

**COMPETENCY-BASED TRAINING AND SKILLS ACQUISITION OF
AUTOMOTIVE STUDENTS IN TECHNICAL TRAINING INSTITUTES IN THE
EASTERN REGION OF UGANDA**

**BY
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**THESIS SUBMITTED TO THE DEPARTMENT OF TECHNOLOGY EDUCATION,
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EDUCATION IN TECHNOLOGY EDUCATION (MECHANICAL AND
AUTOMOTIVE ENGINEERING OPTION)
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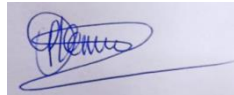
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DEDICATION

This work is dedicated to my beloved wife, Amutos Kevin, and my children, Ogwang Jovan, Achom Faith, and Okung Gabriel, whose love, patience, and understanding have been a constant source of strength and inspiration. I also extend my heartfelt appreciation to my brother, Ogwang Joseph, and my esteemed friends, Eria Namomo, Osanga Nimrod, Olupot Badru, Kisu Muhamed Aata, Sempala Sebastian, and Abwimo Simon, for their unwavering support and encouragement throughout the course of my studies. May the Almighty God abundantly bless and reward you all for your invaluable contributions to the success of this work.

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ABSTRACT

This study examined competence-based training (CBT) and skill acquisition for automotive students in Technical Training Institutes in Eastern Uganda, aiming to determine the influence of availability of instructional resources, infrastructure relevance, human resource capacity, and financial adequacy on skill acquisition. A mixed-methods approach integrated quantitative and qualitative data from three hundred forty-one (341) participants, 288 students, 40 instructors, and 13 administrators, selected via stratified sampling. Data were collected using a combination of research instruments, including questionnaires, interviews, focus group discussions (FGDs), and document analysis. The collected data were analyzed using **Minitab (version 2022)** to generate both descriptive and inferential statistical results. Quantitative data was processed with descriptive and inferential statistics, while qualitative data underwent thematic analysis. Instrument validity and reliability were ensured through pilot testing and expert validation. Questionnaires showed instructional resources were moderately effective (mean 2.89, SD 1.28), with 75.7% of students using them weekly, but 80.9% face access issues; FGDs and interviews confirmed shortages (47% students, 80% instructors). Infrastructure was slightly adequate (mean 3.24 students, SD 1.24); with 90.6% finding it conducive per questionnaires, yet interviews revealed 80% of instructors noted outdated equipment (60%), supported by maintenance logs. Human resource capacity supported CBT, with 77.8% of students noting methodology alignment (mean 3.56, SD 1.10) via questionnaires, but interviews indicated 70% of instructors reported staffing shortages, verified by training records. Financial support is inadequate (mean 2.84, SD 1.32), with 87.5% affirming practical training impact per questionnaires, though 38.5% of administrators lacked funding mechanisms per interviews and budget reviews. Recommendations, institutes should prioritize the modernization and availability of instructional resources to reflect current industry standards, institutes need to invest in expanding and upgrading training facilities, recruit more qualified instructors and support staff to mitigate current staffing shortages and institutes must advocate for increased budget allocations and explore alternative funding sources

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ABBREVIATIONS

TVET- Technical Vocational Education and Training

CBT-Competence-Based Training

FGDs-Focus Group Discussions

SD- Standard Deviation

ASEP-Automotive Service Educational Program

CBET-Competency-Based Education Training

CDACC-Curriculum Development Assessment and Certification Council

KNQF-Kenya National Qualifications Framework

LMS- Learning Management Systems

NGO- Non-Governmental Organizations

GUREC-Gulu University Research Ethics Committee

UNCST-Uganda National Council for Science and Technology

CAO - Chief Administrative Officer

CHAPTER ONE: INTRODUCTION

1.0 Introduction

This chapter entails the background of the study of the automotive industry in Uganda specifically the Eastern Region, and the statement problem. In addressing the problem, well-formulated objectives and research questions have been developed. This chapter also discusses the significance and justification for this study while stating the assumptions made. A theoretical frame work is elaborated and a conceptual framework showing variables in the study is also presented. Operational definitions of key terms are provided to ensure conceptual clarity and consistency throughout the research. Collectively, these components establish the foundation for the study and guide the subsequent analysis and discussion.

1.1 Background to the study.

Technical training institutes play a crucial role in equipping students with the necessary skills and knowledge to excel in various industries. In the context of the automotive sector, these institutes are vital in preparing students for a successful career in a rapidly evolving and competitive industry (Threton & Walter, 2009).

Research conducted globally has focused on various aspects of automotive training and work performance which recognizes the importance of creating a competent skilled labor through effective training to meet the industry demand worldwide (Saleh & Ainiah, 2024). Studies have examined the effectiveness of training methodologies, instructional resources, curriculum relevance, and the impact of emerging technologies on technical education (Fischer Martinand Jungmann, 2014). In Germany and Japan, the dual education system combines classroom instruction with hands-on apprenticeship training. In this model, students split their time between vocational schools and apprenticeships at automotive companies (Hummelsheim & Baur, 2014). This approach ensures that students gain practical experience and theoretical knowledge simultaneously. The effectiveness of this strategy is reflected in Germany's highly skilled workforce, which is well-prepared to meet industry demands. Additionally, Japan places a strong emphasis

on continuous learning and skill upgrades, ensuring that technicians remain proficient with the latest automotive technologies (Bambang Sudarsono et al., 2021a). The integration of Kaizen (continuous improvement) principles into training programs further enhances the skills and efficiency of the workforce. In the U.S., partnerships between automotive companies and technical colleges have been emphasized. Programs like General Motors' Automotive Service Educational Program (ASEP) align curricula with industry needs and provide students with real-world experience through internships and cooperative education (Bambang Sudarsono et al., 2021b). This collaboration ensures that graduates are job-ready and possess the practical skills required by employers.

Within the African continent, the automotive industry is recognized as a significant contributor to economic growth and job creation. Technical training institutes across Africa strive to produce competent automotive graduates to support the industry's development. In South Africa, The National Artisan Development Strategy focuses on increasing the number of qualified artisans through improved training quality and alignment with industry standards (Siwela & Van Der Bank, 2021). This strategy involves partnerships between training institutions and the automotive industry to ensure curricula are relevant and up-to-date. The use of workplace-based learning, such as apprenticeships and internships, is a key component of this strategy, providing students with hands-on experience and enhancing their employability. In Nigeria, The National Automotive Council has worked to enhance the curriculum of technical schools to better match industry needs. This includes updating training materials, providing modern equipment, and facilitating partnerships with automotive manufacturers (Bambang Sudarsono et al., 2021a). Additionally, Nigeria has implemented competency-based training programs that focus on developing specific skills required by the industry, ensuring that graduates are well-prepared for the workforce. In Kenya, Competency-Based Education Training (CBET) has been adopted as a transformative approach within Technical and Vocational Education and Training (TVET) institutions to enhance the practical skills and employability of automotive students. The CBET system is designed

to equip learners with specific, measurable competencies aligned to occupational standards developed in collaboration with industry stakeholders. Automotive training emphasizes hands-on experience, modular delivery, and outcome-based assessment, where learners progress upon demonstration of mastery in key areas such as engine systems, vehicle electronics, diagnostics, and repair. Implementation is guided by the Kenya National Qualifications Framework (KNQF) and overseen by the Curriculum Development Assessment and Certification Council (CDACC), which ensures the relevance and quality of training programs (2013_SDC_Understanding-VET_Concept-Paper-1, 2014). Instruction is learner-centered, with instructors acting as facilitators and assessors in both simulated and real-work environments.

In Uganda, the automotive industry has witnessed growth and has become a significant contributor to the nation's economy according to Ministry of Finance, Planning. (2025). Technical training institutes in Uganda have been actively working to address the skills gap and produce skilled automotive professionals. Okumu, I. M., & Bbaale, E. (2018). Despite efforts to expand TVET programs in Uganda, there are several challenges and gaps in the existing system which includes:

- i. TVET programs may not be readily accessible to all students, especially those in rural areas, due to insufficient infrastructure and resources. (Erimirwa, M. P. (2023,))
- ii. Some TVET institutions lack adequately trained instructors, modern equipment, and facilities, impacting the quality of training,
- iii. The curriculum of TVET programs, including automotive training, may not always align with industry needs and technological advancements, leading to a skills gap among graduates.
- iv. TVET education is sometimes perceived as inferior to academic education, leading to a stigma against vocational careers and a preference for white-collar jobs. Mukooli, H. M. (2022).

While efforts are underway to address these challenges and improve the quality and relevance of TVET programs in Uganda, more investment in infrastructure, teacher

training, industry partnerships, and curriculum development is needed to fully realize the potential of vocational education in preparing students for careers in the automotive industry. (ILO PROSPECTS | Occupations and Skills Assessment for Youth in Selected Refugee Settlements of Isingiro, Arua and Madi Okollo Sub-regions in Uganda, 2022)

These research gaps present an opportunity for further investigation into the effectiveness of competency development strategies in Uganda's automotive technical training institutions. Addressing these gaps can provide more targeted and evidence-based solutions to improve technical education in the automotive sector, thereby enhancing graduates' competencies, skills and the overall development of the automotive industry in Uganda. By conducting more focused studies in the Ugandan context, particularly in regions like Eastern Region, policymakers and educational institutions can better align training programs with industry demands and foster a skilled workforce capable of meeting the automotive industry's evolving demand (Justin, 2020). Therefore this research aimed at investigating the effectiveness of competence-based training of automotive students in technical training institutes in Eastern region of Uganda.

