer to the capability or determination to persevere. In the context of classrooms, resources encompass physical demonstration aids, students' contextual understandings, teachers' subject expertise, non-teaching expertise, and the organized structure of materials, ideas, and activities.

Teaching and learning involve all complex processes utilized in active transfer of Knowledge, Skills, Attitude and Habits (KASH) from an instructor to a learner.

As outlined by Sequeira (2012), learning brings a permanent change in behavior through acquisition of new skills. Teaching, also referred to as instruction is employment of different techniques to impact knowledge, skills and attitude on a learner. Of importance is that information can only be passed to the learner effectively if an instructor utilizes the right materials to present relevant content (American Psychological Association, 2015). Teaching is the act of engaging with learners to help them understand and apply knowledge, concepts, and processes. This involves designing lessons, selecting content, delivering instruction, assessing progress, and reflecting on the effectiveness of the teaching methods used. Teaching is not just about imparting information; it's about actively involving students in constructing their own knowledge. A teacher needs to understand not only the subject matter but also how students learn and how to motivate them to become active participants in their own learning process. Effective teaching requires a systematic understanding of how learning occurs.

The goal of teaching is not only to pass on information but also to empower students to become active creators of knowledge, both for themselves and for others. However, this transformation cannot happen without the active participation of students. Therefore, teaching is about creating the right conditions—pedagogical, social, and ethical—in which students are willing to take responsibility for their own learning, both individually and as a group (Chirdeachin, et al., 2019).

Learning, on the other hand, is the process of acquiring knowledge or skill through study, practice, instruction, or experience. It is about what students are expected to do in order to gain knowledge or skills. Teaching and learning resources are therefore potent

instructional facilities that must be envisaged by teachers in administration of content of the curriculum. There are many factors that affect implementation of curricula such as the curriculum used in Medical Laboratory Sciences . Limited TLR and poor implementation are some of these factors, (Bosibori *et al*, 2015).

In a study involving 134 preschool teachers, Bosibori et al. (2015) found that insufficient teaching and learning resources negatively impacted curriculum implementation, leading to deficiencies in learners' knowledge, skills, and attitudes. Teaching-learning resources are tools used by teachers to help students achieve the learning objectives outlined in the curriculum. These materials can supplement classroom instruction or engage students' interest, ultimately enhancing their retention of concepts. Additionally, students are more likely to learn effectively when properly motivated through a variety of teaching-learning resources. Teaching and learning resources have been defined differently by different authors, however most of the definition have got almost the same meaning. Below are some examples of the definitions from different authors;

Teaching learning resources are tools that classroom teachers use to help their learners learn quickly and thoroughly. A teaching aid can be as simple as a chalkboard or as complex as a computer program, (Klaus, 2010).

Teaching learning resources is a material which the teacher uses to facilitate the learning, understanding and acquisition of knowledge, concept, principles or skills by his learners, (Tamakloe, et, al. 2017).

Teaching and learning resources play a crucial role in supporting and enhancing students' learning experiences. They aid in comprehension and enjoyment of the lessons, ensuring that learners grasp the intended objectives. Moreover, these resources enable teachers to assess the students' understanding of the subject matter (Hayford, 2013).

Learning resources, on the other hand, are essential facilities that facilitate effective learning by stimulating and encouraging desirable changes in learner behavior. The primary goal of teaching is to facilitate learning, with the most effective teaching being that which leads to the most effective learning.

According to Mohammad (2014), availability of resources affects the quality of training in any medical service. Resources may include instructional materials and media that a teacher may use to stimulate all the senses of the learner during learning. Materials include all those physical structures such as classrooms and objects such as printed texts, charts, posters, LCD projectors, internet, smart phones, computers, physical facilities as well as human resource. A cross-sectional survey conducted by Wynter *et al* (2019), on educational resources used by medical students during learning. The researcher concluded that majority of the students used traditional resources and not modern resources such as E-learning.

Teaching and learning resources play a critical role in facilitating the acquisition of knowledge, skills, and attitudes by learners. Bloom's Taxonomy, a widely used framework in education, provides a hierarchy of cognitive skills that can be targeted by teachers to promote effective learning. In this context, "adequate supply" generally refers to a sufficient availability of human resources, physical facilities, teaching aids, and financial resources. Adequacy of TLR determines an educational system's efficiency, according to Padmanabhan *et al.*, (2015). For effective teaching and learning, human resources, physical facilities, teaching aids and financial resources are basic tools, their absence or inadequacy makes teachers handle subjects in an abstract manner, portraying it as dry and non-exciting.

It is crucial to have a well-thought-out plan for adequate human resources, physical facilities, teaching aids, and financial resources to support educational endeavors. A shortage of textbooks, libraries, and physical facilities can hinder the educational system's ability to fully address new demands (Coombs, 1970). Improving the quality, efficiency, and productivity of education requires better human resources, physical facilities, teaching aids, and financial resources. Teaching and learning resources (TLR) consist primarily of four components: human resources, physical facilities, teaching aids, and financial resources (DFID, 2007).

Previous studies on the availability of TLR in education have shown that they are not always accessible in schools, which has raised concerns among educators. According to Lyons (2012), learning is a multifaceted activity influenced by students' motivation, physical facilities, teaching resources, and teaching skills. The availability of TLR enhances school effectiveness as these resources are fundamental in improving students' academic performance. Essential resources for teaching and learning include human resources such as teachers and support staff, physical facilities such as laboratories, libraries, and classrooms, teaching aids such as projected and non-projected materials, and financial resources.

TLR help enhance access to education and improve educational outcomes by providing students with engaging and meaningful learning experiences, thereby reducing absenteeism. It is essential for schools to provide these resources in both quality and quantity to facilitate an effective teaching-learning process. Several studies have examined the impact of instructional materials on education. For example, Oladejo et al. (2010) investigated the effects of instructional resources on students' performance in the West Africa School Certificate Examinations (WASCE). They found that the availability

of material resources significantly affects students' achievement, as these resources facilitate the learning of abstract concepts and discourage rote learning. Inadequate TLR compromise education, leading to low academic achievement, high dropout rates, behavioral issues, demotivated teachers, and unmet educational objectives. Material resources include textbooks, charts, maps, audiovisual and electronic instructional materials such as radio, tape recorder, television and video tape recorder.

Other category of material resources consist of paper supplies and writing materials such as pens, eraser, exercise books, crayon, chalk, drawing books, notebooks, pencil, ruler, slate, workbooks and so on (Atkinson, et al.,2021).

This observation aligns with the findings of Likoko et al. (2013), whose study highlighted that private schools tend to outperform public schools, largely due to the superior availability and adequacy of teaching and learning materials. It is apparent that the quality and quantity of these materials play a crucial role in influencing students' academic performance. The author further emphasized that educational institutions equipped with ample resources, such as textbooks, are better positioned to excel in examinations compared to those with limited resources. Consequently, inadequate access to teaching and learning materials and equipment is often cited as a contributing factor to poor academic performance. This underscores the importance of ensuring that schools are well-equipped with a variety of high-quality resources to support effective teaching and learning processes. The terms endemic, outbreak, epidemic and pandemic relate to the occurrence of a health condition compared to its predicted rate as well as to its spread in geographic areas (Grennan, 2019). An endemic condition occurs at a predictable rate among a population. An outbreak corresponds to an unpredicted increase in the number of people presenting a health condition or in the occurrence of cases in a new area. An

epidemic is an outbreak that spreads to larger geographic areas. A pandemic is an epidemic that spreads globally. The emergence and spread of infectious diseases with pandemic potential occurred regularly throughout history. Major pandemics and epidemics such as plague, cholera, flu, severe acute respiratory syndrome coronavirus (SARS-CoV) and Middle East respiratory syndrome coronavirus (MERS-CoV) have already afflicted humanity. The world was facing the new coronavirus disease 2019 (COVID-19) pandemic. During centuries, implementation of public health measures such as isolation, quarantine and border control helped to contain the spread of infectious diseases and maintain the structure of the society. In the absence of pharmaceutical interventions, these containment methods may be used nowadays to control COVID-19 pandemic, Piret et al., (2021). Several significant pandemics have had profound impacts on both human populations and economies. These include influenza, smallpox, plague, AIDS, cholera, dengue, West Nile disease, SARS, and tuberculosis.

Influenza pandemics, in particular, are unpredictable but occur in cycles, often having severe effects on societies worldwide. Approximately every century since the 1500s, there have been about three influenza pandemics. In the twentieth century, three major influenza pandemics occurred: the Spanish flu in 1918–1919, the Asian flu in 1957–1958, and the Hong Kong flu in 1968–1969. Each of these pandemics had significant impacts on human life and economic development.

In the twenty-first century, the H1N1 2009 virus was the first pandemic influenza to affect the globe, resulting in over 18,000 deaths. The Ebola outbreak, which occurred in 2014–2016, resulted in over 11,000 deaths and cost the world more than US\$2 billion. The Zika virus outbreak in 2016 spread to 34 countries, threatening the health of populations.

These outbreaks have raised concerns among scientists and governments about their devastating effects on the global economy and education systems.

In December 2019, the COVID-19 pandemic emerged from Wuhan province, China, spreading rapidly to various parts of the world. COVID-19 has highlighted how pandemics can be worsened by factors such as poverty, weak health systems, and a lack of global cooperation. The pandemic has had a significant impact on the delivery of education and has placed immense pressure on health systems worldwide. By the end of July 2020, approximately 17,000,000 cases of COVID-19 had been reported worldwide, with over 660,000 deaths. The pandemic has also caused major disruptions to global social and economic structures, leading to the most severe global recession since the 1930s.

Therefore, pandemic preparedness plans emphasize that non-pharmaceutical interventions should be implemented first to control human-to-human transmission of the pathogen. Ideally, these interventions should adequately control the spread of an infection while minimizing societal and economic disruption. Risks of resurgence can follow once these non-pharmaceutical interventions are lifted. Once available, rapid testing together with contact tracing (Teixeira and Doetsch, 2020) and isolation of infected individuals should be put in place for a more effective response.

The global COVID 19 pandemic had far-reaching consequences that were considered to jeopardize hard won gains made in improving global education (UN, 2020). The spread of the virus necessitated the closure of learning institutions and businesses with all Countries focusing on ensuring continuation of learning to avoid the disruption of learning to the extent possible by introducing or scaling up existing distance education modalities based on different mixes of technology. As part of continued learning and

teaching, many Countries adopted use of internet to provide online platforms with teachers and school administrators are encouraged to use applications. This was also supported by live lessons or record massive open online course styled lessons. This was delivered through television, radio, digital learning management systems and existing applications in maintaining communication between teachers and learners. Additionally, government agencies continued to launch awareness campaigns or communication strategies on distance education for all targeted groups, including parents, students, teachers and administrators (UNESCO, 2020).

Education is crucial for achieving all 17 UN Sustainable Development Goals (Global University Network for Innovation 2019). KMTC contributes significantly to the attainment of these goals, which were established by the United Nations in 2015 as a roadmap to create a better and more sustainable future for everyone by 2030. The College contributes not only to the achievement of Goal 3 (good health and well-being) but also to the attainment of several other SDGs. Medical training institutions have an important role to play in the realization of the African Union Agenda 2063, a comprehensive framework for development of the African continent over the next 40 years. KMTC's role in the implementation of this agenda includes: Supporting public health initiatives aimed at addressing key health challenges such as infectious diseases, non-communicable diseases as well as maternal and child health issues, fostering collaborations with professionals, governments, and other stakeholders to support development of sustainable healthcare systems in Africa, capacity building in healthcare matters by providing education, training and development opportunities for healthcare professionals to improve the overall quality of care, delivered in Africa, promoting research and innovation by awarding grants to researchers that contribute to the development of new medical technologies and approaches that can help to improve

healthcare outcomes for people on the continent, training diverse healthcare professionals that will help improve access to healthcare in Africa, adopting modern technology and innovation including Open, Distance and E-Learning (ODEL) resources to offer opportunities for students to access KMTC academic programmes remotely.

The EAC Vision 2050 has six goals which are anchored on several pillars supported by an enabling environment. Goal six (well-educated, enlightened and healthy human resources) is anchored on the human capital development pillar of the vision. It has outlined the key components of human capital as good health promotion, nutrition, education, and skills development. It further emphasizes the need for quality education and specifies that an educated population is required for effective, and efficient production, knowledge transfer, and technological adaptation and innovation.

Through the KMTC Strategic Plan 2023-2028, the College will provide enablers to support the achievement of this goal by implementing the Key Result Areas (KRA) on quality of training; research, innovation and consultancy; digital transformation, and institutional sustainability. The KRA on quality training in this Plan, which is further supported by a strategy to expand training opportunities through market driven courses, directly supports this goal. Similarly, the goals on digital transformation, research, innovation and consultancy will support the technological adaptation and innovation aspirations, respectively.

Article 43 (1) (a) of the Constitution of Kenya 2010 guarantees the right to access the highest attainable standard of health for every Kenyan citizen with a focus on quality healthcare services including reproductive healthcare. Article 43 (2) outlines that a person shall not be denied emergency medical treatment subject to Article 20 (5) which provides assurances that a Court or authority shall be guided if the State claims it does

not have the resources to implement the right. It further provides impetus in Article 21 (2) with respect to implementation of the Bill of Rights that the State shall take measures in setting standards. To meet its obligations as stipulated in Chapter four (4) of the Constitution, KMTC is responsible for training competent middle-level healthcare professionals for the provision of promotive, preventative, curative, palliative, and rehabilitative services within their scope of practice. Additionally, KMTC should invest in research, digital technologies, and provision of consultancy services in health related disciplines to promote innovation in healthcare delivery to assure realization of constitutional rights. The Kenya Health Policy 2014-2030 aims to improve the health and well-being of all Kenyans through the provision of equitable, affordable, accessible, and quality health services. KMTC supports the realization of this goal. The College plays a vital role in supplying skilled healthcare professionals across various levels to meet the country's health demands. To achieve this, it is crucial to ensure the provision of adequate teaching and learning resources at all times.

The broader impact of the crisis in this area is concerning. According to UNESCO, approximately 1.25 billion students have been affected by the pandemic, posing a significant challenge to the attainment of SDG 4 (Solberg and Akufo-Addo 2020). The emergence of the COVID-19 pandemic disrupted traditional classroom learning, making it unsafe for students to attend physical classes due to the risk of COVID-19 infection.

Students had to adapt to e-learning, where schools provided instruction online and through other technologies like TV and radio. Many national ministries of education quickly shifted to emergency remote instruction to ensure business continuity during the initial phase of the pandemic. However, concerns have been raised about the readiness

of teachers, school administrators, students, and parents for this transition to online instruction (UNESCO 2020).

Questions have arisen regarding the need for school infrastructure, finances, and a unique set of skills for educators and learners to successfully transition from face-to-face teaching and learning to alternative instructional methods. Schools at all levels, from early childhood to university, have been affected globally. Although most countries gradually lifted restrictions on movement, public education systems struggled to respond quickly, as classrooms were not designed for the recommended physical distancing measures of three to six feet (1–2 meters) to prevent the spread of the virus.

According to Onyema et al (2020), the COVID-19 outbreak poses serious concerns to global education systems. Efforts to contain COVID-19 prompted unscheduled closure of schools in more than 100 Countries worldwide. COVID-19 school closures left over one billion learners out of school. According to United Nations Educational, Scientific, and Cultural Organization (UNESCO) (2020), data as of 3 May 2020, almost 1.2 billion students and youth around the world were affected by the closure of schools and Universities due to the outbreak of COVID-19, representing 70% of this social segment worldwide. A study by Ngwacho (2020), however, contend that a survey in Kenya by Nation Team immediately after closure of schools revealed that only a small percentage of the 17 million Kenyan learners mostly in urban centers were able to access digital gadgets while their counterparts in rural areas were unable to study digitally.

Nyamai, et al. (2020), also emphasize that the reality on the ground is different, with some pupils not engaged in any form of coordinated, meaningful learning and that some learners in public and private schools are not well-equipped for homeschooling and many parents are struggling to support them. The lack of internet, laptops, television set, smart phones, radios, and proper supervision has left many learners in desperate situations and

for families who can afford the gadgets, frequent power blackouts, expensive data bundles and unconducive home environments defeat this endeavor (Nyamai et al, 2020).

UNESCO (2020) add that unequal access to digital learning portals, lack of access to technology or good internet connectivity is an obstacle to continued learning especially for students from disadvantaged families. The COVID-19 pandemic caused the most significant disruption to education systems in human history, affecting nearly 1.6 billion learners in over 200 countries. School closures and shutdowns of other learning facilities impacted over 94% of the global student population (Pokhrel & Chhetri, 2021). COVID-19 has caused unprecedented disruption to the Medical Education process and to healthcare systems worldwide, (Woolliscroft, 2020). Education systems have been severely disrupted by the global coronavirus pandemic. Measures that mitigate transmission of COVID-19 and its health impacts are crucial for getting children back to school and learning, whilst also keeping them, and the teaching staff and local communities, safe. Vaccination and behavioral measures such as social distancing are key. Infrastructure within schools, such as adequate handwashing facilities, ventilation systems, and physical space to support social distancing also have an important role to play.

The COVID-19 pandemic puts people at risk of developing life-threatening conditions, presenting substantial challenges for Medical Education, as instructors must deliver lectures safely, while also ensuring the integrity and continuity of the Medical Education process. These challenges have resulted in limited patient care due to the focus on COVID-19 patients, which restricts the availability of bedside teaching opportunities for medical students. Consequently, they are unable to complete their clerkships, Calhoun et. al, (2020).

According to Amadioha (2018), instructional materials are alternative communication channels that teachers use to solidify concepts during the teaching and learning process. This suggests that effective teaching goes beyond traditional methods to include various teaching aids.

Studies by Dhakal (2017) and Gogoi (2015) in India found limited use of printed materials like magazines and wall charts in secondary schools. Although some schools have audiovisual resources such as televisions, computers, and internet services, they are rarely utilized. This raises questions about the effectiveness of instruction with limited use of these materials, as they create a more enjoyable learning environment, stimulate learning, and reduce the energy teachers need to explain content to students (Gogoi, 2015). The limited availability of these resources may lead to lower student achievement. This prompted a study to assess the adequacy of teaching materials in a Kenyan context and examine their impact on student outcomes.

In a study on teaching and learning resource availability, and teachers' effective classroom management and content delivery in secondary schools in Rwanda, Bizimana and Orodho (2013) found a lack of laboratory apparatus and consumables, as well as audiovisual resources like projectors, screens, and radios. This meant that practicals for science subjects could not be effectively taught, impacting student classwork achievement, as practicals make teaching interactive and stimulate learning (Gogoi, 2015). Additionally, teachers were not improvising these resources, relying instead on purchased ones. The limited availability of instructional resources like projectors, radios, and televisions led to a lack of continuity in lesson presentations, decreased student interest in learning, and made teaching less real and meaningful to them (Amadioha, 2017).

Muthoka (2014) noted that many instructional supervisors are unable to adequately supply instructional materials to teachers, including textbooks, science laboratories, teaching aid models, and access to computers with internet. This limited provision of resources can hinder student comprehension and discourage effective teaching and learning. Busljeta (2013) highlighted that teaching resources like the internet enhance teaching by making it more modern and effective. Insufficient internet provision may have contributed to poor performance in schools in Machakos County, as there is a significant difference in performance between students taught with instructional resources and those taught without (Ajoke, 2017). Therefore, a descriptive survey study was conducted to accurately describe the provision of teaching resources and provide valid findings.

Although the Basic Education Act (2013) in Kenya states that it is the government's responsibility to provide infrastructure and sufficient financial resources, many schools have complained of late disbursement of free education funds and suppliers stopping deliveries (Mwangangi, 2017). To achieve the different levels of Bloom's Taxonomy, teachers must use appropriate resources that align with each level. Here are some examples:

Remembering: At this level, learners are expected to recall information from memory. Teachers can use resources such as flashcards, memory games, and quizzes to help learners remember important facts.

Understanding: At this level, learners are expected to demonstrate their comprehension of concepts and ideas. Teachers can use resources such as graphic organizers, concept maps, and videos to help learners understand complex topics.

Applying: At this level, learners are expected to apply their knowledge to solve problems or complete tasks. Teachers can use resources such as case studies, simulations, and experiments to help learners apply their learning to real-world situations.

Analyzing: At this level, learners are expected to break down information into its component parts and analyze its relationships. Teachers can use resources such as data sets, primary sources, and literature to help learners develop their analytical skills.

Evaluating: At this level, learners are expected to make judgments about the value or quality of information. Teachers can use resources such as debates, peer review, and critical analysis exercises to help learners develop their evaluative skills.

Creating: At this level, learners are expected to generate new ideas or products based on their learning. Teachers can use resources such as project-based learning, design challenges, and creative writing exercises to help learners develop their creative skills.

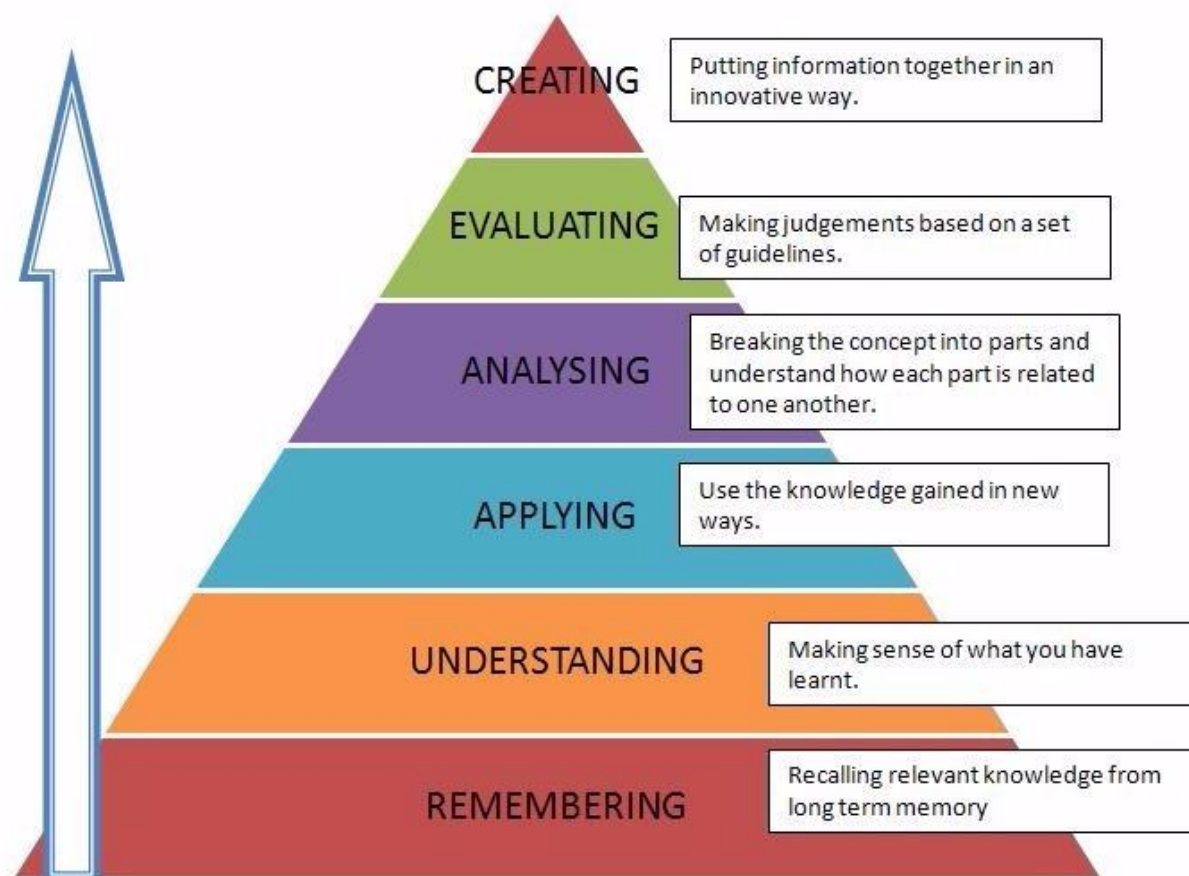


Figure 1: Bloom's Taxonomy of Knowledge (Shabatura (2018)).

Arranged from the lowest to the highest, the first level in cognitive domain is knowledge or recall. It involves recalling relevant knowledge from long term memory. The second level is understanding or comprehension and involves making sense of what is learnt. The third level is applying the knowledge in new ways.

The fourth level involves synthesizing new information from what is learnt. The fifth level is evaluating what has been learnt based on the objectives, creating and putting information together in an innovative way (Shabatura, 2013). Teaching and learning resources are essential in achieving knowledge, skills, and attitudes using Bloom's Taxonomy. By providing appropriate resources that align with each level, teachers can help learners progress through the cognitive hierarchy and achieve deeper learning outcomes.

2.1 Harden's Ten Questions and SPICES Model

Teaching and learning resources are a core component in learning, knowledge skills and even during assessment of teaching and learning. When assessing knowledge, attitudes and practices, it is vital that lecturers' use proper assessment instruments so as to maintain validity and reliability. In a research study by Harden (2017), on ten questions during curriculum planning, teaching and learning resources play a crucial role in the planning and implementation phases.

In one of the questions on what teaching and learning strategies to be adopted, Harden (2017), outlines the importance of TLR in the SPICES model. Dent (2014), conducted a study on using SPICES model to develop innovative teaching strategies in Korea, innovative teaching strategies demand better TLR. Additionally, when exploring what teaching methods of Department to be used, it is worth noting that the methods of Department of teaching depend on the TLR available. Dent (2014), recommended SPICES Model of educational strategies in Medical Education. However, TLR must be availed for SPICES Model to be effective. SPICES model is outlined as follows (Dent, 2014).

2.1.1 Student Centered Learning

Teaching and learning resources such as study guides, logbooks promote individual learning approach by students. Student-centered learning is a teaching approach that shifts the focus of instruction from the teacher to the student, aiming to cultivate learner autonomy and independence. It empowers students by placing responsibility for their learning path in their hands, equipping them with the skills and framework needed to learn a specific subject and meet specific performance requirements. This approach

emphasizes skills and practices that support lifelong learning and independent problem-solving, aligning with the constructivist learning theory.

In student-centered learning, students' interests are paramount, and their voices are central to the learning process. They have the freedom to choose what to learn, how to pace their learning, and how to assess their own learning, essentially taking on the role of the classroom facilitator. This stands in contrast to traditional teacher-centered learning, where the teacher plays the primary active role and students are more passive recipients of knowledge.

In a student-centered learning environment, students are active, responsible participants in their learning, determining their own pace and approach. The term can also refer to educational approaches that recognize and accommodate individual differences among learners, emphasizing each student's unique interests, abilities, and learning styles. In this context, the teacher acts as a facilitator of learning for each individual student, rather than for the class as a whole.

2.1.2 Problem Based Learning

Skills lab and demonstration laboratories with the needed adequate reagents for Medical Laboratory Sciences students assist to provide diagnostic or management of patient problems. Problem-Based Learning (PBL) is an educational approach that centers around students engaging with a subject by solving open-ended problems presented in trigger material. Unlike focusing on solving problems with defined solutions, PBL emphasizes the development of various skills and attributes, such as knowledge acquisition, improved group collaboration, and communication skills.

Initially developed for medical education, PBL has expanded to other learning programs, enabling learners to develop skills essential for their future professional practice. It enhances critical appraisal, literature retrieval, and fosters continuous learning within a team setting.

PBL tutorials typically involve small groups of learners, with each student taking on a role within the group, either formal or informal, which often rotates. The process emphasizes students' reflection and reasoning to construct their own learning. The Maastricht seven-jump process guides PBL, involving clarifying terms, defining problems, brainstorming, structuring hypotheses, setting learning objectives, engaging in independent study, and synthesizing information. Essentially, it entails identifying existing knowledge, determining what information is needed, and how and where to access new information to solve the problem.

Tutors in PBL facilitate learning by supporting, guiding, and monitoring the learning process, aiming to enhance students' confidence in addressing problems and deepen their understanding. This approach is grounded in constructivism and represents a departure from traditional lecture-based teaching and learning philosophies.

Teaching PBL requires a different approach compared to traditional classroom or lecture teaching, often necessitating more preparation time and resources to support small group learning.

2.1.3 Integrated or Inter-Professional Learning

Demonstration labs allow students to reflect on clinical experiences encountered as well as interaction with other professionals. Additionally, presence of Clinical Instructors who teach in both classroom and in demonstration labs should be readily available. Integrative

Learning comes in many varieties: connecting skills and knowledge from multiple sources and experiences; applying skills and practices in various settings; utilizing diverse and even contradictory points of view; and, understanding issues and positions contextually." making connections within a major, between fields, between curriculum, co-curriculum, or between academic knowledge and practice. Inter-professional learning is a collaborative pedagogical approach for preparing future healthcare practitioners to be effective team members in the healthcare system, to address growing and complex medical issues.

2.1.4 Community Based Learning

This involves moving teaching to community areas where they can access more teaching and learning resources. Community-Based Learning is an educational approach in which students learn by engaging and interacting with their local communities. For example, students in a classroom may organize an effort to work at local homeless shelters or food banks as part of their CBL program. The idea behind this approach is that students can learn real-world skills through community engagement while providing needed services that promote positive social outcomes. CBL often involves volunteer work and is often associated with the term service-based learning since these types of initiatives typically allow students to offer various community services. Proponents of community-based learning believe CBL provides authentic learning experiences because it can give students real-world skills and experiences that they may not acquire in traditional classrooms. CBL supporters also believe it is important to teach children these skills early, so they can continue to build upon them as they progress through their education. It may also be defined as experiential learning where students and lecturers collaborate with communities to address problems and issues. Simultaneously both are gaining

knowledge and skills and advancing personal development. There is an equal emphasis on helping communities and providing valid learning experience to students.

2.1.5 Electives with a core

This outlines how students can be guided to choose areas of further studies using available teaching and learning resources.

2.1.6 Systematic Approach

As a pre-requisite in teaching, teaching and learning resources such as structured logbooks ensure students achieve required competences during teaching and learning. Training is a planned process that directs learning towards achieving specific outcomes, leading to achieving performance objectives. The Systematic Approach to training infers that training is done in a planned, systematic way, and that it is directed towards improving job performance. Organization has to contend with many problems every day, and training is only one option they may choose to use to solve these problems. Instead of the training option they could choose to send for work study experts, or systems analysts, or they might invest in new plant and machinery, or they may hire newly fully trained staff. The training option and the four steps in the systematic approach to training must be closely associated with real and not imaginary performance problems.

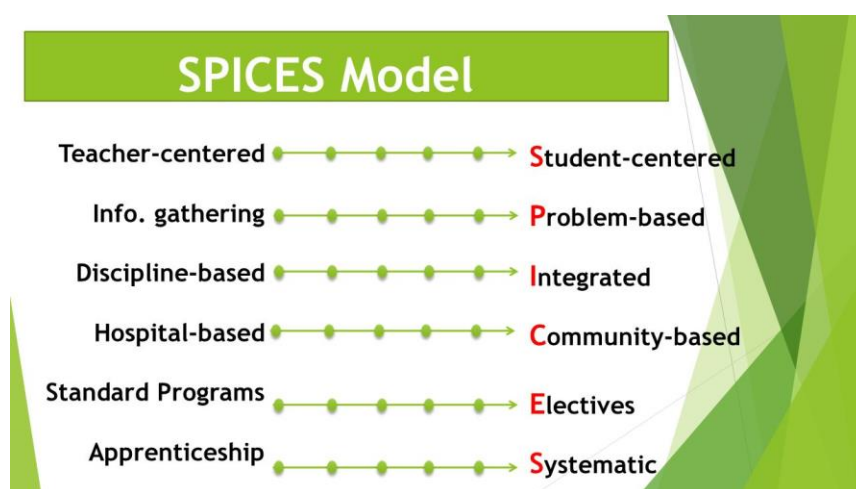


Figure 2: Harden's SPICES Model

2.2 State of Teaching and Learning Resources in Medical Colleges

Learning resources are things that teachers can access to help them do some aspect of their job better as part of the professional development process (either pre-service or in-service). This is important because the quality of teachers has been highlighted as the most important factor in determining the effectiveness of a school system (Barber and Mourshed, 2007). Resources might be institution-specific, such as school behaviour or inclusion policy documents, assessment procedures, or information for new teachers. Some institutions have a library or part of the staffroom where there are books or journals about teacher development that teachers can use, and there are of course online resources that all teachers can access. Human resources are also important learning resources. Experienced or specialist teachers are a source of knowledge for new teachers or teachers wishing to specialize in a new area, and communities of practice such as local or national associations can provide useful professional networking opportunities. The World Health Organization declared COVID-19 a global pandemic, resulting in disruptions to education at an unprecedented scale.

A pandemic is defined as “an epidemic occurring over a very wide area, crossing international boundaries, and usually affecting a large number of people” (Porta 2014). Pandemics are, therefore, identified by their geographic scale rather than the severity of illness. For example, in contrast to annual seasonal influenza epidemics, pandemic influenza is defined as “when a new influenza virus emerges and spreads around the world, and most people do not have immunity” (WHO 2010). The COVID-19 pandemic has caused the most significant disruption to education systems ever recorded, impacting nearly 1.6 billion learners across more than 190 countries and all continents. School closures and the shutdown of other learning facilities have affected 94 percent of the

world's student population, rising to 99 percent in low and lower-middle-income countries. This crisis is worsening existing education disparities, particularly for vulnerable groups such as those in poor or rural areas, girls, refugees, persons with disabilities, and forcibly displaced persons, limiting their access to continued learning. The potential learning losses could have long-lasting effects, potentially reversing decades of progress, especially in ensuring educational access and retention for girls and young women. Economic impacts from the pandemic may lead to an additional 23.8 million children and youth (from pre-primary to tertiary levels) dropping out or being unable to access school next year. Beyond education, the closures of educational institutions have hampered the provision of essential services, including access to food, affected parental ability to work, and increased risks of violence against women and girls. The pandemic has also strained development assistance and education funding, potentially exacerbating existing gaps in education financing, which were substantial even before COVID-19. However, the crisis has also spurred innovation within the education sector. Various innovative approaches, such as the use of radio, television, and take-home packages, have been developed to support education continuity. Distance learning solutions have been rapidly implemented, supported by quick responses from governments and partners worldwide, including the Global Education Coalition convened by UNESCO. This crisis has highlighted the crucial role of teachers and the ongoing responsibility of governments and key partners to support education personnel. It has also emphasized the importance of ensuring that no one is left behind in the future of learning, particularly children and youth lacking resources or an enabling environment for learning, the teaching profession in need of better training and support for new methods of education delivery, and the broader education community, including local

communities, which are essential for ensuring education continuity during crises and for building a better future.

During this era of COVID-19, many Countries are encouraged to invest in Medical Education so as to enhance capacity building especially in diagnostic courses. This is because there is a shortfall in testing and diagnosing of diseases such as COVID-19 in many Countries worldwide and in many developing Countries (Ossai & Ogbuoji, 2021). According to Ossai and Ogbuoji (2021), COVID-19 has had a negative impact on Medical Education; such as economic effects with effects on salaries of teachers. In an inductive study of four Medical Colleges in Sub-Saharan Africa (SSA) by Malwadde *et al* (2015), the researchers deduced that staffing with competent personnel and dependence on external funding were major challenges in facilitation of teaching and learning. In another study conducted by Greysen *et al* (2011), on Medical Education in SSA, the researchers denoted that availability of medical curriculums and staff competences should be a primary focus during teaching and learning.