1.2. Statement of the problem:

Despite the adoption of Competency-Based Training (CBT) in Uganda's Technical and Vocational Education and Training (TVET) institutions in 2016, there remains a persistent discrepancy between the competencies acquired by automotive graduates and the skills demanded by the labor market (Herbert & Etoru, 2024). Uganda's automotive industry continues to experience rapid technological transformation; however, many graduates from TVET institutions lack sufficient practical competencies required for modern vehicle diagnostics, repair, and maintenance (Garuzooka et al., 2018). This skills gap undermines national efforts to address youth unemployment and achieve the objectives of Uganda's *Vision 2040* and the *Skilling Uganda Strategic Plan* (Kyobe & Rugumayo, 2005). Given the critical role of the automotive sector in promoting industrialization and socio-economic development, concerns persist that current pedagogical approaches and institutional practices are inadequately aligned with the evolving demands of the industry.

Consequently, graduates often lack the technical proficiency, problem-solving ability, and adaptability necessary to perform effectively in contemporary automotive workplaces. Therefore, it is imperative to investigate the factors influencing the implementation of CBT in automotive training programs in the eastern region of Uganda.

1.3 Objectives of the study

1.3.1 General objective

The main objective was to investigate the effectiveness of competence-based training and skill acquisition of automotive students in technical training institutes in the eastern region of Uganda.

1.3.2 Specific Objectives:

- (i) To determine the influence of availability of instructional resources on competence-based training of Automotive students in Uganda.
- (ii) To evaluate infrastructure relevance on competence-based training of Automotive students in Uganda.
- (iii) To establish the influence of human resource capacity on competence-based training of Automotive students in Uganda.
- (iv) To assess the financial adequacy on competence-based training of Automotive students in Uganda.

1.4. Research questions

- (i) How does the availability and quality of instructional resources in automotive education institutions in Uganda impact the competence-based training of automotive trainees?
- (ii) In what ways does the adequacy and appropriateness of infrastructure affect the competency-based training of automotive trainees in Uganda?
- (iii) What is the role of automotive instructors' availability and experience in facilitating competence-based training of automotive trainees in Uganda?

- (iv) How does the level of financial investment and budget allocation impact competence-based training of automotive trainees Uganda?

1.5 Justification of the Study:

- (i) **Relevance to Socioeconomic Context:** The automotive sector is a significant contributor to Uganda's economy, and the availability of a skilled workforce is crucial for its growth.
- (ii) **Academic and Practical Relevance:** The research topic aligns with the core objectives of technical training institutions and their mission to prepare students for gainful employment.
- (iii) **Potential for Positive Impact:** The findings of this research have the potential to create positive change in the education system, workforce development, and economic growth in Uganda. The knowledge generated can lead to evidence-based decision-making and trans-formative actions to address the skills gap and boost the automotive sector's performance.

1.6 Significance of the study:

- (i) **Fill knowledge gap:** The research has addressed a significant gap in the existing literature by investigating the training of automotive students in technical training institutions in Eastern Region of Uganda and its impact on their competencies.
- (ii) **Inform policy and practice:** The findings of this research have provided evidence-based insights to policymakers and educational institutions on the strengths and weaknesses of current automotive training programs.
- (iii) **Enhanced workforce development:** As the automotive industry plays a crucial role in Uganda's economic growth, ensuring a skilled and competent workforce is essential.

1.7. Assumptions of this study

- (i) Graduates churned out from technical training institutions in the Eastern Region possess skills and competencies that are relevant to the demands of the automotive industry in Uganda.

- (ii) The participants provided honest and accurate responses during data collection, including questionnaires, interviews and focused group discussions.
- (iii) The sample of automotive students, instructors, and administrators was a representative of the broader population in Eastern region of Uganda.

1.8 Scope and limitations of the study

1.8.1 Scope of the Study:

This research was confined to the Eastern Region of Uganda. The Eastern Region is among the four regions in Uganda with a total number of 37 districts.

The study focuses on technical training institutions that offer automotive-related programs at certificate level and their graduates.

Eastern Region in Uganda has a high demand for automotive services due to its agricultural and commercial activities. It has several public technical training institutions that offer automotive courses, such as St Kizito Technical Training Institute Madera, Iganga Technical Institute, Jinja vocational training Institute, Kasodo Technical Institute, Kaberemaido Technical Training Institute, Nkoko Memorial Tehcnical Training Institute, Busoga Nsadu Technical Institute, Kapchwora Technical Institute, Kaliro Technical Institute, Ogoli Technical Institute, Nalwire Technical Institute Among others.

Eastern region was affected by civil unrest and insecurity in the past. Most important insurgency factions were Uganda People's Democratic Army (UPDA), the Uganda People's Army (UPA), Alice Auma's Holy Spirit Movement (HSM), and Joseph Kony's army (which later become the Lord's Resistance Army) between 1986 -1995, which had disrupted the education system and affected the quality of education. According to a report by auditor General for the year 2021/2022 UBTEB showed that the TVET institutions in the Eastern region had recorded increased enrolment of students from 20 students per class to 50 students per class but these institutions experienced strained instructional, human and infrastructural resources. The report also noted that the increased enrolment of students resulted to deterioration and congestion of the existing facilities with 73.0% of classrooms holding more than 45 students. This state of affairs

prompted the researcher to investigate the effectiveness of competence-based training of automotive students in technical training institutes in the Eastern region of Uganda.

The investigation will encompass an analysis of practical competency performance gaps, and competency development strategies adopted in the region. Additionally, the research will explore the alignment of technical education with emerging trends in automotive technology.

1.9 Limitations of the Study:

Several limitations were acknowledged in this research as highlighted below;

- (i) Although the study concentrated on selected technical training institutions within the Eastern region, this focused approach allowed for a more in-depth exploration of the institutions included. The targeted scope enabled a thorough understanding of regional dynamics and provided valuable insights specific to the Eastern region's context.
- (ii) While participant responses may have been influenced by personal experiences and perceptions, this also ensured that the study captured genuine, real-world reflections from those directly involved in technical training. Such firsthand accounts enriched the data with diverse viewpoints and practical insights.
- (iii) By centering on the Eastern region, the study offers findings that are highly relevant to the local context. This regional focus contributes valuable baseline information that can guide future comparative studies across other regions of Uganda and East Africa, thereby enhancing understanding of regional differences in technical training.

1.10 Theoretical framework.

The Competency-Based Training (CBT) approach is rooted in educational and vocational theories that prioritize the acquisition of measurable, job-relevant skills aligned with industry and occupational standards. For this study on CBT implementation among automotive students in the Eastern Region of Uganda, two interrelated theoretical perspectives underpin the analysis: Human Capital Theory and the Systems Theory of

Vocational Education and Training (VET). These frameworks collectively provide both an economic justification for skills development and a structural understanding of how training systems operate and interact with broader socioeconomic forces.

1.10.1 Human Capital Theory

Human Capital Theory, advanced by scholars such as Becker (1964) and later supported by Schultz (1971), posits that education and training represent investments in individuals that enhance their productivity, employability, and contribution to economic growth. According to this theory, individuals and societies gain returns on educational investments through improved performance, higher earnings, and increased national competitiveness.

In the context of Competency-Based Training, this theory emphasizes the value of equipping learners with practical, market-oriented skills that directly contribute to workforce productivity. As Otoo et al. (2018) assert, education and training raise the productivity of individuals by imparting useful, applicable knowledge and competencies. Similarly, Wawire (2006) and Cilliers (2021) highlight that in developing economies such as Uganda, aligning education with labor market demands bridges the gap between training institutions and industry needs. Through this lens, CBT for automotive students aims to produce graduates who are work-ready, technically competent, and capable of contributing to national development goals.

1.10.2 Systems Theory of Vocational Education and Training.

The Systems Theory of VET, applied to vocational education by scholars such as Billett (2001), conceptualizes vocational education as a dynamic and interdependent system. This system consists of inputs (e.g., human, material, and financial resources), processes (e.g., curriculum design, instructional methods, and assessment), and outputs (e.g., competent graduates who meet labor market standards). According to Billett (2001), the effectiveness of a vocational training system depends on how well these elements align with labor market requirements. In the Ugandan context, the Systems Theory underscores the importance of coordination among stakeholders-such as training institutions, industry partners, policymakers, and funding agencies-to ensure that CBT is effectively implemented. It draws attention to the adequacy of teaching resources, the relevance of infrastructure, instructor competence, and institutional support systems as determinants of successful CBT outcomes.

While Human Capital Theory provides the economic and developmental rationale for investing in skill-based education, the Systems Theory offers a holistic analytical framework for examining how various institutional and contextual factors influence training effectiveness. Together, these theories create a comprehensive understanding of CBT implementation:

By integrating these two perspectives, the study not only justifies the adoption of CBT as a strategy for human resource development but also provides a lens to analyze the systemic factors-such as resource allocation, policy coherence, and institutional management-that shape its implementation outcomes.

In summary, the integration of Human Capital Theory and Systems Theory of VET provides a solid theoretical foundation for exploring the factors influencing Competency-Based Training in automotive education in Eastern Uganda. Human Capital Theory underscores the purpose of CBT-enhancing individual and national productivity-while Systems Theory explains the processes and structures required to achieve these outcomes effectively.

1.11 Conceptual framework

The conceptual frame work representation adopted is taxonomic model where Verbal description is done and categorizing phenomena into classes by William A. Paton and John B. Canning. In the diagram below, the Dependent Variable is "Competent automotive graduate" Which is influenced by the Independent Variable "Instructional resource, Infrastructure relevance, Human resource capacity and financial resource" The intervening variables play a role in bridging the competency performance gaps and influencing the effectiveness of training methodologies.

Figure 2: Conceptual framework. (Researcher)

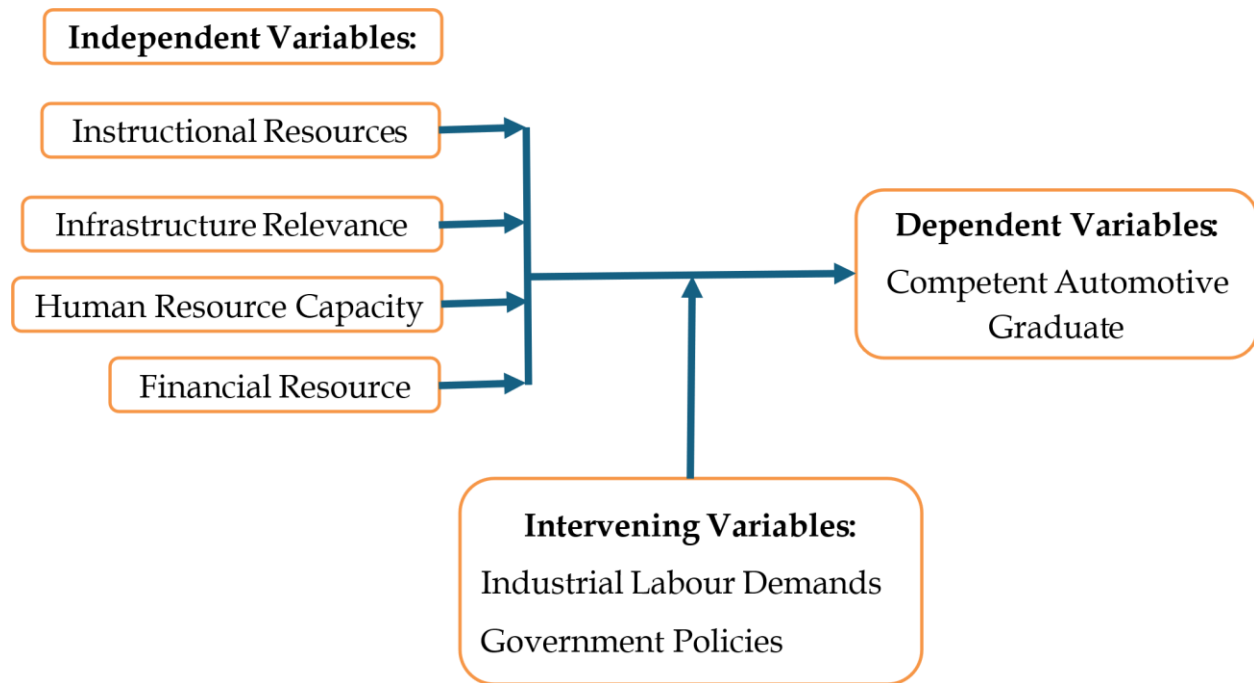


FIGURE 1: Conceptual framework. (Researcher).

Dependent Variable: Automotive Students’ Competencies

This is the main outcome variable that the study seeks to explain or predict. It refers to the specific skills, knowledge, and abilities that automotive students are expected to develop through their training. These competencies are critical for their performance in the automotive industry and reflect how well Competency-Based Training has been implemented. The success of the training is ultimately measured by the level of competencies acquired by students.

Independent Variables

These are the factors hypothesized to influence or determine the competencies of automotive students. They represent key inputs and conditions within the training environment, and they are as follows; Instructional Resources: These include all the teaching and learning materials such as textbooks, automotive tools, equipment, and technological aids that support effective learning. Adequate and up-to-date instructional resources ensure that students gain hands-on experience and practical knowledge, Infrastructure Relevance: This refers to the physical facilities available for training, such as workshops, classrooms, laboratories, and service bays. The relevance and modernity

of these infrastructures are vital in creating an environment that simulates real-world automotive work settings, thus enhancing skill acquisition and Human Resource Capacity: This encompasses the qualifications, experience, training, and overall capability of instructors and trainers. Competent trainers with industry experience and pedagogical skills can deliver effective instruction, provide mentorship, and ensure that students meet competency standards.

Intervening Variables

Intervening variables act as mediators or bridges that influence how the independent variables affect the dependent variable. They play a crucial role in addressing gaps between training inputs and outcomes by shaping the process through which competencies are developed:

Together, these variables provide a comprehensive framework for analyzing how different institutional factors affect the competency levels of automotive students in Uganda's vocational training context.

1.12 Operational definition of terms.

- (i) Automotive students: Refers to individuals who are enrolled in technical training institutions and are pursuing education and training in automotive-related programs such as automotive mechanics, engineering, and other automotive disciplines.
- (ii) Technical Training Institutions: Encompasses educational establishments that offer specialized courses and programs in the automotive field, providing theoretical knowledge and practical hands-on experience to prepare students for careers in the automotive industry.
- (iii) Practical Competency Performance Gaps: Represents the disparities between the expected level of practical competencies required in the automotive industry and the actual competencies demonstrated by automotive graduates upon completing their training.

- (iv) Technology-Enhanced Learning (TEL): Refers to the incorporation of modern technologies, such as virtual simulations, augmented reality, and e-learning platforms, in the automotive training curriculum to enhance students' learning outcomes and prepare them for the technological advancements in the automotive industry.
- (v) Technical Training Institutions: Government or privately-owned vocational and technical schools or colleges in Uganda that offer formal training programs in automotive technology and related fields.
- (vi) Student Competence: The demonstrated ability of automotive students to apply knowledge, skills, and attitudes to perform tasks and solve problems according to industry standards. Competence is assessed through practical evaluations, workplace assessments, and performance-based tasks.
- (vii) Effectiveness of CBT: The extent to which CBT achieves its intended outcomes, including skill acquisition, industry readiness, and employability of graduates. In this study, effectiveness is measured through student performance, graduate employability, and feedback from industry stakeholders.
- (viii) Instructional Resources: Teaching and learning materials used in the delivery of CBT, including tools, machinery, manuals, audio-visual aids, simulators, and ICT equipment. In this study, it refers to the availability, adequacy, and relevance of resources used in training automotive students.
- (ix) Infrastructure Relevance: The adequacy, functionality, and industry-compliance of physical facilities such as classrooms, workshops, laboratories, and service bays in training institutions. This study considers whether these facilities meet the practical training needs of automotive students.
- (x) Human Resource Capacity: The qualifications, professional experience, technical skills, and pedagogical competence of instructors involved in CBT delivery. It also includes continuous professional development and staff-to-student ratios in automotive programs.

- (xi) **Financial Adequacy:** The extent to which training institutions receive sufficient and timely financial support to implement CBT effectively. This includes funding for materials, infrastructure maintenance, staff development, and industry linkages.
- (xii) **Industry Standards:** Competence expectations set by the automotive industry in Uganda or internationally, which define what a competent worker should be able to do in real-world job settings. These standards guide the design and assessment of CBT curricula.

1.13 Summary

This research focuses on investigating the competency-based training of automotive students in technical training institutes in eastern region of Uganda and its impact on their acquisition of skill. The study aims to understand the instructional resources, Infrastructure, and Human resource employed, identify practical competency performance gaps among graduates, and explore competency development strategies to align with trends in automotive technology. The theoretical framework draws on human capital theory, emphasizing the role of education and training in enhancing productivity; social learning theory, highlighting the importance of observational learning; and technology-enhanced learning, advocating for the integration of modern technologies in education. Through this research, the study aims to contribute valuable insights into the state of technical education in the automotive sector, inform policy recommendations, and promote the development of a skilled workforce capable of driving Uganda's automotive industry forward to achieve Uganda's vision 2040 which is "A transformed Ugandan society from a peasant to a modern and prosperous country"

CHAPTER TWO: LITERATURE REVIEW.

2.0 Introduction.

The purpose of this literature review was to explore the relationship between the training employed in technical training institutes and the subsequent skills of automotive students, with a specific focus on Eastern region in Uganda. A comprehensive understanding of the existing literature was essential to discern the various training approaches applied in automotive education. By having a look into this body of knowledge, the review opened insights into how different training methods influence the knowledge acquisition, skill development, and overall Competencies of automotive students.

2.1 Influence of instructional resources on competence-based training of automotive students in Uganda.

CBT has become a core strategy for TVET reforms in Uganda, aimed at producing graduates who meet the evolving demands of the labor market. The successful implementation of CBT depends heavily on the availability, adequacy, and quality of instructional resources (SDC_Understanding-VET_Concept-Paper-1, 2008.). Instructional resources include tools, machines, learning materials, and teaching aids that facilitate practical learning and hands-on experience – critical components in automotive training.

2.1.1 Nature and Importance of Instructional Resource

Resources in CBT are tailored to develop practical, cognitive, and behavioral competencies in learners. According to Maclean and Wilson (2009), effective CBT delivery is anchored in resource-rich environments where learners can interact directly with industry-standard tools and equipment. For automotive students, resources such as engines, diagnostic tools, workshop manuals, vehicle systems, and safety gear enable the simulation of real-world work environments.