The researchers observed that these may be lacking. Indeed teaching and learning resources in most Medical Colleges in Africa need proper scaling and upgrading.

The possibility of future pandemics poses a significant and immediate threat to global human life. How can we improve the detection and control of disease outbreaks caused by both known and emerging pathogens? What lessons have we learned from the global impact of SARS-CoV-2, the virus responsible for the COVID-19 pandemic since 2020? Preparedness is crucial. Are we better prepared now for a similar outbreak in the future? This study examines the importance of preparing for future pandemics, evaluates our current level of preparedness, and outlines areas for improvement. Preventing a crisis in learning from becoming a generational catastrophe requires urgent action from all

stakeholders. Education is not just a fundamental human right; it is also a key facilitator of all other human rights. It is a global public good and a primary driver of progress across all 17 Sustainable Development Goals, serving as the foundation of just, equitable, inclusive, and peaceful societies. When education systems collapse, it becomes challenging to sustain peaceful, prosperous, and productive societies.

According to the Department of Health and Social Care UK, several factors contribute to the risk of infectious disease emergence, including population growth, urbanization, increasing global mobility, climate change, and changes in food and agricultural systems. These drivers are expected to persist and intensify.

For over 20 years, epidemiologists, biosecurity experts, and public health professionals have been engaged in preparedness planning. Key elements include surveillance for pathogen detection, data collection and modeling for spread measurement, public health awareness raising, and the development of therapies and vaccines. The ongoing public health risk posed by epidemics and pandemics necessitates a continuous and systematic assessment of global preparedness.

National governments play a crucial role in responding to disease outbreaks, with the WHO Health Emergencies Programme (WHE) working to enhance preparedness for large-scale outbreaks and pandemics. Frameworks such as the WHO International Health Regulations (IHR) Core Capacity Monitoring Framework and the Joint External Evaluation (JEE) have significantly improved our understanding of preparedness requirements. However, despite significant investments in global health surveillance, many parts of the world remain ill-equipped to respond to new and emerging threats. The COVID-19 pandemic revealed that the world was even less prepared than previously thought. Leading scientists emphasize the need to overhaul strategies for dealing with

catastrophic events like the emergence of the SARS-CoV-2 virus, although this transformation has not yet occurred.

Improving surveillance, addressing economic and social inequality, and enhancing access to medicines and vaccines are among the considerations for better pandemic preparedness. Surveillance systems could be more refined, as delays in detecting outbreaks can lead to exponential spread. Genomic sequencing techniques have advanced, enabling the detection of novel pathogens and monitoring their spread. However, further global expansion of this technology, especially in high-risk areas, is needed.

Research indicates a link between income inequality and higher COVID-19 incidence and mortality rates in the US. Addressing inequality should be a vital aspect of pandemic preparedness, or at least strong measures should be implemented during health emergencies. The pharmaceutical industry rapidly developed vaccines in response to COVID-19, highlighting the need for increased funding for early-stage work. Initiatives like the Coalition for Epidemic Preparedness Innovations (CEPI) are working to accelerate vaccine development for novel diseases, aiming for a 100-day target. Dr. Anthony Fauci has proposed creating 'prototype' vaccines targeting key virus families to expedite vaccine development during outbreaks.

Future pandemic preparedness is crucial for finding better solutions to potential outbreaks of known or novel pathogens and saving lives. While international governments have invested millions in preparedness, significant challenges remain. To effectively deal with future pandemics, we must address global challenges such as inequality and improve disease surveillance and vaccine availability for all. (WHO, 2021).

According to Tsinuel *et al* (2016), establishing Medical Colleges is one task; however, expansion of the Medical Colleges to meet demands of the society is an even bigger task. Most Medical Colleges in Africa lack infrastructure, facilities, laboratories and classrooms as well as skills laboratories (Tsinuel *et al*, 2016). Human resource is also a major challenge. The situation may be worse during this time of COVID-19 and other emerging scourges. For example, although many Countries have envisaged Information, Communication and Technology (ICT), there is unequal access to internet connection. This has made it difficult for many Medical Colleges to utilize virtual learning and e-Learning platforms (UNESCO, 2020).

According to Prince Edward Island (2008), TLR should be activity-based rather than lecture-based. Additionally, TLR should be equally shared and considerate to all genders as well as to people with special needs (PEI, 2008). Despite the fact that Medical Colleges offer different medical courses with different curricula, unequal distribution of TLR may influence outcomes of health care delivery (Khan, 2012). Resource equity is the allocation and use of resources to create student experiences which enable learning (Travers, 2018). Indeed in an ever changing scientific world encompassed by current diseases such as COVID-19, there is need for equity of TLR in Medical Colleges. According to Landry (2021), lack of equity in teaching leads to student frustration and missed opportunities in Medical Education. According to Mann *et al* (2020)...“COVID-19 pandemic may open a wider conversation about resource availability for medical students”. Resources such as textbooks, educational websites may therefore not be available to many. There is therefore need to address inequities in TLR in Medical Education. Therefore, to offer quality Medical Education, COVID-19 has reminded all Medical Colleges they need to reevaluate and assess the state of TLR in their various cadres (Mann *et al*, 2020).

Although most Medical Colleges have inadequate resources for teaching and learning in Africa, Kilmarx (2019), pointed out that interventions such as; curriculum availability, recruitment of new staff, expansion of laboratories as well as more training sites and strengthening ICT capacity should be effected so as to achieve targets of Sustainable Development Goal (SDG) 3.

2.3 Accessibility to eLearning Platforms and Internet

E-learning accessibility involves different technologies and standards. First of all, both the e-learning content and the e-learning platform should be accessible, in order to be effective. Several standards have been defined to provide an accessible eLearning. E-learning materials are often used with a specific technology, or configuration, which can make them less available to people who have limited access capabilities or who are using non-standard computer equipment. Learners with disabilities using assistive technologies can benefit greatly from e-learning, not just because it allows distance and flexible learning activities, but also because it helps students with disabilities in accessing resources which would otherwise present significant barriers for them. These barriers can include the interface elements of the Learning Content Management Systems (LCMS) in which learning materials and objects reside, and the manner in which users interact with those objects. LCMS environments typically contain a variety of components which do not always share a consistency of interface logic or interactive elements, ranging from posts in a forum, form elements in tests or timed quizzes through to playing embedded videos or downloading a variety of document formats.

According to Lawaless (2018), eLearning is also known as electronic learning which means delivery of learning content through digital resources such as computers, tablets or even cellular phones. The main focus, however, is that these devices must be

connected to internet. ELearning is cost effective, saves time and lowers environmental exposures where infectious diseases such as Ebola are rampant (Lawless, 2018). In a teaching and learning environment; medical students undertaking laboratory sciences are constantly faced with health hazards of contracting infectious diseases. ELearning encourages medical students such as those undertaking Medical Laboratory Sciences to exert control of their learning (Huynh, 2017). According to Frehynwot *et al* (2013) eLearning in Medical Education can take many forms; blended learning, web-based learning and simulations. However, there is need for institutional support, ICT expertise and student engagement.

In a study involving review of literature on Teaching and Learning Resources (TLR), O'Doherty (2018) deduced that factors such as poor technical skills, inadequate infrastructure and absence of institutional strategies affect development of eLearning. Of importance to note is that inability to use computer resources renders eLearning irrelevant. However, in developed Countries where there is vast internet connectivity and well trained lecturers, eLearning is more convenient and vibrant.

An electronic survey involving 995 participants in the UK revealed that they had adequate knowledge on eLearning. However, their level of knowledge was dependent on training on eLearning (Tashkandi, 2020). This was supported by Housounah, Raheel and Ahefzi (2020), who conducted a study on digital response during COVID-19 pandemic. In the study, the researchers concluded that COVID-19 has presented an avenue for trained health professionals to showcase their computer skills.

In developing Countries, the situation may however, be different given that TLR are limited as compared to developed Countries. According to Barteit *et al* (2019), medical eLearning does not measure up to its potential in low-resource Countries. At a critical

time when the world was eclipsed by COVID-19 cloud, developing Countries must advance in terms of eLearning and improvement of internet access. Another study conducted on use of eLearning as a TLR in Medical Colleges in Liberia. Although the researchers acknowledge the presence of eLearning, it is difficult for most Medical Colleges to implement eLearning due to; inadequate infrastructure, lack of skilled personnel and limited internet access (Walsh *et al*, 2018). Availability of the curriculum in all medical programs in Medical Colleges worldwide; including Medical Laboratory Sciences are guided by prescribed curricula. According to Harden *et al* (2017), a curriculum is the sum total of all the experiences of a learner during a learning program. Medical curricular therefore, encompass major competences, which a learner is expected to achieve through theory and practicum approaches. Medical Laboratory Sciences curriculum outlines the basic learning objectives and the TLR essential for achievement of these technical skills. In itself, the curriculum is therefore a core teaching and learning resource.

According to Lansik (2021), Medical Laboratory Sciences curriculum should be readily available in all Medical Colleges administering the program. This is mainly because of the presence of medical laboratory boards which regulate the administration of the curriculum. However, storage, accessibility and availability of enough copies of the curriculum and frequent curriculum review are gaps that need to be addressed. Drafting of the curriculum is conducted by relevant bodies worldwide. In the US, the National Accrediting Agency for Clinical Laboratory Science (NAACLS) is the premier accrediting body for laboratory education.

On the other hand, in South Africa, the society of Medical Laboratory Technology of South Africa (SMLTSA) provides guidance for implementation of Medical Laboratory

Sciences curriculum. In Kenya, the Kenya Medical Laboratory Technicians and Technologists Board (KMLTTB) is mandated with the task to inspect implementation of the curriculum; in various Medical Colleges.

As per KMLTTB requirements, all Medical Colleges offering Medical Laboratory Sciences program must have KMLTTB harmonized curricula and use them for their teaching (KMLTTB, 2021). According to KMTC Strategic Plan of 2018-2023, regulatory bodies such as KMLTTB provide accreditation and validation of curriculum for medical laboratory science. KMTC has the mandate of implementation of the curriculum in all Campuses offering medical laboratory science. As many Countries continue to grapple with COVID-19, Medical Colleges reckon that curricular ought to be made accessible to medical educators. According to Darvasi (2020), medical educators ought to make online learning more engaging and accessible to learners. However, it remains to be seen whether medical curricula can be availed on online platforms for learners as well as teachers to access as a digital resource especially in Kenya.

Nevertheless, accessibility to the curriculum by Medical Laboratory Sciences lecturers remains a priority in many Medical Colleges. Additionally, KMLTTB requires at least one copy of the curriculum in department in every Campus. This should in turn, be accessible to all lecturers in the department. In the wake of COVID-19, an important aspect in curriculum development and implementation in Medical Laboratory Sciences is curriculum review. In a study conducted by Kok (2020), the researcher concluded that a significant gap exists in the time allocated for emerging diseases. The researcher therefore recommended timely review of the curriculum to accommodate infectious diseases such as COVID-19. In an editorial discussion by Ross, Crowe and Tyndall in 2015, emerging infectious diseases pose a humanitarian crisis.

In order to mitigate learning disruption, human resources and financial losses as a result of future pandemics, we must plan now” (Ross, Crowe and Tyndall, 2015). According to Novak (2019), innovative strategies enables medical programs review their curricula in order to address emerging needs in the medical field. In an assessment of pre-service graduates in Kenya, (Kinaro and Mombo, 2015), deduced that there are major gaps in quality and adequacy of curricula. The researchers recommended an installation of a standard framework to guide curriculum review process that has been lacking. Time, also a major resource in teaching and learning, is captured in the curriculum. Various modules that students must go through have different time limits for theory and practicum. In Medical Laboratory Sciences, each semester is divided into hours. These hours must be met so as to meet the prescribed time allocated for completion of the course by KMLTTB. The disruptions caused by COVID-19 have led to approximately 40 million children worldwide missing out on early childhood education during their critical pre-school year (UNICEF, 2020). Jelimo (2020) notes that on March 15, 2020, the Kenyan government abruptly closed all schools and colleges nationwide in response to COVID-19, affecting nearly 17 million learners. This closure not only impacted learners and teachers but also brought about various economic and social issues, including interrupted and lost learning, education exclusion, homelessness, nutrition and economic crises, childcare challenges, increased teenage pregnancy cases, financial burdens on households, and sexual exploitation. These effects have been more severe for underprivileged children and their families in urban poor communities. The shift to remote and digital learning has widened the learning gap, excluding many learners due to lack of internet access and reliable electricity. According to a report in the Standard newspaper, many parents cannot afford school-related expenses like learning materials and daily internet bundles, putting them at a disadvantage compared to those who can afford these items (UNICEF, 2020).

This situation further widens the inequality gap, impeding access to quality education and continuous learning. In urban informal settlements, learning has been minimal due to these challenges. Additionally, smartphones are often unaffordable for these communities. Even when adults have smartphones, issues around privacy and unsupervised internet use by children hinder access to learning. In areas with electricity and technology, the high cost of the internet remains a barrier. These disadvantages present significant challenges for marginalized families and learners, who must compete with more privileged peers during national exams. Extended periods of interrupted online learning can reverse learning gains, especially for students with learning challenges who may struggle with remote learning strategies or lack access to necessary resources. Children from marginalized communities, whose parents may have low literacy levels and limited education resources, are at risk of falling behind. These parents, often focused on providing for their families, may lack the time and knowledge to support their children's learning effectively (UNESCO, 2020).

The challenges of remote learning underscore that it cannot entirely replace classroom learning; it is intended to supplement existing knowledge. The pandemic and school closures have disrupted this balance, leading to a loss of learning unless alternative arrangements are made. Remote learning has faced numerous challenges due to inadequate infrastructure and limited preparation time for teachers and the government. Many teachers and education stakeholders lack the skills for online teaching, and there is insufficient cost planning for online education, assessment, and evaluation. Additionally, many learners lack the necessary devices for online learning, compounding access issues. In 2019, the Kenyan government launched a 24.6 billion laptop project to bridge the digital learning gap in schools, but implementation was uneven and often ineffective due to high costs and lack of expertise (Kenya Ministry of Education, 2019).

Loss of livelihoods, especially in low-income households, has forced some learners into income-generating activities to support their families. In poverty-stricken areas, securing food takes precedence over learning. For example, learners from disadvantaged neighborhoods may work instead of attending school to help provide for their families. This has led to an increase in sexual exploitation, with young girls engaging in transactional sex to obtain essential needs like sanitary towels and support their families, resulting in early and unplanned teenage pregnancies. This situation exacerbates learning disruption. As a country, it is crucial to address these challenges and ensure continued access to quality, equitable, and inclusive education, as outlined in Article 53 of the constitution, during and after the pandemic. The government should develop practical measures and policies to include all members of society. As the pandemic continues and the total number of deaths rises, the timeline for schools reopening remains uncertain. Therefore, remote and digital learning may become a permanent fixture. The government must incorporate digital learning into new policy interventions necessitated by the pandemic, as relying solely on parents to sustain education will be insufficient.

Therefore, learners missed a stimulating and enriching environment, learning opportunities, social interaction and in some cases adequate needs. This is likely to compromise their longer-term healthy development, especially those children from poor and disadvantaged families, (United Nation, 2020). In technical and vocational education and training systems, vulnerabilities including low levels of digitalization and long-standing structural weaknesses, have been brought to light by the crisis. Disruptions in work places made it difficult to implement apprenticeship schemes and work-based learning modes, key elements of a functional and market-responsive technical and vocational system. In the higher education sub-sector, while online learning has generally taken place through recorded lectures and online platforms, some Universities have

postponed learning and teaching until further notice, due to the lack of information technology (IT) infrastructure for both students and teachers. Questions also remain about how to harmonize semesters and academic calendars, as some programmes have been successfully implemented online, while others could not be. An estimated 40 per cent of the poorest Countries failed to support learners at risk during the COVID-19 crisis, (UNESCO, 2020). Past experiences show that both education and gender inequalities tend to be neglected in responses to disease outbreaks, (UNESCO, 2020). Domestic chores, especially for girls, and the work required to run households or farms, can also prevent children from getting sufficient learning time. Children with disabilities who were already marginalized before the outbreak are not always included in strategies of distance learning, (United Nation, 2020). Refugee and forcibly displaced children are further marginalized and deprived of school-based support services, such as school meals and psychosocial support programs. The most vulnerable learners also have poor digital skills and limited access to the hardware and connectivity required for distance learning during school closures.

In half of the 21 European countries examined, Grade 4 pupils from lower socio-economic backgrounds were half as likely to have internet access as their more advantaged peers (European Commission, 2020). In seven low-income countries, less than 10 percent of the poorest households have electricity. Many learners in developing countries, especially the youngest and minority groups, are not fluent in the language of instruction (UNESCO, 2020). Even when they could access understandable content, living conditions, economic stress, and the low education levels and digital skills of parents meant many children did not benefit from the stable environment and learning support needed to adapt to these new modes of instruction.

In most European countries, children from lower socio-economic backgrounds are more likely to lack reading opportunities, a quiet room, and parental support during school closures. In both low-income and upper-middle-income countries, children in the poorest households receive significantly less help with their homework (UNICEF, 2020). The learning loss, both short and long term, is expected to be significant. Researchers in Canada estimate that the socio-economic skills gap could increase by more than 30 percent due to the pandemic (Catherine and Pierre, 2020).

The World Bank identifies three possible scenarios for the loss of learning, a reduction in average learning levels for all students, a widening of the distribution of learning achievements due to highly unequal effects of the crisis on various populations, or a significant increase of students with very low level of achievement due in part to massive dropouts, (World bank, 2020). This suggests 25 per cent more students may fall below a baseline level of proficiency needed to participate effectively and productively in society, and in future learning, a result of the school closures only, (World bank, 2020). In the foundational years of education, the impact might be the strongest. Simulations on developing Countries participating in the Programme for International Student Assessment (PISA) suggest that without remediation, a loss of learning by one-third (equivalent to a three-month school closure) during Grade 3 might result in 72 per cent of students falling so far behind that by Grade 10 they will have dropped out or will not be able to learn anything in school, (Michelle, 2020).

The economic loss might reach \$16,000 of lost earnings over a student's lifetime, translating over time into \$10 trillion of lost earnings globally, (World bank, 2020). According to UNICEF, (2020), Two thirds of the world's school-age children or 1.3 billion children aged 3 to 17 years old do not have internet connection in their homes,

according to a new joint report from UNICEF and the International Telecommunication Union (ITU). Lack of connectivity doesn't just limit children and young people's ability to connect online. It prevents them from competing in the modern economy. It isolates them from the world. And in the event of school closures, such as those currently experienced by millions due to COVID-19, it causes them to lose out on education. Put bluntly: Lack of internet access is costing the next generation their futures. Nearly a quarter of a billion students worldwide are still affected by COVID-19 school closures, forcing hundreds of millions of students to rely on virtual learning. For those with no internet access, education can be out of reach. Even before the pandemic, a growing cohort of young people needed to learn foundational, transferable, digital, job-specific and entrepreneurial skills to compete in the 21st century economy.

The digital divide is perpetuating inequalities that already divide countries and communities, the report notes. Children and young people from the poorest households, rural and lower income states are falling even further behind their peers and are left with very little opportunity to ever catch up.

Globally, among school-age children from richest households, 58 per cent have internet connection at home, compared with only 16 per cent from the poorest households. The same disparity exists across country income level as well. Less than 1 in 20 school-age children from low-income countries have internet connection at home, compared with nearly 9 in 10 from high-income countries. Large parts of rural areas are not covered with a mobile-broadband network, and fewer rural households have access to the internet. The gap in the mobile broadband adoption and internet use between developed and developing countries is especially large, putting the almost 1.3 billion school-age children mostly from low-income countries and rural regions at risk of missing out on

their education because they lack access to the internet at home.” There are also geographic disparities within countries and across regions. Globally, around 60 per cent of school-age children in urban areas do not have internet access at home, compared with around three-quarters of school-age children in rural households. School-age children in sub-Saharan Africa and South Asia are the most affected, with around 9 in 10 children unconnected.

According to Muthima (2015), perception, in psychology and the cognitive sciences, involves acquiring, interpreting, selecting, and organizing sensory information. The term "perception" originates from the Latin word *perceptio*, which means "receiving, collection, and action of taking possession, apprehension with the mind or senses." Perception is the process through which the brain interprets sensations, giving them order and meaning based on the collected information. Sensations are stimulated by receptor cells in the eyes, ears, nose, mouth, and skin surface, which then send nerve impulses to the brain. Upon receiving these sensations, the brain automatically interprets or perceives them (Wortman et al., 2014). An individual's perceptions can also be influenced by the value associated with the object or service. Wortman et al. (2014) further note that two schools of thought explain the development of the perception process, which seeks to understand why people perceive the world as they do. Perception is determined by both physiological and psychological characteristics of the human being whereas sensation is conceived with only the physiological features. Thus, perception is not just what one sees with the eyes it is a much more complex process by which an individual selectively absorbs or assimilates the stimuli in the environment, cognitively organizes the perceived information in a specific fashion and then interprets the information to make an assessment about what is going on in one's environment.

Perception is a subjective process; therefore, different people may perceive the same environment differently based on what particular aspects of the situation they choose to selectively absorb, how they organize this information and the manner in which they interpret it to obtain a grasp of the situation. The empiricist view suggests that perception processes are primarily learned. When babies are born, they have limited or no ability to perceive form (the ability to see unified patterns), depth (the ability to see the visual world in three dimensions), perceptual constancies (the tendency to see objects as having stable properties), and other similar aspects. To them, the world is a "great blooming, buzzing confusion." Infants gradually develop adult-like perceptions through learning from the environmental cues they encounter. For example, when a young child touches a hot oven for the first time, their skin senses the heat, and this information is quickly and automatically transmitted through nerve networks to the brain, where it is interpreted. The child instinctively moves away from the oven, feeling fear. Since the child has no prior experience, there is no pre-existing meaning to interpret this new experience. However, the child still forms general perceptions of the oven, such as it being hot, causing pain, and inducing fear. With repeated interactions, specific perceptions are formed. As the child gathers more information from contact with an object, specific perceptions are developed, which may lead to action or inaction. According to the empiricist view, knowledge must be imposed on sensory data to organize it (Muthima, M, 2015). Winkler et al. (2011) support this view by explaining the process of perception formation using a learning cycle.

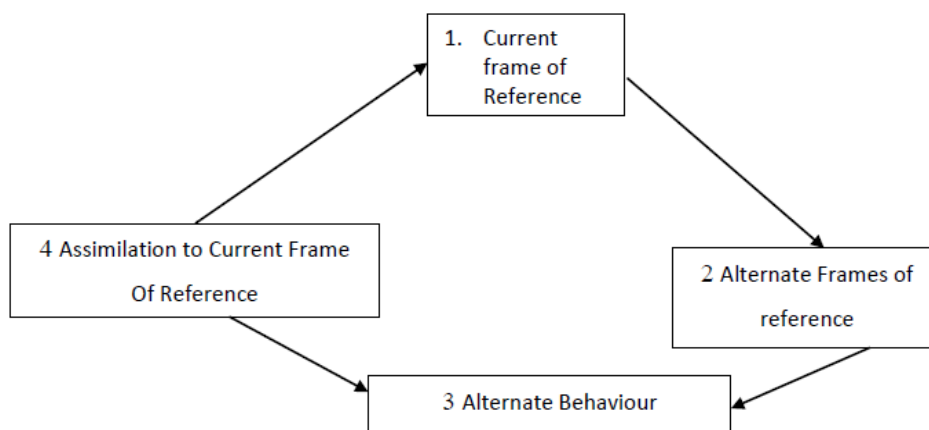


Figure 3: Attitude Learning Cycle (Wortman et al.; 2014)

According to Figure 1, in the first phase, an individual responds to a stimulus from the environment based on their current frame of reference. In the second phase, they are exposed to a different perspective on the stimulus through interaction with others. This leads to the generation of new action possibilities in the third phase, influenced by the new frame of reference. Finally, in the fourth phase, the new perspective and behavioral options become integrated into the individual's existing frame of reference and behavior. This model implies that our perceptions are constantly evolving due to new stimuli from the environment. Perception is therefore a dynamic process of learning that causes our perceptions to change over time.

The second view is the nativist perspective, which suggests that learning alone cannot account for all perceptual processes. Instead, perception also emerges from the functioning of our sensory system. The nativist view emphasizes the automatic organization of sensory information. Therefore, according to these views, what we perceive through our senses is partly determined by how our sensory systems are programmed and partly by what we have learned (Wortman et al., 2014).

Additionally, Winkler et al. (2011) note that an individual's preferred way of perceiving and doing things leads to preferred perceptual and behavioral styles, which in turn shape attitudes. This perception-attention-transformation-action cycle provides a model of the individual at a particular learning moment. This aligns with Bandura's (2017) perspective, where an action or behavior is influenced by the attention given to an object after perceptions are obtained from the senses. This attention is then transformed into an action determined by the perception held by the individual. Actions and perceptions reflect behavior, such that a person with a negative perception of an object would avoid it, while one with a positive perception would approve of it. Attitude formation begins with perceptions, followed by the attention given to the perception, which is then transformed into behavior, ultimately reflected in the attitude or action of the individual. It should be noted that "as human beings, we are unique because our behavior is influenced by actively constructing meaning; it cannot be explained simply by stimuli-response mechanisms."

The way information is perceived can only be explained by the cognition or rational thinking theory, the affect or emotional mode of transformation, or the value or attitude mode of transformation. However, individuals do not engage equally in all three modes. With the help of perception, the needs of various people can be determined, because people's perception is influenced by their needs. Like the mirrors at an amusement park, they distort the world in relation to their tensions. In view of all that has been said, this study therefore aspired to determine the perceptions of lecturers and learners towards resource availability for teaching and learning of medical laboratory students at Kenya Medical Training College in the advent of COVID-19.

2.4 Perceptions of Lecturers and Students Towards Adequacy of Teaching and Learning in Medical Colleges

2.4.1 Human Resources

Human resource is the set of people who make up the workforce of an organization, business sector, industry, or economy. A narrower concept is human capital, the knowledge and skills which the individuals command. Human resources are defined as sources of strength that come from humans who can be utilized by the organization.

Human resources in an educational organization refer to all the human beings working in that organization, including lecturers, students, administrators and all other support staff working in that organization. According to Parent et.al, (2015), the planning of health sectors often considers exclusively its work in terms of management concerning its own human resources without any perspectives of coordination regarding human resource management in health and education system. This coordination however appears necessary so far as the health and education sectors provide their contribution to the improvement of health care and services quality. The adequacy between staff managements concerned with health and education remains essential indeed. It relates to learning modalities to reach the qualitative objectives for training and health care recommended by health standards. Thus a learning/teaching ratio in liaison with the teaching mechanism of the initial education should be referred to the existing resources in the field of education in order to adapt teaching structures to the real possibilities of the Country and to consider the close links between trainings and health care quality regarding the staff management. No educational system rises above the quality of her teachers anywhere in the world. Thus the growth and development of skill- based courses in any Country of the world largely depend on the quality and adequacy of teachers in

these areas of professional endeavor. The bedrock of adequate foundation and training of needed manpower in a Country irrespective of area of specialization is a function of the sound products from the teacher education in that Country. This is why Gidado (2023) said that the major problems of teacher education in Nigeria is that the teacher that are being trained are not sufficiently prepared to meet the complex demand of the teaching profession in Nigerian schools. (Paret F at al, 2015)

It is an educational truism that a teacher can only teach what he knows. Tanner and Tanner (2018), said that the success of a curriculum largely depend on teachers handling it. In skill- based courses, education as opposed to liberal education, teachers' preparation is more compounded because of the practical skills and competencies that must be imparted. This implies that teachers' quality is more critical in skill-based courses. Unfortunately, availability and adequacy of qualified teachers is disturbingly absent in our institutions unless those that are trained abroad but when they come home to teach, the necessary materials are either not available or inadequate. (Gidado, 2023)

Kenya Medical Training College (KMTC) operates in the healthcare sector, providing mid-level training for health professionals. As the national provider of training services for health professionals, it is mandated by the government to offer Certificates, Diplomas, and Higher National Diplomas. With the current ratio of 1.38 health professionals per 10,000 people, there is a need to at least triple the number of skilled health professionals in Kenya to achieve the desirable ratio of 4.45 per 10,000 people (KMTC, 2018).

In its strategic plan for 2018-2023, KMTC has identified several key strategic issues: 1: Quality of training 2: Staff development 3: Research, innovation, and consultancy 4: Linkages, collaboration, and partnerships 5: Development of infrastructure and

facilities 6:Information and Communications Technology (ICT) 7:Income generation and resource mobilization 8:Marketing, communications, and brand recognition.

Regarding human resources, KMTC's staff establishment has increased from 3,932 in 2012 to 5,960 in 2017. The current staff population is 2,393, including 1,189 faculty members and 1,204 support staff. The College has provided relevant training, short courses, and programs to enhance productivity in teaching, management, and research. New positions have also been created to support the emerging needs of the College.

The staff includes seconded personnel from county governments (340), the Ministry of Health, and part-time lecturers in specialized areas. Maintaining teaching excellence is essential for KMTC to fulfill its mandate of educating and skilling health professionals for Kenya. Recruitment, retention, and development of staff are crucial to ensure they deliver on the quality promise. According to Jain, Mathew, and Bedi (2012), maintaining employees at various levels helps an organization set and achieve its goals. There is a strong positive correlation between the establishment of human resources in teaching and learning and the outcomes of these processes. In medical education, the significance of human resources, both skilled and unskilled, has been increasingly emphasized. Effective teaching and learning, carried out by competent staff, are crucial for curriculum implementation and planning. The presence of skilled and unskilled staff in medical colleges is equally important. Choudhury (2014) notes that the unequal distribution of staff in medical colleges indirectly affects medical access for populations. Compared to developed countries, developing nations are resource-poor in terms of human resources (Kamau, 2013). For instance, in Kenya, the National Education Sector Strategic Plan 2018-2022 highlights a shortage of lecturers for medical and scientific courses. The adequacy of Teaching and Learning Resources (TLR) is critical for the success of the

educational system. The Student-Teacher Ratio (STR), which measures the number of students assigned to teachers, is used to determine teacher adequacy. The STR indicates a teacher's workload and helps estimate the teaching manpower required for projected student enrollments. It also helps assess whether teachers are over- or under-utilized. An educational institution's human resources include teachers and support staff, such as laboratory assistants and cooks, involved in the teaching and learning process.

Optimal use of available human resources, particularly teachers, is necessary for good performance. In cases of teacher shortages, the head teacher and Board of Management (BOM) should hire temporary teachers, as many trained but unemployed teachers are available. Implementing the Medical Laboratory Sciences curriculum requires adequate preparation in terms of human, physical, teaching aids, and financial resources. Simon Kangethe et al. (2011) found that inadequate teaching and learning materials in public secondary schools led to ineffective teaching and learning processes, compounded by insufficient funds for purchasing these resources. The United Nations General Assembly Resolution 70/1, part of the 2030 Agenda, includes Quality Education as a global sustainable development goal, aiming to ensure inclusive and equitable quality education and promote lifelong learning opportunities for all. One focus area is the need for adequate physical infrastructure and an environment that fosters learning for everyone (UN, 2017).

UNESCO (2010) reports that out of 61 million young learners globally who do not pass basic examinations, 41% live in sub-Saharan Africa. Without appropriate actions, many young learners may end up like the estimated 875 million adult illiterates worldwide. Recognizing the need for a knowledgeable and skilled population to achieve its Vision 2030 Agenda of becoming an industrializing middle-income economy, Kenya adopted

the United Nations and UNDP resolution on Quality Education, advocating for quality education accessible to all children in public schools (MOE 2017 Report). A World Bank report states that learning resources significantly influence learner performance, teacher motivation, and educational outcomes, noting that institutions lacking adequate resources tend to show low learner performance (World Bank, 2020).

The OECD report indicates that material shortages hinder teaching and lower learner performance (OECD, 2007). It asserts that good examination performance in schools is directly related to the adequacy and usage of learning resources, concluding that schools lacking sufficient resources are likely to perform poorly in most subjects. The Kenya Public Expenditure Review by the Ministry of Education (MOE, 2015) reveals that approximately KES 116 billion was spent on education during the 2014/2015 fiscal year, with 50% allocated to primary education. However, this investment has not translated into improved learner performance. Effective learning in schools is largely influenced by the adequacy of school resources and infrastructure.

The Republic of Kenya (2012) report shows that schools are experiencing work overload, and teachers have minimal resources for lesson preparation (KNEC Reports from 2012 to 2016). Adequate resource materials are essential for effective teaching, and learners can learn effectively if these materials and supporting infrastructure are available. Proper use of available resources significantly impacts students' readiness to learn and perform in national examinations. The provision of adequate resources is fundamental to teaching and learning activities. A lack of adequate resource materials hampers curriculum delivery and diminishes learners' interest in the learning process. UNESCO (2020) states that providing adequate teaching and learning materials is a key factor in improving results, emphasizing that the availability, adequacy, proper usage, and high standard of

school resources are crucial for making learning interesting and improving learners' achievements, particularly in English. Libraries, audio, and visual materials are vital for language performance.

The report concludes by stressing the role of learning resources in enhancing learner skills and acquiring relevant competencies. According to Harden (2017), effective management of the educational process involves planning, organizing, leading, and controlling, as exemplified by the organogram of Kenya Medical Training College, which outlines the management of medical programs like medical laboratory sciences. According to KMLTTB (2012), the recommended teacher-student ratio is 1:10 in the classroom and 1:6 in the clinical area, ensuring manageable student numbers for effective teaching and learning. This helps to maintain a manageable number of students for effective teaching and learning.