Globally, instructional resources are recognized as essential components in automotive training and technical education in general. They play a vital role in enabling hands-on,

practical learning and bridging the gap between classroom instruction and workplace requirements. The nature and importance of these resources are emphasized across various regions and policy frameworks due to rapid technological advancement in the automotive industry, which demands equally, modernized training environments. Instructional resources in automotive training include:

- (i) Technical equipment: engine models, transmission systems, suspension systems, diagnostic scanners, and computer-based training modules.
- (ii) Workshop infrastructure: vehicle lifts, hoists, welding and fabrication tools, electrical and electronic workbenches.
- (iii) Learning aids: manuals, charts, e-learning software, simulation tools, and augmented reality training systems.
- (iv) Digital tools: online diagnostics platforms and automotive-specific software systems used in modern vehicle servicing.

According to Kyobe & Rugumayo, 2005 , these resources must reflect current industry standards to ensure students acquire up-to-date skills that match labor market demands. Importance of Instructional Resources in Automotive Training is as follows.

- (i) Skill Development and Competency Acquisition: Instructional resources provide learners with opportunities to develop competencies through experiential learning. This is a central principle of Competency-Based Training (CBT), where learners are evaluated on the practical demonstration of skills rather than rote knowledge. "Skills acquisition in technical trades requires consistent exposure to industry-grade tools and resources. Without these, competency development is compromised." - ILO, 2010
- (ii) Adaptation to Technological Advancements: The automotive industry is undergoing rapid transformation due to automation, electric vehicles (EVs), and digital diagnostics. Training institutions must equip students with relevant tools to keep pace with these changes. The World Bank (2019) emphasizes that outdated tools result in graduates who are ill-prepared for modern workplaces, reducing their employability.

- (iii) **Enhancement of Teaching and Learning:** Well-equipped institutions enable trainers to demonstrate concepts practically, making learning more engaging and efficient. According to (Kyobe & Rugumayo, 2005), instructional resources enhance both the quality and efficiency of teaching, allowing trainers to implement learner-centered pedagogies.
- (iv) **Alignment with Industry Requirements:** Global automotive companies and industry bodies advocate for industry-institution linkages, where training resources match what is used in actual workshops and service centers. The German Dual Training System is often cited as a model, where students alternate between classroom instruction and real-world practice using industry-standard tools (Kyobe & Rugumayo, 2005).
- (v) **Motivation and Student Retention:** Access to functional, modern tools motivates students by giving them a sense of professionalism and job readiness. Studies in Asia and Africa have shown that well-equipped workshops significantly reduce dropout rates in automotive training programs (Kyobe & Rugumayo, 2005).

In the context of Uganda, several studies have highlighted gaps in the provision of instructional materials in TVET institutions. A study by (Herbert & Michael Etoru, 2024) reported that most public technical institutes in the country suffer from inadequate and outdated training equipment, negatively affecting the acquisition of hands-on skills. This challenge is particularly prominent in the Eastern region, where some institutions lack the financial capability to upgrade workshops or purchase relevant training tools.

2.1.2 Impact on Student Competency Development:

The absence of adequate instructional resources compromises the core principles of CBT, which emphasize learning-by-doing and performance-based assessments. According to Herbert & Michael Etoru, 2024, students trained in under-resourced environments often graduate with limited exposure to practical tasks, making them less competent and less attractive to potential employers in the automotive sector. These disconnect between

training and industry needs results in skill gaps that undermine the objective of CBT. In contrast, institutions with well-equipped workshops have reported improved student engagement, better learning outcomes, and increased confidence among trainees when handling automotive systems (Benedick & Nogas, 2024). Such findings reinforce the notion that instructional resources are not supplementary, but central to the competence development process in vocational training.

2.1.3 Instructional Resources and Trainer Effectiveness:

Instructional resources also affect how effectively instructors deliver the CBT curriculum. Instructors who lack adequate tools may rely on theoretical teaching, which contradicts the philosophy of CBT. According to Zamora & Alava, 2025.) many automotive instructors in Uganda expressed frustration over having to teach complex automotive procedures without the necessary equipment to demonstrate them.

This results in a shift from practical to theoretical instruction, diluting the value of CBT. Moreover, it reduces instructors' ability to conduct formative assessments, which are essential for tracking student progress in skill acquisition.

2.1.4 Online Educational Platforms

Online educational platforms have revolutionized the landscape of CBT in automotive engineering globally. These platforms offer flexibility, accessibility, and a wide range of resources that traditional classroom settings often lack. Learning Management Systems (LMS) like Moodle, Edmodo, and Google Classroom have become integral in delivering CBT, allowing students to progress at their own pace and according to their competency levels (Granić, 2022). The integration of multimedia resources, virtual simulations, and interactive modules enhances the learning experience, making it more engaging and effective. Studies have shown that online platforms can significantly improve the practical skills and theoretical knowledge of automotive students by providing real-time feedback and diverse learning materials (Hamilton et al., 2021).

In Africa, the adoption of online educational platforms for CBT in automotive engineering is gaining momentum, albeit with some challenges. The continent's diverse educational landscape means that while some regions have advanced digital infrastructure, others are still developing. Platforms like KREDO and SC Training have been instrumental in providing automotive training through virtual reality (VR) and micro learning modules, which are particularly beneficial in regions with limited access to physical training facilities. However, issues such as internet connectivity, digital literacy, and access to devices remain significant barriers. Despite these challenges, the potential for online platforms to democratize education and provide high-quality training to a broader audience is immense (Vassilakopoulou & Hustad, 2023).

In Uganda, the influence of online educational platforms on CBT for automotive students is still in its nascent stages. The Ugandan government and educational institutions are increasingly recognizing the importance of digital learning tools in enhancing vocational training. Initiatives to integrate platforms like Moodle and Google Classroom into the curriculum are underway, aiming to bridge the gap between theoretical knowledge and practical skills (Ssentanda, 2014). However, similar to other African countries, Uganda faces challenges related to infrastructure, such as inconsistent internet access and limited availability of digital devices. Despite these hurdles, the adoption of online educational platforms is seen as a crucial step towards improving the quality and accessibility of automotive training in the country. By leveraging the strengths of online educational platforms, Uganda can enhance the competence-based training of automotive students, ensuring they are well-equipped with the necessary skills and knowledge to thrive in the industry.

2.1.5 Educational Software:

Educational software, often referred to as "edtech," has emerged as a transformative force in the field of education, reshaping the way students learn and educators teach. With technological advancements, the use of educational software has gained momentum

globally, offering numerous advantages while presenting its own set of challenges (Allman et al., 2023).

In North America, the United States and Canada have been at the forefront of incorporating edtech in their educational systems. Virtual classrooms, interactive learning modules, and adaptive assessment tools have become integral to modern education. These technologies offer accessibility and adaptability, catering to diverse learning styles (Allman et al., 2023).

In Europe, countries like Finland and the Netherlands have embraced edtech, focusing on personalized learning and innovative pedagogical approaches. The advantages of educational software include personalized learning pathways, real-time assessment, and the ability to reach students in remote or underserved areas. Regionally, the adoption and impact of educational software vary. In Africa, including Uganda, the adoption of edtech is in its nascent stages. Challenges such as limited technological infrastructure and resource constraints affect widespread integration. Yet, initiatives by the Ugandan government and international organizations are striving to enhance digital literacy and access to educational technology (Ntorukiri et al., 2022).

In Uganda, educational software is gaining recognition as a means to expand access to quality education. The Ugandan perspective reflects a growing awareness of the potential benefits, including equitable access, interactive content, and tailored learning experiences. The challenges include limited technological infrastructure, resource constraints, and the need for teacher training to effectively incorporate edtech into the curriculum.

The integration of educational software in Uganda's education system holds promise for enhancing learning outcomes and equipping students with 21st-century skills. As the government continues to address infrastructure challenges and promote digital literacy, educational software is set to play a pivotal role in shaping the future of education in the country.

2.1.5 Educational Videos:

Educational videos have become a cornerstone in the realm of competence-based training (CBT) for automotive students worldwide. These videos provide visual and auditory learning experiences that can significantly enhance understanding and retention of complex automotive concepts. Platforms like YouTube, Coursera, and Khan Academy offer a plethora of educational videos that cover a wide range of automotive topics, from basic engine mechanics to advanced diagnostic techniques¹. The use of videos allows for the demonstration of practical skills and procedures, which is crucial in automotive training. Research indicates that students who utilize educational videos as part of their learning process tend to perform better in practical assessments and have a deeper understanding of theoretical concepts.

Regionally, the adoption and impact of educational videos can vary. In Europe, countries like the United Kingdom and Finland have incorporated educational videos into their educational practices, promoting student-centered learning and multimedia resources. Educational videos have the potential to enhance self-directed learning and provide students with a wealth of content (Carmichael et al., 2020.).

In Africa, including Uganda, the adoption of educational videos is on the rise, although challenges such as limited internet access, resource constraints, and infrastructure gaps affect their widespread integration. Nonetheless, the Ugandan government, in collaboration with international organizations and NGOs, is actively working to improve technology access in education (Carmichael et al., 2020.).

In Uganda, educational videos are gaining recognition as a dynamic tool to supplement traditional classroom teaching. The Ugandan perspective reflects a growing awareness of the potential benefits of educational videos, especially in regions with limited access to quality education. As initiatives to bridge the digital divide and promote digital literacy continue, educational videos are poised to play a pivotal role in shaping the future of education in Uganda (Namubiru Ssentamu et al., 2020).

By embracing educational videos, Uganda can enhance the effectiveness of competence-based training for automotive students, providing them with the tools they need to succeed in a rapidly evolving industry.

2.1.6 Library Resources:

Libraries provide access to a vast collection of books, journals, and multimedia materials that support research and learning across various subjects.

Students and educators can access both physical and digital resources through libraries.