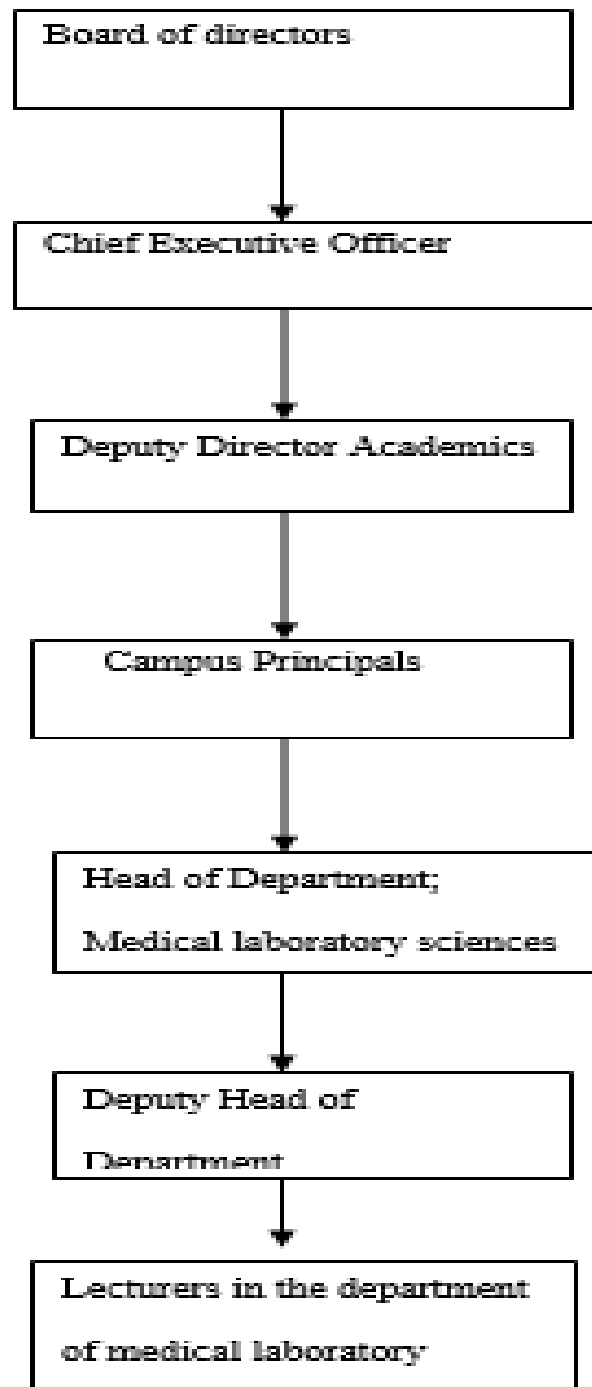


Figure 4: KMTC Organizational Structure

2.4.2 Skilled Staff in Medical Colleges

According to Talukder (2011), Medical Colleges should have adequate trained manpower on Medical Education, audiovisual experts, computer operators and support staffs. In essence, human resource establishment in Medical Colleges should focus on staff with technical skills in various fields; such as lecturers with specialized skills on that field. In India, challenges of Medical Education in various cadres include lack of lecturers and uneven distribution of institutions making it hard to balance the skilled human resource (Rao *et al*, 2011). In recent decades, there has been remarkable worldwide growth in medical colleges enrollment, resulting in heightened demand for faculty and support staff due to the well-established fact that higher education requires a significant workforce. In certain countries, this sector accommodates millions of individuals. Yet, higher education institutions frequently encounter financial limitations, which pose challenges in recruiting full-time staff and providing competitive salaries. Consequently, this can lead to heavy workloads for current personnel and intense competition in certain fields. Indeed, the scarcity of highly skilled educators in particular domains is a global issue.

Across many nations, there exists a disparity between the demand for higher education and the supply of professionals possessing requisite qualifications to teach in esteemed institutions, as other professional sectors offer more lucrative compensation. Moreover, the absence of incentives and research prospects often hampers the retention of proficient academics. The expanding deficit in personnel encompasses not only faculty members but also extends to crucial support positions like administrators and service staff. Medical colleges encounter difficulties in both recruiting and retaining skilled individuals for roles in administrative management, library services, and student support. Moreover,

alongside the issues concerning academic staffing, universities in the Global South contend with infrastructure limitations and scarce resources, impacting the standards of education and research. These hurdles are particularly heightened for institutions situated in rural or marginalized regions.

With increased demand for better health, Medical Colleges around the world have been tasked with the role of training more and more Health Workers. This adds the desire to employ adequate human resource. In a survey conducted by Nausheen *et al* (2018), in United States, many Medical Colleges were being established. In the study, the researchers inferred that there is need for the Medical Colleges to address the human resource issues facing the staffs. Yet another study was conducted in United States to determine why faculty would consider leaving academic medicine. The researchers deduced that negative perceptions about the institution and the culture were associated with dissatisfaction (Linda *et al*, 2012).

2.4.3 Number of teaching staff in Medical Education

The widely acknowledged reality in academia is that scholars remain consistently occupied irrespective of their rank or role. A significant portion of their time is devoted to evening and weekend commitments, driven partly by the industry's competitiveness and their passion for their vocation. However, the primary factor compelling professionals in medical education to invest extensive hours lies in their assumption of multiple responsibilities. The nature of work in this domain transcends traditional hours, persisting even in transitions such as colleague retirements or transitions to different institutions or sectors.

It is predicted that Medical Colleges might have an upsurge in the number of students in the coming years; mainly because of emergence of new diseases such as COVID-19,

making medical courses more preferable. According to a publication in India by Kaul (2018), Medical Councils have ensured that teacher; student ratio should be 1;3. Indeed Developed Countries boast of better and robust number of teaching staff as compared to developing Countries. A descriptive survey was conducted in Sub-Saharan African Medical Colleges in 2012. One of the data that was primarily collected was the resource capacity. The study noted that 69% of the lecturers in these Medical Colleges were internal while 31% were external lecturers and the number of lecturers ranged between 1 – 2,023 lecturers (Chen *et al*, 2012).

The researchers deduced that it is essential for more research to be conducted to build Medical Education capacity. The study findings agreed with those of Mullan et al (2011) in Sub-Saharan Africa who concluded that ubiquitous faculty shortages in basic and clinical sciences were a big barrier during teaching and learning in Medical Education. According to (KMLTTB, 2020), the recommended teacher student ratio in the classroom is 1:10, while in the clinical area is 1:6. Further at least a specialty in each discipline. This helps to regulate the number of students which are manageable for effective teaching and learning.

2.4.4 Non-Technical Staff in Medical Colleges

Effective human resource management (HRM) is mandatory for efficient delivery of services in educational institutions. Equally important is the role of non-teaching staff; that assist in provision of a conducive ambience for teaching and learning (Barreto, 2020). The anticipated scarcity of personnel in higher education is expected to escalate in the forthcoming years. This issue will primarily stem from the rapid aging of the workforce within the post-secondary sector. In the next decade, a considerable number of employees in universities and colleges are set to retire, departing with invaluable years

of expertise and insight. Medical Colleges profoundly depend on non-teaching staff for their expertise and in facilitation of teaching and learning. According to Richards (2018) non-teaching staff's role in teaching and learning are often overlooked.

Non-teaching staff include administrative officers, ICT officers, drivers, security officers, librarians, cooks, cleaners, desk officers, store keepers, laboratory assistants and clerical officers. For medical courses such as Medical Laboratory Sciences, laboratory assistants are essential for the important role of running activities of medical laboratory. According to Azeem (2014), non-teaching staff perform significant roles in course delivery. Educational institutions should consequently appreciate the skills and expertise that non-teaching staff provide in their various departments where they are deployed (Diana, 2012). Even when they are not deployed in teaching and learning departments, they play a crucial role in educational settings. According to Francisco (2020), non-teaching staff such as administrative officers play a pivotal role in every educational setting.

2.5 Perceptions of lecturers and students towards adequacy of physical facilities for teaching and learning

Quality education has been regarded as a fundamental way to achieve development and growth among nations worldwide. According to the World Bank Development Report, creating a nation with educated citizens facilitates both individual and national development (World Bank, 2018). However, the delivery of quality education demands the availability of conducive teaching and learning environment where the physical infrastructures take part. According to Dumont, *et al.*, (2021), schools should have well equipped infrastructures, including bathrooms and classrooms which allow sanitation

rather than contamination of diseases. Moreover, if school buildings are prone to be flooded by intensive rains, swept away by high winds, exposed to hazardous materials, or decaying for lack of maintenance, it hinders both teaching and learning, making it harder to produce the level of academic results that are possible in a safe and healthy building. Despite the necessity of infrastructure, its effects have not paid much yield in terms of quality education. According to Atkin (2019), it is important for the schools to have well improved physical infrastructures since having such infrastructures within and outside the classrooms will make both teachers and students comfortable in the teaching and learning process. The presence of good infrastructures also motivates students to stay in schools as the school environment becomes welcoming and attractive. This raises a necessity and comparable sense to consider educational infrastructure as a significant component to learning and achievement of the students. Therefore, the physical infrastructures should be given due consideration when planning for improving the quality of education offered in the schools. This is because they create friendly learning environment, which enhances students' school attendance, ultimately improving academic achievement (Uline & Moran, 2018).

Despite education being an important impetus for personal and national development, the quality of education offered in public secondary schools in Tanzania has remained a point of discussion for decades due to low academic achievement of the form four students in the national examinations. The decline in the performance of students in national examinations in the country has been linked to the learning environment that is not conducive to learning. Lack of classrooms, toilets, water, and electricity have been pointed out as being the contributing factors for students, especially in public secondary schools not to perform well in the national examinations.

For example, a study conducted by Ngusa (2021), in Tanzania revealed that English language teachers in the country were not in a good position to teach effectively due to the lack of instructional materials. Moreover, HakiElimu (2011), observed a significant difference in the performance of students from private and public secondary schools, whereas the students in private schools outperformed their counterparts in public schools. One of the factors for such differences was the presence of physical infrastructures in private schools which were adequate and in good conditions compared to the ones in public schools. Similar observations were made by Mosha (2014), who concluded that the quality of education cannot be separated from the context and circumstances that are found in the school. Thus, educational infrastructures, including classrooms, laboratories for science practical and open fields for games are very essential for the delivery of quality education in the secondary schools. It is through these infrastructures where formal and non-formal education takes place at school. Educational infrastructure are general physical things such buildings, which enable learning and teaching process frequently formal and non-formal curriculum oriented activities involved in teaching and learning to take place.

In Arusha District the availability of physical Infrastructure is still a problem though the government has tried to solve the problem of insufficient classroom in the year 2021 through the TCRP 5441 Project, but still more effort is needed for the establishment of more infrastructures such as classrooms, Laboratories, changing rooms for girls students, dormitories and hostels (Cash, 2016). However, most of the schools in Arusha have acute shortages of instructional materials. Particularly, most schools seem to have scarcity of textbooks and reference books and physical facilities such as classrooms, desks and chairs. While acknowledging the government initiatives in providing quality education

and increasing access to secondary school education, the academic achievement of the students in learning institutions are still poor.

Physical facility refers to the physical environment and infrastructure in which teaching and learning activities take place. It includes the buildings, classrooms, laboratories, libraries, playgrounds, sports fields, and other physical spaces used. Physical facilities from institutions range from school buildings, offices, classrooms, library, laboratory, toilet facilities to other infrastructures which would likely motivate student to learn. Experience has shown most of the physical facilities in institutions appear not to be sufficient. Again the available ones seem not to be of standard quality. Some seem to be in a dilapidated condition while others seem to lack of maintenance culture. In learning institutions, the teaching and learning facilities contribute to academic achievement in the school system, Hallak (2020). The development and maintenance of physical facilities in educational institutions by communities, parents, and sponsors should continue to be encouraged. This is because lack of such facilities interferes with learning process (Republic of Kenya, 1988a). DFID (2007), indicates the importance of school facilities in relation to quality education. Difference in school facilities would be seen to account for difference in achievement. Physical facilities include classrooms, lecture theatres, auditoriums, administrative block, libraries, laboratories, workshops, play grounds, assembly halls, and special rooms like clinics, staff quarters, students' hostels, kitchen, cafeteria, and toilet amongst others. He further asserts that learning experiences are fruitful when there are adequate quantity and quality of physical resources; and that unattractive school buildings, crowded classrooms, non availability of playing ground and surroundings that have no aesthetic beauty can contribute to poor academic

performance. Fonseca et al., (2015), posit that the physical conditions and organization of Schools facilitate or inhibit construction of a culture of success. Ministry of Education Science and Technology, MOEST (2015), explains the importance of ensuring that there are adequate and appropriate facilities for teaching and learning so that educational programmes could be implemented effectively. Hardens (2017), in his ten questions of curriculum development has emphasized on the adequacy of environment for effective teaching and learning.

These questions are: (1) What are the needs in relation to the product of the training programme? (2) What are the aims and objectives? (3) What content should be included? (4) How should the content be organized? (5) What educational strategies should be adopted? (6) What teaching methods should be used? (7) How should assessment be carried out? (8) How should details of the curriculum be communicated? (9) What educational environment or climate should be fostered? (10) How should the process be managed? That environment is known as learner-centered environment in which learners and teachers are learning from each-other. Learner-centered or learner oriented environment proposes a global shift away from instruction that is fundamentally teacher-centered, at times persuasively termed as ‘sage on the stage’ focusing instead on learning outcomes. Education in our middle schools and high schools these days is rapidly changing. The old notion of a classroom where the learners are sitting quietly and neatly in their seats, while the teacher is up front pouring pearls of wisdom and knowledge into their brains is absurd. Now the teachers are only facilitators and learners are primary operational, so if learners have to perform the key role in teaching-learning process, the environment of this process also should be learner oriented. For making the classroom environment as resource for learning, schools must create learning environments that are as engaging and relevant as the ones that learners incline to outside of school. When

learners will be more engaged with learning, automatically they will enjoy this process. It is also a fact that when learners are more engaged and more successful when they can connect to what they are learning, to situations they care about in their community and in the world, so teacher should try to give them chances to gain experiences from the community and real world.

According to (WHO, 2010) the classroom should provide a good environment for teaching and learning with consideration of the following questions: Is the space large enough for the number of students? Social distancing, also known as physical distancing, is the practice of keeping distance between yourself and people you don't live with. It also involves avoiding groups, gatherings and crowds in both indoor and outdoor spaces (CDC, 2020). With the advent of COVID-19, public health experts and researchers have found that limiting close contact between people is one of the optimal ways to slow the spread of COVID-19, (CDC, 2020). Although people can contract COVID-19 by touching their noses and mouths with hands that have been exposed to the virus through surfaces and objects, this is not thought to be the primary way the virus spreads, (CDC, 2020). Instead, exposure to droplets that are dispersed into the air when an infected person coughs, sneezes or talks are thought to be the main drivers of the virus' spread. The droplets can settle in the noses and mouths of people close by and can even be inhaled into the lungs. This mode of transmission is what makes social distancing necessary in learning institutions, (CDC, 2020). According to (CDC, 2020), it recommends that you keep at least six feet between you and others. This is about 1.8 meters and the equivalent to two arms' length. The recommendation is based on the fact that COVID-19 seems to spread mainly among people who are within about six feet of each other (and more vulnerable to coming into contact with those droplets) for extended periods. Other respiratory illnesses like influenza also spread in the same way.

However, not all organizations and research bodies agree on a specific distance people should maintain.

The World Health Organization (2020), for instance, advises people to stay three feet away from others. In contrast, scientists in a recent study contend that these droplets travel much farther than six feet sometimes as far as 8 meters (Bourouiba, 2020). Social distancing has emerged as one of the most effective strategies to curb the transmission of COVID-19. Within educational settings, this entails minimizing contact between groups of students and maintaining a safe distance of 1-2 meters between pupils and staff. The specific safety distance varies among countries depending on the level of virus containment achieved. This precaution is crucial because until a widespread vaccine becomes available, there remains a possibility of schools facing intermittent closures due to future outbreaks, especially at the local level. Beyond addressing the immediate challenges posed by the COVID-19 pandemic, there are clear advantages to expanding learning opportunities beyond the traditional classroom setting through various distance learning approaches. Accordingly, plans for school reopening could incorporate blended learning modalities to ensure all students can access the curriculum effectively. Guidelines in many countries recommend reducing class sizes to facilitate the required social distancing measures. Some nations have specified maximum student capacities per classroom, such as France and the United Kingdom, which suggest limiting primary class sizes to 15 students while maintaining safety distances. (UNESCO,2020).

Ensuring a minimum safety distance between students and staff hinges on factors like classroom size, availability of space, and student-to-teacher ratios. Countries with smaller class sizes may find it easier to comply with social distancing protocols provided

they have adequate space. For instance, public schools in France typically have smaller class sizes compared to the United Kingdom. While returning to school is mandatory in most OECD countries, attendance remains optional in others like Canada, the Czech Republic, France, and Spain, with remote learning options available for those who choose to stay home. These hybrid measures aim to support school reopening while maximizing social distancing efforts. To ensure equitable access to face-to-face instruction amid reduced class sizes, approximately 60% of OECD member and partner countries are implementing rotational schedules to alternate students throughout the day when on-site capacity is limited.

However, unless schools can effectively implement hybrid learning models combining in-person and online experiences, reduced classroom instruction time may be inevitable. Consequently, distance learning remains prevalent in many countries until the end of the academic year to support students, including those opting for remote learning due to health or personal reasons. However, depending on environmental factors like temperature, humidity and a patient's unique physical makeup, exhaled droplets containing pathogens could travel up to 8 meters.

The current public health recommendations for slowing the spread of viruses are based on older models of disease transmission. However, it should be noted that keeping at least six feet between you and others around you is likely to significantly lower your chances of infection, (CDC, 2020). Due to limited evidence, further research is needed to better understand these protective measures. The farther you are, though, the less likely you are to come in contact with infectious respiratory droplets.

However, according to (CDC, 2020), other preventative measures (like wearing a mask or face covering outside of the home and washing hands often) can also substantially

reduce your risk of getting COVID-19. Further, the physical facilities should be large enough for; a table in the front of the room for setting up visual aids and placing teaching materials. Space for audiovisual equipment (e.g., flipchart, screen, overhead projector, computer and projector if available, video player, monitor); the students should be able to see the projection screen and other visual aids. Space for students to work in small groups; if your classrooms do not allow for group activities, a room being used for simulated practice can also be used for small group work and skills practice. Is the room properly heated or cooled and ventilated? Simple things like adding a fan, space heaters, or dark curtains to prevent too much sunlight can help make a room more comfortable. Is the lighting adequate? Make sure that there is enough light and the room can be darkened enough to show visual aids and still permit students to take notes. Is the seating appropriate? Some classrooms have fixed seats; others have movable chairs and tables. Make sure everyone can see you and the visual aids. Movable chairs and tables are ideal because they can be arranged to accommodate work in small groups and allow the teacher to move from group to group as needed. Is there audiovisual equipment in working order available? Make sure spare parts such as bulbs are readily available. The video monitor should be large enough so that all students can see it well. There should be enough electrical connections, and extension cords, electrical adaptors, and power strips (multi-plugs). Create space for students to gather to review a case study, watch a video, or look at wall charts or posters (e.g., Integrated Management of Childhood Illness or anatomy posters). This may be difficult in some classrooms, such as traditional tiered lecture halls, in which case the students may turn in their seats and work in small groups. Although you may not have a choice of classrooms, and you may be limited by a lack of supplies or adequate facilities, look for changes that you can make to improve the classroom environment. (CDC, 2020)

The status of physical facilities especially in public schools, Tertiary Colleges like KMTC and Universities today appear to be of great concern to educators. Due to increase in the college enrolment rate and pandemic like Covid-19, Ebola and Influenza the provision of school facilities have dwindled. These problems and concerns necessitates finding out the perception of lecturers and students on adequacy of the physical facilities and especially in line with the set standards by regulatory bodies like the Nursing Council, Clinical Officers Council, Pharmacy board and the Kenya Medical Laboratory Technicians and Technologies Board, (2012). The KMLTTB (2012), clearly state the profile of each physical facility to include the; Classrooms, Demonstration rooms, Libraries, Ablution/ Toilets and transportation in regards to; number in place, size, sitting capacity, fittings in regards to windows, doors, emergency exits, desks/fixed benches, water provision, necessary plumbing (sink and waste disposal) essential equipment, reagents and availability of current books/journal as per prescribed list. It is a common phenomenon that nowadays, many Medical Colleges are located on buildings or Campuses built for other purposes (Akram *et al*, 2016). Medical Colleges must have various physical resources such as classrooms, laboratories, staffrooms, fittings, libraries and safety facilities; all of which support all medical curriculums (Akram *et al*, 2016).

2.5.1 Availability of Classrooms and Laboratories

Classrooms and medical laboratories for students undertaking laboratory sciences remain to be very crucial in Medical Schools even with surfacing of COVID-19. According to Tai, Wushuo and Kun (2017), smart classroom includes space for accommodating all types of learning equipment. These can include furniture and electronic devices which facilitate learning. Despite so many advancements in technology, traditional classrooms are still the most common classrooms set ups. According to Maggio *et al* (2013),

classroom setting includes classes, lecture halls, conference rooms as well as physical laboratories. Classroom also encompasses physical learning environment that includes space, lighting, and ventilation. The absence of laboratory facilities exerts various impacts on students' experiments. Firstly, it obstructs their capacity to acquire practical skills and apply theoretical knowledge in a hands-on setting. This dearth of hands-on experience can result in students encountering difficulties in comprehending scientific concepts, grappling with unfamiliar terminology, and finding learning materials challenging to digest. Furthermore, the unavailability of essential equipment and materials for conducting experiments outside of the classroom further hampers students' acquisition of new knowledge and development of scientific reasoning. Additionally, the inadequate utilization of science laboratory facilities by educators also detrimentally affects students' learning outcomes. Factors such as insufficient resources, including laboratory equipment, constrained time for practical work, and students' lack of engagement in laboratory activities, significantly contribute to the limited practice of laboratory work. Overall, the inadequacy of laboratory facilities impedes students' practical learning experiences and undermines their capacity to fully grasp and apply scientific principles.

When availed, these set the stage for content administration and curriculum implementation by teachers (Harden, 2017).

According to Harden (2017), it is in the classroom and laboratory where teaching is conducted and assessed. Further infrastructure put up for a particular number of students; soon turns out to be overcrowded when government policy demands that the same institution increase the number of students to be admitted or in case of a pandemic like covid-19 among others. An example is The Federal Democratic Republic of Ethiopia

(2015), which faced a challenge of increased number of students to join university that exceeded available space. Veitia et al., (2001), argue that increased intake beyond the available infrastructure in the third world remain as a setback for a number of years because government policies are not pegged on revenue.

Kenya and more so, Kenya Medical Training College found itself in the same category of having to take excess students (double intake) in 2011, from the usual 60 to 132; by a government directive to all public institutions as opined by Boit and Kipkoech (2012). Sifuna (1998), argues that double intake exerts pressure on all available resources resulting in graduating low quality students. This leads to overcrowding in teaching rooms and a higher student ratio to the lecturers. Tutorial groups will also be overcrowded too, hence complains by lecturers concerning overcrowding and excess workload.

2.5.2 Fittings for teaching and learning

Fittings are defined as large items of movable equipment that occupy a teaching and learning space, fittings do not leave permanent damage when moved. Fittings for classroom, demonstration laboratories, offices, skills lab and computer labs include furniture, cabinets, safety accessories such as fire extinguishers, laboratory equipment among several other learning equipment. Further to the fittings, ventilation of teaching and learning space is paramount especially in the control of pandemics like COVID -19. The main purpose of classroom ventilation is to create indoor environmental conditions that reduce the risk of health problems among learners and minimize their discomfort, to eliminate any negative effects on learning.

Recent experiments show that inadequate ventilation rates in classrooms can result in a high prevalence of acute health symptoms, better known as Building Related symptoms or Sick Building Syndrome symptoms (Mahdavi et. al, 2020). Inadequate classroom ventilation can also reduce the speed at which language-based and mathematical tasks that are typical of schoolwork are performed by pupils and can reduce progress in learning as measured by the number of pupils who pass standard mathematics and language tests. In the wake of COVID-19 pandemic shutdowns, safe reopening of Schools and Universities for in-person instruction, and sustainable maintenance of safe conditions, has become an international priority. Since inhalation of respiratory aerosols containing infectious material is a key route of transmission for SARS-CoV-2 and other airborne pathogens Greenhalgh et al. (2021), gathering of students and educators in school facilities with insufficient ventilation poses a public health risk. Since aerosol transmission is significant at both short- and room-scale distance, ventilation and filtration, along with distancing and mask wearing, are important components of layered risk reduction (Corsi et al. 2021). A correlation between improvements in ventilation and air filtration in schools and lower rates of COVID-19 incidence has been shown (Gettings et al., 2021). In addition to building-level guidelines, e.g. that HVAC filters should be upgraded, outdoor air dampers should be opened entirely when weather permits, and demand-control ventilation should be disabled (ASHRAE, 2020), increased attention is being placed on room-level ventilation and air cleaning. The Harvard Schools for Health group (Jones et al., 2020) and others (Corsi et al. 2021) recommend classrooms meet a minimum of 3 outdoor-air supplied air changes per hour at standard occupancy and room sizes, and that this should be augmented with air cleaning (i.e., filtration or ozone-free upper-room germicidal ultraviolet light) for a total of 4–6 air changes per hour of outdoor plus filtered air. These recommendations are consistent with the minimum ventilation

rates recommended by (ASHRAE, 2020). In spaces with known ventilation issues, steps may be taken to increase the fraction of outdoor air that is supplied, improve the filtration efficiency of the recirculated air, or provide filtration on a room level.

However, there is an overall lack of room-level ventilation data in educational spaces in the U.S. that would allow such planning. There are a number of reasons for this data gap, including that, while recommended guidelines exist for room-level ventilation ASHRAE (2020), in many locations strict requirements only exist for special room types such as wet-chemical laboratories and auditoriums, or for buildings with special certification. Mitigating the spread of infectious disease, however, introduces an additional demand to flush a room's air quickly enough to reduce the risk of occupants inhaling airborne pathogens generated by even *one* infected individual. The direct flow measurement techniques used by building managers and engineers to characterize ventilation rates in mechanically ventilated buildings cannot be applied to naturally ventilated spaces. Other approaches for characterizing ventilation may require technical expertise for execution or data interpretation, or specialized instrumentation, which reduces accessibility. As educators, administrators, and building managers need to plan for safe operations in the advent of COVID-19, hence there is need for practical approaches for characterizing ventilation in all teaching and learning rooms, as well as support for small-scale, short-term decision making, like with respect to opening windows and doors and running fans, air conditioners, or supplemental air cleaning.

Odunaiya et.al.(2014), conducted a study to determine the ergonomic suitability of educational furniture in the University of Bodan in Nigeria. The researchers inferred that furniture, although essential, was not ergonomically suitable for the students. The researchers indicated that further research was recommended to determine effect of

furniture on learners' health. (KMLTTB, 2020), check list for Medical Laboratory Sciences training institutions, identifies the following fittings; windows, doors, emergency exit, furniture, floors, classroom space, lighting, ventilation, microscope, reagents and lab equipment.

2.6 Perceptions of staff and students towards adequacy of projected and non-projected aids in teaching and learning

Adequacy of TLR refers to satisfactory or acceptable quality and quantities of material resources, physical facilities and human resources.

According to DFID (2007), adequacy of instructional materials such as projected and non-projected teaching aids are the main instruction materials which are cost effective input affecting student performance. The same way human resources, physical facilities and finances are necessary to a learning program, it is also prudent to have apparatus of instructional media before implementation of a program. Issenberg et al., (2016), presents a wide range of equipment resources to facilitate teaching and learning. These include computers, laptops, projectors, internet and wall charts. Laboratories and skills laboratories are part of the instructional material. As it is recommended that tutorial groups should be 7-10 students and equal number could use a projector, but a student laptop ratio should be 1:1. Beyond that, overcrowding will occur hence reducing the ability of implementing teaching and learning as argued by both Erickson (2008), Prince and Fielder (2006).

According to Skochelaks *et al.*, (2015), key to almost instructional media is the supply of electricity. Though at times electricity is available in the third world Countries; it is not distributed equally across the Country. So the thought of getting laptops and projectors cannot surpass the installation of electricity. Contractors installing electricity

should consider installing backups because in the third world there are a lot of interruptions on electricity lines. A lot has changed, such as the introduction of solar energy and currently some of the interruptions are accidental and others are caused due to repairs being carried out on the line. Erickson (2008) urges that implementers should know that instructional media is based on the population of students; they have the same weight as text books. Students should not crowd in one room to watch one projector. The Federal Democratic Republic of Ethiopia (2015) faced the same challenge of having more students than the infrastructure because there was high intake of students. Another challenge they faced was lack of teaching hospitals in that the existing ones could only absorb a small number of the students. This resulted in overcrowding in classes, wards in the teaching hospitals and the use of few instructional media which became a problem.

To solve the problem of overcrowding, one of the options is to source for funding which will allow for expansion of the existing facilities to accommodate more students. This needs the collaboration of the Colleges training health professionals and the government. At Kenya Medical Training College, this initiative has been undertaken especially with the County government partnership, national constituency development fund and donors. Teaching aids are tools used by teachers, facilitators or tutors to help learners improve reading and other skills, illustrate or reinforce a skill, fact, or idea and relieve anxiety, fears, or boredom since many teaching aids are like games. Educators serve as invaluable guides in imparting knowledge and skills within the modern teaching and learning landscape (Joseph, 2015). Utilizing teaching aids is a method they employ to enrich classroom instruction, capture students' attention, and instill motivation for learning. These aids encompass various devices (such as computers and DVDs), instructional tools (like books, chalkboards, and visuals), and tangible objects (including specimens, maps, and globes), all of which facilitate the teaching-learning process effortlessly. The

effectiveness of these aids often hinges on the creativity of the teacher, as they can make learning more engaging and time-efficient by leveraging students' auditory and visual faculties, encouraging active participation. In the past, before the advent of modern technology, educators relied on conventional teaching aids such as chalkboards, chalk, and rudimentary sketches made from dust or mud. They also utilized elements from nature, real-life objects, and specimens to aid in teaching. Books constituted the primary conventional resource available to both teachers and learners. (Joseph, 2015)

As technological advancements progressed, non-conventional teaching aids emerged, offering educators and students access to tools like computers, television, interactive whiteboards, and multimedia resources. These modern aids come in diverse forms, providing a plethora of opportunities for activities, games, and media, thereby making teaching both enjoyable and challenging. Their integration plays a pivotal role in contemporary teaching and learning processes. Projected media, including slides, filmstrips, overhead projections, and motion pictures, serve to engage and focus learners through visual stimulation, offering firsthand experiences and promoting conceptual understanding. Each form of projected media has its own advantages, requiring careful consideration of factors like audience, screen quality, lighting, and image brightness to optimize educational impact.

Teaching aids are often referred to as audio-visual aids, as they stimulate both the auditory and visual senses. Contemporary teaching aids aim to engage multiple sensory organs, such as visual aids (illustrations, textbooks, magazines), auditory aids (sound recordings from CDs), and audio-visual aids (combining audio and video materials, DVDs). In fostering classroom discussions and debates, educators employ various resources such as texts, thought-provoking video clips, or controversial images. These

activities enhance students' communication, collaboration, and argumentation skills, as they explore diverse perspectives and engage with global issues. Creating an inclusive classroom culture involves allowing students the freedom to express their opinions respectfully, select appropriate media and tools, and determine how, when, and where to use them to support their learning. While digital tools have increasingly supplanted traditional methods, their efficacy depends on clear learning objectives and the collaborative, creative, and communicative processes they facilitate. Education is no longer confined to the traditional classroom setting, with learning extending to workplaces, homes, communities, and mobile platforms. The proliferation of smartphones and broadband networks enables access to learning opportunities regardless of time or location.

Educational institutions are adapting to this evolving landscape by incorporating diverse learning environments and third-party providers, empowering students to connect learning with real-world contexts and take charge of their educational journey. To make the teaching-learning process effectual, so many resources are available. These resources are also known as teaching aids. We can categorize these resources in different ways as; traditional teaching-learning resources & modern teaching-learning resources or audio teaching-learning resources/aids, visual teaching-learning resources/aids & audio-visual teaching - learning resources/aids, which are classified as follows;

Audio Teaching-Learning Resources: Those resources which involve the sense of hearing are known as audio teaching-learning resources as; radio, tape recorder, audio CD, gramophone.

Visual Teaching-Learning Resources: Those resources which involve sense of vision are known as visual teaching-learning resources as; charts, pictures, models, real objects,

flash-cards, maps, chalkboard, flannel board, bulletin board, overhead projector, slides etc.

Audio-Visual Teaching-Learning Resources: Those resources which involve the sense of vision with sense of hearing are known as audio-visual resources as; television, film strips, film projector, audio-video CD. According to Orwenjo (2021), outcome of teaching and learning is usually dependent on the perceptions of students towards the lecturers and the resources used for teaching. Availability of appropriate media for teaching has an influence on the outcomes of teaching and learning and subsequently on the attitudes of students towards learning.

It is therefore crucial that lecturers and learners exhibit proper perceptions towards the teaching and learning resources such as projected and non-projected media. Teaching resources that promote acquisition of knowledge by learners are categorized into either projected or non-projected aids (Njeru, Kang'ethe, Kwena & Otieno, 2020). Non-projected media include handouts, chalk or white board, pictures, posters and flip charts while projected aids include; overhead projectors, films, videos and power point slides. The efficiency of projected and non-projected aids depends on availability of teaching and learning resources such as Manikins, skillslab equipment, flip chart stands, and white board markers, and computers, printers, printing papers, internet and scanners. In the post-COVID era, many Medical Colleges look to modernize education and optimize student learning through use of digital platforms.

According to a study by Subedi (2019), on perceptions of students' towards teaching and learning resources, the usage of internet was very low. In the study, projected media which required the use of internet were very ineffective and this affected teaching and learning. This led to negative perceptions by students. According to Srinivasan, Dinesh

Kumar (2020), learners and lecturers have different perceptions towards the use of computers and projections for teaching and learning. This affects the use of digital platforms such as eLearning platforms. In an online cross-sectional survey on perceptions of medical students on online teaching during the era of COVID-19, perceived challenges included flexibility of equipment for online education and internet connection (Dost *et al.*, 2020). Innovative strategies have been introduced such as Open Educational Resources (OER). However, the success of these resources is dependent on the costs of implementation and perceptions of the learners towards their use. Bandyopadhyay and Romy (2017) conducted a study on students' perceptions on the methods of Department of teaching anatomy and physiology in India. In the study, the researchers inferred that 60% of the learners preferred the use of chalk and board while 33% preferred use of projected media such as LCD projector. The availability of such teaching and learning resources is therefore crucial in Medical Education.

Instructional media are at times not enough to serve all the students. This results in overcrowding of students to one projector as it was experienced by The Federal Democratic Republic of Ethiopia (2015). Erickson (2008), urges that implementers should take note that instructional media is be based on the population of the students like text books. Overcrowding is brought about by the lack of funds to buy more instructional media apparatus. Kei (2011), affirms this by arguing that the cost of buying instructional media is high, that they are very expensive for institutions struggling to get funding. Due to scarcity of resources available lecturers are left to improvise on the best way to teach without instructional media; resulting in reducing innovative teaching and learning method to a mixed one. A mixed method is when a lecturer uses a tutorial to present a lecture turning the event to be a lecturer led event as opposed to being a student lead role, as opined by Veitia *et al.*, (2001). The few instructional media apparatus that

are functional are faced with interruptions on electricity line, yet almost all instructional media apparatus use electricity as opined by Skochelaks et al., (2015). Hence it is important for contractors contracted to install electricity to consider installing them with backups.

2.7 Perceptions of Lecturers Towards Financial Resources for Teaching and Learning

Education finance is a term used to describe the financial and in-kind resources available for education. The concept of education finance also addresses questions about how resources are allocated, used, and accounted for to achieve sustainable, quality education for all learners. Education systems in crisis settings are funded in a variety of ways, including most importantly by national governments, but also household expenditures and foreign aid in the form of both humanitarian and development assistance, which complements domestic spending. It has been estimated that \$75 billion will be needed each year at minimum to get on track for providing the world's learners with universal education by 2030 (Dammu, et. al, 2023).

The COVID-19 pandemic has fundamentally changed the landscape for learning institutions. Leaders including Board of management and heads of departments are left wondering how to meet the greater needs of students while managing uncertainty around safety, social distancing, and of course, revenue impact. With some districts already operating at the edge of deficit spending, there is difficult, strategic planning to be done to ensure that student needs are met despite significantly less funding. Even before the COVID-19 pandemic, learning institutions were facing a triple squeeze on budgets: a higher bar for student learning and more high-need students, unsustainable cost structures, and flat or declining revenue. With the arrival of COVID-19, there is an even

greater depth, breadth and inequity of student need that is magnified by the pandemic; ongoing constraints on service delivery from social distancing; and greater financial pressure due to massive drops in tax revenue. The financial challenges from COVID-19 are great. Economists predict that the COVID-19 pandemic will drive an economic decline significantly larger than the Great Recession, which saw 10 percent unemployment and a 2.6 percent decline in GDP. The current numbers are still evolving but experts predict direr outcomes for the pandemic's impact, including a peak unemployment rate of 16 percent, a 5.6 percent decline in GDP, and significant state budget slashing.