In the global context, libraries serve as sanctuaries of knowledge and learning.

In North America, the United States and Canada boast a rich tapestry of libraries, from public and school libraries to renowned university libraries. These libraries house a vast array of books, research materials, and digital resources. They offer students and researchers the advantage of extensive collections, quiet study spaces, and expert librarians to guide their exploration of knowledge (Bouaamri, 2023; Salubi, 2023).

Regionally, the role of library resources may vary. In Europe, countries like the United Kingdom and Finland are known for their strong emphasis on library-based learning. European libraries provide an eclectic mix of educational resources, supporting research, and fostering a culture of intellectual inquiry.

In Africa the regional perspective on library resources reflects a growing awareness of their importance. Challenges such as limited funding, the availability of up-to-date materials, and the need to expand access to quality library resources in underserved regions are focal points of concern. The Ugandan government, in partnership with international organizations and NGOs, is working to address these issues, improving library infrastructure and access to resources (Salubi, 2023).

In Uganda, library resources are regarded as vital tools for education and research. The Ugandan perspective underscores the significance of libraries, both in urban and rural areas, as places where students, educators, and researchers can access a wide array of educational materials. As efforts to enhance library infrastructure and access continue, these resources remain invaluable tools in the quest for knowledge (Andema et al., 2013).

Instructional resources play a pivotal role in the success of competency-based training, particularly in highly technical fields such as automotive engineering. In the Eastern region of Uganda, limited access to adequate and relevant training tools continues to hinder the development of student competencies, reduce instructor effectiveness, and impair the overall quality of CBT delivery. To bridge the gap between training and labor market expectations, there is a critical need for investment in instructional infrastructure, capacity building, and equitable resource allocation across TVET institutions.

2.2. Infrastructure relevance on competence-based training of automotive students in Uganda.

State-of-the-art training facilities offer students hands-on experience with the latest automotive technologies. A study by (Okello, 2011) found that students who had access to modern, well-equipped labs and workshops demonstrated higher levels of engagement and skill acquisition compared to those in outdated environments. Quality facilities provide students with realistic learning experiences that mirror real-world scenarios, enhancing their problem-solving skills and adaptability.

Globally, the effectiveness of Competency-Based Training (CBT) is strongly tied to the availability and quality of infrastructure in training institutions. Infrastructure encompasses workshops, laboratories, tools, equipment, learning spaces, and digital technologies necessary for skills acquisition (ILO, 2017). According to Grollmann and Rauner (2016), modern and well-equipped training environments are critical for facilitating experiential learning and simulating real-world work environments. Countries such as Germany and Australia have demonstrated the importance of advanced infrastructure in delivering high-quality vocational education, particularly in technical fields like automotive mechanics. These countries integrate dual training systems where institutional learning is complemented by on-the-job training in industry-standard settings, reinforcing the role of relevant infrastructure in achieving competence. Moreover, the (Garuzooka et al., n.d.) emphasizes the increasing importance of digital infrastructure in CBT delivery, especially with the advent of smart automotive

technologies and electric vehicles. The integration of simulation tools, diagnostic software, and computerized automotive systems into training curricula requires institutions to continually invest in up-to-date infrastructure to ensure learners gain relevant, market-driven competencies.

In Africa, the implementation of CBT has gained momentum, but many countries still struggle with inadequate infrastructure, which hampers the effectiveness of training programs. The African Union (2015) acknowledges that the lack of appropriate facilities and tools in many TVET institutions remains a critical barrier to skill development. For instance, in Nigeria and Ghana, studies have shown that outdated equipment and overcrowded workshops negatively impact student competence and motivation (Faul & Savage, 2023)

According to (Abdisa & Hawitibo, 2021)., the success of CBT in Africa depends largely on contextualized infrastructure development, including partnerships with industry to equip institutions with modern tools and to facilitate industrial attachments. The World Bank notes that while some countries have initiated infrastructure improvement projects through donor funding and public-private partnerships, progress is often uneven and hampered by poor maintenance, lack of funding, and limited technical support.

In the East African region, countries such as Kenya, Tanzania, and Rwanda are also pursuing CBT reforms in TVET, but infrastructure gaps remain a significant challenge. Kenya, for example, through its Ministry of Education and the Kenya National Qualifications Authority (KNQA), has acknowledged that many TVET institutions are ill-equipped to deliver practical training that meets industry standards (Bank, 2023). Similarly, research by (Samuel et al., 2024) highlighted that despite adopting CBT, the lack of relevant infrastructure such as functional workshops, training vehicles, and diagnostic tools hinders effective learning outcomes in automotive programs.

Rwanda, on the other hand, has made notable progress through strategic investments in model TVET centers with industry-grade facilities, demonstrating the positive correlation between infrastructure development and successful CBT implementation.

These examples underline the need for Uganda to prioritize infrastructure development in its own CBT implementation strategy.

In Uganda, the relevance of infrastructure in CBT delivery, particularly in automotive training, is increasingly being recognized. However, many technical institutes continue to operate with insufficient and outdated facilities, limiting their ability to provide practical, industry-aligned training (Peter et al., 2022). The Uganda Business and Technical Examinations Board (UBTEB) and the Directorate of Industrial Training (DIT) have both emphasized the need to strengthen institutional capacity through improved infrastructure to enhance skills development (Yiga, d.). While some donor-supported projects have attempted to bridge this gap, there remains a substantial mismatch between training infrastructure and the competency requirements of the automotive industry in Uganda (Samuel et al., 2024). Investments in infrastructure, such as upgrading workshops, providing access to diagnostic equipment, and establishing partnerships with industry players, can greatly contribute to bridging this gap and ensuring that automotive students are adequately prepared for the workforce (Abdisa & Hawitibo, 2021). Globally and locally, infrastructure is recognized as a cornerstone for successful implementation of CBT, particularly in automotive training. In countries with advanced TVET systems, infrastructure development has gone hand-in-hand with curriculum reform and industry collaboration (TVET CENTRES OF EXCELLENCE FOR RWANDA, n.d.). However, in Uganda, inadequate and irrelevant infrastructure continues to hinder the full realization of CBT objectives. To improve the competence of automotive graduates, Uganda must prioritize the upgrading of training infrastructure – particularly in under-resourced regions – to align with current industry standards.

2.3. Influence of human resource capacity on competency-based training of automotive students in Uganda.

Human resource encompasses a range of factors that influence the quality of education and student learning outcomes. These factors include the expertise of instructors, mentorship programs, industry interactions, and the overall support system within educational institutions.

Human resource capacity is a critical determinant in the effective implementation of CBT, particularly in technical fields such as automotive mechanics. Globally, successful CBT systems rely on well-trained instructors who possess both pedagogical skills and up-to-date industry knowledge. Countries with mature TVET systems, such as Germany, Australia, and Canada, emphasize continuous professional development (CPD), industry attachments, and dual qualifications for trainers to align teaching with current labor market demands. According to (Kisige & Neema-Abooki, 2017a), CBT requires a shift from traditional teaching to facilitation, mentoring, and performance-based assessment. Trainers must be competent not only in technical content but also in delivering learner-centered instruction and conducting valid, criterion-referenced assessments. The International Labor Organization also highlights that without skilled and adequately supported trainers, even the best-designed CBT curricula fail to achieve desired outcomes. Qualified instructors with industry experience are essential for delivering high-quality automotive education and fostering practical skill development (De Blick et al., 2024). One measurable aspect of human resource capacity is the trainee-to-trainer (or student-instructor) ratio. The lower the number of trainees per trainer, the more attention each trainee can receive, particularly important in hands-on, workshop-based training like automotive programs. A global indicator “Trainee-Trainer Ratio” is defined as the average number of VET trainees per trainer

Across Africa, human resource constraints remain a major challenge to effective CBT implementation. Many TVET institutions are staffed by instructors who lack exposure to industry practices or training in CBT methodology. Studies from Nigeria and Ghana have shown that the shortage of qualified trainers, coupled with limited opportunities for professional development, significantly undermines the quality of skills training Beniga, 2022 notes that while many African countries have adopted CBT policies, their implementation has been inconsistent due to a lack of trained human capital. The transition from content-based to outcome-based education requires a paradigm shift that many educators have not been prepared for. Additionally, weak linkages between TVET institutions and industry partners make it difficult for trainers to keep pace with

emerging technologies and workplace practices, especially in dynamic sectors like automotive engineering.

In East Africa, the influence of human resource capacity on CBT outcomes is increasingly evident. Kenya, Rwanda, and Tanzania have invested in TVET reforms, but challenges related to human capital persist. For instance, in Kenya, the Ministry of Education acknowledged that many TVET trainers lacked certification in CBT delivery and assessment when the curriculum shift begins. A study by (Shukurani et al., n.d.-a) found that most automotive trainers in Kenya had limited exposure to industrial attachments or in-service training, which limited their ability to teach modern vehicle systems.

Similarly, in Rwanda the research reported that TVET instructors were inadequately prepared for CBT implementation due to limited training in instructional design, digital literacy, and assessment procedures. Rwanda has made some progress through targeted professional development programs and partnerships with industry, but scaling these efforts across all institutions remains a challenge (Kisige & Neema-Abooki, 2017a). These trends suggest that human resource capacity is a shared bottleneck in the region's push for competency-based automotive training.

In Uganda, the human resource capacity for automotive education faces significant challenges, including a shortage of qualified instructors and limited opportunities for professional development. Many technical training institutions struggle to attract industry-experienced educators due to low salaries and limited career advancement prospects (Wellbrock et al., 2020). As a result, students may receive inadequate instruction and mentorship, impacting their skill acquisition and employability. To address this issue, efforts to improve instructor recruitment, provide on-going training and support, and enhance collaboration between educational institutions and industry partners are essential. By investing in the development of automotive instructors, Uganda can improve the quality of automotive education and better prepare students for success in the automotive industry.

The educational quality and expertise of instructors significantly influence the skill acquisition process among automotive students globally. Instructors with advanced

degrees, specialized training, and industry experience are better equipped to deliver high-quality education and effectively transfer practical skills to students (Mehrtash Moeinand Centea, 2020), instructors who engage in continuous professional development and stay abreast of advancements in automotive technology can provide students with relevant and up-to-date training. However, challenges such as faculty shortages, inadequate training opportunities, and limited resources may hinder the educational quality and expertise of instructors in some regions.

In the Eastern African region, the educational quality and expertise of automotive instructors vary across technical training institutions. While some institutions boast highly qualified educators with extensive industry backgrounds, others may struggle to attract and retain skilled instructors. This variance in instructor expertise affects the consistency and effectiveness of automotive education programs, impacting student learning outcomes and employability. Additionally, disparities in access to training resources and professional development opportunities further contribute to differences in instructor expertise across the region (De Blick et al., 2024).

In Uganda, the educational quality and expertise of automotive instructors face notable challenges, including faculty shortages, limited training resources, and inadequate professional development opportunities (Kisige & Neema-Abooki, 2017b). Many instructors may lack formal qualifications or industry experience, impacting their ability to deliver comprehensive automotive education. Additionally, the lack of standardized instructor certification processes and professional development initiatives further compounds these challenges. Improving the educational quality and expertise of automotive instructors in Uganda requires targeted interventions, including enhanced recruitment strategies, increased training resources, and structured professional development programs.

From a global to a Ugandan perspective, the literature underscores that human resource capacity is a foundational pillar for effective competency-based training, particularly in technical disciplines such as automotive studies. Despite various efforts and reforms, Uganda continues to grapple with the challenge of building a robust instructor workforce

capable of delivering CBET effectively. Addressing gaps in qualifications, ongoing professional development, industry linkage, and motivation of trainers is crucial to realizing the goals of competency-based training for automotive students in Uganda.

2.4. Influence of financial resources on competence-based training of automotive students in Uganda.

The pursuit of education, particularly in specialized fields like automotive technology, demands a significant investment of time, effort, and financial resources. As students endeavor to acquire essential skills and knowledge, financial constraints can emerge as a significant obstacle.

Globally, financial investment is recognized as a foundational pillar in the effective implementation of Competence-Based Training (CBT), particularly in technical and vocational education. According to the International Labor Organization and UNESCO, CBT requires substantial financial input to ensure institutions are equipped with industry-relevant tools, updated infrastructure, qualified instructors, and continuous learning materials. In fields like automotive training, this investment becomes more critical due to the rapid evolution of vehicle technologies, such as electric mobility, automated diagnostics, and hybrid systems (Patrick et al., 2025).

Countries with successful CBT models – such as Germany, Australia, and South Korea – have achieved this largely due to strong public funding, effective public-private partnerships, and deliberate investments in TVET infrastructure. For example, in Germany’s dual training system, both government and industry share the financial responsibility for training, ensuring that learners receive practical experience using modern tools. Shukurani et al., 2020) further emphasizes that countries investing consistently in TVET see better returns in terms of graduate employability, industrial innovation, and sustainable workforce development. Financial constraints exert a profound influence on the learning environment within automotive education globally. In Eastern Africa, financial constraints significantly impact the learning environment in automotive education. Technical training institutions in the region grapple with

inadequate infrastructure, including outdated workshops, laboratories, and libraries, due to limited funding (Shukurani et al., n.d.-b 2020). Insufficient financial resources also restrict the implementation of modern teaching methods and innovative pedagogical approaches, constraining students' exposure to practical learning experiences. Moreover, budgetary limitations may impede institutions' efforts to address socio-economic disparities among students, exacerbating inequalities in access to educational resources and support services (Shukurani et al., n.d.-b 2020).

In Uganda, the implementation of CBT under the *Skilling Uganda* strategy has been constrained by limited and inconsistent financial resources. The Ministry of Education and Sports identifies inadequate funding as a critical barrier to improving TVET infrastructure, acquiring modern training tools, and supporting instructor training. Automotive training programs are especially affected due to the high costs of procuring vehicles, engines, diagnostic tools, and consumables for hands-on learning.

According to the Uganda Business and Technical Examinations Board, many institutions operate under budget constraints that force them to limit the number and quality of practical sessions offered. The Directorate of Industrial Training also notes that while there is strong demand for CBT-certified graduates, most institutions lack the financial capacity to sustain high-quality, industry-aligned training (Kisige & Neema-Abooki, 2017c).

Donor-funded programs, such as those supported by the World Bank and the Belgian Development Agency (Enable), have made positive contributions to specific centers of excellence. However, their reach is limited, and many rural and pre-urban institutions remain under-resourced. To ensure the effectiveness and sustainability of CBT in Uganda's automotive sector, there is a pressing need for increased public investment, targeted subsidies, and private sector engagement in co-financing training programs. (Abdisa & Hawitibo, 2021).

2.5. Conclusion

In conclusion, the literature review highlights the importance of competence-based training of automotive students in technical institutions and its significant impact on their subsequent skills in Uganda. The reviewed studies consistently emphasize the importance of providing comprehensive and practical training to students to enhance their skills and knowledge, ultimately leading to better Competencies.

However, despite the wealth of existing literature on this topic, there are notable gaps that need to be addressed.

Firstly, many of the reviewed studies have focused on developed countries, and there is a scarcity of research specifically tailored to the Ugandan context.

Secondly, Limited Access to TVET programs: These programs may not be readily accessible to all students, especially those in rural areas, due to insufficient infrastructure and resources.

Thirdly, Poor Quality of Training: Some TVET institutions lack adequately trained instructors, modern equipment, and facilities, impacting the quality of training.

Fourthly, Relevance of Curriculum: The curriculum of TVET programs, including automotive training, does not always align with industry needs and technological advancements, leading to a skills gap among graduates.

Fifthly, Perception and Stigma: TVET education is sometimes perceived as inferior to academic education, leading to a stigma against vocational careers and a preference for white-collar jobs.

In summary, the existing literature provides valuable insights into the relationship between automotive student training and their competencies. The unique challenges and gaps in the TVET programs faced by automotive students in Uganda have not been fully addressed in these studies, warranting further investigation into the local context to better prepare automotive students for successful careers in Uganda's automotive industry.

CHAPTER THREE: METHODOLOGY

3.0 Introduction:

This section outlines the research methodology employed to investigate the competency-based training and skill acquisition of automotive students in technical training institutions and its correlation with their competencies in Uganda, with a specific focus on the Eastern region. The methodology provides a detailed plan for data collection, analysis, and ethical considerations to achieve the research objectives.

3.1 Philosophical Research Paradigm:

The research adopted a pragmatic philosophical paradigm, recognizing the value of combining both quantitative and qualitative approaches. This paradigm allowed for a comprehensive understanding of the research topic, combining numerical data from questionnaires with qualitative insights from interviews and observations.

3.2 Research Design:

A mixed-methods research design was used to gather a holistic view of the training of automotive students and their Competencies. This design combined both quantitative and qualitative data collection techniques to provide a well-rounded analysis of the subject.

3.3 Quantitative Component:

A structured survey was administered to a sample of automotive students in technical training institutes across the Eastern region. The survey included closed-ended questions to gather quantitative data on the types of training experienced by students, perceived effectiveness, and self-reported measures of Competencies attained. The quantitative component aims to quantify trends, patterns, and correlations within the data.

3.4 Qualitative Component:

In-depth interviews and focus group discussions were conducted with automotive students, instructors, and Administrators to gain deeper insights into the qualitative

aspects of training experiences and work performance. Open-ended questions explored perceptions, challenges, and success stories related to training methods and their impact on students' abilities in a practical work setting.

The methods that were used for obtaining qualitative data include;

3.4.1 Interviews

A diverse range of participants were selected including instructors, students, and administrative staff from each technical training institute.

A set of open-ended questions were used to guide the interview while allowing participants to express their thoughts freely.

3.4.2 Focused Groups Discussion

Organized groups of participants with similar roles were used (e.g., a group of students and a group of instructors). Discussions were guided encouraging all participants to share their views.

3.4.3 Observations

Specific training sessions, workshops, or classroom activities were observed.

A checklist or guide was used to focus observations on relevant aspects, (such as:

Student engagement and participation, Interaction between instructors and students, Use of training materials and equipment, Practical skills application)

Observations were conducted and detailed notes were taken. Use of a non-intrusive approach was applied to avoid influencing the natural behavior of participants.

3.5 Document Analysis

Relevant Documents were identified by gathering curricula, training materials, policy documents, institutional reports, and student assessments.

A Review Guide was developed to systematically review and extract relevant information from the documents.

Examining the documents was done for content related to training effectiveness, curriculum relevance, industry collaboration, and identified challenges.

3.6 Study Area

The study was conducted in the Eastern region, Uganda. Eastern region contains 37 districts. This region was selected due to its significance in the automotive industry within Uganda and its diverse technical training institutions offering automotive-related programs. The following TVET institutions were selected in the eastern region.