Government spending on education has increased steadily during the last decade, but the COVID-19 pandemic has impacted public finances dramatically, resulting in a significant contraction in education budgets. According to the World Bank and UNESCO, two-thirds of governments reported low and lower-middle-income Countries cut their education budgets in 2020 after the onset of the COVID-19 pandemic. More can be done to leverage private capital to support schools, teachers and parents to mitigate the impacts of decreased income during this time. Capacity building and training programs are clearly needed to come alongside schools and families in order to support remote learning. Many schools are looking to fund initiatives that can improve the availability of remote learning, but currently lack the funding to do so. Funds are also required for families to invest in equipment needed to access remote learning platforms for children. Across the board, school stakeholders have continued to struggle and student learning losses are expected to last for some time. The current generation stands to lose as much as \$10 trillion in lifetime earnings as a result of the pandemic (World Bank, 2020). As schools phase reopening, getting children back into the classroom and ensuring schools and families have the access to financing they need to continue operating, pay

educational expenses, catch learners up and improve education quality overall is now more critical than ever.

In March 2022, a UNICEF survey of 122 Countries showed that only one third of Countries had increased public resources for education while a quarter had reported a decrease in budget, (UNICEF, UNESCO, World Bank, 2022). The importance of foreign aid to safeguard spending on education and ensure that learners' access to education is maintained has therefore increased considerably. Approximately \$14.7 billion in Official Development Assistance (ODA) was dedicated to education in 2020, which represents 6.5% of the total. The bulk of this comes from the development aid budgets of donor governments and the remainder from humanitarian funding. Education in emergency financing is a subset of this education funding, although there is no agreement on the scope of what, precisely, it entails. It might be provided for a short time in a quick-onset emergency to cover the immediate needs of learners affected by emergency, or over the long term, over several years, to sustain education in a protracted crisis where formal education systems are unable to accommodate all learners. In this sense, education in emergency financing straddles the nexus between humanitarian assistance and development cooperation, which are both important sources of funding for education in emergency. This support is channeled through UN agencies, non-governmental organizations (NGOs) and intermediaries, including dedicated global funds for education response such as Education Cannot Wait and the Global Partnership for Education (GPE). Aid recipients include UN agencies, national and international NGOs, and civil society organizations. Although education in emergency has been a subject of international focus over the last two decades, there was a time when education was not prioritized during emergencies.

Education is now recognized as a critical sector in humanitarian response and a key element of development cooperation in crisis settings. The Global Education Cluster (GEC), established in 2007 and co-led by UNICEF and Save the Children, is the main coordination mechanism for delivering such assistance in humanitarian crisis, with UNHCR leading the coordination of refugee responses. In 2010, the importance of education in emergency was affirmed by the UN General Assembly in a resolution urging Member States to implement strategies and policies to ensure and support the realization of the right to education as an integral element of humanitarian assistance and humanitarian response (Burde et. al, 2017). Technical knowledge on providing education in crisis settings has evolved since then, with the Inter-agency Network for Education in Emergencies (INEE) Minimum Standards being agreed to amongst the diverse actors involved. In order to increase funding for providing education to learners in emergencies, the UN Global Education First Initiative (GEFI) agreed in 2012 to spend a minimum of 4% of humanitarian funding on education. In 2015, education in emergency was captured in SDG4, which seeks to ensure inclusive and equitable quality education and promote lifelong learning opportunities for all. In 2016, education in emergency gained further attention with the establishment of the first dedicated UN-hosted fund. In 2018, the Global Compact on Refugees reaffirmed the importance of inclusive national education systems in facilitating access to refugees and host community children. Funding for education comes from multiple sources, such as public funds from governments, school fees, donor funding, and a blend of all these. The amount of funding from each source depends on the Country context. For example, according to Our World in Data, in 2010, education accounted for about 8 percent of government spending in the Central African Republic, while it accounted for about 21 percent in Ghana. After governments, households are often the largest source of education financing. In Nepal, households

contribute about 49 percent of total funding for education, while in Uganda, households contribute about 57 percent (Author, 2019). Worldwide, different governments are involved in financing education through funding and grants to the medical students (Robert *et al*, 2021).

Financial support from various agencies government or non-governmental organizations, is paramount in the running of Medical Colleges. In higher education institutions such as KMTC, the pandemic has had and will continue to have a drastic financial impact. Institutions are suffering from lost revenue to partial tuition refunds, room and board, and fees. With colleges and universities facing such substantial losses in revenue, there's a very good chance tuition costs could climb at a faster rate to compensate for losses. As a corollary, to match these increasing tuition costs, student loan debt could surge even more. This pandemic is existential for many institutions like KMTC which have seen funding dwindle over the years, as most donors, are not constitutionally required to fund them.

In the purchase of medical equipment, fittings, safety equipment and construction of physical facilities, there must be a good financial plan in store. Additionally, human resource establishments rely on the finances available to hire the required number of teaching and non-teaching staff. In a study by Wambua (2015), in Kenya the researcher pointed out the importance of government funds in the smooth running of institutions. Although the study was conducted in Secondary Schools, the results can be inferred to Medical Colleges which also depend on government funding to purchase equipment and pay salaries of staff. Teaching and learning resources are majorly distributed according to the size of the institution (Wambua, 2015). Relevant Ministry should therefore guide the institutions on budgeting. The current funding model in Kenya is based on relevant

ministries, which caters for 80% of the unit cost while the remaining 20 per cent is borne by the institutions and students. This arrangement places more emphasis on the number of student enrollment, and in each case, the cost is fixed. However, this type of financing strategy has reduced funding for large institutions of learning. Although learning institutions like KMTC receive government funding, there is a growing funding gap. With COVID-19, the government effected a 26% reduction in funding. Additionally, while the government is ideally required to cover 80% of the tuition burden per student, it currently covers only 49.5% of the tuition. The funding gap in learning institutions has increased by more than double in the last few years. Over the last years, government funds to learning institutions through the relevant ministries has been declining gradually from 66.4% in the financial year 2021/2022 to as low as 48.11% in 2023. As a result, public learning institutions are confronting a buildup of pending bills amounting to Ksh 65 billion as of February 2023 and are thus not able to meet their statutory obligations, including remittances to pension schemes, health insurance, and taxes. Learning institutions like KMTC have resorted to increasing the cost of tuition and accommodation on the students to bridge the gap.

Though students have access to the national student loan scheme provided by the HELB, its capacity is limited to funding only a small percentage of learning institutions students. During the financial 2022/2023, HELB only covered 58% of the students under Kenya Universities and Central Placement Services. This was attributed to inadequate funding from the exchequer and low repayment by former beneficiaries, with over Ksh 9.9 billion defaults.

In Medical Colleges, the various heads of department are expected to develop departmental budgets which must be approved at Campus level before they are shared at

higher offices. In the advent of COVID-19, there was a lot of uncertainty whether many governments have been able to support Medical Colleges with enough financial aid (World Bank Group, 2020). According to Sharma and Bhaska (2020), COVID-19 has immensely affected Medical Education and its effects were felt beyond the pandemic. According to OECD (2020), financing the health sector forms a crucial force in the war against COVID-19 and in the achievement of SDG 3. This ultimately means that Medical Colleges are at the forefront in the fight against the pandemic; bearing in mind the need for Health Workers such as Medical Laboratory Technologists who assists in diagnosis of such scourges. Contemporary society maintains the belief that the education system serves as a solution to various societal issues, while also recognizing its inherent flaws. Both in developing and developed nations, the challenge of resource scarcity is a prevalent reality encountered by education systems globally. Insufficient financial resources can lead to diminished academic performance and reduced interest in certain educational subjects, creating a cyclical pattern originating from the lack of financial support. The higher education space in Kenya is characterized by major issues that trace back to inadequate funding. There is need for learning institutions like KMTC to actively seek for alternative funding to boost their revenues through contract research, partnerships, talent development, innovations, consultancies and other income generating activities as some of them have implemented these initiatives since the government started reducing funding allocation. To encourage a more effective way of utilizing the available public resources prudently among learning institutions, the government could consider pegging performance to budgeting. This would provide financial incentives for improved financial management by learning institutions.

Kenya Medical Training College has a finance department which receives and reviews budget from various heads of department in various Campuses. From these budgets, the

finance departments are able to prioritize the purchase of different items for teaching and learning and pave way for payment of staff salaries. Further on this the finance department also advices on allocation of funds for student support (KMTC, 2020).

2.8 Theoretical Framework

This research adopted paradigm of pragmatic world view to guide in the theoretical framework of the research method, Saunders, Lewis and Thornhill (2015). A paradigm in research refers to philosophical assumptions that guide the actions of a researcher (Lincoln *et al*, 2011). There are four major philosophical approaches to the process of how to carry out a research namely: - post positivism, constructivism, and advocacy or participatory and pragmatism as opined by Creswell (2017). They explain the various approaches researchers adopt when choosing a particular research method of a study. Such methods include:-

One, the post positivists view represents a group of individuals whose view is after positivism; they hold a deterministic view that human beings decide their own issues and that their causes probably determine effect or outcome. Groups who hold this view approach research with an already determined set of mind hence they do research to prove their view; because to them what is being observed determines their world view. Hence, their view that knowledge is better understood by describing the phenomena that one is experiencing. What a particular individual is going through forms and shapes one's view or perceptions. Two, the social constructivist view assume that people develop a subjective meaning of their environment. Since community is shaped by culture and environment, researchers should focus to get meaning from the view of the community. For the researcher to understand individuals, they rely on the way research participants view their world or environment which has been influenced by culture.

It means that decisions made are not individualistic but are to advance the interests of the community; since knowledge is constructed through interaction with others. So, knowledge is generated from the community as people interact when doing their day today activities as opined by Ernest (2013).

Three, advocacy or participatory view opine that research cannot be done without taking into consideration the people's political agenda. When a researcher is conducting research, one has to intertwine it with the existing political agenda of the research participants. It is so because of being the only way a researcher will get meaning in participants' statements. Every research must contribute change to the society and so it starts with the needs of the community as argued by Kemmis and Wilkinson (2014). This view is what propelled the birth of action research aimed at giving solutions to community problems as argued by Fay (2014). Action research is one of the innovative methods of teaching and learning, it uses the team work approach whereby participants from diverse professions come together to seek for solutions to community problems as opined by Reason and Bradbury (2008).

The fourth paradigm and last is the pragmatic paradigm whereby holders of this paradigm identify a research problem, then seek for a solution to it.

When solutions are identified; the said solutions come with various challenges whose solutions have to be researched further and this forms a spire of action research as opined by Reason and Bradbury (2008). In conducting research using this paradigm, allows for a mixed method approach to benefit from both quantitative and qualitative data. This enables the researcher secure an in-depth answer to the problem as opined by Morgan (2007).

Pragmatism is a form of research paradigms that involves both qualitative and quantitative methods. The pragmatism paradigm emphasizes that the best research methods are those that help a researcher answer research questions. According to Ryan (2018), there are three common theories used in the paradigm of the pragmatism namely; positivism, interpretivism and critical theories. Pragmatism combines both interpretivism and positivism. Positivists value objectivity while interpretivists value subjectivity. In positivism, emphasis is on quantitative research methods of data which adhere to factual information gathered through structured questionnaires (Mackey and Gass, 2015). According to Mackey and Gass (2015), positivists concentrate on surveys that determine the current trends. The focus here is on facts that must be proven through measurement (Ryan, 2018). On the other hand, interpretivist has an argument that truth and knowledge are subjective based on peoples' understanding of occurrences. Additionally, researchers have ideas of their own beliefs which guide them on the methods of data to use during data collection and analysis (Ryan, 2018). The paradigm of pragmatism has continually evolved over time and even more so during times of pandemics like COVID-19. This is an argument in critical theory which acknowledges that the evolution of mankind is complex to investigate (Howell, 2013). Pragmatism is a research paradigm that emphasizes the practical consequences and usefulness of ideas, theories, and knowledge. According to pragmatism, the value and meaning of concepts and beliefs lie in their practical application and usefulness in solving real-world problems and improving human experience.

In research, pragmatism often involves combining multiple research methods, both qualitative and quantitative, to address a research question or problem.

Researchers who adopt a pragmatic approach typically focus on developing practical solutions to real-world problems and use a variety of research methods and sources to gather information, including surveys, interviews, case studies, experiments, and observations. One of the key features of pragmatism is its emphasis on the importance of context in understanding human experience and behavior. According to pragmatists, knowledge is always situated and context-dependent, and researchers must take into account the specific context in which knowledge is produced and applied. Pragmatism is commonly used in a range of fields, including education, psychology, sociology, and business, where researchers seek to address practical problems and make a positive impact on people's lives. It can be contrasted with more theoretical and abstract research paradigms, such as idealism or positivism. In this study, positivism, interpretivism and critical theories were crucial because the subjects are people (students and lectures) being questioned on adequacy of teaching and learning resources in Medical Education. The researcher is also part of the study because the research may demand critical thinking of the outcomes of the study. This research study employed the paradigm of pragmatism; as it forms a basis for argument. The goal of the research was to find out the perception of the lecturers and students on the adequacy of teaching and learning resources in the advent of COVID-19, the users who happen to be students and lecturers have their own opinions and meaning to the program. When answering questionnaires, they are presenting their views about their perception of the adequacy of the teaching and learning resources in Kenya Medical Training College in the advent of COVID 19. Therefore the meaning and reaction of the users of this program in Kenya Medical Training College will change accordingly. In this research their perception about the adequacy of teaching and learning resources that is human resources, physical facilities, teaching aids (projected and non-projected media) and financial resources, formed the way they

conceptualized the pedagogy in Medical Laboratory Sciences programs in the advent of COVID-19 at Kenya Medical Training College. The study adopted modified theoretical framework of Creswell (2009).

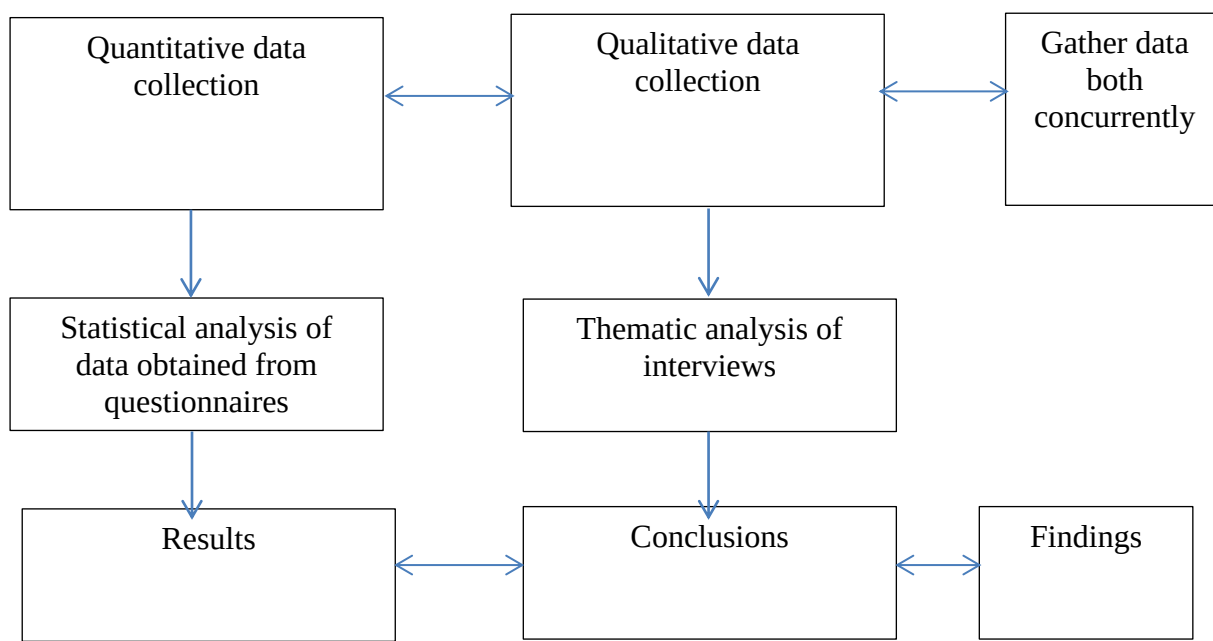


Figure 5: Modified Theoretical Framework (Adopted from Creswell, 2009)

2.9 Conceptual Framework

A conceptual framework can be broadly defined as a theory or literature review, or more narrowly as the factors and variables studied. The definition varies among authors, but all provide context for the study. Ravitch and Riggan (2017), view a conceptual framework as an argument with two parts: establishing the study's importance and intended audience, and demonstrating alignment among research questions, data collection, analysis, and rigorous procedures. They believe the conceptual framework informs and describes the development and presentation of the study. Further, according to Lydia, et al., (2015), conceptual frame work should assist a researcher to develop awareness and understanding of the situation under scrutiny and show the relationship of the variables under the study. Conceptual framework are important in that they assist a

researcher to organize his or her thinking in order to complete an investigation successfully. To give a broad scope to thinking about the research, provide clear link from the literature to research objectives and questions, formulate research design, and last by providing reference point for discussion of literature, methodology and data analysis. A conceptual framework is usually presented in graphic form or a diagram representing main concept, variables and relationship with each other. In other words it is a network of interlinked concepts that provide a comprehensive understanding of the study. This research adopted Stake's Model of evaluation which concedes antecedents, transactions and outcomes aspects as stated by Mutema et al. (2010), because it was the concept that met the need of this research. This model of evaluation takes the existing environment as the antecedent. This includes the environmental factors such as human resources, physical facilities, teaching and learning aids such as computers, projectors, connectivity of internet and finances are grouped in the antecedents. This involves the teaching environment, presence of the heads of departments, lecturers, and support staff. The mission and vision of Kenya Medical Training College forms the values of this institution.

In its vision, it wants to be the model institution in the training and development of competent health professionals by providing adequate teaching and learning resources, the college hopes to achieve that. The next stage of evaluation is the transaction: this is the interaction within teaching and learning and the participants in the advent of covid - 19. This has the element of the independent variables (human resources, physical facilities, teaching aids and finances) interacting with dependent variable (lecturers and students perception of teaching and learning resources in the advent of covid-19). The evaluation was centered on students being facilitated to learn, lecturers being equipped to facilitate teaching and learning, support staff providing logistics for resources to

facilitate both lecturers and students in teaching and learning in the advent of covid-19. The third stage is the outcome. This is where the results of the interactions of various variables presents an outcome which is either successful or a failure as argued by Rathy (2014). This is the stage whereby the study reveals the scenario in place and in reference to adequacy of teaching and learning resources in the advent of covid-19. The antecedents which are teaching and learning resources to include human resources, physical facilities, teaching and learning aids and finances whose inadequacy in them changes the outcome. That when there is adequacy of resources, teaching and learning aids, human resources, physical facilities and finances, will improve the outcome. Teaching and learning resources are the independent variables, in that their adequacy are affected by pandemics like the covid-19 among others.

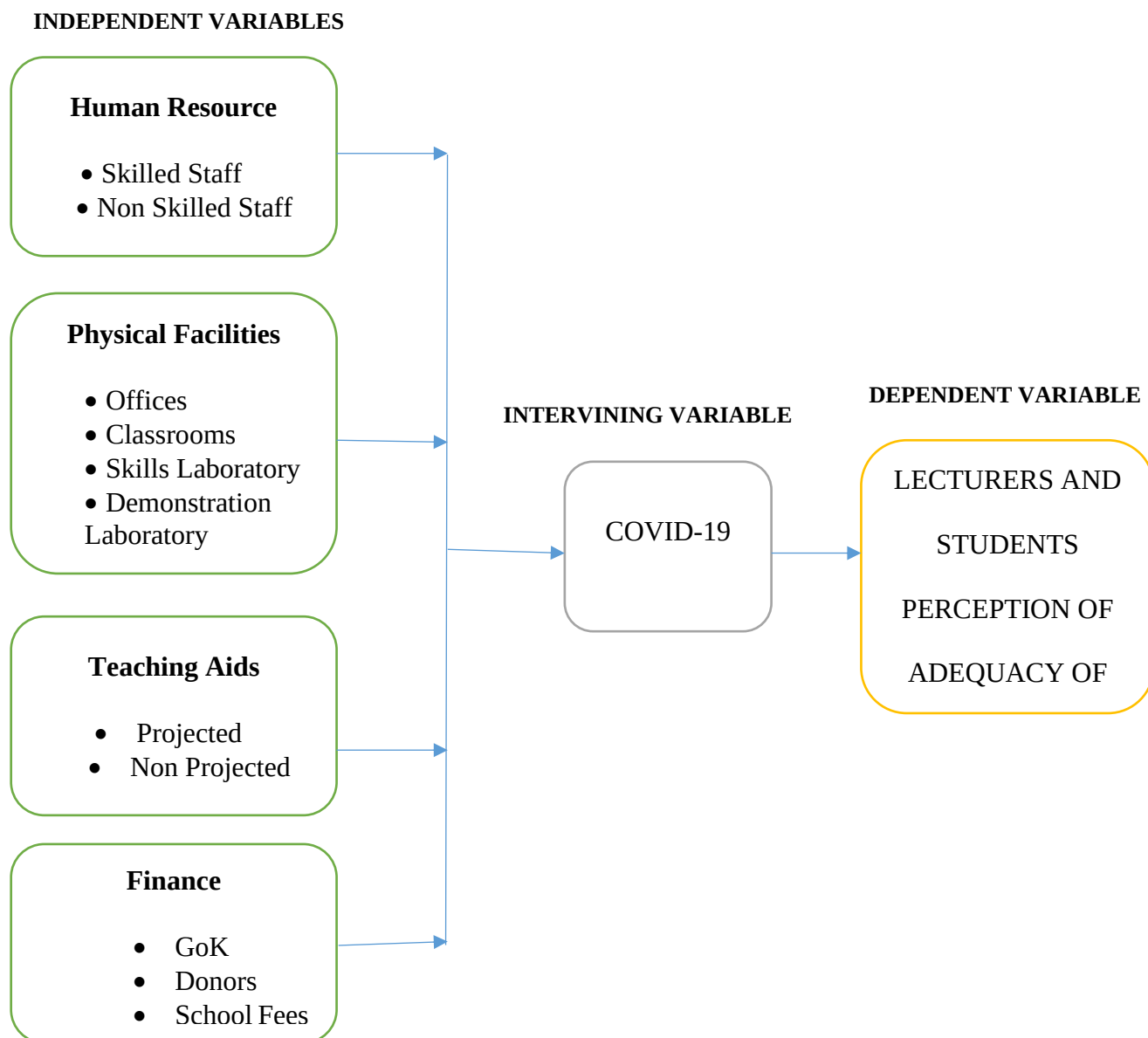


Figure 6: Conceptual Framework

In (Figure 5) the inputs are (Independent variables); Human resources, physical facilities, teaching aids and financial resources. The process was to determine the adequacy of teaching and learning resources in the advent of COVID-19, which was the intervening variable. The output was the lecturers' and students' perception on the adequacy of teaching and learning resources in the advent of COVID-19. Figure 5 depicts the existing relationship between the independent variables, the intervening variable and dependent variable.

2.10 Conclusion

This chapter has highlighted in detail the relevant and recent literature review of on lecturers and students perceptions of adequacy of teaching and learning resources.

The review was done in regards to the domains of Medical Laboratory Sciences requirement boards, this is in reference to challenges faced by learning institutions in regards to adequacy of teaching and learning resources in the event of pandemics or any other eventuality. Teaching and learning demands for adequacy in teaching and learning resources for smooth and continued learning process.

CHAPTER THREE

RESEARCH DESIGN AND METHODOLOGY

3.0 Introduction

This chapter focused on the research design and methodology that was utilized in this study. The chapter covers the study design, study setting, study population, inclusion/exclusion criteria, sample size determination, sampling techniques, research instruments, data collection methods of department, validity and reliability, and ethical considerations.

3.1 Location of the Study

There are 12 Campuses of Medical Laboratory Sciences of Kenya Medical Training College spread in the eight regions of Kenya (North Eastern, Eastern, Western, Coast, Central, Rift valley, Nyanza and Nairobi). These campuses are Kakamega, Kitui, Embu, Machakos, Portreitz, Meru, Nakuru, Nairobi, Kombewa, Lake Victoria, Kisii and Nyeri (KMTC 2020) with a total of 33 permanent employed lecturers heads of departments inclusive. Out of the 8 Regions in Kenya, see (Appendix XI) Eastern Region was randomly selected through simple random sampling.

The KMTC Campuses in this Region include KMTC Machakos, Meru, Embu and Kitui (33%) of the total 12 campuses. Further selected via census sampling. In the four campuses of this region (Eastern) there were 18 permanent employed lectures Head of Department inclusive. This translates to 54.4% which forms a representative of the total lecturers population.

3.2 Study Design

The study is descriptive cross-sectional study of mixed method. Creswell (2017), identified four major types of mixed methods designs which are the Triangulation Design, the Embedded Design, the Explanatory Design, and the Exploratory Design. This study employed triangulation mixed method design which promotes the use of several data collection methods such as questionnaires and interviews. According to (Johnson & Onwuegbuzie, 2004), mixed methods research is defined as a research where the researcher mixes or combines quantitative and qualitative research techniques, methods, approaches, or concepts into a single study. Mixed methods design, is more than simply collecting both qualitative and quantitative data; but the data are integrated, related, or mixed at some stage of the research process (J. Creswell & Plano Clark, 2007). The rationale for carrying out a mixed method research is that when qualitative and quantitative methods are combined they capture the trends and details of the situation and they complement each other and yield a more complete analysis. This design was adequate in collecting data that addressed the intended research questions for this study (Mugenda & Mugenda, 2019).

3.3 Study Population

The study involved all 18 lecturers and 514 students in the department of Medical Laboratory Sciences in the four KMTC Campuses; Embu, Meru, Kitui, Machakos, as represented in the table below;

Table 3. 1 Medical laboratory students and lecturers in the four Campuses of KMTC

S/No.	KMTC Campus	Student population	Number of lecturers
1.	Machakos	125	7
2.	Meru	129	3
3.	Kitui	130	3
4.	Embu	134	5
TOTAL		514	18

3.4 Eligibility Criteria

These are guidelines that outline who can or cannot participate in the study

3.4.1 Inclusion Criteria

- All lecturers in the department of medical laboratory sciences employed on permanent basis in Meru, Machakos, Embu and Kitui Campuses of KMTC.
- All medical laboratory students in Meru, Machakos, Embu and Kitui Campuses of KMTC.

3.4.2 Exclusion Criteria

- Campus Lecturers who do not belong to the department of Medical Laboratory Sciences
- All other campuses offering medical laboratory sciences outside eastern region.
- Lecturers from other Campuses which do not offer Medical Laboratory Sciences
- Other medical laboratory lecturers outside eastern region
- Other medical laboratory services outside eastern region – Kenya.
- Contracted lecturers
- Lecturers on leave
- Students undertaking other courses in the four Campuses.

3.5 Variables

- Human resources
- Physical facility
- Teaching Aids
- Financial Resources
- Covid-19
- Perception of lecturers and students

3.6 Sample Size Determination

Since the number of lecturers is less than 30, census sampling method was used to determine lecturers (all 18 lecturers) sample size, while sample size determination for students. Fischer et al. (1990), method of determining the sample size for a population less than 10,000 was used to determine the sample of students. The standards of determining the sample size was used as follows: $n = Z^2pq/d^2$

Z -Normal deviance at the level of 95% confidence interval =1.96

p- Proportion of population with desired characteristics

q- proportion without desired characteristics

n- Desired sample size

d - Statistical error margin (5%)

Since there is no estimate available of the proportion, the target population was assumed to have the same characteristics (50%)

Therefore

$$n = \frac{1.96^2 \times 0.5 \times 0.5}{0.05^2}$$

$$0.05^2$$

$$n = 385$$

N which is 514 students is less than 10,000 (the population of Medical Laboratory Students).

Therefore, Yamane (1987) formula was used to determine the actual sample size in a population less than 10,000:

$$nf = \frac{n}{1 + n/N}$$

nf = desired sample population less than 10,000

n= desired sample size = 385

N = student total population = 514

$$nf = \frac{385}{1 + 385/514}$$

Therefore, the sample size was 220 students.

3.7 Sampling Techniques

Kenya is divided into eight (8) Regions, see (appendix XI); formally provinces which were replaced by a system of counties in 2010. The Regions include, Central, North Eastern, Coast, Nyanza, eastern, Rift Valley, Nairobi and Western. Central Bureau of statistics Kenya (2021), out of the eight Region the researcher used simple random sampling technique to choose one out of the eight (8) Regions, in the case Eastern Region was selected. Further, census sampling was utilized whereby all the KMTC Campuses in the selected Region that trains Medical Laboratory Sciences were used as study site for this research. Thereafter, the researcher utilized census method to include all the lecturers to participate in the study. This means the researcher selected all lecturers as respondents

because they were at the right place at the right time where the researcher was interested in (Kothari, 2017).

In this case, the researcher selected only the lecturers in the department of Medical Laboratory Sciences as they undertake their duties in the department. According to Polit and Beck (2008), convenience sampling is best used where groups of participants are heterogeneous. Although sampling bias is common, this method allows the researcher to choose non-randomly the participants of the study (Kothari, 2017). For the medical laboratory students, the study employed proportionate sampling technique. Proportionate sampling is a method in which a researcher divides a population into subgroups and then applies random sampling methods of data to the subgroups to develop the required sample size (Salkind, 2010). In this way, strata was created for first year, second year and third year students to form the sample size of 220, after which simple random sampling was carried out in each stratum.

Table 3. 2: Showing the strata of medical laboratory students

S/No.	KMTC Campus	Student population	Sample; Sample size/population $\times$ stratum size e.g. $220/514*125$	Level of students	Sample; Sample size/population $\times$ stratum size e.g. $53/125*30$
1.	Machakos	125	53	First year (30 students)	13
				Second year (45 students)	19
				Third year (50 students)	21
2.	Meru	129	55	First year (30 students)	13
				Second year (49 students)	21
				Third year (50 students)	21
3.	Kitui	130	56	First year (30 students)	12

				Second year (50 students)	22
				Third year (50 students)	22
4.	Embu	130	56	First year (30 students)	12
				Second year (50 students)	22
				Third year (50 students)	22
TOTAL		514	220		220

3.8 Data collection tools

This referred to devices that were used to gather data to the set objectives.

3.8.1 Data collection instruments

The researcher employed self-administered closed and open-ended structured questionnaire see (appendix VII,VIII, IX, X), to collect quantitative and qualitative data from the lecturers, the students and Heads of Departments of the Department of Medical Laboratory. A questionnaire is usually free from researcher bias and respondents had adequate time to read and respond to the questions (Kothari, 2017). The tool had open ended, closed ended questions, Likert scale on teaching and learning resources. Each item on the questionnaire tested on the specific objectives of this study. The questionnaire consisted of a section on demographic characteristics of the respondents, a section on human resource adequacy, a section on physical facilities adequacy and a section on the state of teaching aids adequacy at KMTC. Additionally, the questionnaire contained a Likert scale to test on perceptions of respondents towards teaching and learning resources in the department of Medical Laboratory Sciences at KMTC.

Further, interview guides were used. The interview guides are qualitative data collection techniques which are used to gain in-depth understanding of the actual situation

(Nyumba, 2018). In this study, interview guides were used to collect data from Head of Departments.

3.9 Validity and reliability of the instruments

3.9.1 Validity

Construct validity was ensured by ascertaining that the data collection tools would address the objective of the study. The research instruments underwent scrutiny from a panel of peer reviewers. Further, the research instruments were reviewed thoroughly by lecturers from Moi University who clarified and modified them accordingly.

3.9.2 Reliability of the data collection tools

Reliability refers to extent to which the results can be reproduced when the research is repeated under the same conditions, (Mugenda & Mugenda, 2019). To ensure reliability, the researchers supervisors went through all the interview guides and questionnaires to ascertain that they are accurate, has internal consistency, clearly defined how questions were phrased to guide against errors such as omitted variable bias or information bias.

During piloting, all participants were given the same information and tested under the same conditions of which the questions on the questionnaires used were reedited while others were deleted to improve on clarity.

The reliability result for students' questionnaire was 0.894 while for lecturers was 0.907 with an average reliability test of 0.901. This means the data collection instruments were consistent and reliable in collecting the information required for this study, as argued by (Watson 2013).

3.9.3 Pilot Study

A pilot study was conducted at the department of Medical Laboratory Sciences at KMTC Nakuru Campus; which is not one of the Campuses chosen for this study. This included 10% of the participants who were selected to participate in the pretesting of the data collection instruments (Mugenda and Mugenda, 2019). This means one Head of Department, one lecturer and 22 students from department took part in the exercise which yielded fairly consistent responses. The pilot study enabled the researcher to check the feasibility and improve on the research design. Further by conducting the pilot study, the researcher was well prepared to face the challenges that might arise in the larger study.

3.10 Implementation of the study

This is the process of putting a plan into effect through execution process.

3.10.1 Data collection procedure

This is the operational pattern that stipulates what information is to be gathered from what sources with which procedures

3.10.2 Data Collection Method and Procedure

Data was collected by use of interview guides and questionnaires. The questionnaires were administered by the researcher directly to the chosen sample for the study. Respondents were allowed enough time to complete the questionnaires. Four research assistants were included in the data collection process; one from each Campus. The research assistants were lecturers outside the department of Medical Laboratory Sciences. Before the actual day of data collection, the research assistants underwent thorough training on the process of data collection. The participants were given adequate time to fill the questionnaires after which the researcher and the research assistants picked

and stored them ready for analysis. Further, the researcher interviewed each Heads of Department through the provided interview guides.

3.10.3 Student and Lecturers Questionnaires

The researcher employed self-administered closed and open-ended structured questionnaire see (appendix VII, VIII, IX), to collect quantitative data from the lecturers, the students and Heads of Departments of the Department of Medical Laboratory. A questionnaire is usually free from researcher bias and respondents had adequate time to read and respond to the questions (Kothari, 2017). The tool had open ended, closed ended questions, Likert scale on teaching and learning resources. Each item on the questionnaire tested on the specific objectives of this study. The questionnaire consisted of a section on demographic characteristics of the respondents, a section on human resource adequacy, a section on physical facilities adequacy and a section on the state of teaching aids adequacy at KMTC. Additionally, the questionnaire contained a Likert scale to test on perceptions of respondents towards teaching and learning resources in the department of Medical Laboratory Sciences at KMTC.

Further, interview guides were used. The interview guides are qualitative data collection techniques which are used to gain in-depth understanding of the actual situation (Nyumba, 2018). In this study, interview guides were used to collect data from Head of Departments.

3.10.4 Interview Guides for the Heads of Medical Laboratory Science Department

The interview guides are qualitative data collection techniques which are used to gain in-depth understanding of the actual situation (Nyumba, 2018). In this study, interview guides were used to collect data from each of the four Heads of Department medical

laboratory to triangulate response from the questionnaire (Appendix X). This involved oral questioning where open ended questions were used with the guide of an interview checklist. The interviewees were subjected to the same questions. An audio recorder was used during the interviews and the data collected was later transcribed.

3.11 Data management and Analysis

3.11.1 Data Entry

Data was checked for completeness, coded and entered into excel spreadsheet then exported to SPSS® version 28 (IBM Corporation, New York, USA) for analysis.

3.11.2 Quantitative data analysis

Descriptive statistics by means of frequency, proportions and median were used to summarize the data. Inferential statistics was done to test the association between the dependent and independent variables. The normality of the data was determined using Kolmogorov Smirnov and Shapiro Wilk tests (Razali & Wah, 2011) and was found not to be normally distributed. Analysis was carried out using Mann-Whitney, Kruskal-Wallis, Chi-square and logistic regression. Statistical significance was considered for $p < 0.05$.

The individual's responses to the Likert scale items were aggregated and weighted median computed as composite scores. These transformed statistics were then used to carry out descriptive and inferential statistics. Further, mean score of interpretation was used. Mean score level interpretation

- (i) From 1 to 1.80 represents (Very inadequate)/very poor / very dissatisfied
- (ii) From 1.81 until 2.60 represents (inadequate) / poor/dissatisfied
- (iii) From 2.61 until 3.40 represents (neutral)/ Average/Neutral

(iv) From 3.41 until 4.20 represents (adequate) Good/Satisfied

(v) From 4.21 until 5.00 represents (very adequate)/very good/ very satisfied

3.11.3 Qualitative data analysis

The qualitative data generated from in-depth interviews contained narrative from heads of the Medical Laboratory Science Department on the various aspects of the study. The data was organized, cleaned, coded, predetermined and the emergent themes were used to manage data using N Vivo.

3.12 Ethical Considerations

According to (Bhandari, 2022), ethical considerations in research are a set of principles that guide your research designs and practices. Scientists and researchers must always adhere to a certain code of conduct when collecting data from people. The goals of human research often include understanding real-life phenomena, studying effective treatments, investigating behaviors, and improving lives in other ways. What you decide to research and how you conduct that research involve key ethical considerations. These considerations work to; protect the rights of research participants, enhance research validity, maintain scientific or academic integrity. Prior to conducting the study, the ethical approval was obtained from Moi University Ethics and Research Committee (IREC) see (appendix III) and the department of Medical Education. Permission was also sought from KMTC research and Ethics Committee and from the office of the Director. Additionally, approval for data collection was obtained from the National Commission for Science, Technology, and Innovation (NACOSTI) see (appendix IV). The Principals of the four KMTC Campuses where the research was conducted were notified for purposes of organizing the smooth flow of events and procedures during the data collection.

Voluntary informed consent was sought from the lecturers in the department of Medical Laboratory Sciences in these Campuses. Confidentiality was ensured and assured by use of anonymous questionnaires see (appendix VIII,IX,X), where respondents were not required to fill their names while filling the tool.

3.12.1 Confidentiality

Confidentiality of the participants was assured by ensuring that none of the research documents had their names on. All the questionnaires and in-depth interview notes were kept under lock and key. All computerised data were password protected.

3.13. Dissemination of study findings

The findings of this study will be of benefit to the learning institutions, Policy makers, Medical Laboratory Technician Technology Board(MLTTB), Ministry of health, Ministry of Education, Kenya Medical Training Colleges Department of Medical Laboratory Sciences and other practitioner organizations. The findings will be shared through conference presentations, poster presentations and publications in peer-reviewed journals. So far two research articles from the study have been published in referred journals.

3.14. Study Limitations

Limitations are the unforeseen factors that are likely to hinder the investigator from carrying out a study as planned. Such factors include change in weather conditions, change in political climate of a Country, escalating chaos (Wambungu, et. al, 2015). This resonates with (Matula, et al., 2018), who reported that limitations are constraints or drawbacks, that the researcher may encounter when conducting a study, which he may have little or no control, for example the inability of the respondents to express

themselves freely during data collection. In this study, respondents had reservations in sharing of information with regard to adequacy of teaching and learning resources in their Campuses since they mistook the researcher to be on faultfinding mission. However, the researcher physically visited the Campuses during data collection and explained to the respondents that the study's aim was for academic purposes and improvement as far as teaching and learning resources are concerned.

This study was carried out in four Campuses in the department of Medical Laboratory Sciences of KMTC namely Meru, Embu, Kitui and Machakos.

3.15 Conclusion

This chapter has described the procedure that was used in conducting the study. It has given a description of the research design, study site, study population and sampling procedures and the research instruments that were used in collecting data. It has also presented the procedures that were used in data collection, data analysis methods as well as the ethical considerations and procedures that were followed before commencing the study.

CHAPTER FOUR

RESULTS

4.0 Introduction

This chapter presents the results of the study which is based on the collected analyzed and interpreted data from the structured questionnaires and the interview guide. The chapter is divided into seven sections, which include: introduction, characteristics of the respondents, adequacy of teaching and learning resources in the advent of COVID-19 by lecturers and students in the department of Medical Laboratory Sciences of Kenya Medical Training College, among three clusters of study population focusing majorly on students and lectures and further, analyses the same among head of department. Further, normality of data distribution was presented using the demographic data among the participants to ascertain the mode of regression analysis to be used and finally, the results for comparison between the students and lecturers' perception on the adequacy of teaching and learning resources.

4.1 Demographic Characteristics of Participants

The response rate, also known as completion rate or return rate, is the number of people who answered the survey divided by the number of people in the sample. It is usually expressed in the form of a percentage. Response rates are commonly used to measure data quality, and low response rates could result in nonresponse bias.

Response rates are therefore an important measure for education surveys, and low response rates could potentially impact the validity of estimates, analysis, and inference in research (Krishnamurty, P. (Ed.) (2018).

The response rate among students indicating the percentage of respondents who completed the questionnaires see (appendix VIII,IX,X), was 100% (=220), Lecturers

response was 100 % (=18) and the Heads of Departments response was 100 % (=4). When response rates are high, the potential for differences between respondents and non-respondents are lower increasing the likelihood that survey results can be generalized to the population sampled, and reducing the likelihood of response bias (Brtnikova, et al.,2018). (Mulusa, 1988), opined that the higher the response rate, the more likely the results are representative of the population provided the sampling is appropriate, hence 100% return rate is deemed as an accurate representation of the population responses. The good response rate was attributed to the fact that the researcher physically visited the study sites.

Table 4. 1: Demographic Characteristics of Respondents

Participants	Sample Size	Return rate	Percentage %
Students	220	220	100%
Lecturers	18	18	100%

4.1.1 Test of normality using the demographic and non-demographic data among study population (students)

This was performed using demographic and non-demographic data which was meant to ascertain the regression analysis approach to be applied at the latter stage of the results. Subject to the demographic and non-demographic data among students, of the 220 questionnaires see (appendix X), issued, 220 students responded to these questions at 100% as shown on (table 4.2)

Table 4. 2 Test of Normality
Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Gender	220	100%	0	0%	220	100.0%
Campus	220	100%	0	0%	220	100.0%
Year of study	220	100%	0	0%	220	100.0%
Age	220	100%	0	0%	220	100.0%

Tests of Normality

	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Gender	.381	220	.000	.627	220	.000
Campus	.193	220	.000	.852	220	.000
Year of study	.235	220	.000	.800	220	.000
Age	.224	220	.000	.863	220	.000

Normality test demonstrated a p value below .05, indicating that data was not normally distributed using demographic and non-demographic data.

4.1.2 Gender Distribution

The gender distribution among students indicated a seemingly higher percentage in males (58%), similar to lecturer group (55.6%) with over one third being between the age category of 21-23 years while for lecturers the majority were between the ages of 31-40 years at 39%. The number of students per Campus distribution was averagely, similar. By the year of study, second and third years formed the largest proportion with almost 70% both. See the table 4.3, figure 6 and figure 7.

Table 4. 3 Gender of the respondents (Students and Lecturers)

Students		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	128	58.2	58.2	58.2
	Female	92	41.8	41.8	100.0
	Total	220	100.0	100.0	
Missing		0			
Total		220	220	100.0	

Lecturers		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	10	55.6	55.6	55.6
	Female	8	44.4	44.4	100.0
	Total	18	100.0	100.0	

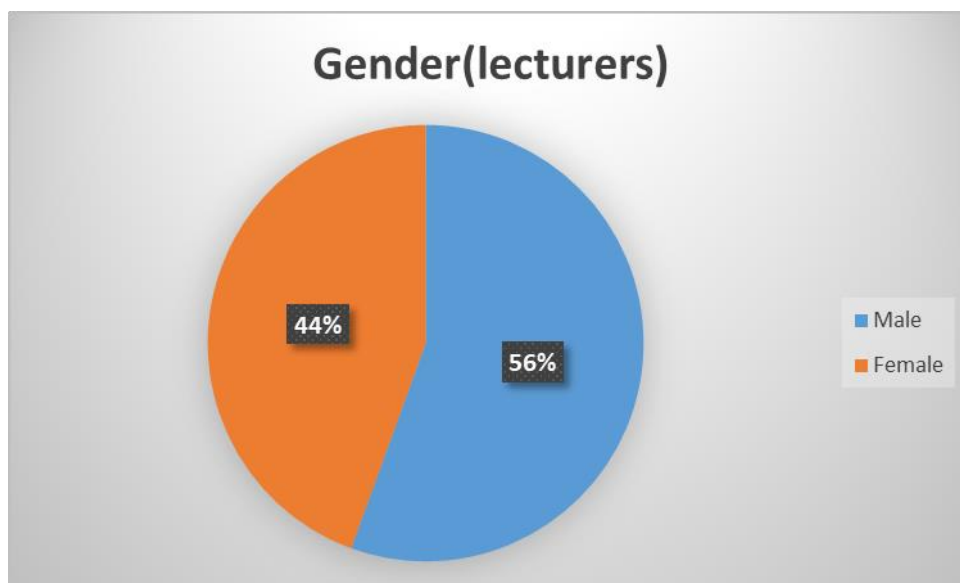


Figure 7: Gender of respondents' lecturers

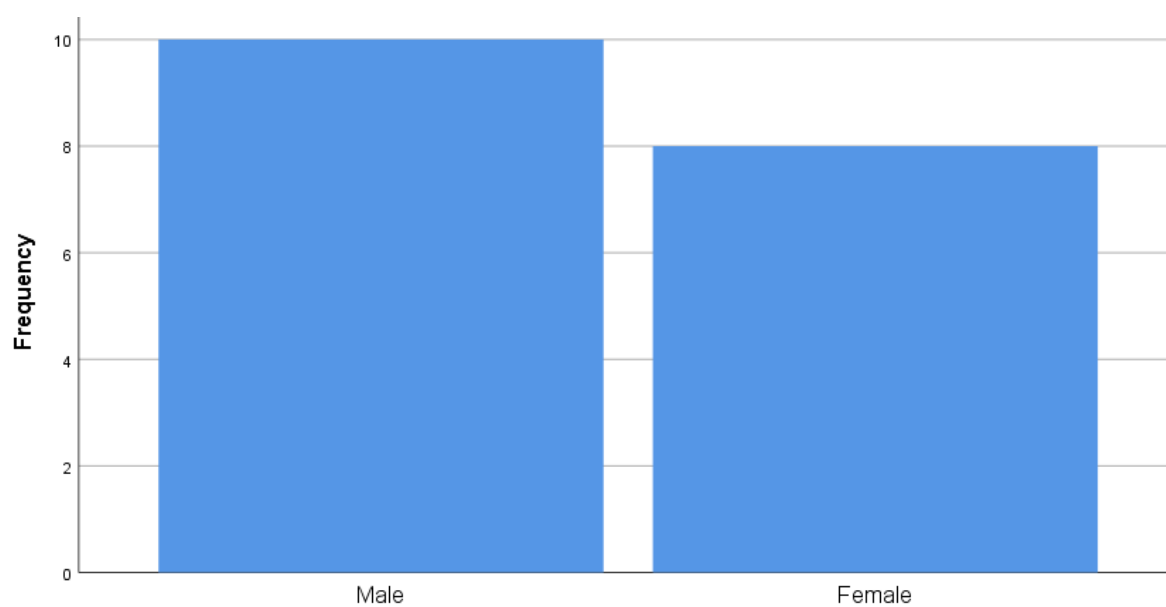


Figure 8: Gender of respondents' lecturers

4.1.3 Age of respondents.

Majority of the lecturers were aged between 30-41 years 7 (39%), while majority of the students were aged between 21-23 years 76 (35%), the lowest among them was 25 years 36 (16%). See table 4.4, figure 5, figure 6 and figure 7.

Table 4. 4 Age of respondents

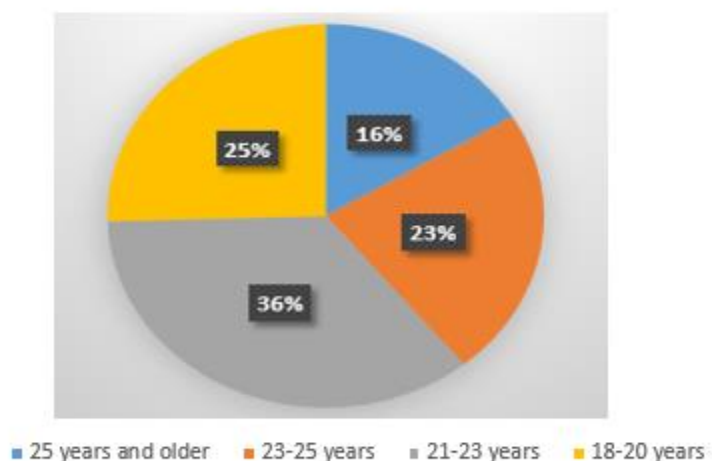
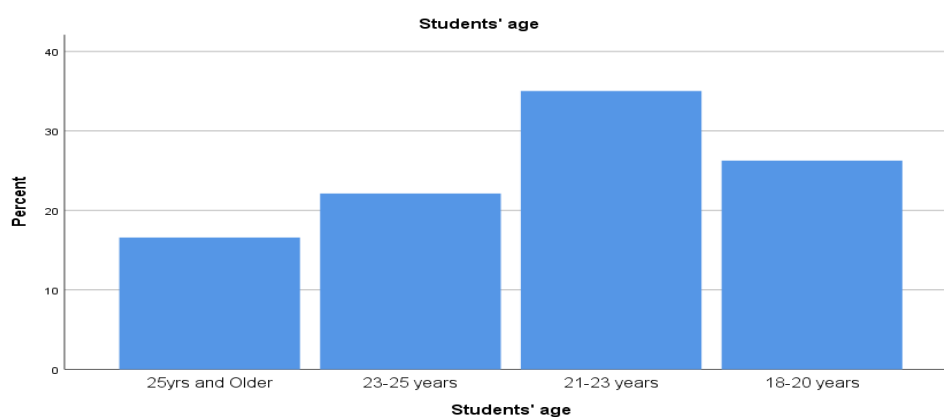
Lecturers Age

Valid	51 Years and Above	6	33.3	33.3	33.3
	41-50 years	4	22.2	22.2	55.6
	31-40 years	7	38.9	38.9	94.4
	21-30 years	1	5.6	5.6	100.0
	Total	18	100.0	100.0	

Students' Age

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	25yrs and Older	36	16.4	16.2	16.2
	23-25 years	50	22.7	22.7	38.7
	21-23 years	78	35.4	35.6	74.3
	18-20 years	56	25.4	25.7	100.0
	Total	220	100	100.0	
Missing	System	0	0	0	0
Total		220	100.0		

Age of respondents (students)

**Figure 9: Age of Respondents students****Figure 10: Age of respondents-Students**

4.1.4 Campus Respondents of Students and Lecturers according to the four Campuses

Campuses respondents of students was Machakos 53 (100%), Meru 55(100%), Kitui 56(100%) and Embu 56(100%) while for lecturers Machakos 7(100%), Meru 3(100%), Kitui 3(100%) and Embu 5(100%). See table 4.5, figure 10 and figure 11 below.

Table 4. 5 Campus Respondents

Students		Respondent's Campus			
Valid	Meru	55	25.5	25.5	25.5
	Embu	56	28.2	28.2	53.6
	Machakos	53	20.9	20.9	74.5
	Kitui	56	25.5	25.5	100.0
	Total	220	100.0	100.0	

Lecturers

Valid	Meru	3	16.7	16.7	16.7
	Embu	5	27.8	27.8	44.4
	Machakos	7	38.9	38.9	83.3
	Kitui	3	16.7	16.7	100.0
	Total	18	100.0	100.0	

4.1.5 Year of study

Majority of the students were at the third year of study 86 (39.2 %). See table 4.6

Table 4. 6: Year of study of students' respondents

Students	Respondent's Year of study				
----------	----------------------------	--	--	--	--

Valid	First Year	50	22.7	22.7	22.7
	Second Year	84	38.1	38.1	60.8
	Third Year	86	39.2	39.2	100.0
	Total	220	100.0	100.0	

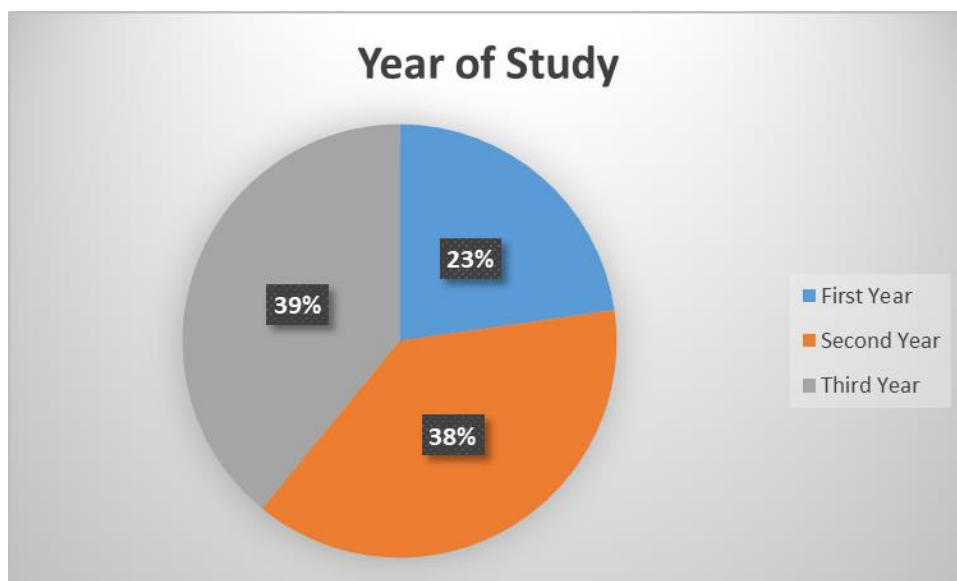


Figure 6: Year of study

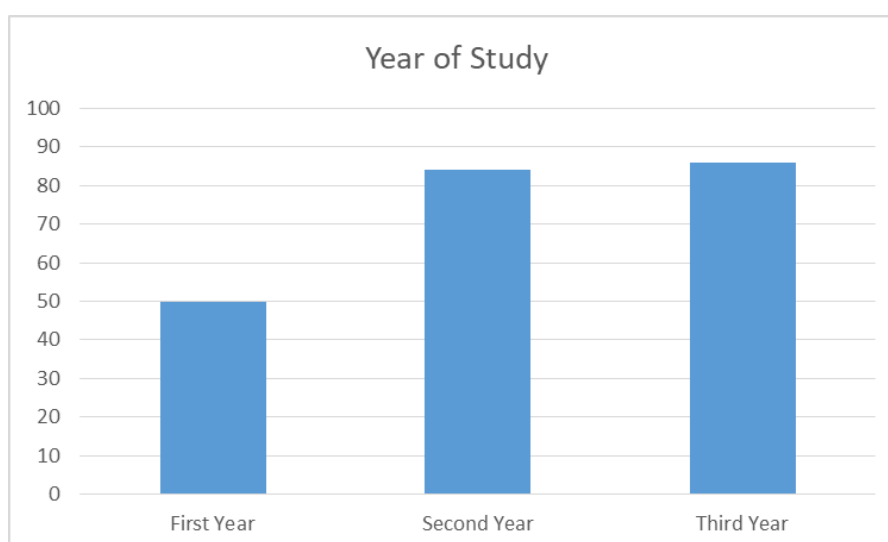


Figure 7: year of study

4.1.6 Lecturers' education level, working years in KMTC and experience in profession

The demographic information of the Head of Department and lecturers was based on their education level, length of service in the current Campus and duration of teaching for the lecturers. Demographic characteristics give a clear understanding of the respondents and Campuses included in the study.

Lecturers' education level.

Findings indicated that the majority of the lectures, 14 (77.8%), had a bachelor degree while 1(5.6%) had master degree and 3 (16.7%) had diploma. These findings indicate that the lecturers in the Campuses were professionally qualified

Table 4. 7 Lecturers level of education

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Masters	1	5.6	5.6	5.6
	Degree	14	77.8	77.8	83.3
	Diploma	3	16.7	16.7	100.0
	Total	18	100.0	100.0	

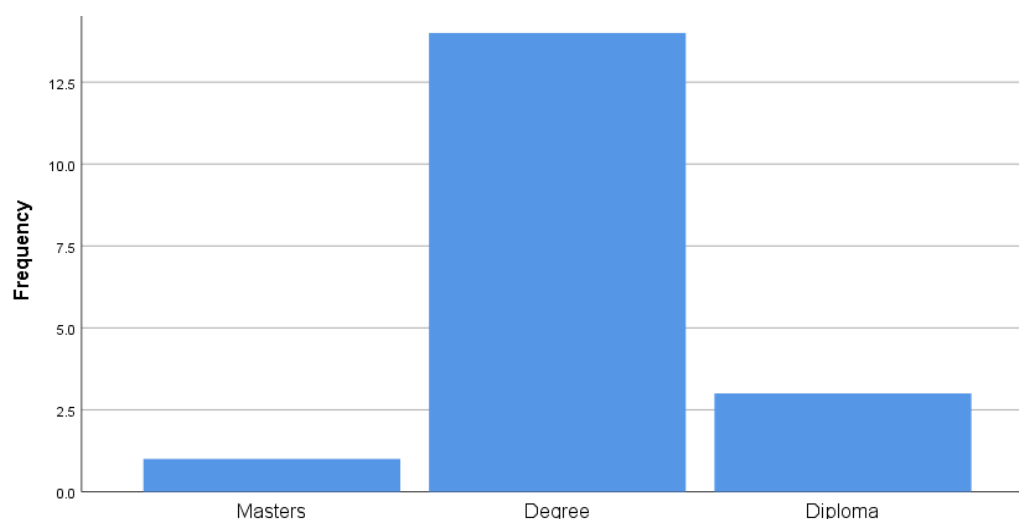


Figure 8: Lecturers level of Education

Working years of the lecturers in KMTC.

The findings indicated that majority of the lecturers 6 (33.3%) had between 6-10 years' working experience in their current Campuses on the other hand the lowest 2 (11.1%) of

them had stayed in their Campuses for 11-15 years and 2 (11.1%) for 16-20 years. See table 4.8 and figure 13

Table 4. 8: Lecturers working experience

	Frequency	Percent	Valid Percent	Cumulative Percent
Above 21 years	3	16.7	16.7	16.7
16-20 years	2	11.1	11.1	27.8
11-15 years	2	11.1	11.1	38.9
6-10 years	6	33.3	33.3	72.2
0-5 years	5	27.8	27.8	100.0
Total	18	100.0	100.0	

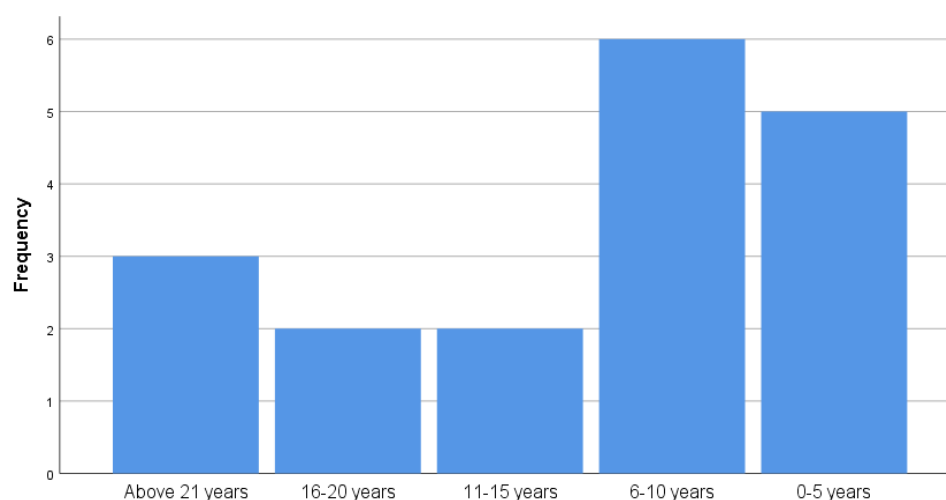
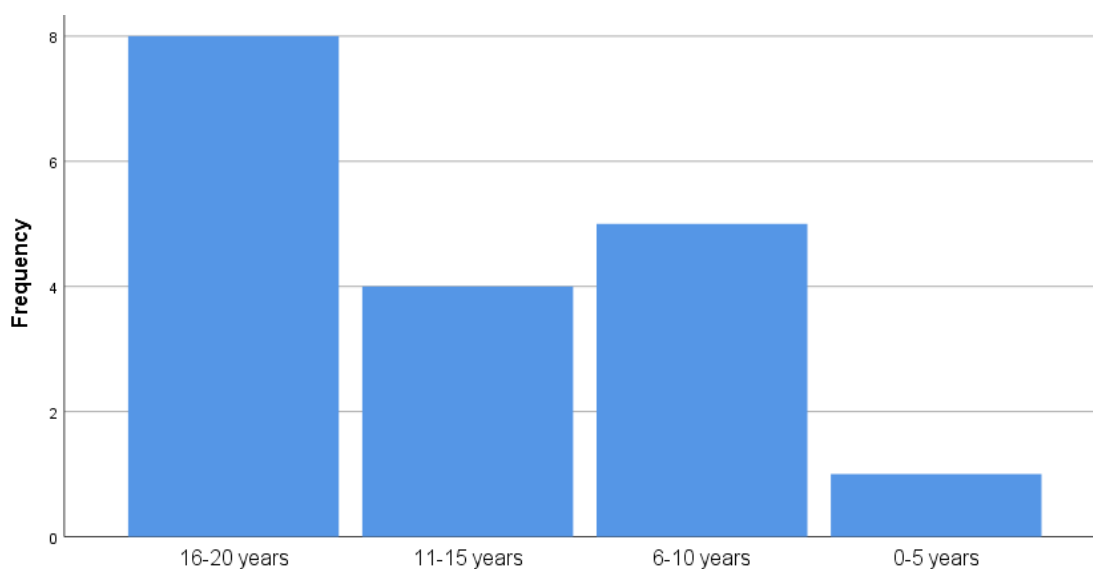


**Figure 9: Lecturers working experience
Years in profession.**

The findings indicated that majority of the lecturers 8 (44.4%) had between 16-20 years' in their profession. This was followed by 5 (27.8%) who had between 6-10 years, 4 (22.2%) had 11-15 years and only 1(5.6%) had 0-5 years. This indicates that the lecturers had enough professional experience. See table 4.9 and figure 14.

Table 4. 9: Lecturers' Years in profession

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	16-20 years	8	44.4	44.4	44.4
	11-15 years	4	22.2	22.2	66.7
	6-10 years	5	27.8	27.8	94.4
	0-5 years	1	5.6	5.6	100.0
	Total	18	100.0	100.0	

**Figure 10: Lecturers' Years in profession**

The analysis of variance between and within groups among *student category* relative to independent variables and dependent variable

Study year, number of staffs, age group, number of classes occupied by Medical Laboratory Sciences department, satisfaction level with physical facilities, state of facilities and satisfaction level on adequacy of teaching aids were significant between and within groups ($P < .05$). This one-way ANOVA indicated that, there is a relationship with dependent variable. This means there is statistically significant difference between

the means of the groups represented by these variables (on adequacy of teaching and learning resources), which prompts further tests.

Table 4. 10 The analysis of variance between and within groups among student category relative to independent variables and dependent variable.

ANOVA						
		Sum of Squares	df	Mean Square	F	Sig.
Study year	Between Groups	5.250	3	1.750	3.183	.025
	Within Groups	108.332	197	.550		
	Total	113.582	200			
Number of staffs	Between Groups	15.247	3	5.082	28.686	.000
	Within Groups	34.902	197	.177		
	Total	50.149	200			
Age	Between Groups	9.465	3	3.155	3.277	.022
	Within Groups	186.742	194	.963		
	Total	196.207	197			
Number of classes occupied by MEDICAL LABORATORY SCIENCES department	Between Groups	1.855	3	.618	10.509	.000
	Within Groups	10.886	185	.059		
	Total	12.741	188			
Satisfaction level with physical facilities	Between Groups	21.575	3	7.192	4.442	.005
	Within Groups	312.455	193	1.619		
	Total	334.030	196			
State of facilities	Between Groups	22.737	3	7.579	5.645	.001
	Within Groups	256.443	191	1.343		
	Total	279.179	194			
Satisfaction level on adequacy of teaching aids	Between Groups	22.424	3	7.475	3.657	.014
	Within Groups	365.904	179	2.044		
	Total	388.328	182			

Objective one: To determine perceived adequacy of human resources by the lecturers and students in Medical Laboratory Sciences department of Kenya Medical Training college.

As table 4.11 indicates, male lecturers showed a higher mean score relative to availability as compared to female lecturers by (mean=1.4709), (mean=1.0045) respectively. All the number of lecturer staff were perceived by students to be very inadequate, that is, falling in the category of from 1 until 1.80 (Very Inadequate). Particularly, students perceived being up to just a neutral (mean = 3.2048).

Table 4. 11 Adequacy of teaching and support staff at the Medical Laboratory Sciences department (students)

		Number of male lecturers in Medical Laboratory Sciences department	Number of female Lecturers In Medical Laboratory Sciences department	Satisfaction level with staffing
N	Valid	220	220	220
	Missing	0	0	0
Mean		1.4709	1.0045	3.2048
Std. Deviation		.50027	.06696	1.38616

In order to determine the availability and adequacy of staff including male and female (support staff and lecturers), the aggregate perception by students was interpreted based on mean scores and standard deviations of the responses to the selected open-ended items rated on five-point scale and since the mean scores required proper interpretation, it was important to give the scale for interpretation based on five scale interpretation as follows:

Mean score level interpretation

- From 1 to 1.80 represents (Very Inadequate) / very poor /Very Dissatisfied.
- From 1.81 until 2.60 represents (Inadequate) / Poor / Dissatisfied
- From 2.61 until 3.40 represents (Neutral) / Average / Neutral
- From 3:41 until 4:20 represents (adequate) / Good / Satisfied
- From 4:21 until 5:00 represents (Very adequate) / Very good / Ver Satisfied

This is further demonstrated by the (table 4.12), which indicated that, only about 51.8% were not satisfied with the lecturer's staffing.

Table 4.12: Level of satisfaction with staffing on lecturers (by students).

	Frequency	Percent	Valid Percent	Cumulative Percent	
Valid	Extremely Dissatisfied	40	12.9	18	18
	Dissatisfied	34	10.2	13.9	31.3
	Neutral	45	15.1	20.5	51.8*
	Satisfied	55	20.0	27.1	78.9
	Extremely Satisfied	46	15.6	21.1	100.0
	Total	220	73.8	100.0	
Missing	System	0			
Total	220	100.0			

As table 4.13 indicated, a mean satisfaction level of 1.0538 towards the male support staff falls in the (Very Inadequate/Very Poor/Very Dissatisfied) category. On the other hand, the mean satisfaction level of 1.0045 towards the female support staff also falls in the (Very Inadequate/Very Poor/Very Dissatisfied) category. In general, the satisfaction levels of students towards both male and female support staffing were low, with a mean satisfaction level (3.2048) below the "Neutral" category.

Table 4. 13 Level of satisfaction with staffing on support staff (by students)

		Number of male support staff	Number of female support staff	Satisfaction level
N	Valid	220	220	220
	Missing	0	0	0
Mean		1.0538	1.0045	3.2048
Std. Deviation		.67569	.06696	1.38616

Objective two: To determine perceived adequacy of physical facilities by the lecturers and students in Medical Laboratory Sciences department of Kenya Medical Training college. Number of rooms occupied by offices (table 4.15), classrooms (table 4.16), demo laboratories (table 4.17), and skills laboratories (table 4.18), indicated the following means and standard deviations and specific frequencies as shown in (table 4.14). The means are in discourse as indicated by the specific tables for each group number of rooms. Only the classrooms occupied more than three rooms at 65% while the others occupied less than 50% in terms of 3 rooms. Of concern is that, the demo and skills laboratories indicated a single room occupancy at over 80%, in Medical Laboratory Sciences department, a key requirement for sufficient rooms as shown in (table 4.16).

Table 4. 14: Adequacy of physical facilities by students

		Offices	Classrooms	Demo-laboratories	Skills	Computer laboratories
N	Valid	199	196	186	14	187
	Missing	21	24	34	206	33
Mean		3.0050	2.7704	1.0376	1.0000	1.0107
Std. Deviation		1.14370	.52948	.26239	.00000	.10314

Table 4. 15: Offices room occupancy in numbers according to students

Rooms occupancy in number by different physical facilities					
Offices room occupancy in numbers					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Offices (1)	37	14.5	16.1	16.1
	Offices (2)	39	15.0	16.6	32.7
	Offices (3)	41	16.4	18.1	50.8
	Offices (4)	103	44.5	49.2	100.0
	Total	220	100	100.0	
Missing	System	0	0		
Total		220	100		

Table 4. 16: Classrooms room occupancy in numbers by students

Class room occupancy in numbers

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Classrooms (1)	9	1.8	2.0	2.0
	Classrooms (2)	50	19.5	21.9	24.0
	Classrooms (3)	149	65.0	73.0	96.9
	Classrooms (4)	12	2.7	3.1	100.0
	Total	220	100	100.0	
Missing	System	0	0		
Total		220	100.0		

Table 4. 17 : Demonstration laboratory occupancy in numbers by students

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Demo Labs (1)	192	95.2	97.3	97.3
	Demo Labs (2)	15	2.0	2.2	99.5
	Demo Labs (4)	13	.5	.5	100.0
	Total	220	100	100.0	
Missing	System	0	0		
Total		220	100.0		

Table 4. 18: Skills laboratory occupancy in numbers by students

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Skills Lab(1)	220	100	100.0	100.0
Missing	System	0	0		
Total		220	100.0		

Satisfaction level on adequacy of physical facilities by students

Satisfaction level on adequacy of physical facilities (rooms occupied by offices, classrooms, demo laboratories, skills laboratories and computer laboratories) by students in Medical Laboratory Sciences department to the reliability test using the actual value for Cronbach's alpha was 81.5% indicating an acceptable level, $\alpha = .82$ (table4.19)

Table 4. 19: Case Processing Summary

		N	%
Cases	Valid	220	100
	Excluded ^a	0	0
	Total	220	100.0
Reliability Statistics			
Cronbach's Alpha		N of Items	
.815		5	

Using the measures of central tendency to interpret the five level Likert scale on satisfaction level in regards to number of rooms occupancy, and using the five point mean interpretation (table 4.20), there was no adequate number of rooms in all the five clusters with only demo laboratories showing the highest mean (3.1698), however yet, even below the adequacy (2.61 until 3.40 represents (Neutral)/ Average / Neutral)

Table 4. 20: Satisfaction level on rooms occupied by students

Satisfaction level on rooms occupied by	N	Minimum	Maximum	Mean	Std. Deviation
Offices,	220	1.00	5.00	2.8261	1.38252
Classrooms	220	1.00	5.00	2.2595	1.31783
Demo laboratories	220	1.00	5.00	3.1698	1.37666
Skills laboratories	220	1.00	5.00	3.1041	3.68819
Computer laboratories	220	1.00	5.00	2.5818	1.36747
Valid N (listwise)	220				

- a) From 1 to 1.80 represents (Very Inadequate) / very poor /Very Dissatisfied.
- b) From 1.81 until 2.60 represents (Inadequate) / Poor / Dissatisfied
- c) From 2.61 until 3.40 represents (Neutral) / Average / Neutral
- d) From 3:41 until 4:20 represents (adequate) / Good / Satisfied
- e) From 4:21 until 5:00 represents (Very adequate) / Very good / Ver Satisfied

The initial analysis of internal consistency using Cronbach's test indicated a very poor outcome on this variable on state of ten (10) structures and or equipment's at 13 % (Table 4.21)

Table 4. 21: Reliability Statistics (Cronbach's Alpha Based on Standardized Items).