- (i) Jinja vocational Training Institute. GPS Coordinates 0.4342° N, 33.2181° E with the population of 515 students in various disciplines. It has 31 qualified and full-time instructors and 24 support staff.
- (ii) Kakira community Technical Institute. GPS Coordinates 0.48043,33,27442 with the population of 289 students in various disciplines. It has 26 qualified and full-time instructors and 19 support staff members.
- (iii) Butaleja Technical Institute GPS Coordinates 0.9077° N, 33.9523° E with the population of 314 students in various disciplines. It has 16 qualified and full time Instructors and 23 support staff headed by a qualified experienced Principal.
- (iv) Iganga Technical Institute. GPS Coordinates 0.5999° N, 33.4606° E with the population of 617 students in various disciplines. It has 30 qualified and full time Instructors and 20 support staff headed by a qualified experienced Principal.
- (v) Nalwire Technical institute; GPS Coordinates Latitude. 0.31865° or 0° 19' 7" north with the population of 370 students in various disciplines. It has 15 qualified and full time Instructors and 21 support staff headed by a qualified experienced Principal.
- (vi) Kasodo Technical Institute. GPS Coordinates Latitude. 1.16211° or 1° 9' 44" north; Longitude. 33.68568° or 33° with the population of 360 students in various disciplines. It has 35 qualified and full time Instructors and 13 support staff headed by a qualified experienced Principal.

- (vii) St Kizito's Technical Institute Madera. GPS Coordinates 045 4461294 with the population of 430 students in various disciplines. It has 35 qualified and full time Instructors and 22 support staff headed by a qualified experienced Principal.
- (viii) Ogolai Technical Institute GPS Coordinate address 2JJV+334, Amurai with the population of 310 students in various disciplines. It has 28 qualified and full time Instructors and 12 support staff headed by a qualified experienced Principal.
- (ix) Tororo Technical Institute GPS Coordinates 0.6959° N, 34.2594° E with the population of 380 students in various disciplines. It has 32 qualified and full time Instructors and 15 support staff headed by a qualified experienced Principal.
- (x) Nkoko Memorial technical institute Kityerera B, Mayuge: Longitude. 33.53314° or 33° 31' 59" east. Open Location Code. 6GGM9G3M+97 with the population of 320 students in various disciplines. It has 14 qualified and full time Instructors and 11 support staff headed by a qualified experienced Principal.



FIGURE 2: Map of the Eastern Region of Uganda Showing the Districts and the Selected TVET Institutes (indicated in blue).

3.7 Sampling Procedure:

A combination of purposive and stratified random sampling techniques was employed. Purposive sampling was used to select specific technical training institutions known for their automotive programs. Stratified random sampling was used to select a representative sample of automotive students, Instructors and Administrators from these institutions. Purposive Sampling was used because it allows for the intentional selection of technical training institutions known for their automotive programs. This ensures that the research focuses on institutions with established expertise in automotive training, thereby making the findings more relevant to addressing competence-based training concerns.

Stratified Random Sampling was chosen to ensure a balanced and representative selection of respondents—automotive students, instructors, and administrators. By dividing the population into distinct subgroups (strata) and randomly selecting participants from each, the study maintains fairness and accuracy, reflecting diverse perspectives across different roles in the training ecosystem.

3.7 Participant Selection

Participants were being selected based on the following criteria:

Institutional Affiliation: Participants must be affiliated with a recognized technical training institute offering automotive training programs in the Eastern Region of Uganda. This includes both public and private institution

Willingness to Participate: Participants must be willing to provide informed consent to participate in the study and be available for interviews or focus group discussions.

3.8 Institutional Selection

Institutions are selected based on the following criteria:

Accreditation and Recognition: Institutions must be accredited by relevant Ugandan education authorities and recognized for providing automotive training programs.

Program Offering: Institutions must offer competency-based automotive training programs that include both theoretical and practical components.

Geographical Location: Institutions must be located within the Eastern Region of Uganda to ensure the study focuses on the specific regional context.

3.9 Sample Size:

The sample size was determined based on principles of saturation in qualitative data collection and appropriate sample size calculation for quantitative data. It was designed to ensure sufficient representation from each category of respondents.

The sample size was determined from the expression;

$$n = \frac{z^2 \times p(1 - p)}{E^2} \dots \dots \dots i$$

Where:

n = required sample size

Z = Z – score corresponding to the desired confidence level (e. g., for a 95% confidence level, Z would be approximately 1.96)

p = estimated proportion of the population (0.5 is used for maximum variability, yielding the largest sample size)

E = desired margin of error, let $E = 5\%$

$$\begin{aligned}n &= \frac{1.96^2 * 0.5(1 - 0.5)}{0.05^2} \\ &= 384.16 \\ n &= 384\end{aligned}$$

Table 1: Estimated Sample Size

s/n	Participants	Expected number
1	Number of students	324
2	Number of instructors	40
3	Number of administrators	20
	Total	384

3.10. The Study Variables:

The main variables in this research include instructional Resources, infrastructural relevancy, human capacity, financial relevancy and automotive students' competencies. The intervening variables are government policies and industrial labor demand.

3.11 Data Collection Instruments:

Multiple data collection instruments were used, including:

3.11.1 Questionnaire:

Structured questionnaires were developed to gather quantitative data from automotive graduates, industry professionals, and employers.

Focus Group Discussions were conducted with a total of 120 students, comprising 12 participants from each institute, to obtain qualitative insights. Each session lasted

approximately one hour, allowing adequate time for comprehensive interaction and participation among all respondents.

3.11.2 Interview Schedule:

Semi-structured interviews were conducted with a subset of participants to obtain qualitative insights.

3.11.3 Observation Checklist:

Observations were made during practical training sessions to supplement data from other sources.

3.12 Validity and Reliability of the Instruments:

3.12.1 Validity

To ensure the validity of the research instruments, the questionnaire and interview schedule were subjected to expert review by supervisors and lecturers from the Department of Technology Education at the University of Eldoret. Additional validation and ethical clearance were obtained from the Gulu University Research Ethics Committee (GUREC) and the Uganda National Council for Science and Technology (UNCST). These reviews were aimed at ensuring the accuracy, consistency, and credibility of the data collection instruments.

In addition, the selection of participants was designed to capture diverse perspectives within the technical training institutions. The sample comprised instructors and trainers with different years of experience in teaching automotive courses, administrative staff responsible for overseeing technical training programs, current students enrolled in automotive training programs, as well as students who had completed at least one practical training module or internship to provide informed feedback on the practical aspects of their education.

3.12.2 Reliability

Reliability of the research instrument was established through a pilot study conducted at Ntinda Vocational Training Institute. The institute was selected because it possesses highly qualified faculty members who deliver hands-on and engaging competency-based training using modern, state-of-the-art facilities and equipment. The internal consistency of the instrument was evaluated using Cronbach's alpha coefficient, with values above 0.70 indicating an acceptable level of reliability for the research tool.

3.13 Data collection procedure

Permission to conduct the study was obtained from the Uganda National Council for Science and Technology (UNCST) and the Permanent Secretary of the Education Service Commission. Subsequently, the researcher sought approval from the District Education Officers and the principals of the selected technical institutes to carry out the research in the Eastern region of Uganda. Ten technical training institutions offering Automotive Engineering programs were purposively selected for the study.

The researcher personally visited the selected institutions to engage with respondents, obtain informed consent, and ensure adherence to ethical research standards. Data was collected from principals, heads of departments, instructors, and trainees through the administration of questionnaires, conducting interviews, and facilitation of focus group discussions.

3.14 Data analysis:

To analyze both qualitative and quantitative data for the research on competence-based training of automotive students in Eastern Uganda, a comprehensive approach was employed using Minitab software 2022. Quantitative data was collected through questionnaires and interviews to measure various competencies. This data was entered into Minitab, where it underwent cleaning a process to remove any inconsistencies or errors. Descriptive statistics such as mean, median, standard deviation, and range were calculated to summarize the data. Inferential statistics, including hypothesis testing, t-

tests and regression analysis, were conducted to determine significant differences between groups and identify relationships between variables. Additionally, graphs and charts (histograms, box plots, scatter plots) were created to visually represent the data and identify trends.

Qualitative data was gathered through interviews, focus groups, and questionnaires. Using Minitab, the qualitative data was organized and coded to identify recurring themes and patterns through thematic analysis. Content analysis was performed to quantify the presence of certain words, themes, or concepts within the qualitative data. To ensure reliability and validity, qualitative findings were cross-verified with quantitative data through triangulation.

To integrate both qualitative and quantitative data, the datasets were imported into Minitab and merged based on common identifiers. Mixed methods analysis was conducted to explore how qualitative insights explain quantitative results. Joint displays, such as matrices and graphs, were used to present integrated findings. The integrated data was interpreted to provide a comprehensive understanding of the competencies of automotive students, highlighting how qualitative themes support or contrast with quantitative findings. Finally, the integrated results were presented in a cohesive manner, using visual aids and narrative descriptions to convey the findings effectively.

3.15 Ethical considerations:

Ethical considerations for this study prioritized the well-being and rights of participants, adhering to the guidelines set forth in the UNCST Handbook (2014) on conducting research among human subjects. The study was guided by the four principles of research ethics: respect for persons, beneficence, justice, and respect for communities.

- (i) In respect for persons: Informed consent was obtained from all participants, ensuring they are fully aware of the study's purpose, procedures, potential risks, and benefits. Participants were informed of their right to withdraw from the study at any point without facing any adverse consequences.