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.134	.837	10

Subject to this outcome, the approach to ensure a feasible internal validity was maintained by the use of "scale if item deleted" to do away with the variable item with the highest Cronbach alpha (which on a Likert scale was asking of the state of the doors, from this view, the students might have given disproportionate views on state of the doors as majority may not bother, especially, female gender, and as such, there was a poor consistency on this variable. Removing this and retaking nine (9). The internal consistency improved marginally to acceptable that is from 13 % to 71% (table 4.22).

Table 4. 22 : Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.709	.867	9

Using the measures of central tendency to interpret the five level Likert scale on the state of facilities using on a scale of five, showed an average state as reported with majority falling under poor state as depicted in (table4.23). Generally, there was poor state of facilities (From 1.81 until 2.60 which represents poor), as determine from mean computation of a five Likert scale as shown in (table 4.23).

Table 4. 23 Descriptive Statistics on the perceived adequacy on state of facilities.

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
State of Furniture	220	1.00	53.00	3.1041	3.68819
State of Windows	220	1.00	5.00	2.5818	1.36747
State of Lab equipment	218	1.00	5.00	2.4633	1.25578
State of Reagents	210	1.00	5.00	2.5667	1.25954
State of Microscope	216	1.00	5.00	2.3287	1.27892
State of Doors	220	1.00	333.00	*3.8824	22.27524
State of Ventilation	215	1.00	5.00	2.5023	1.35300
State of Lighting	220	1.00	5.00	2.4911	1.43933
State of Classroom space	220	1.00	55.00	3.1306	3.82136
State of Floors	220	1.00	5.00	2.7489	1.33885

Mean score level interpretation.

- a) From 1 to 1.80 represents (Very Inadequate) / very poor /Very Dissatisfied.
- b) From 1.81 until 2.60 represents (Inadequate) / Poor / Dissatisfied
- c) From 2.61 until 3.40 represents (Neutral) / Average / Neutral
- d) From 3:41 until 4:20 represents (adequate) / Good / Satisfied
- e) From 4:21 until 5:00 represents (Very adequate) / Very good / Very Satisfied

The perceived adequacy of teaching aids

Objective three to determine perceived adequacy of projected and non-projected teaching aids by the lecturers and students in Medical Laboratory Sciences department of Kenya Medical Training College. The adequacy of teaching/learning aids was assessed by asking the lecturers and students to rate the satisfaction level to ascertain the adequacy of the resources using a Five Point Likert scale (1=Extremely dissatisfied to indicate lack of enough aids, 2= Dissatisfied, 3=Neutral, 4=Satisfied and 5=Very Satisfied, to indicate satisfactory levels of the aids). The lecturers and students were asked to rate fourteen (14) different factors associated with the state of teaching/ aid at the MEDICAL LABORATORY SCIENCES department the factors used to rate the state of the teaching /learning aids provided included the level of satisfaction on of; Whiteboards Flipcharts, Overhead Projectors, Posters., Handouts, Chalkboards, Magnetic boards, Textbooks, DVD players, Tape recorders, Episcopes, Computer assisted aids Internet Connectivity.

Normality test gave a high internal reliability (almost 91.6% of test items table 4.24) meaning the items were reliable. The satisfaction level on perceived adequacy of teaching/learning aids among lecturers and students. Based on a Likert scale of 5, and in reference to, mean level interpretation below (table 4.25) only whiteboard and overhead projectors indicated above good satisfaction level (from 3:41 until 4:20 represents (adequate) / Good / Satisfied). Table 4. 24

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.894	.916	14

Table 4. 25: Descriptive Statistics on Teaching Aids(Projected and non projected teaching aids)

Satisfaction with:	N	Minimu m	Maximu m	Mean	Std. Deviation
Whiteboards	217	1.00	5.00	3.6452	1.52096
Flipcharts	203	1.00	5.00	3.0345	1.33639
Overhead Projectors	213	1.00	5.00	3.7042	1.18633
Posters	201	1.00	5.00	3.2139	1.28024
Handouts	200	1.00	5.00	3.3050	1.32694
Chalkboards	194	1.00	5.00	2.7577	1.44612
Magnetic boards	185	1.00	5.00	2.2919	1.32746
Textbooks	212	1.00	5.00	3.5613	1.35989
DVD players	201	1.00	5.00	2.6468	1.47296
Tape recorders	198	1.00	33.00	2.7222	2.57252
Episcope	187	1.00	5.00	2.5615	1.39130
Computer assisted aids	207	1.00	5.00	3.0386	1.33600
Internet Connectivity	213	1.00	5.00	2.7042	1.40479
Learning systems	213	1.00	5.00	2.9718	1.47596

Mean score level of interpretation was from 2.61 until 3.40 representing neutral and average.

- a) From 1 to 1.80 represents (Very Inadequate) / very poor /Very Dissatisfied.
- b) From 1.81 until 2.60 represents (Inadequate) / Poor / Dissatisfied
- c) From 2.61 until 3.40 represents (Neutral) / Average / Neutral
- d) From 3:41 until 4:20 represents (adequate) / Good / Satisfied
- e) From 4:21 until 5:00 represents (Very adequate) / Very good / Very Satisfied

The analysis of variance between and within groups among lecturer category relative to independent variables and dependent variable

Objective one: To determine perceived adequacy of human resources by the lecturers in Medical Laboratory Sciences department of Kenya Medical Training college.

In order to determine the availability and adequacy of staff including male and female (support staff and lecturers), the aggregate perception by lecturers was interpreted based on mean scores and standard deviations of the responses to the selected open-ended items rated on four-point scale; and since the mean scores required proper interpretation, it was important to give the scale for interpretation based on five scale interpretation as follows:

Mean score level interpretation

- (i) From 1 to 1.80 represents (Very inadequate)/very poor / very dissatisfied
- (ii) From 1.81 until 2.60 represents (inadequate) / poor/dissatisfied
- (iii) From 2.61 until 3.40 represents (neutral)/ Average/Neutral
- (iv) From 3.41 until 4.20 represents (adequate) Good/Satisfied
- (v) From 4.21 until 5.00 represents (very adequate)/very good/ very satisfied

As (table 4.26) indicated, male lecturers showed a higher mean score relative to availability as compared to female lecturers (mean=3.4444), (mean= 1.7778) respectively. Generally, all the number of lecturer staff were perceived to be inadequate, that is, falling in the category of from 1until 1.80 (Very Inadequate). Particularly, lecturers were perceived to be inadequate in Medical Laboratory Sciences department as demonstrated by the level of satisfaction (mean = 1.5833).

Table 4. 26: Adequacy of teaching staff at the Medical Laboratory Sciences department by lecturers

		Number of <i>male</i> lecturers in Medical Laboratory Sciences department	Number of <i>female</i> lecturers in Medical Laboratory Sciences department	Satisfaction level with staffing
N	Valid	18	18	12
	Missing	0	0	6
Mean		3.4444	1.7778	1.5833
Std. Deviation		1.54243	.94281	.51493

A similar trend was experienced among support staff for both males and females' findings, however, seemingly better in overall satisfaction level (mean =2.6875) as compared to that of lecturers (mean = 1.5833) as indicated in (table 4.27).

Table 4. 27: Adequacy of support staff at the Medical Laboratory Sciences department

		Number of male support staff	Number of female support staff	Satisfaction level
N	Valid	11	12	16
	Missing	7	6	2
Mean		1.2727	1.5833	2.6875
Std. Deviation		.46710	.51493	1.30224
Sum		14.00	19.00	43.00

Objective two: To determine perceived adequacy of physical facilities by the lecturers in Medical Laboratory Sciences department of Kenya Medical Training college.

Number of rooms occupied by offices, classrooms, demo laboratories, skills laboratories and computer laboratories indicated the following means and standard deviations (table 4.28). The means generally indicated a range of 1 to 2.5 and as per the scale interpretation, the scores indicated an inclination towards inadequacy of the physical facilities. Specific tables for each group of number rooms. Seemingly, the findings among lecturers was almost similar to that of students and further of concern as demonstrated by student category was the demo and skills laboratories that indicated a single room occupancy at over 80%, in Medical Laboratory Sciences department, a key requirement for sufficient rooms.

Table 4. 28: Adequacy of physical facilities by the lecturers

		Offices	Classrooms	Demo-laboratories	Skills Laboratories	Computer laboratories
N	Valid	18	18	18	18	18
	Missing	0	0	0	0	0
Mean		2.5556	2.3333	1.1111	1.0000	1.0000
Std. Deviation		.78382	.84017	.47140	.00000	.00000
Sum		46.00	42.00	20.00	1.00	1.00

Rooms' occupancy in number by different physical facilities in regards to lecturers' responses

Table 4. 29: Office room occupancy in numbers (Number of Medical Laboratory Sciences Offices)

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		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Offices (1)	1	5.6	5.6	5.6
	Offices (2)	8	44.4	44.4	50.0
	Offices (3)	7	38.9	38.9	88.9
	Offices (4)	2	11.1	11.1	100.0
	Total	18	100.0	100.0	

Table 4. 30: Classrooms room occupancy in numbers

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Classrooms (1)	3	16.7	16.7	16.7
	Classrooms (2)	7	38.9	38.9	55.6
	Classrooms (3)	7	38.9	38.9	94.4
	Classrooms (4)	1	5.6	5.6	100.0
	Total	18	100.0	100.0	

Table 4. 31: Demonstration laboratory occupancy in numbers

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Demo Labs (1)	17	94.4	94.4	94.4
	Demo Labs (3)	1	5.6	5.6	100.0
	Total	18	100.0	100.0	

Table 4. 32: Skills laboratory occupancy in numbers

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Skills Lab (1)	1	5.6	100.0	100.0
Missing	System	17	94.4		
Total		18	100.0		

Table 4. 33: Computer laboratory occupancy in numbers

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Computer Labs (1)	17	94.4	100.0	100.0
Missing	System	1	5.6		
Total		18	100.0		

Satisfaction level on adequacy of physical facilities (rooms occupied by offices, classrooms, demo laboratories, skills laboratories and computer laboratories) by lecturers in Medical Laboratory Sciences department. The reliability test using the actual value for Cronbach's alpha. On test items for physical facilities among lecturers indicated an acceptable level, $\alpha = .0.78$. (tables 4.35). This is a high value of alpha meaning the items are reliable.

Table 4. 34: Satisfaction level on physical facilities among lecturers

		N	%
Cases	Valid	18	100
	Excluded ^a	0	0
	Total	18	100.0

Table 4. 35: Reliability table on 5 physical test items

Cronbach's Alpha	N of Items
0.78	5

Using the measures of central tendency to interpret the five level Likert scale on satisfaction level among lecturers in regards to number of rooms occupancy, and using the five-point mean interpretation (table 4.36), indicated that there was inadequate number of rooms in all the five clusters with only computer laboratories indicated the highest mean (3.2941), however yet just like among students, even below the adequacy (3:41 until 4:20 represents adequate).

Table 4. 36: Five level Likert scale on satisfaction level among lecturers on room occupancy

Satisfaction level on rooms occupied by lecturers						
	N	Minimum	Maximum	Sum	Mean	Std. Deviation
Offices,	18	1.00	4.00	54.00	3.0000	1.02899
Classrooms	18	1.00	4.00	46.00	2.5556	.92178
Demo laboratories	18	1.00	4.00	50.00	2.9412	1.02899
Skills laboratories	18	1.00	5.00	34.00	3.0909	1.44600
Computer laboratories	18	1.00	4.00	56.00	3.2941	.98518
Valid N (listwise)	18					

Mean score level interpretation

- (i) From 1 to 1.80 represents (Very inadequate)/very poor / very dissatisfied
- (ii) From 1.81 until 2.60 represents (inadequate) / poor/dissatisfied
- (iii) From 2.61 until 3.40 represents (neutral)/ Average/Neutral
- (iv) From 3.41 until 4.20 represents (adequate) Good/Satisfied
- (v) From 4.21 until 5.00 represents (very adequate)/very good/ very satisfied

The state of several facilities at the Medical Laboratory Sciences department measured on a Likert scale among lecturer category

The analysis of internal consistency using Cronbach's test indicated a very good reliable internal consistency outcome on the variable regarding state of ten (10) structures and or equipment's at over 90% (Table 4.37) meaning the test item were reliable.

Table 4. 37: Reliability test on variable items (state of physical facilities)er

Reliability Statistics	
Cronbach's Alpha	N of Items
.907	10

Using the measures of central tendency to interpret the five level Likert scale on the state of facilities using on a scale of five using the table of interpretation (table 4.38), generally, there was poor state of facilities ranging from a mean value of 1.8889 to 2.8889 (From 1.81 until 2.60 represents poor), as determine from mean computation of a five Likert scale as shown in table 4.38

Table 4. 38: State of facilities

	N	Minimum	Maximum	Sum	Mean	Std. Deviation
State of Furniture	18	1.00	4.00	47.00	2.6111	.91644
State of Windows	18	2.00	4.00	51.00	2.8333	.92355
State of Lab equipment	18	1.00	4.00	46.00	2.5556	.92178
State of Reagents	18	1.00	4.00	41.00	2.2778	.82644
State of Microscope	18	1.00	4.00	34.00	1.8889	.75840
State of Doors	18	1.00	5.00	43.00	2.5294	1.12459
State of Ventilation	18	1.00	4.00	42.00	2.3333	.90749
State of Lighting	18	1.00	4.00	43.00	2.3889	.91644
State of Classroom space	18	1.00	5.00	52.00	2.8889	1.27827
State of Floors	18	1.00	4.00	47.00	2.6111	1.03690
Valid N (listwise)	18					

Mean score level interpretation

- (vi) From 1 to 1.80 represents (Very inadequate)/very poor / very dissatisfied
- (vii) From 1.81 until 2.60 represents (inadequate) / poor/dissatisfied
- (viii) From 2.61 until 3.40 represents (neutral)/ Average/Neutral
- (ix) From 3.41 until 4.20 represents (adequate) Good/Satisfied
- (x) From 4.21 until 5.00 represents (very adequate)/very good/ very satisfied

Heads of Department analysis/findings

Table 4. 39: Heads of Department gender characteristics

It was an equal distribution in percentage

Gender					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	2	50.0	50.0	50.0
	Female	2	50.0	50.0	100.0
	Total	4	100.0	100.0	

Table 4. 40: Age of Heads of Department

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	51 Years and Above	1	25.0	25.0	25.0
	41-50 years	2	50.0	50.0	75.0
	31-40 years	1	25.0	25.0	100.0
	Total	4	100.0	100.0	

Table 4. 41: Heads of Department by Campus

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Meru	1	25.0	25.0	25.0
	Embu	1	25.0	25.0	50.0
	Machakos	1	25.0	25.0	75.0
	Kitui	1	25.0	25.0	100.0
	Total	4	100.0	100.0	

Table 4. 42: Heads of Department professional years characteristics

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	16-20 years	2	50.0	50.0	50.0
	11-15 years	1	25.0	25.0	75.0
	6-10 years	1	25.0	25.0	100.0
	Total	4	100.0	100.0	

Table 4. 43: Heads of Department working experience at KMTC

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Above 21 years	1	25.0	25.0	25.0
	16-20 years	1	25.0	25.0	50.0
	6-10 years	1	25.0	25.0	75.0
	0-5 years	1	25.0	25.0	100.0
	Total	4	100.0	100.0	

Table 4. 44: Heads of Department level of education

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Masters	1	25.0	25.0	25.0
	Degree	3	75.0	75.0	100.0
	Total	4	100.0	100.0	

Table 4. 45: Number of Heads of Department in the Campuses

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	3	2	50.0	50.0	50.0
	5	1	25.0	25.0	75.0
	6	1	25.0	25.0	100.0
	Total	4	100.0	100.0	

Table 4. 46: Gender distribution among Heads of Department in the Campuses

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	2 Female	2	50.0	50.0	50.0
	4 Males	1	25.0	25.0	75.0
	6 Males	1	25.0	25.0	100.0
	Total	4	100.0	100.0	

Lecturer -Student ratio and perception on staffing adequacy by Heads of Department

75% of the respondents indicated that, the comparative numbers between lecturers and students was not sufficient with just a 50 % satisfaction level among the Heads of Department relative to staffing adequacy as shown in (table 4.47).

Table 4. 47: Lecturer -Student ratio and staffing adequacy satisfaction level

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	1	25.0	25.0	25.0
	No	3	75.0	75.0	100.0
	Total	4	100.0	100.0	
Staffing adequacy satisfaction level					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Dissatisfied	2	50.0	50.0	50.0
	Satisfied	2	50.0	50.0	100.0
	Total	4	100.0	100.0	

Subject to above, Univariate Analysis of Variance was conducted between lecturer-student ration and perception on adequacy of staffing at MEDICAL LABORATORY SCIENCES department that indicated that a 33% (contribution on the perceived satisfaction level on staffing relative to poor lecturer – student ratio as shown in (table 4.48)

Table 4. 48: Staffing Satisfaction level among Heads of Department

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	1.333 ^a	1	1.333	1.000	.423
Intercept	33.333	1	33.333	25.000	.038
Lecturer-Student Ratio	1.333	1	1.333	1.000	.423
Error	2.667	2	1.333		
Total	40.000	4			
Corrected Total	4.000	3			
R Squared = .333 (Adjusted R Squared = .000)					

It was further evident that, satisfaction level with support staff was just up to 50% as shown in (table 4.49).

Table 4. 49: Support Staff Satisfaction level as perceived by Heads of Department

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Extremely Dissatisfied	1	25.0	25.0	25.0
	Neutral	1	25.0	25.0	50.0
	Satisfied	2	50.0	50.0	100.0
	Total	4	100.0	100.0	

Adequacy of physical facilities as perceived by Heads of Department

With a rating as either adequate or not adequate, Heads of Department responded to the question which indicated that, generally, office space, classrooms, demo-labs and skills labs were adequate with at least over 50%, while computer labs was rated at 100% (table 4.50). This is somewhat in discourse with students and lecturers perceptions

Table 4. 50: Adequacy of offices as perceived by Heads of Department

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Adequate	3	75.0	75.0	75.0
	Not Adequate	1	25.0	25.0	100.0
	Total	4	100.0	100.0	

Table 4. 51: Adequacy of classroom as perceived by Heads of Department

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Adequate	2	50.0	50.0	50.0
	Not Adequate	2	50.0	50.0	100.0
	Total	4	100.0	100.0	

Table 4. 52: Adequacy of demonstration laboratory as perceived by Heads of Department

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Adequate	3	75.0	75.0	75.0
	Not Adequate	1	25.0	25.0	100.0
	Total	4	100.0	100.0	

Table 4. 53: Adequacy of skills laboratory as perceived by Heads of Department

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Adequate	1	25.0	100.0	100.0
Missing	System	3	75.0		
Total		4	100.0		

Table 4. 54: Adequacy of computer laboratory as perceived by Heads of Department

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Adequate	4	50.0	50.0	50.0

Table 4. 55: Adequacy of transport as perceived by Heads of Department

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Adequate	4	100.0	100.0	100.0

To determine perceived adequacy of financial resources for teaching and learning by lecturers (Head of Departments) in Medical Laboratory Sciences department of Kenya Medical Training college. On whether the department have a budget committee, it was indicated at 100% that they actually did and on whether the departmental budget meets the departmental teaching and learning needs, the responses indicated at 100% concurrence as no, similarly to a Campus having a budget committee (table 4.55)

Table 4. 56: Availability of Departmental budget:

Do you have a departmental budget					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	4	100.0	100.0	100.0

Does your departmental budget meet the teaching and learning needs					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	NO	4	100.0	100.0	100.0

Does your Campus have a budget committee					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	4	100.0	100.0	100.0

The analysis on satisfaction level was further pegged on the measures of central tendency subject to perceived adequacy of financial resources for teaching and learning among Heads of Department. The adequacy of financial resources was assessed by asking the heads of department to rate the satisfaction level to ascertain the adequacy of the resources using a Five Point Likert scale (1=Extremely dissatisfied to indicate lack of enough aids, 2= Dissatisfied, 3=Neutral, 4=Satisfied and 5=Very Satisfied, to indicate satisfactory levels of the financial resources for the department). They were asked to rate level of satisfaction with: Government of Kenya funds, donor, school fees, development budget allocation and recurrent budget allocation. The satisfaction level of items of perceived adequacy of financial resource among Heads of Department on internal consistency reliability analysis indicated an acceptable level, $\alpha = .96$ (table 4.57).

Table 4. 57: Heads of Department on internal consistency reliability

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.957	.977	5

Response based on a Likert scale of 5, and in reference to interpretation table (table 4.58), Level of satisfaction with Government Of Kenya Funds, donor funds and school fees indicated satisfied with means on a Likert scale of 5 reported as 3.7500, 3.5000 and

4.0000 respectively, with development and recurrent budget allocation indicating mean average (From 3:41 until 4:20 represents (adequate) / Good / Satisfied).

Table 4. 58: Source of Funds

		Level of satisfaction with GOVERNMENT OF KENYA Funds	Level of satisfaction with Donor Funds	Level of satisfaction with School fees	Level of satisfaction with Development Budget allocation	Level of satisfaction with Recurrent Budget allocation
N	Valid	4	4	4	4	4
	Missing	0	0	0	0	0
Mean		3.7500	3.5000	4.0000	3.2500	3.2500
Median		4.0000	4.0000	4.0000	3.5000	3.5000
Mode		4.00	4.00	4.00	4.00	4.00
Std. Deviation		.50000	1.00000	.00000	.95743	.95743
Variance		.250	1.000	.000	.917	.917

Mean score level interpretation

- (i) From 1 To 1.80 Represents (Very Inadequate)/Very Poor / Very Dissatisfied
- (ii) From 1.81 Until 2.60 Represents (Inadequate) / Poor/Dissatisfied
- (iii) From 2.61 Until 3.40 Represents (Neutral)/ Average/Neutral
- (iv) From 3.41 Until 4.20 Represents (Adequate) Good/Satisfied
- (v) From 4.21 Until 5.00 Represents (Very Adequate)/Very Good/ Very Satisfied

Further the researcher performed regression analysis to determine whether the conclusions and recommendations to be drawn from this research are feasible.

Regression Analysis

Modelling Satisfaction level on learning systems (adequacy of teaching aids in the Medical Laboratory Sciences department in relation to gender, year of study and Campus (with female gender coded as coded 2) among students' category.

Ordinal regression analysis

The (table 4.59) indicated the case processing summary with clear labels of the variables and their values for the variables included in the analysis. Here, modelling satisfaction level on learning systems (adequacy of teaching aids in the Medical Laboratory Sciences department in relation to gender, year of study and Campus (with female gender coded as coded 2). The model fitting information table (table 4.60) shows that there was improvement in the ability to predict the outcome (the baseline or „Intercept Only“ model) against the model with all the explanatory variables. Notably, the significant chi-square statistic ($p < .000$) indicates that the final model gives a significant improvement over the baseline intercept-only model. These statistics under goodness of fit are intended to test whether the observed data are consistent with the fitted model. The p value in this output was large (p value = 1.000) (table 4.61), and as such the conclusion was that the data and the model predictions were similar and that it was a good model. In linear regression (table 4.62), R^2 (the coefficient of determination) summarizes the proportion of variance in the outcome that can be accounted for by the explanatory variables. Here, the pseudo R^2 value (Nagelkerke = 99 %) indicates that the factors; gender, year of study and Campus explains a relatively a very great proportion of the variation between students in their perception on satisfaction level on teaching and learning systems. Parameter estimates (table 4.63), indicated that, number of rooms occupied by offices and classrooms had more satisfaction level relative to teaching and learning systems as compared to rooms number occupied by demo-labs, computer labs and skills labs. Same case for male gender as opposed to female gender, Embu Campus as opposed to Machakos Campus (there were no response from other Campuses), and year one and two of study as opposed to year three.

However, the difference in satisfaction level on the said variables was not significant ($p < 0.05$), in all. Test of parallel lines (table 4.64), had an insignificant p value (1.000), which indicated that, the location parameters (independent variables herein) are the same across the response category (dependent variable, the satisfaction level on teaching and learning systems)

Table 4. 59: Modelling Satisfaction level on learning systems (adequacy of teaching aids in the Medical Laboratory Sciences department in relation to gender, year of study and Campus among students' category.

Case Processing Summary			
		N	Marginal Percentage
How satisfied are you with the adequacy of teaching aids in the department of Medical Laboratory Sciences	Extremely Dissatisfied	4	36.4%
	Dissatisfied	3	27.3%
	Neutral	1	9.1%
	Satisfied	2	18.2%
	Extremely Satisfied	1	9.1%
Gender	Male	7	63.6%
	Female	4	36.4%
Campus	Embu	7	63.6%
	Machakos	4	36.4%
Year of study	First Year	3	27.3%
	Second Year	3	27.3%
	Third Year	5	45.5%
Valid		11	100.0%
Missing		209	
Total		220	

Table 4. 60: Model Fitting Information (Consistency of observed data)

Model Fitting Information				
Model	-2 Log Likelihood	Chi-Square	df	Sig.
Intercept Only	30.913			
Final	.000	30.913	6	.000
Link function: Logit.				

Table 4. 61: Goodness-of-Fit of the data

Goodness-of-Fit			
	Chi-Square	df	Sig.
Pearson	.257	26	1.000
Deviance	.498	26	1.000

Table 4. 62: Linear Regression (proportion of variance in the outcome).

Pseudo R-Square	
Cox and Snell	.940
Nagelkerke	.992
McFadden	.957

Table 4. 63: Parameter Estimates (physical facilities relative to learning system)

		Estimate	Std. Error	Wald	df	Sig.	95% Confidence Interval	
							Interval	
							Lower Bound	Upper Bound
Threshold	[How satisfied with the Learning systems = 1.00]	-61.610	42.838	2.068	1	.150	-145.571	22.351
	[How satisfied with the Learning systems = 2.00]	-53.290	38.455	1.920	1	.166	-128.660	22.080
	[How satisfied with the Learning systems = 3.00]	-47.525	35.952	1.747	1	.186	-117.990	22.940
	[How satisfied with the Learning systems = 4.00]	-38.542	37.487	1.057	1	.304	-112.015	34.932
Location	Number of rooms occupied by Offices	-44.954	28.841	2.429	1	.119	-101.482	11.574
	Number of rooms occupied by Classrooms	-32.695	19.967	2.681	1	.102	-71.829	6.439
	Number of rooms occupied by Demo labs	0 ^a	.	.	0	.	.	.
	Number of rooms occupied by Skills lab	0 ^a	.	.	0	.	.	.
	Number of rooms occupied by Computer labs	0 ^a	.	.	0	.	.	.
	[Gender=1.00]	72.195	41.976	2.958	1	.085	-10.076	154.465
	[Gender=2.00]	0 ^a	.	.	0	.	.	.
	[Campus=2.00]	58.657	35.989	2.656	1	.103	-11.881	129.194
	[Campus=3.00]	0 ^a	.	.	0	.	.	.

[Year of study =1.00]	22.775	15.428	2.179	1	.140	-7.464	53.014
[Year of study =2.00]	85.521	49.154	3.027	1	.082	-10.820	181.861
[Year of study =3.00]	0 ^a	.	.	0	.	.	.

Table 4. 64: Test of Parallel Lines^a

Model	-2 Log Likelihood	Chi-Square	df	Sig.
Null Hypothesis	.000			
General	.000 ^b	.000	12	1.000
The null hypothesis states that the location parameters (slope coefficients) are the same across response categories.				
a. Link function: Logit.				
b. The log-likelihood value is practically zero. There may be a complete separation in the data. The maximum likelihood estimates do not exist.				

Modelling Satisfaction level on Development budget allocation in the Medical Laboratory Sciences department in relation demographic and non-demographic characteristics among Heads of Department category.

Ordinal regression analysis

The (table 4.65) indicated the case processing summary with clear labels of the variables and their values for the variables included in the analysis. Here, modelling on Development budget allocation in the Medical Laboratory Sciences department in relation to gender, years of experience, length in profession, and training on curriculum, gender, age, and Campus and education level. The model fitting information (table 4.66)

indicated that there is improvement in the ability to predict the outcome (the baseline or Intercept Only model) against the model with all the explanatory variables. Notably, the significant chi-square statistic ($p < .000$) indicated that the final model gives a significant improvement over the baseline intercept-only model.

These statistics under goodness of fit are intended to test whether the observed data are consistent with the fitted model. The p value in this output was large (p value = 1.000) (table 4.67), and as such the conclusion was that the data and the model predictions were similar and that it was a good model. In linear regression (table 4.68), R^2 (the coefficient of determination) summarizes the proportion of variance in the outcome that can be accounted for by the explanatory variables. Here, the pseudo R^2 value (Nagelkerke = 100 %) indicated that the explanatory variables had a very great proportion of the variation between Heads of Department in their perception on satisfaction level on Development budget allocation. Parameter estimates (table 4.69) indicated that, length in profession and working experience at KMTC had more satisfaction level relative to Development budget allocation as compared to having been trained on curriculum. Same case for male gender as opposed to female gender. However, the difference in satisfaction level on the said variables was not significant ($p < 0.05$), in all. Test of parallel lines (table 4.70) had an insignificant p value (1.000), which indicated that, the location parameters (independent variables herein) are the same across the response category (dependent variable, the satisfaction level on Development budget allocation).

Table 4. 65: Modelling Satisfaction level on development budget allocation.

Case Processing Summary			
		N	Marginal Percentage
How satisfied are you with the departmental budget allocation	Dissatisfied	1	25.0%
	Neutral	1	25.0%
	Satisfied	2	50.0%
Gender	Male	2	50.0%
	Female	2	50.0%
Campus	Meru	1	25.0%
	Embu	1	25.0%
	Machakos	1	25.0%
	Kitui	1	25.0%
Age	51 Years and Above	1	25.0%
	41-50 years	2	50.0%
	31-40 years	1	25.0%
Highest Education level	Masters	1	25.0%
	Degree	3	75.0%
Valid		4	100.0%
Missing		0	
Total		4	

Table 4. 66: Model Fitting Information

Model Fitting Information				
Model	-2 Log Likelihood	Chi-Square	df	Sig.
Intercept Only	8.318			
Final	.000	8.318	3	.040

Table 4. 67: Goodness-of-Fit

	Chi-Square	Df	Sig.
Pearson	.000	3	1.000
Deviance	.000	3	1.000

Table 4. 68: Coefficient of determination (summary of the proportion of variance)

Pseudo R-Square	
Cox and Snell	.875
Nagelkerke	1.000
McFadden	1.000

Table 4. 69: Parameter Estimates

		Estimate	Std. Error	Wald	df	Sig.	95% Confidence Interval	
							Lower Bound	Upper Bound
Threshold	[Level of satisfaction with Development budget allocation = 2.00]	-65.574	1884.968	.001	1	.972	-3760.044	3628.895
	[Level of satisfaction with Development budget allocation = 3.00]	-40.382	1540.832	.001	1	.979	-3060.358	2979.595
Location	Length in profession	26.358	1861.297	.000	1	.989	-3621.718	3674.433
	Working Experience	-26.407	1095.475	.001	1	.981	-2173.499	2120.685
	Attended training on curriculum	0 ^a	.	.	0	.	.	.
	[Gender=1.00]	-26.407	2379.914	.000	1	.991	-4690.953	4638.139
	[Gender=2.00]	0 ^a	.	.	0	.	.	.
	[Campus=1.00]	0 ^a	.	.	0	.	.	.
	[Campus=2.00]	0 ^a	.	.	0	.	.	.
	[Campus=3.00]	0 ^a	.	.	0	.	.	.
	[Campus=4.00]	0 ^a	.	.	0	.	.	.
	[Age=1.00]	0 ^a	.	.	0	.	.	.
	[Age=2.00]	0 ^a	.	.	0	.	.	.
	[Age=3.00]	0 ^a	.	.	0	.	.	.
	[Level of education=2.00]	0 ^a	.	.	0	.	.	.
	[Level of education=3.00]	0 ^a	.	.	0	.	.	.

Table 4. 70: Test of Parallel Lines^a

Model	-2 Log Likelihood	Chi-Square	df	Sig.
Null Hypothesis	.000			
General	.000 ^b	.000	3	1.000
The null hypothesis states that the location parameters (slope coefficients) are the same across response categories.				

The ordinal regression analysis on pertinent key dependent variables between students and Heads of Department , that is satisfaction levels on learning systems and satisfaction levels on development budget allocation seemingly gave the same statistical output which further indicted that, the conclusions and recommendations to be drawn from this research are feasible as per the model fitting analysis and pseudo R squared outputs being above 0.7 on relevant covariates predicting specific outcome between the two groups, that is, the satisfaction level.

Correlation between Likert scale variables for two ordinals using spearman rank correlation

The three categories of respondents (students, lecturers and Heads of Department) using Likert scale independent variable(s) on key dependent variables on satisfaction level was performed to ascertain the correlation between the specific variables in each cluster

Correlation between satisfaction levels on budget among Heads of Department

Subject to level of satisfaction with Government of Kenya funds, donor funds, school fees, development budget allocation and recurrent budget allocations. The spearman's rank correlation test indicated that, there was a very strong correlation between satisfaction level on donor funds satisfaction level and Government of Kenya funds, same

case for the correlation between Satisfaction levels on recurrent budget allocation and satisfaction level on development fund both with a significant p value (at the 0.01 level (2-tailed) and a very strong coefficient correlation (1.000).

This indicated that, the Heads of Department perception on budget was that, the government funding would affect donor funding same case for development fund which related strongly with recurrent budget allocation.

Table 4. 71: Correlations between satisfaction levels on specific budget/ financial resources variables

Correlations between satisfaction levels on specific budget/ financial resources variables			Satisfaction level on Government of Kenya funds	Satisfaction level on Donor funds	Satisfaction levels on School fees	Satisfaction levels on development funds	Satisfaction levels on recurrent budget allocation
Spearman's rho	Satisfaction level on Government Of Kenya funds	Correlation Coefficient	1.000	1.000**	.	.816	.816
		Sig. (2-tailed)	.	.	.	.184	.184
		N	4	4	4	4	4
	Satisfaction level on Donor funds	Correlation Coefficient	1.000**	1.000	.	.816	.816
		Sig. (2-tailed)	.01	.	.	.184	.184
		N	4	4	4	4	4
	Satisfaction levels on School fees	Correlation Coefficient	.	.	.	.	.
		Sig. (2-tailed)	.01	.	.	.	.
		N	4	4	4	4	4
	Satisfaction levels on development funds	Correlation Coefficient	.816	.816	.	1.000	1.000**
		Sig. (2-tailed)	.184	.184	.	.	.
		N	4	4	4	4	4
	Satisfaction levels on recurrent budget allocation	Correlation Coefficient	.816	.816	.	1.000**	1.000
		Sig. (2-tailed)	.184	.184	.	.	.
		N	4	4	4	4	4

Correlation between satisfaction levels on specific variables aiding in learning among students at Medical Laboratory Sciences department

The state of laboratory equipment and satisfaction level on; computer assisted aids, interment connectivity and Learning Systems were negatively correlated. Satisfaction level on computer assisted aids was correlated with satisfaction levels on interment connectivity and Learning Systems as shown below (table 4.72). This indicated that, key aiders in learning at the Medical Laboratory Sciences department would compromise the other related learning aids.

Table 4. 72: Correlation between satisfaction levels on specific variables aiding in learning among students in the department of Medical Laboratory Sciences

			State of laboratory equipment	Satisfaction level with computer assisted aids	Satisfaction level with interment Connectivity	Satisfaction level with Learning Systems
Spearman's rho	State of laboratory equipment	Correlation Coefficient	1.000	-.416**	-.421**	-.347**
		Sig. (2-tailed)	.	.000	.000	.000
		N	218	205	207	207
	Satisfaction level with computer assisted aids	Correlation Coefficient	.416**	1.000	.561**	.552**
		Sig. (2-tailed)	.000	.	.000	.000
		N	205	207	203	202
	Satisfaction level with interment Connectivity	Correlation Coefficient	-.421**	.561**	1.000	.463**
		Sig. (2-tailed)	.000	.000	.	.000
		N	207	203	213	208
	Satisfaction level with Learning Systems	Correlation Coefficient	-.347**	.552**	.463**	1.000
		Sig. (2-tailed)	.000	.000	.000	.
		N	207	202	208	213

Comparison between lecturers and students' perception in regards to human resources satisfaction.

Generally, based on the variable included for this independent t-test analysis, students reported slightly higher satisfaction levels on lecturer availability (3.9423) as well as on support staff (table 4.73). This study indicated that, there were no significant differences between the lecturers and the students on the satisfaction levels regarding support staff ($p > 0.05$), as opposed to significant differences in the satisfaction level on lecturer's availability ($p < 0.05$).

Table 4.73: Comparison between lecturers and students' perception in regards to human resources satisfaction.

Group Statistics

	Group	N	Mean	Std. Deviation	Std. Error
Lecturers	Student	208	3.9423	1.08861	.07548
	Lecturer	17	3.2941	1.04670	.25386
Support Staff	Student	162	3.1852	1.38861	.10910
	Lecturer	16	2.6875	1.30224	.32556

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	T	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
Lecturers	Equal variances assumed	.689	.407	2.367	223	.019	.64819	.27386	.10851	1.18787
	Equal variances not assumed			2.447	18.943	.024	.64819	.26485	.09375	1.20263
Support Staff	Equal variances assumed	.001	.980	1.375	176	.171	.49769	.36202	-.21677	1.21214
	Equal variances not assumed			1.449	18.536	.164	.49769	.34335	-.22218	1.21755

Generally, based on the variable included for this independent t-test analysis, lecturers indicated slightly higher satisfaction levels with demo laboratory, skills laboratory and computer laboratory as well as the state of the laboratory as compared to student's group.

On the contrary, lecturers reported a mean of 2.27 lower than the mean of 2.56 among students in regards to the state of laboratory reagents, table 4.74.

Table 4.74: Group Statistics on the comparison between lecturers and students on satisfaction based on physical facilities

Satisfaction Level (Physical facility)	Group	N	Mean	Std. Deviation	Std. Error Mean
Demo Laboratory	Student	202	2.8317	1.38987	.09779
	Lecturer	17	2.9412	1.02899	.24957
Skills Laboratory	Student	181	2.2431	1.32351	.09838
	Lecturer	12	2.9167	1.50504	.43447
Computer Laboratory	Student	214	3.1682	1.36685	.09344
	Lecturer	18	3.2222	1.00326	.23647
State of the Laboratory	Student	213	2.4460	1.25636	.08608
	Lecturer	18	2.5556	.92178	.21726
State of reagents	Student	205	2.5659	1.26484	.08834
	Lecturer	18	2.2778	.82644	.19479

Using an independent t-test, a comparison was done between the lecturer and student groups on five key variables of consideration; satisfaction level in regards to (physical facilities) demo laboratory, skills laboratory and computer laboratory and state of laboratory and state of reagents. This study found out that, there were no significant differences between the lecturers and the students on the satisfaction levels regarding demo, skills and computer laboratories as well as state of laboratory equipment's and reagents as the group means were statistically insignificantly different because the value in the "**Sig. (2-tailed)**" row is more than 0.05, in all this relying on the rows of equal variances assumed

On the other side, the p -value of Levene's test is 0.021 thus, the null of Levene's test is rejected and conclude that the variance in the perception on state of laboratory reagents among students is significantly different than that lecturers [$t(25) = 1.347$, $p = 0.021$]. by focusing on "equal variances not assumed" row for the t test (and corresponding confidence interval) results.

Independent Samples Test		Levene's Test for Equality of Variance		t-test for Equality of Means					95% Confidence Interval of the Difference	
		F	Sig.	t	Df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Demo Laboratory	Equal variances assumed	2.457	.118	-.317	217	.751	-.10949	.34509	-.789	6.57067
	Equal variances not assumed			-.408	21.251	.687	-.10949	.26804	-.666	5.244753
Skills Laboratory	Equal variances assumed	.621	.432	-.169	191	.092	-.67357	.39784	-1.458	.11116
	Equal variances not assumed			-1.51	12.155	.156	-.67357	.44547	-1.642	.29569
Computer Laboratory	Equal variances assumed	2.404	.122	-.164	230	.870	-.05400	.32968	-.703	5.59558
	Equal variances not assumed			-.212	22.678	.834	-.05400	.25426	-.580	3.47240
State of the Laboratory	Equal variances assumed	2.735	.100	-.361	229	.718	-.10955	.30305	-.706	6.48759
	Equal variances not assumed			-.469	22.712	.644	-.10955	.23370	-.593	3.37423
State of reagents	Equal variances assumed	5.371	.021	1.948	221	.344	.28808	.30401	-.311	0.88720
	Equal variances not assumed			1.347	24.625	.190	.28808	.21389	-.152	0.72893

On a Likert scale, the mean of students on the satisfaction level on teaching aids was slightly above that of lecturers as show in table r below at 3.0 and 2.8 (in lecturers). This was generally above average among the two groups. Further, the independent t-test indicated a statistically similar perception on the satisfaction level on teaching aids (P value > 0.05)

Table 4.75: Group Statistics on the comparison between lecturers and students on satisfaction based on teaching aids.

Group Statistics

	Group	N	Mean	Std. Deviation	Std. Error Mean
Satisfaction teaching Aids	withStudent	208	3.0144	1.46613	.10166
	Lecturer	18	2.8889	1.36722	.32226

Independent Samples Test

		Levene's Test for Equality of Variances			t-test for Equality of Means					
Teaching AIDS	F		Sig.	t	Df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Satisfaction level	Equal variances assumed	.355	.552	.350	224	.726	.12553	.35843	-.58079	.83185
	Equal variances not assumed			.372	20.535	.714	.12553	.33791	-.57816	.82923

QUALITATIVE DATA RESULTS OF THE RESPONDENT CHARACTERISTICS

HOD's Perception of Human resources

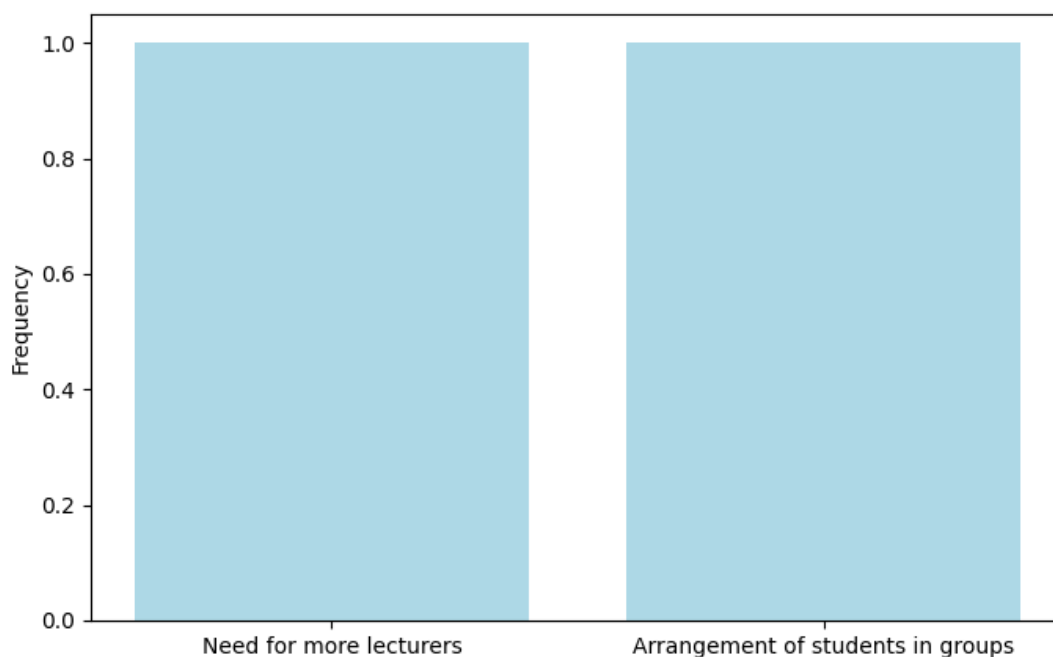


Figure 116: Adequacy of Human Resources in Medical Laboratory Sciences Department (COVID-19)

Data Analysis:

Themes Identified:

Need for More Lecturers Due to COVID-19 Requirements:

This theme highlights the requirement for additional teaching staff to manage the increased workload and changes necessitated by COVID-19. Due to social distancing and other health guidelines, the existing number of lecturers is insufficient to effectively manage smaller class sizes and maintain the quality of education.

Arrangement of Students in Groups for Social Distancing:

This theme underscores the necessity of organizing students into smaller groups to adhere to social distancing protocols. This arrangement ensures that the health and safety guidelines are met while continuing the educational process. It requires logistical planning and additional resources to implement effectively.

Interpretation:

Both themes have been mentioned once, indicating they are equally significant concerns that the department is facing in response to the COVID-19 pandemic. These themes reflect the primary challenges and adjustments required to continue educational activities while adhering to health and safety guidelines.

HOD's Perception of Physical facilities

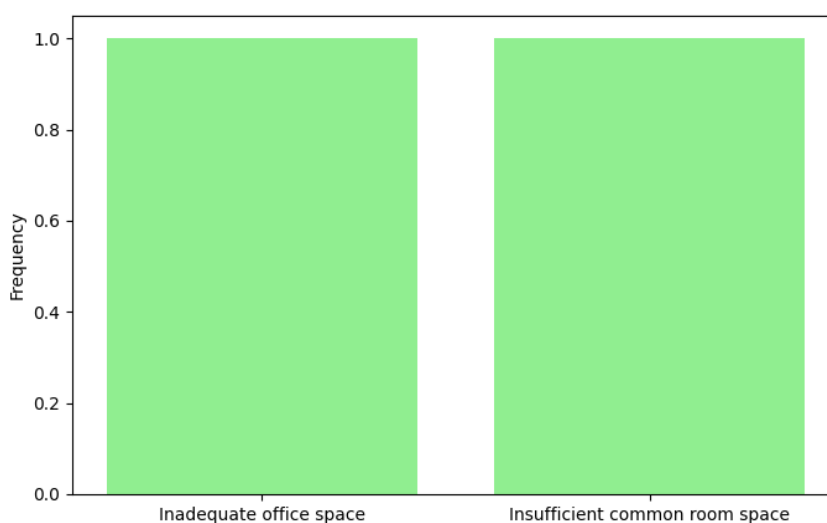


Figure 127: Adequacy of Physical Facilities in Medical laboratory Sciences Department (COVID-19)

Data Analysis:

Themes Identified:

Inadequate Office Space Due to Sharing with the Deputy:

This theme points out the issue of limited office space within the department. The head of the department (HOD) has to share an office with the deputy, which leads to a lack of adequate workspace. This situation can affect the efficiency and privacy needed for administrative tasks and meetings.

Insufficient Common Room Space for Lectures:

This theme highlights the problem of not having enough space in common rooms to conduct lectures. The lack of sufficient lecture space can impede the ability to

accommodate all students comfortably and safely, especially considering any social distancing requirements that might be in place due to health guidelines.

Interpretation:

Both themes have been mentioned once, indicating that they are equally significant concerns that the department is currently facing. These themes reflect the primary spatial challenges that need to be addressed to improve the working and learning environment within the department.

HOD's Perception on Projected and Non-projected teaching aids

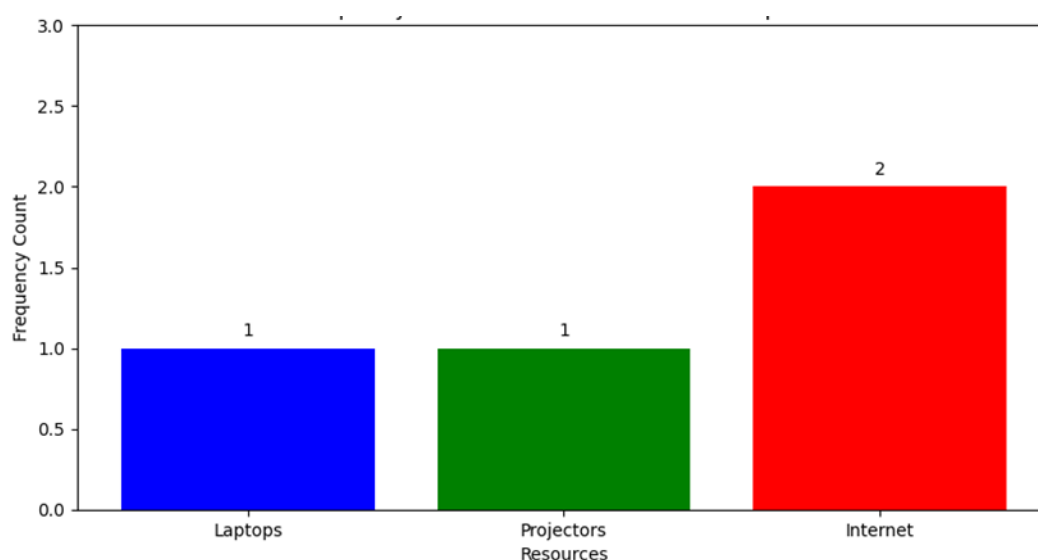


**Figure 138: Projected and non -projected teaching aids
Data Analysis**

Extracted Themes:

Laptops:

The theme of laptops is mentioned once in the response. This indicates that the availability of laptops is a concern, albeit mentioned less frequently compared to other themes. The specific mention implies that the current number of laptops is insufficient to meet the needs of the department during the COVID-19 pandemic.

Projectors:

Similarly, projectors are mentioned once. This suggests that the availability or adequacy of projectors is another significant concern for the department. The single mention points to a potential need for more projectors to facilitate effective teaching and learning.

Internet:

The internet theme is mentioned twice, making it the most frequently mentioned issue in the response. This theme covers both the availability and reliability of the internet. The higher frequency indicates that internet issues are a critical concern for the department, affecting both staff and students. The internet's slow speed and unreliability are major obstacles to maintaining smooth and effective communication and online learning during the pandemic.

Interpretation:

The frequency counts provide a quantitative measure of the issues mentioned in the response. The themes of laptops and projectors each have a frequency count of 1, indicating they are significant but not as critical as the internet issue, which has a frequency count of 2. The repeated mention of internet issues highlights its importance and suggests that addressing internet availability and reliability should be a priority for the department.

HOD's Perception of Departmental Finance

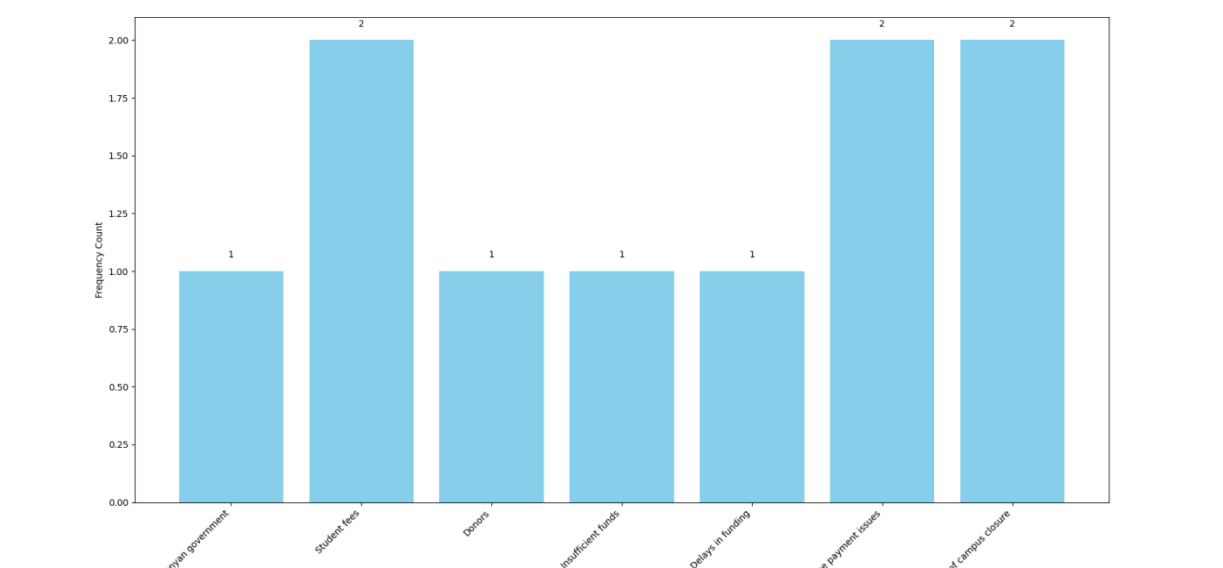


Figure 149: Department Financial Status
Data analysis

Key Themes Identified:

Sources of Finance:

- Kenyan Government: Mentioned once as a source of finance.
- Student Fees: Mentioned twice; once as a source of finance and once highlighting issues with timely payments.
- Donors: Mentioned once as an additional source of finance.

Financial Issues:

Insufficient Funds: Mentioned once, indicating that the funds from all sources are not enough to meet the department's needs.

Delays in Funding: Mentioned once, indicating that there are frequent delays in receiving the funds necessary for the department's operations.

Student Fee Payment Issues: Mentioned twice, highlighting that students often do not pay their fees on time, causing financial strain.

Impact of Campus Closure: Mentioned twice, emphasizing the significant financial impact caused by the closure of the campus due to COVID-19, leading to a halt in fee collection and affecting both recurrent and development budgets.

Frequency Count:

- Kenyan Government: 1
- Student Fees: 2 (once as a source, once for payment issues)
- Donors: 4
- Insufficient Funds: 4
- Delays in Funding: 4
- Student Fee Payment Issues: 4
- Impact of Campus Closure: 4

Interpretation:

The frequency counts indicate the prominence of each theme in the response. Student fees and the impact of the campus closure are the most frequently mentioned issues, each with a frequency count of 2. This highlights the critical financial challenges posed by delays and insufficiency of student fee payments, compounded by the campus closure. The reliance on multiple sources of finance (Kenyan government, student fees, and donors) underscores the complexity of the department's financial situation, with each source presenting its own set of challenges.

4.3 Conclusion

This chapter presented the findings from all the processes and procedures earlier described to generate and collect data relating to the set objectives. This included the demographic characteristics of the respondents and the response rate from the quantitative tool as well as the emergent themes from the qualitative aspect.

CHAPTER FIVE

DISCUSSION

5.1 Introduction

This chapter discusses the findings and their implications based on the research objectives and the literature reviewed. The researcher sought to fulfill the following objectives; to determine perceived adequacy of human resources by the lecturers and students in Medical Laboratory Sciences department of Kenya Medical Training College, and to determine perceived adequacy of physical facilities by the lecturers and students in Medical Laboratory Sciences department of Kenya Medical Training College. To determine perceived adequacy of projected and non-projected teaching aids by the lecturers and students in Medical Laboratory Sciences department of Kenya Medical Training College. To determine perceived adequacy of financial resources for teaching and learning by lecturers in Medical Laboratory Sciences department of Kenya Medical Training college.

5.2 Perceived Adequacy of Human Resources

The first objective sought to determine perceived adequacy of human resources by the lecturers and students in Medical Laboratory Sciences department of Kenya Medical Training College. In trying to determine perception of the lecturers and students on adequacy of human resources, most of the respondents demonstrated knowledge on the human resource staffing status.

5.2.1 Lecturers and Students

According to Choudhury (2014), unequal distribution and inadequacy of both teaching and non-teaching staffs in Medical Colleges has had an indirect impact on medical training and access by populations. In this study majority of the lecturers and students perceived staff to be inadequate in Medical Laboratory Sciences department in the advent

of COVID-19. This scenario was made even worse due to the fact that COVID-19 pandemics presented requirements, needs and challenges that needed to be addressed for continuity of teaching and learning. To ensure teaching and learning continuity amid and beyond the pandemic, higher education institutions need to migrate to flexible teaching and learning modality by recalibrating the curriculum, capacitating the faculty, and upgrading the infrastructure. These strategic actions have to be continuously assessed, modified, and enhanced to respond to the volatile, uncertain, and changing scenarios in times of crisis.

Further Jain, Mathew and Bedi (2012), states that, maintenance of employees at different levels assists an organization to set and achieve its goals. Indeed there exists a strong positive relationship between human resource establishment during teaching and learning and the outcome of teaching and learning. In Medical Education, the importance of human resource, whether skilled or unskilled, has increasingly been highlighted.

5.2.2 Heads of Department

According to Talukder (2011), Medical Colleges should have adequate trained manpower on Medical Education, audiovisual experts, computer operators and support staffs. In essence, human resource establishment in Medical Colleges should focus on staff adequacy with technical skills in various fields; such as lecturers with specialized skills on that field.

Most of the Heads of Department indicated that the college had inadequate teaching and non-teaching staff, this might lead to consequences of the workforce shortage among health professionals. Golz, et al., (2022), opines that the pandemic has brought to light the fragile balance that affects all healthcare systems. Governments have realized that these systems and the professionals working in them need support at different levels and all the time without disruption to strengthen the retention of the workforce. Health

professionals' education can play an important role in ensuring that new generations of workers have sound personal and professional competencies to successfully face the challenges of professional practice at all the time. As the saying goes experience is a good teacher, COVID-19 brought in an experience worth to be a good teacher especially in reference to preparedness of teaching and learning. Further COVID-19 pandemic affected every area of education and put a spot light on the strengths and challenges of learning institutions. That is why educators and all others concerned should apply the lesson learnt to plan for the future.

5.3 Perceived Adequacy of Physical Facilities.

The second objective was to determine perceived adequacy of physical facilities by the lecturers and students in Medical Laboratory Sciences department of Kenya Medical Training College.

The success of any program depends on the availability and adequacy of resources such as; offices, classrooms, demo laboratories, skills laboratories and computer laboratories. Physical facilities refer to the school plant, that is, the school buildings, classrooms, library, laboratories, toilet facilities, offices and other materials and infrastructures that would likely motivate students towards learning. Physical facilities are germane to effective learning and academic performance of students. In support of this, Hallak (2020), identified facilities as the main factor contributing to academic achievement in the school system. They include the school buildings, classroom, libraries, laboratories and recreational equipment among others Odunaiya (2014), claimed that the quality, appropriateness and adequacy of these items contribute to not only performance in the school and also systems that ensure continuity of learning and teaching. According to UNESCO, (2022), measures that mitigate transmission of COVID-19 and its health impacts are crucial for getting children back into school and learning, whilst also keeping

them, and the teaching staff and local communities, safe. Vaccination and behavioral measures such as social distancing are key. Infrastructure within schools, such as adequate handwashing facilities, ventilation systems, and physical space to support social distancing also have an important role to play. While these measures are important in prevention and control of COVID-19, its implementation brought in challenges whereby due to social distance number of students per class was reduced to a quarter of student attendance.

5.3.1 Lecturers and Students

In the study majority of the lecturers and students felt that the number of rooms occupied by offices, classrooms, demo laboratories, skills laboratories, and computer laboratories were not adequate. Recent studies have emphasized the importance of the availability of physical facilities. Summarizing Ajayi et al, (2021), they emphasized that the availability of these resources are quite important to achieving effectiveness in instructional delivery and supervision in the institution system. They further stressed that non-availability of basic facilities such as classrooms, office accommodation, workshops, sporting facilities, laboratories, library among others which is being experienced in learning institutions is a perfect reflection of what is obtained in the learning institution system. Ogunniyi (2022), claimed that laboratories play a key role in the teaching and learning of science. Further Adedeji (2023), noted that these facilities have to be adequate and should be in good condition and readily available at all times for teaching and learning. In support of the above a well sited school building with aesthetic conditions, laboratory and playground often contribute to improved performance in the school system.

He further argued that the availability of school building and other plant facilities are very important as they could enhance effective teaching and learning. Further, Altbach

(2022), is of the view that adequate facilities are essential for academic work. Also, in support of this Adewunmi (2023), claimed that for effective teaching to take place in any educational setting there must be provision of adequate and quality physical facilities. Further, he revealed that the availability of adequate number of physical facilities had significant influence on pupil's academic performance. He further emphasized that adequate number of physical facilities should be in place in learning institutions. It is evident that inadequate provision of school resources has been a major factor of poor students' academic performance in schools. Without adequate physical resources/facilities there would be a continuous decline in students academic performance. In support of this view, Ajayi (2021), emphasized on the need for the availability of physical materials in the institution system in order to boost teachers' job performance. This would invariably, enhance academic performance of students. In a related study carried out by Nwankwo (2022), he revealed that adequate provision and maintenance of institution plant is a remedy (solution) for any academic encumbrance. This means that running the school system without adequate provision and maintenance of school plant can be very cumbersome for teachers.

In support of this, Nwankwo (2022), also maintained that the provision and maintenance of physical facilities such as building, laboratories, libraries, furniture, equipment, among others are very important for effective and efficient institutional administration and better academic performance (on the part of students) and smooth continuous teaching and learning. Also, in recent studies carried out by Okunamiri (2003), on the provision and utilization of school facilities in some selected secondary schools in Nigeria, his findings revealed that although facilities were adequately provided in some schools, they were not effectively utilized. He further emphasized on the need to ensure effective and efficient realization of the goals and objectives of the educational system. The lack of laboratory

facilities has several effects on students' experiments. Firstly, it hinders their ability to gain practical experience and apply theoretical knowledge in a hands-on manner. This lack of practical experience can make it difficult for students to understand and grasp scientific concepts, as they struggle with unfamiliar terms and find learning materials challenging to comprehend. Additionally, the absence of necessary equipment and materials for conducting experiments at home further impedes students' ability to acquire new knowledge and formulate scientific explanations. Moreover, the underutilization of science laboratory facilities by teachers also negatively impacts students' learning outcomes. The lack of resources, such as laboratory equipment, limited time for laboratory work, and students' lack of engagement in laboratory activities, are major factors that contribute to the low practice of laboratory work. Overall, the lack of laboratory facilities hampers students' practical learning experiences and affects their ability to fully comprehend and apply scientific concepts.

This implies that the availability of physical facilities alone does not enhance learning; rather it is the adequate utilization of these facilities that can only motivate students to learn and enhance their academic performance. A review of previous studies conducted by Omotosho (2020), on the availability of physical facilities and equipment in African Countries is disheartening. His studies reveal that most secondary schools' building in Ondo State were old and in a dilapidating condition. Many of the classrooms, laboratories, examination halls, libraries and office furniture were in a terrible state of disrepair, a scenario that may affect teaching and learning and which has contributed to poor academic performance. Most windows were out of use, thereby causing hazards to life while fluorescent tubes for providing electricity were out of place.

5.3.2 Heads of Department

Adequate physical facilities such as office space, classrooms, demo-labs and skills labs give teachers and students a safe space to teach as well as one that is beneficial for their physical and emotional health. To be precise, (KMLTTB, 2020) states the requirement of offices/rooms in terms of the number, size and capacity for the lecturers. Classrooms, laboratories, demonstration laboratories and libraries should be made in terms of number of rooms, size and fittings (windows, doors, emergency exit, ground, desks, fixed benches, water provision, plumbing, fire extinguishers, safety cabinet and essential apparatus/equipment). The Heads of Department responded to the question of adequacy of physical facilities which demonstrated that, they were adequate. This is in discourse with students' and lecturers perceptions on adequacy of physical facilities. A growing body of research has found that school facilities can have a profound impact on both teacher and student outcomes. With respect to teachers, school facilities affect teacher recruitment, retention, commitment, and effort. With respect to students, school facilities affect health, behavior, engagement, learning, and growth in achievement.

Thus, researchers generally conclude that without adequate facilities and resources, it is extremely difficult to serve large numbers of students not forgetting that infrastructure is the pillar of any institutions of higher learning. However the researcher puts it that, infrastructure in Medical Schools is always compromised by internal and external intervening factors such as pandemics, political, economic, social, development in Medical Education, information communication technology and stake holders. According to (D. K Mutunga and B. W. Karanja, 2020), recent years in Kenya have seen a lot of focus on access to higher education, but while ensuring that all those who qualify for higher education transit to the various institutions of higher learning, the efforts to develop the infrastructural capacity of these institutions has not matched the growth in student numbers. It is an accepted fact that quality learning does not only depend on

relevant curriculum content, but is very much influenced by the learning experience created by the physical environment and especially the adequacy of: lecture halls, laboratories, libraries, accommodation facilities, assessment instruments and instructional aids.

5.4 Perceived adequacy of projected and non-projected teaching aids

The third objective was to determine perceived adequacy of projected and non-projected teaching aids by the lecturers and students in Medical Laboratory Sciences department of Kenya Medical Training College. According to Orwenjo (2021) outcome of teaching and learning is usually dependent on the perceptions of students towards the lecturers and the resources used for teaching. Availability of appropriate media for teaching has an influence on the outcomes of teaching and learning and subsequently on the attitudes of students towards learning. It is therefore crucial that lecturers and learners exhibit proper perceptions towards the teaching and learning resources such as projected and non-projected media. Teaching resources that promote acquisition of knowledge, skills and attitude by learners are categorized into either projected or non-projected aids (Njeru, Kang'ethe, Kwenia & Otieno, 2020). Without adequate teaching aids, students may struggle to grasp complex concepts or visualize abstract ideas. Visual aids, such as diagrams, charts, or multimedia presentations, are crucial for enhancing comprehension and engagement in the learning process. Without them, students may become disinterested or find it challenging to understand the material, leading to lower academic performance. Teaching aids serve as tools for effective communication between educators and students. They help teachers convey information in a clear and concise manner, catering to different learning styles and abilities. Inadequate teaching aids can hinder effective communication, making it difficult for educators to convey concepts effectively or facilitate interactive discussions in the classroom. Teaching aids stimulate

creativity and innovation in the learning environment. They encourage educators to explore new teaching methods and experiment with different approaches to engage students. Without access to a variety of teaching aids, educators may struggle to innovate in their teaching practices, leading to a lack of dynamism and diversity in the classroom. Interactive teaching aids, such as interactive whiteboards or educational games, can foster active participation and collaboration among students. Without access to such aids, student participation may decline, leading to passive learning experiences and reduced opportunities for peer interaction and collaboration. Inadequate teaching aids can exacerbate existing inequalities in education. Schools with limited resources may struggle to provide essential teaching aids, placing students at a disadvantage compared to those attending schools with better-equipped facilities. This can widen the gap in academic achievement and opportunities between students from different socio-economic backgrounds. Educators may experience increased levels of stress and frustration when faced with inadequate teaching aids. Teaching without the necessary tools can be challenging and time-consuming, leading to burnout and dissatisfaction among teachers. This can negatively impact teacher retention rates and overall morale within the education system.

Non-projected media include handouts, chalk or white board, pictures, posters and flip charts while projected aids include; overhead projectors, films, videos and power point slides. The efficiency of projected and non-projected aids depends on availability of teaching and learning resources such as Manikins, skillslab equipment, flip chart stands, white board markers, computers, printers, printing papers, internet and scanners. In the post-COVID era, many Medical Colleges look to modernize education and optimize student learning through use of digital platforms. However they were faced with challenges like technology integration in teaching and learning, (Dost et al. 2020).

Non-projected teaching aids, such as textbooks, manipulatives, and models, are essential for enhancing students' understanding of concepts and engaging them in the learning process. Without access to a variety of these aids, students may struggle to grasp abstract or complex ideas, leading to reduced comprehension and motivation. For example, hands-on manipulatives can help tactile learners, while visual aids like diagrams and charts can benefit visual learners. Inadequate non-projected aids can make it challenging for educators to effectively differentiate instruction, leaving some students behind or failing to challenge others. Science kits and laboratory equipment allow students to conduct experiments and make observations firsthand. Without access to these aids, students may miss out on opportunities for hands-on learning experiences, limiting their ability to develop critical thinking and problem-solving skills.

Schools with limited resources may struggle to provide adequate non-projected teaching aids, exacerbating existing inequalities in education. Students attending these schools may not have access to the same learning opportunities as their peers in schools with better-equipped facilities. This can widen the gap in academic achievement and opportunities between students from different socio-economic backgrounds. Educators may experience frustration and burnout when faced with inadequate non-projected teaching aids. Teaching without the necessary tools can be challenging and time-consuming, requiring educators to spend extra time preparing materials or improvising in the classroom. This can lead to increased stress levels and decreased job satisfaction among teachers.

Non-projected teaching aids stimulate creativity and innovation in the classroom by providing educators with tools to create engaging and interactive learning experiences. For example, art supplies and craft materials allow teachers to incorporate hands-on

activities into lessons. Without access to these aids, educators may struggle to innovate in their teaching practices, leading to less dynamic and engaging lessons.

A study by Alqurashi (2020), investigated lecturers' perceptions of online teaching during the pandemic in Saudi Arabia. The study found that lecturers faced several challenges, including a lack of experience with online teaching and a shortage of adequate technology and resources. Further Chinnery et al. (2020) found that lecturers in the UK also faced several challenges during the pandemic. These challenges include a lack of access to technical support, inadequate infrastructure, and limited interaction with students. Several studies have investigated students' perceptions of online learning during the COVID-19 pandemic. A study by Islam et al. (2020), found that students in Bangladesh faced several challenges, including a lack of access to technology, a lack of interaction with lecturers, and inadequate resources.

Similarly, a study by Aslam et al. (2020), investigated students' perceptions of online learning in Pakistan. The study found that students faced several challenges, including a lack of motivation, a lack of interaction with lecturers, and inadequate resources.

5.4.1 Lecturers and Students

The satisfaction level on perceived adequacy of teaching/learning aids among lecturers and students showed unacceptable level, which was in agreement with a study by Subedi (2019) on perceptions of students' towards teaching and learning resources, the usage of internet was very low. In the study, projected media which required the use of internet were very ineffective and this affected teaching and learning. This led to negative perceptions by students. According to Srinivasan, Dinesh Kumar. (2020) lecturers and students have different perceptions towards the use of computers and projections for teaching and learning. This affects the use of digital platforms such as eLearning platforms. In an online cross sectional survey on perceptions of medical students on

online teaching during the era of COVID-19, perceived challenges included flexibility of equipment for online education and internet connection (Dost *et al*, 2020). Bandyopadhyay and Romy (2017), conducted a study on students' perceptions on the methods of teaching anatomy and physiology in India. In the study, the researchers inferred that 60% of the learners preferred the use of chalk and board while 33% preferred use of projected media such as LCD projector. The availability of such teaching and learning resources is therefore crucial in Medical Education.

5.4.2 Heads of Departments

The satisfaction level on perceived adequacy of teaching/learning aids among heads of departments showed acceptable level of adequate. Innovative strategies have been introduced such as Open Educational Resources (OER). However, the success of these resources is dependent on the costs of implementation, skills, technology, internet availability and perceptions of the learners towards their use.

According to Srinivasan, Dinesh Kumar. (2020) learners and lecturers have different perceptions towards the use of computers and projections for teaching and learning. This affects the use of digital platforms such as eLearning platforms. In an online cross sectional survey on perceptions of medical students on online teaching during the era of COVID-19, perceived challenges included flexibility of equipment for online education and internet connection (Dost *et al*, 2020).

5.5 Perceived Adequacy of Financial Resources

The fourth objective was to determine perceived adequacy of financial resources by the lecturers and heads of department in Medical Laboratory Sciences department of Kenya

Medical Training College. Different governments are involved in financing education through funding and grants to the medical institutions. Financial support from various agencies; government or non-governmental organizations, is paramount in the running of Medical Colleges. In the purchase of medical equipment, fittings, safety equipment and construction of physical facilities, there must be a good financial plan in store.

5.5.1 Lecturers

The perception of lecturers on adequacy of financial resources was average. However this was contrary on school fees which had no significant correlation between satisfaction levels and donor fund, development budget and recurrent budget variables. Worldwide, different governments are involved in financing education through funding and grants to the medical institutions (Robert *et al*, 2021). Financial support from various agencies; government or non-governmental organizations, is paramount in the running of Medical Colleges. In the purchase of medical equipment, fittings, safety equipment and construction of physical facilities, there must be a good financial plan/budget in store. Additionally, human resource establishments rely on the finances available to hire the required number of teaching and non-teaching staff. The findings suggest that there is a strong positive correlation between satisfaction levels on government funds and satisfaction levels on donor funds.

This means that if a lecturer is satisfied with the government funds, they are likely to be satisfied with the donor funds as well. Additionally, the analysis reveals that there is a moderate positive correlation between satisfaction levels on development funds and satisfaction levels on recurrent budget allocation, indicating that satisfaction with these two variables is related. However, the study found no significant correlation between satisfaction levels on school fees and satisfaction levels on donor funds, development

budget, and recurrent budget variables. This suggests that satisfaction with school fees is not influenced by these financial resources.

Overall, the study shows that the perception of lecturers on the adequacy of financial resources in Kenya Medical Training College was average, with some correlations between different sources of funding, but not with school fees. These findings can be useful for policymakers and administrators in making decisions on how to allocate resources bearing in mind that the education response required in case of a pandemic such as the COVID-19 in the education sector, more so in Kenya Medical Training College. Similar opinion was given by (UNICEF, 2020), while the closure period of schools is still uncertain, an extended interruption of education can have serious consequences: children risk to fall far behind in their learning and those who were already vulnerable may never return to school. Moreover, and generally closure of schools also entails the interruption of access to other important basic services provided by schools such as school feeding, health, water, sanitation, hygiene, recreational programs, extracurricular activities, as well as pedagogical and psychosocial support.

5.5.2 Heads of Department

The satisfaction levels of Heads of Department in relation to various sources of funding, including government funds, donor funds, school fees, development budget allocation, and recurrent budget allocations, were found to be highly correlated. Specifically, satisfaction levels with donor funds were strongly linked to satisfaction levels with government funds, and satisfaction levels with development fund were strongly linked to recurrent budget allocations.

These findings indicated that the perception of Heads of Department is that government funding has an impact on donor funding, and that recurrent budget allocations strongly influence the allocation of development funds. In a study by Wambua (2015), the

researcher pointed out the importance of government funds in the smooth running of institutions. Although the study was conducted in secondary schools, the results can be inferred to Medical Colleges which also depend on government funding to purchase equipment, build infrastructure and pay salaries of staff. Teaching and learning resources are majorly distributed according to the size of the institution. Relevant Ministry guide the institutions on planning and budgeting. Noting that the current funding model in Kenya is based on relevant ministries, which caters for 80% of the unit cost while the remaining 20 per cent is borne by the institutions and students. This arrangement places more emphasis on the number of student enrollment, and in each case, the cost is fixed. However, this type of financing strategy has reduced funding for large institutions of learning. Although learning institutions like KMTC receive government funding, there is a growing funding gap. With COVID-19, the government effected a 26% reduction in funding. Additionally, while the government is ideally required to cover 80% of the tuition burden per student, it currently covers only 49.5% of the tuition. The funding gap in learning institutions has increased by more than double in the last few years. Over the last years, government funds to learning institutions through the relevant ministries has been declining gradually from 66.4% in the financial year 2021/2022 to as low as 48.11% in 2023. As a result, public learning institutions are confronting a buildup of pending bills amounting to Ksh 65 billion as of February 2023 and are thus not able to meet their statutory obligations, including remittances to pension schemes, health insurance, and taxes. Learning institutions like KMTC have resorted to increasing the cost of tuition and accommodation on the students to bridge the gap. Though students have access to the national student loan scheme provided by the HELB, its capacity is limited to funding only a small percentage of learning institutions students. During the financial 2022/2023, HELB only covered 58% of the students under Kenya Universities and Central Placement

Services. This was attributed to inadequate funding from the exchequer and low repayment by former beneficiaries, with over Ksh 9.9 billion defaults.

The higher education space in Kenya is characterized by major issues that trace back to inadequate funding. There is need for learning institutions like KMTC to actively seek for alternative funding to boost their revenues through contract research, partnerships, talent development, innovations, consultancies and other income generating activities as some of them have implemented these initiatives since the government started reducing funding allocation. To encourage a more effective way of utilizing the available public resources prudently among learning institutions, the government could consider pegging performance to budgeting. This would provide financial incentives for improved financial management by learning institutions.

In Medical Colleges like KMTC, the various heads of department are expected to develop departmental plans (procurement, maintenance) and budgets which must be approved at Campus level before they are shared at higher offices. The budget plan therefore should factor for unforeseen occurrence such as COVID-19 pandemic to avoid disruption of education systems. In the advent of COVID-19, there was a lot of uncertainty whether many governments had been able to support Medical Colleges with enough financial aid for teaching and learning, (World Bank Group, 2020). According to Sharma and Bhaska (2020), COVID-19 has immensely affected Medical Education and its effects were felt beyond the pandemic. Notwithstanding that, from financing point of view, the challenge was already daunting before COVID-19. The early 2020 estimate of the financial gap to reach SDG4-quality education- in low and lower middle income Country was a staggering \$148 billion dollar annually. It is estimated that the COVID-19 crisis will increase this financing gap up to one third (United Nation, 2020). More can be done to leverage private capital to support schools, teachers and parents to mitigate the impacts

of decreased income during this time. Capacity building and training programs are clearly needed to come alongside schools and families in order to support remote learning. Many schools are looking to fund initiatives that can improve the availability of remote learning, but currently lack the funding to do so. Funds are also required for families to invest in equipment needed to access remote learning platforms for children. Across the board, school stakeholders have continued to struggle and student learning losses are expected to last for some time. The current generation stands to lose as much as \$10 trillion in lifetime earnings as a result of the pandemic (World Bank, 2020). As schools phase reopening, getting children back into the classroom and ensuring schools and families have the access to financing they need to continue operating, pay educational expenses, catch learners up and improve education quality overall is now more critical than ever.

CHAPTER SIX

CONCLUSION AND RECOMMENDATIONS

6.1 Introduction

This chapter presents conclusions and recommendations made from the findings in this research. The main objective of the study was to determine perceived adequacy of teaching and learning resources in the advent of COVID-19 by lecturers and students in the department of Medical Laboratory Sciences of Kenya Medical Training College, while the specific objectives were, to determine perceived adequacy of physical facilities by the lecturers and students in Medical Laboratory Sciences department of Kenya Medical Training college, to determine perceived adequacy of projected and non-projected teaching aids by the lecturers and students in Medical Laboratory Sciences department of Kenya Medical Training college and to determine perceived adequacy of financial resources for teaching and learning by lecturers in Medical Laboratory Sciences department of Kenya Medical Training college.

6.2 Conclusion

The main objective of the study was to determine perceived adequacy of teaching and learning resources in the advent of COVID-19 by lecturers and students in the department of Medical Laboratory Sciences of Kenya Medical Training College. The first specific objective of this research was to determine perceived adequacy of human resources by the lecturers and students in Medical Laboratory Sciences department of Kenya Medical Training College. There was evidence that both lecturers and students generally perceived that human resources were not adequate in the department of Medical Laboratory Sciences at KMTC in the advent of COVID-19. The study has highlighted the importance of adequate teaching and learning resources in KMTC to prepare for similar pandemics.

The second specific objective was to determine the perceived adequacy of physical facilities to include; offices, classrooms, demo laboratories, skills laboratories, and computer laboratories by the lecturers and students in Medical Laboratory Sciences department of Kenya Medical Training College. There was evidence that the lecturers and students perceived that the physical facilities were inadequate in the advent of COVID-19.

The third specific objective was to determine the perceived adequacy on projected and non-projected teaching aids to include; whiteboards, flipcharts overhead projectors, posters, handouts, chalkboards, magnetic boards, textbooks, DvD players tape recorders, episcope, computer assisted aids, internet connectivity. There was evidence that the lecturers and students perceived that the teaching aids were inadequate in the advent of COVID-19. Inadequate projected teaching aids can have significant implications for both students and lecturers, ranging from limited engagement and understanding to inequity in education and teacher burnout. Inadequate non-projected teaching aids can have significant implications for both students and lecturers, including ineffective differentiation, inequity in education, teacher frustration and burnout, and reduced creativity and innovation. It is essential for education policymakers and stakeholders at KMTC to prioritize investments in teaching aids to ensure quality education and equitable opportunities for all lecturers and students.

The fourth specific objective was to determine the perceived adequacy on financial resources to include; Government of Kenya fund, Donor fund, School fees. There was evidence that the lecturers perceived that the funding by government of Kenya funds and donor funds were strongly positively correlated, same as on development funds and recurrent budget allocation. However, the heads of department in the four campuses perceived that the financial resources were not adequate.

6.3 Recommendations

Based on the findings of this research, the following recommendations are made:

- i. There is need to provide adequate human resources in the Medical Laboratory Sciences department of Kenya Medical Training College to ensure adequacy. This can be achieved by recruiting more lecturers, laboratory technicians, and non-teaching staff.
- ii. Provide adequate physical facilities to the department of Medical Laboratory Sciences at KMTC, including offices, classrooms, demo laboratories, skills laboratories, and computer laboratories. This can be achieved by renovating existing facilities, constructing new ones, and ensuring that they are properly equipped.
- iii. Provide adequate teaching aids to the department of Medical Laboratory Sciences at KMTC, to include whiteboards, flipcharts, overhead projectors, posters, handouts, chalkboards, magnetic boards, textbooks, DvD players tape recorders, episcope, computer-assisted aids, and internet connectivity. This can be achieved by purchasing new teaching aids, upgrading existing ones, and ensuring that they are readily available for use.
- iv. Provide and avail adequate financial resources available to the department of Medical Laboratory Sciences at KMTC, particularly from the Government of Kenya fund, donor fund, and school fees. This can be achieved by lobbying the government for increased funding, seeking donations from philanthropic organizations, and encouraging parents and students to contribute to the department's financial resources.
- v. Further study should be done to cover all other departments at KMTC, that is Nursing, Clinical Medicine, Physiotherapy, Medical Imaging Sciences, Health

Records, Pharmacy, Occupational Therapy, Orthopedic Technology, Dental technology, Optometry, Community oral health, Community Health Assistant, Public Health, Health Promotion, Medical Education, Orthopedic and Trauma Medicine, Medical Social Work, Health Counselling of KMTC in all Campuses. Similarly, such research should be done to other private institutions, faith based institutions and institutions of higher learning such as Universities.

These recommendations will help to ensure that the Medical Laboratory Sciences department of Kenya Medical Training College has adequate teaching and learning resources to provide high-quality education and prepare for pandemics like COVID-19.

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APPENDIX I; ACTIVITY TIME CHART 2022 - 2023

ACTIVITY	TIMING IN MONTHS																
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	23	
Proposal writing / submission /correction and approval																	
Questionnaire administering Data collection																	
Data analysis																	
Mock defence, Corrections and Preparation of the final draft																	
Mock defence Corrections Preparation of final manuscript/presentation																	

APPENDIX II; IREC LETTER OF APPROVAL



MOI TEACHING AND REFERRAL HOSPITAL
P.O. BOX 3
ELDORET
Tel: 33471/2/3

Reference: IREC/228/2022
Approval Number: 0004235

Benson Mbat Kondo,
Moi University,
School of Medicine,
P.O. Box 4606-30100,
ELDORET- KENYA.

Dear Mr. Mbat,

LECTURES AND STUDENTS PERCEPTION ON ADEQUACY OF TEACHING AND LEARNING RESOURCES IN ADVENT OF COVID-19 AT KENYA MEDICAL TRAINING COLLEGE

This is to inform you that **MTRH/MU-IREC** has reviewed and approved the above referenced research proposal. Your application approval number is **FAN: 0004235**. The approval period is **2nd September, 2022- 1st September, 2023**. This approval is subject to compliance with the following requirements;

- i. Only approved documents including (informed consents, study instruments, Material Transfer Agreements (MTA) will be used.
- ii. All changes including (amendments, deviations, and violations) are submitted for review and approval by **MTRH/MU-IREC**.
- iii. Death and life threatening problems and serious adverse events or unexpected adverse events whether related or unrelated to the study must be reported to **MTRH/MU-IREC** within 72 hours of notification.
- iv. Any changes, anticipated or otherwise that may increase the risks or affected safety or welfare of study participants and others or affect the integrity of the research must be reported to **MTRH/MU-IREC** within 72 hours.
- v. Clearance for export of biological specimens must be obtained from **MOH at the recommendation of NACOSTI** for each batch of shipment.
- vi. Submission of a request for renewal of approval at least 60 days prior to expiry of the approval period. Attach a comprehensive progress report to support the renewal.
- vii. Submission of an executive summary report within 90 days upon completion of the study to **MTRH/ MU-IREC**.

Prior to commencing your study; you will be required to obtain a research license from the National Commission for Science, Technology and Innovation (NACOSTI) <https://oris.nacosti.go.ke> and other relevant clearances from study sites including a written approval from the CEO-MTRH which is mandatory for studies to be undertaken within the jurisdiction of Moi Teaching & Referral Hospital (MTRH) and its satellites sites.

Sincerely,

PROF. E. WERE
CHAIRMAN

INSTITUTIONAL RESEARCH AND ETHICS COMMITTEE

cc	CEO	-	MTRH	Dean	-	SOP	Dean	-	SOM
	Principal	-	CHS	Dean	-	SON	Dean	-	SOD



MOI UNIVERSITY
COLLEGE OF HEALTH SCIENCES
P.O. BOX 4606
ELDORET
Tel: 33471/2/3
2nd September, 2022



APPENDIX III; NACOSTI APPROVAL LETTER

 REPUBLIC OF KENYA	 NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY & INNOVATION
Ref No: 893988	Date of Issue: 27/September/2022
RESEARCH LICENSE	
	
This is to Certify that Mr. BENSON MBATI KONDO of Moi University, has been licensed to conduct research in Embu, Kitui, Machakos, Meru on the topic: LECTURERS AND STUDENTS PERCEPTION ON ADEQUACY OF TEACHING AND LEARNING RESOURCES IN ADVENT OF COVID-19 AT KENYA MEDICAL TRAINING COLLEGE for the period ending : 27/September/2023.	
License No: NACOSTI/P/22/20289	
Applicant Identification Number 893988	Director General NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY & INNOVATION
Verification QR Code	
	
NOTE: This is a computer generated License. To verify the authenticity of this document, Scan the QR Code using QR scanner application.	

APPENDIX IV; LETTER TO REQUEST FOR DATA COLLECTION

To

The Chief Executive Officer

Kenya Medical Training College

P.O Box 30195- 00100,

NAIROBI

Dear Sir/Madam,

RE: AUTHORITY/PERMISSION.

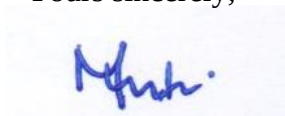
Following the approval by the IREC REF NO. REC/228/2022 and subsequence license by NACOSTI REF NO 893988 all attached to carry out a research entitled **“LECTURERS AND STUDENTS PERCEPTION ON ADEQUACY OF TEACHING AND LEARNING RESOURCES IN ADVENT OF COVID-19 AT KENYA MEDICAL TRAINING COLLEGE- CAMPUSES”** as a partial fulfillment for the award of a Doctorate Degree in Medical Education.

I will visit KMTC Campuses (Machakos, Kitui, Meru and Embu) offering Diploma in Medical Laboratory Sciences for data collection of the same.

It is anticipated that this study will come up with some findings and recommendations that will be beneficial to the Ministry of Health, entire KMTC fraternity and others who might find it beneficial.

In this regards, I respectfully request for your authority/permission for the data collection and the much needed cooperation.

Yours sincerely,



BENSON MBATI KONDO

STD REG. PhD/MED/5755/21

APPENDIX V; APPROVAL LETTER FROM KMTC DIRECTOR

Telegrams: "MEDTRAIN" Nairobi TELEPHONE: NAIROBI 2725191, 2725711/14 Fax: 2722907 Email: info@kmtc.ac.ke Please address all correspondence to: The Director When replying please quote KMTC/ADM/74/VOL.VI (229) Ref: No.		KENYA MEDICAL TRAINING COLLEGE P.O. BOX 30195-00100 NAIROBI
		Date: 4/10/2022

Benson Mbatia Kondo
 Kenya Medical Training College, Mbooni Campus
 P.O Box 153 - 90133
MBOONI

Dear Benson,

RE: PERMISSION TO COLLECT DATA IN KMTC, MERU, MACHAKOS, KITUI AND EMBU CAMPUSES

Reference is made to your letter dated 27th September, 2022 requesting for authorization to carry out a study titled '*Lecturers and Students Perception on adequacy of Teaching and Learning resources in Advent of Covid-19 at Kenya Medical Training College*'.

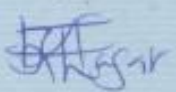
It is noted that the study protocols have received the necessary ethical clearance from the relevant institutions and the required research license by NACOSTI. He has also forwarded plagiarism report.

The KMTC Research and Ethics Review Committee has also reviewed the proposal and is satisfied that no ethical issues will be violated in the data collection process.

Permission is therefore granted for data collection, should any unanticipated issues arise, please contact the College Research Office.

Upon completion of the study, you are requested to submit one (1) hard and soft copy of the research report to the KMTC Chief Executive Officer's Office.

Thank you.


 EGLAH J. KIILAGAT
FOR: CHIEF EXECUTIVE OFFICE

APPENDIX VI; INTRODUCTION LETTER TO THE PRINCIPALS

To

The Principal

Kenya Medical Training College Campus

P.O Box,

.....

Dear Sir/Madam,

RE: RESEARCH.

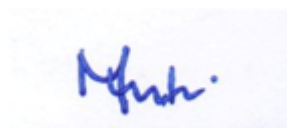
I will conduct a research entitled “ **LECTURERS AND STUDENTS PERCEPTION ON ADEQUACY OF TEACHING AND LEARNING RESOURCES IN ADVENT OF COVID-19 AT KENYA MEDICAL TRAINING COLLEGE-CAMPUSES**”: which will be in partial fulfilment for the award of a Doctorate Degree in Medical Education.

I will visit KMTC Campuses offering Diploma in Medical Laboratory Sciences for data collection of the same.

It is anticipated that this study will come up with some findings and recommendations that will be beneficial to the Ministry of Health, entire KMTC fraternity and others who might find it beneficial.

In this regards, I respectfully request for your much needed cooperation.

Yours Sincerely,



BENSON MBATI KONDO

STD REG. PhD/MED/5755/21

APPENDIX VII; STRUCTURED QUESTIONNAIRE FOR HEADS OF DEPARTMENT

S/NO.....

Name of Researcher; Benson Mbat Kondo

One of the tasks of Kenya Medical Training College is to identify students' needs and concerns; and to address them efficiently to enable the college achieve the vision and mission. I am undertaking this study so as to determine perception of lecturers and students on the adequacy of the teaching and learning resources. The information you give will strictly be kept confidential.

Title of the study; Perceptions of lecturers and students on adequacy of teaching and learning resources in the advent of COVID-19 at Kenya Medical Training College Campuses.

Section 1; Background information for HOD

- | | | | | |
|---|--------------------|-----|--------|-----|
| 1. Gender | Male | () | Female | () |
| 2. Please indicate your Campus | Meru | () | | |
| | Embu | () | | |
| | Machakos | () | | |
| | Kitui | () | | |
| 3. What is your age | 51 years and above | () | | |
| | 41-50 years | () | | |
| | 31-40 years | () | | |
| | 21-30 years | () | | |
| 4. For how long have you worked in this profession? | 16-20 years | () | | |
| | 11-15 years | () | | |
| | 6-10 years | () | | |
| | 0-5 years | () | | |
| 5. Working experience at KMTC | Above 21 years | () | | |
| | 16-20 year | () | | |
| | 11-15 years | () | | |
| | 6-10 years | () | | |

0-5 years ()

6. What is your highest level of education? PhD ()

Masters ()

Degree ()

Diploma ()

Other,

Specify.....

7. Have you ever attended any training in the last six months on curriculum development and review? YES ()

NO ()

Section 2; Perceptions towards teaching and learning resources in department of Medical Laboratory Sciences by the Head of Department in the advent of COVID-

19

Instructions

Please follow the instructions below;

- a) Kindly respond to all the questions honestly and accurately.
- b) Use a pen to fill in the responses.
- c) Mark with a tick (✓) where relevant.
- d) Do not indicate your name anywhere on this questionnaire

1. Indicate the total number of lecturers in your department.....

2. State the number of female and male lecturers in the department

Male.....

Female.....

3. Of the above, indicate the qualifications and according to gender

Male

Female

Doctorate degree () ()

Masters degree () ()

Bachelor of Science () ()

Higher diploma () ()

Diploma () ()

4. As compared to the number of students, are the lecturers enough to facilitate teaching and learning?

YES ()

NO ()

5. Please indicate the total number of support staff.....
6. How satisfied are you with the adequacy of the following members of staff in the department of Medical Laboratory Sciences (tick appropriately, 1 Extremely Dissatisfied, 2 Dissatisfied, 3 Neutral, 4 Satisfied and 5 Extremely Satisfied)?

	5	4	3	2	1
Lecturers					
Support staff					

7. Please indicate the number of rooms occupied by the Medical Laboratory Department

Offices ☐

Classrooms ☐

Demo labs ☐

Skills lab ☐

Computer labs ☐

8. Please rate the below stated facilities in the department of Medical Laboratory Sciences (tick appropriately).

	Adequate	Not adequate
Offices		
Classrooms		
Demo labs		
Skills lab		
Computer labs		
Transport		

9. What is the state of the facilities in Medical Laboratory Department? Please tick below

		Excellent	Good	Average	Fair	Poor
i.	Furniture	()	()	()	()	()
ii.	Windows	()	()	()	()	()
iii.	Lab equipment	()	()	()	()	()
iv.	Reagents	()	()	()	()	()
v.	Microscope	()	()	()	()	()
vi.	Doors	()	()	()	()	()
vii.	Ventilation	()	()	()	()	()
viii.	Lighting	()	()	()	()	()
ix.	Classroom space	()	()	()	()	()
x.	Floors	()	()	()	()	()

10. How satisfied are you with the adequacy of teaching aids in the department of Medical Laboratory Sciences , (tick appropriately, 1 Extremely Dissatisfied,2 Dissatisfied,3 Neutral,4 Satisfied and 5 Extremely Satisfied)?

	5	4	3	2	1
Whiteboards					
Flipcharts					
Overhead Projectors					
Posters					
Handouts					
Chalkboards					
Magnetic boards					
Textbooks					
DVD players					
Tape recorders					
Episcope					
Computer assisted aids					

11. Do you have a departmental budget?

YES ()

NO ()

12. Does your departmental budget meet the teaching and learning needs?

YES ()

NO ()

13. Does your Campus have a budget committee?

YES ()

NO ()

14. How satisfied are you with the adequacy of funds from the below stated sources
(tick appropriately, 1 Extremely Dissatisfied, 2 Dissatisfied, 3 Neutral, 4 Satisfied and 5 Extremely Satisfied)?

	5	4	3	2	1
Government of Kenya					
Donors					
School fees					

15. How satisfied are you with the departmental budget allocations as stated below
(tick appropriately, 1 Extremely Dissatisfied, 2 Dissatisfied, 3 Neutral, 4 Satisfied and 5 Extremely Satisfied)?

	5	4	3	2	1
Development					
Recurrent					

APPENDIX VIII; STRUCTURED QUESTIONNAIRE FOR LECTURERS

S/NO.....

Name of Researcher; Benson Mbat Kondo

One of the tasks of Kenya Medical Training College is to identify students' needs and concerns; and to address them efficiently to enable the college achieve the vision and mission. I am undertaking this study so as to determine perception of lecturers and students on the adequacy of the teaching and learning resources. The information you give will strictly be kept confidential.

Title of the study; Perceptions of lecturers and students on adequacy of teaching and learning resources in the advent of COVID-19 at Kenya Medical Training College Campuses.

Section 1; Background information for Lecturers

1. Gender Male () Female ()
2. Please indicate your Campus

	Meru	()
	Embu	()
	Machakos	()
	Kitui	()
3. What is your age

	51 years and above	()
	41-50 years	()
	31-40 years	()
	21-30 years	()
4. For how long have you worked in this profession?

	16-20 years	()
	11-15 years	()
	6-10 years	()
	0-5 years	()
5. Working experience at KMTC

	Above 21 years	()
	16-20 year	()
	11-15 years	()
	6-10 years	()
	0-5 years	()

6. What is your highest level of education? PhD ()
 Masters ()
 Degree ()
 Diploma ()
 Other,
 Specify.....

7. Have you ever attended any training in the last six months on curriculum development and review? YES ()
 NO ()

Section 2; Perceptions towards teaching and learning resources in the department of Medical Laboratory Sciences by Lecturers in the advent of COVID-19.

Instructions

Please follow the instructions below;

- Kindly respond to all the questions honestly and accurately.
 - Use a pen to fill in the responses.
 - Mark with a tick (✓) where relevant.
 - Do not indicate your name anywhere on this questionnaire
1. Please indicate the number of the following staff in the department of Medical Laboratory Sciences ;

	No.	Male	Female
Lecturers			
Support Staff			

2. How satisfied are you with the adequacy of the following members of staff in the department of Medical Laboratory Sciences (tick appropriately, 1 Extremely Dissatisfied, 2 Dissatisfied, 3 Neutral, 4 Satisfied and 5 Extremely Satisfied)?

	5	4	3	2	1
Lecturers					
Support staff					

3. Please indicate the number of rooms occupied by medical laboratory

Offices

Classrooms

Demo labs ☐Skills lab ☐Computer labs ☐

4. How satisfied are you with the adequacy of the following physical facilities in the department of Medical Laboratory Sciences (tick appropriately, 1 Extremely Dissatisfied, 2 Dissatisfied, 3 Neutral, 4 Satisfied and 5 Extremely Satisfied)?

	1	2	3	4	5
Offices					
Classrooms					
Demo labs					
Skills lab					
Computer labs					

5. What is the state of the facilities in medical laboratory department? Please tick below

		Excellent	Good	Average	Fair	Poor
xi.	Furniture	()	()	()	()	()
xii.	Windows	()	()	()	()	()
xiii.	Lab equipment	()	()	()	()	()
xiv.	Reagents	()	()	()	()	()
xv.	Microscope	()	()	()	()	()
xvi.	Doors	()	()	()	()	()
xvii.	Ventilation	()	()	()	()	()
xviii.	Lighting	()	()	()	()	()
xix.	Classroom space	()	()	()	()	()
xx.	Floors	()	()	()	()	()

6. How satisfied are you with the adequacy of teaching aids in the department of Medical Laboratory Sciences , (tick appropriately, 1 Extremely Dissatisfied, 2 Dissatisfied, 3 Neutral, 4 Satisfied and 5 Extremely Satisfied)?

	5	4	3	2	1
Whiteboards					
Flipcharts					
Overhead Projectors					
Posters					
Handouts					
Chalkboards					
Magnetic boards					
Textbooks					
DVD players					
Tape recorders					
Episcope					
Computer assisted aids					
Internet Connectivity					
eLearning system					

7. Are you aware of availability of budget committee in your departmental budget?

YES ()

NO ()

I do not know ()

8. How satisfied are you with the departmental budget allocations as stated below (tick appropriately, 1 Extremely Dissatisfied, 2 Dissatisfied, 3 Neutral, 4 Satisfied and 5 Extremely Satisfied)?

	5	4	3	2	1
Development					
Recurrent					

LIKERT SCALE

S/NO.	QUESTIONS	RESPONSES				
		Strongly agree	Agree	Neutral	Disagree	Strongly disagree
1.	There are enough teaching and learning resources in my Campus during this time of COVID-19					
2.	The classrooms are adequate for Medical Laboratory Sciences in the Campus during this time of COVID-19					
3.	The laboratory(s) is adequate for teaching and learning during this time of COVID-19					
4.	The laboratory(s) is well equipped to facilitate learning during this time of COVID-19					
5.	There is reliable internet connectivity to facilitate teaching and learning					
6.	The library has enough resources to facilitate teaching and learning during this time of COVID-19					
7.	There are adequate cabinets for every lecturer in the department					
8.	Teaching and learning resources are equally distributed in all Campuses in KMTC					

APPENDIX IX; STRUCTURED QUESTIONNAIRE FOR STUDENTS

S/NO.....

Name of Researcher; Benson Mbat Kondo

One of the tasks of Kenya Medical Training College is to identify students' needs and concerns; and to address them efficiently to enable the college achieve the vision and mission. I am undertaking this study so as to determine perception of lecturers and students on the adequacy of the teaching and learning resources. The information you give will strictly be kept confidential.

Title of the study; Perceptions of lecturers and students on adequacy of teaching and learning resources in the advent of COVID-19 at Kenya Medical Training College Campuses.

Section 1; Background information

- | | | |
|---------------------------------------|--------------------|-----|
| 1. Gender | Male | () |
| | Female | () |
| 2. Please indicate your Campus | | |
| | Meru | () |
| | Embu | () |
| | Machakos | () |
| | Kitui | () |
| 3. Please indicate your year of study | | |
| | First year | () |
| | Second year | () |
| | Third year | () |
| 4. What is your age | 25 years and older | () |
| | 23-25 years | () |

21-23 years ()

18-20 years ()

Section 2; Perceptions towards teaching and learning resources in the department of Medical Laboratory Sciences by Students in the advent of COVID-19.

Instructions

Please follow the instructions below;

- a) Kindly respond to all the questions honestly and accurately.
- b) Use a pen to fill in the responses.
- c) Mark with a tick (✓) where relevant.
- d) Do not indicate your name anywhere on this questionnaire

1. Please indicate the number of the following staff in the department of Medical Laboratory Sciences ;

	No.	Male	Female
Lecturers			
Support Staff			

2. How satisfied are you with the adequacy of the following members of staff in the department of Medical Laboratory Sciences (tick appropriately, 1 Extremely Dissatisfied, 2 Dissatisfied, 3 Neutral, 4 Satisfied and 5 Extremely Satisfied)?

	5	4	3	2	1
Lecturers					
Support staff					

3. Please indicate the number of rooms occupied by medical laboratory

Offices

Classrooms

Demo labs

Skills lab

Computer labs

4. How satisfied are you with the adequacy of the following physical facilities in the department of Medical Laboratory Sciences (tick appropriately, 1 Extremely Dissatisfied, 2 Dissatisfied, 3 Neutral, 4 Satisfied and 5 Extremely Satisfied)?

	1	2	3	4	5
Offices					
Classrooms					
Demo labs					
Skills lab					
Computer labs					

5. What is the state of the facilities in medical laboratory department? Please tick below

	Excellent	Good	Average	Fair	Poor
i. Furniture	()	()	()	()	()
ii. Windows	()	()	()	()	()
iii. Lab equipment	()	()	()	()	()
iv. Reagents	()	()	()	()	()

- v. Microscope () () () () ()
- vi. Doors () () () () ()
- vii. Ventilation () () () () ()
- viii. Lighting () () () () ()
- ix. Classroom space () () () () ()
- x. Floors () () () () ()

6. How satisfied are you with the adequacy of teaching aids in the department of Medical Laboratory Sciences , (tick appropriately, 1 Extremely Dissatisfied, 2 Dissatisfied, Neutral, 4 Satisfied and 5 Extremely Satisfied)?

	5	4	3	2	1
Whiteboards					
Flipcharts					
Overhead Projectors					
Posters					
Handouts					
Chalkboards					
Magnetic boards					
Textbooks					
DVD players					
Tape recorders					
Episcope					
Computer assisted aids					
Internet Connectivity					
eLearning system					

APPENDIX X; STRUCTURED INTERVIEW GUIDE FOR HEADS OF DEPARTMENT

S/NO.....

Name of Researcher; Benson Mbat Kondo

One of the tasks of Kenya Medical Training College is to identify students' needs and concerns; and to address them efficiently to enable the college achieve the vision and mission. I am undertaking this study so as to determine perceptions of lecturers and students on the adequacy of the teaching and learning resources. The information you give will strictly be kept confidential.

Title of the study; Perceptions of lecturers and students on adequacy of teaching and learning resources in the advent of COVID-19 at Kenya Medical Training College Campuses.

This interview guide is designed to facilitate discussion with each of the head of department of the four campuses. Namely; Machakos, Embu, Meru and Kitui

- i. How would you rate the adequacy of human resources (lecturers and subordinate staff)? in the department of medical laboratory sciences in the advent of covid-19

.....

Please explain

.....

.....

How would you rate the adequacy of physical facilities (offices, classrooms, demo labs, skills lab, computer labs) in the advent of covid-19

.....

Please explain.....

.....

.....

- ii. How would you rate the adequacy of projected and un-projected aids in the department in the advent of covid-19?

.....

Please explain

.....

.....
.....

- iii. What was the state of the finance in the department of Medical laboratory sciences in the advent of covid-19

.....

Please explain

.....
.....
.....

Thank you very much for your time

**APPENDIX XI; MAP OF KENYA SHOWING KITUI, MACHAKOS, MERU,
EMBU CAMPUSES AND EASTERN REGION SHADED IN BROWN**