- (ii) For Beneficence. The study was designed to maximize benefits and minimize any potential harm to participants. Confidentiality and anonymity were rigorously maintained to protect the identity of participants. Data was securely stored and only accessible to authorized personnel.
- (iii) Additional in Justice. The selection of participants was fair and equitable, ensuring that no group is unduly burdened or excluded from the potential benefits of the research. Efforts were made to include diverse participants to ensure the findings are representative and applicable to the broader population.
- (iv) Finally, in respect for communities, particular attention was paid to the cultural and contextual sensitivities of the participants in the Eastern region of Uganda. The research process was respectful, inclusive, and aligned with local norms and values. Community engagement will be a key component, ensuring that the research is conducted in a manner that is beneficial and respectful to the local community.

The study obtained ethical approval from the GUREC. Additionally, a letter of introduction was obtained from the University of Eldoret. To conduct the study, authority was sought from the following officials and institutions. The permanent secretary Ministry of Education and Sports. The Chief Administrative Officer (CAO), The District Education Officer of the specific districts, The City Clerk, The Principal Education Officer of the specific Cities and The Principals of the Technical Institutes.

By adhering to these ethical guidelines and obtaining the necessary approvals, the study aimed to ensure the highest standards of ethical conduct and respect for all participants involved.

3.16 Dissemination plan.

The primary avenue for disseminating the research findings was through academic publications and conferences

To influence policy and practice, the research findings were summarized in policy briefs and technical reports. These documents were shared with relevant government bodies, including the Ministry of Education and Sports in Uganda, and educational institutions involved in vocational training. Workshops and seminars were organized to present the findings to policymakers, educational administrators, and instructors, providing a platform for dialogue and feedback.

To reach a broader audience, the research findings were disseminated through digital platforms and media. A dedicated website was created to host the research reports, info graphics, and videos summarizing the key findings. A social media channel, such as Facebook and LinkedIn, was used to share updates and engage with a wider audience.

3.17 Data quality control.

To maintain the integrity of data collection, standardized procedures were strictly followed. This included the use of validated instruments for questioners and interviews, ensuring consistency in data gathering. Training sessions were conducted for all research assistants to familiarize them with the data collection tools and protocols, minimizing the risk of errors and biases.

A stratified random sampling method was employed to ensure a representative sample of the population. This approach helped in capturing diverse perspectives and experiences, thereby enhancing the generalization of the findings. Clear inclusion and exclusion criteria were established to guide the selection of participants.

Robust data management practices were implemented to ensure the security and confidentiality of the data. This included secure storage of data, regular backups, and restricted access to authorized personnel only. Data was anonymized to protect the identity of participants.

The data analysis process had involved multiple stages of validation to ensure accuracy. These included cross-checking data entries, using statistical software for analysis, and conducting peer reviews of the findings. Any discrepancies or anomalies identified during the analysis was thoroughly investigated and resolved.

3.18 Summary:

The methodology outlined in this section provided a comprehensive plan for investigating the training of automotive students in technical training institutions and their competencies in Uganda, specifically in the Eastern region. By combining both quantitative and qualitative data collection methods, the research aimed to gain a deep understanding of the subject matter, ultimately contributing valuable insights to inform policy recommendations and promote the development of a skilled automotive workforce in Uganda.

Table 2: Methodology Table

S/N	Objectives	Technique to be used	Methodology process	Sample size
i)	To determine the influence of instructional resources on competence-based training of Automotive students in Uganda	Questionnaires. Focused group discussions. Interviews	Selected a random sample of Automotive students. Administered questionnaires and focused group discussions.	30 students to respond to questionnaires and 12 students for a (FGDs) in each of the selected ten institutions.
ii)	To evaluate infrastructure relevance on competence-based training of Automotive	Questionnaires	Administered questionnaires, interviews and Conducted on-site observations of classroom/work shop infrastructure.	Four (4) instructors and two (2) administrators from the ten selected TVET institutions

	students in Uganda.	Interviews	Interviewed instructors to gather insights on infrastructure relevance.	Four instructors in each of the selected five institutions
iii)	To establish the influence of human resource capacity on competence-based training of Automotive students in Uganda.	Interviews Questionnaires.	Interview transcripts and survey responses. Conducted in-depth interviews with instructors.	Four instructors and two administrators from each institution
		Document Analysis	Analyzed documented instructor qualifications.	From the selected TVET institutions.
iv)	To assess the financial adequacy on competence-based training of Automotive students in Uganda.	Questionnaires. Interviews	Analyzed financial records using financial ratio analysis. Interviewed institution representatives to gain insights	Two administrators from each of the selected ten institutions.

CHAPTER FOUR: RESULTS, ANALYSIS AND DISCUSSION

4.1. Introduction

This chapter presents the analysis of research through document analysis, in-depth interview guides, focused group discussions and questionnaires for administrators, Instructors and automotive students. The study purposed to investigate the effectiveness of competency-based training of automotive students in technical training institutes in the eastern region of Uganda. The presentation of findings in this chapter is through quantitative and qualitative forms. Quantitative analysis involved use of frequencies, percentages, and means. Qualitative data analysis is presented using descriptive words, categories, or themes, displayed visually through bar graphs, pie charts, tables where each category was labelled and its frequency or proportion is clearly shown.

4.2. Demographic data.

Based on the total number of students and staff available across the selected technical institutions, a total of three hundred forty-one (341) participants were realized. Of these, two hundred eighty-eight (288) were students, forty (40) were instructors, and thirteen (13) were administrators, constituting the expected study population. The obtained sample of 341 exceeds this expected total by 43 respondents.

Table 3: Details of the demographic data

Category	Variable	Response	Total Respondents
Students	Age	Below 20	4
		20-25	252
		26-30	2
		Above 30	0
	Gender	Male	286
		Female	2

	Level of Education	Certificate	288
		Diploma	0
		Bachelor's Degree	0
Instructors			40
	Age	Below 25	0
		25-35	20
		35-45	5
		Above 45	13
	Gender	Male	40
		Female	0
Administrators			13
	Position	Principal/Head	0
		Head of Department	10
		Academic Coordinator	2
		Others	1
	Gender	Male	13
		Female	0

4.2.1. Students' Responses:

Total Respondents: 288 students participated, representing 88.9% of the expected 324 students ($288/324 \times 100$).

Age Distribution: The majority of students (252, 87.5%) were aged 20-25 years, with a small number (4, 1.4%) below 20 years and even fewer (2, 0.7%) aged 26-30 years. No students (0%) were above 30 years, indicating a predominantly young student population typical of technical training programs.

Gender: The student group was overwhelmingly male, with 286 (99.3%) male respondents and only 2 (0.7%) female respondents, reflecting a significant gender imbalance in automotive training programs in the region.

Level of Education: All 288 students (100%) were enrolled in certificate-level programs, with no respondents (0%) at the diploma or bachelor’s degree level, consistent with the entry-level nature of these technical institutes.

4.3. Objective 1: Influence of instructional resources on competence-based training of automotive students in Uganda.

4.3.1. Data from questionnaires

Table 4: Showing Data obtained from questionnaires

Respondent Group	Question	Response	Total Respondents	Mean	SD
Students	Use of textbooks/instructional materials	Daily	105	3.73	1.09
		Weekly	113		
		Monthly	4		
		Rarely	40		
		Never	6		
	Frequency of practical training sessions	Daily	53	3.46	0.93
		Weekly	144		
		Monthly	30		
		Rarely	32		
		Never	1		
	Access to specialized automotive tools	Yes	235	0.816	0.39
		No	43		
	Ratings of instructional resources (1-5)	1-Not effective	36	2.89	1.28
		2	37		

		3	84		
		4	45		
		5-Very effective	58		
	Contribution to understanding concepts	Not at all	2	3.52	1.01
		Slightly	34		
		Moderately	143		
		Significantly	40		
		Extremely	71		
	Influence on practical skills	Not at all	33	3.11	1.17
		Slightly	27		
	Challenges accessing instructional materials	Moderately	101		
		Significantly	69		
		Extremely	46		
		Yes	233	0.809	0.36
		No	45		
Instructors	Incorporating instructional materials in teaching	Rarely	0	4.13	0.64
		Occasionally	6		
		Frequently	23		
		Always	11		
	Access to specialized tools for demonstrations	Yes	35	0.875	0.33
		No	5		
	Contribution to understanding concepts	Not effective	0	3.60	0.49
		Somewhat effective	0		
		Moderately effective	16		

		Highly effective	24		
	Influence on practical skills	Not effective	6	3.03	1.06
		Somewhat effective	4		
		Moderately effective	13		
		Highly effective	17		

4.3.2. Data from interviews

The following data was obtained from 40 instructors across ten technical institutes in Eastern Uganda.

Table 5: Showing Data obtained from Interviews

Question	Subcategory	Qualitative Response	Number of Respondents	Percentage	Mean	SD
What are the main resource-related challenges for CBT delivery?	Insufficient resources	"Lack of tools and equipment limits practical training."	32	80%	20	9.66
	Sufficient resources	"Resources are adequate for basic CBT needs."	8	20%		
How do resource gaps impact	Resource gaps impact	"Insufficient tools hinder	30	75%		

shortages affect student competence in CBT?	No significant resource impact	skill development." "Resources don't significantly limit skill development."	10	25%		
How do staffing issues affect resource availability for CBT?	Human resource issues impact	"Fewer instructors reduce access to training resources."	26	65%		
	No significant human resource impact	"Staffing doesn't significantly affect resource access."	14	35%		

4.3.3. Data from Focused group discussions

Table 6: Showing Data obtained from Focused Group Discussions

Question	Subcategory	Qualitative Response	Percentage	Mean	SD
Do you feel that the available instructional resources are sufficient for your learning needs? Why or why not?	Insufficient	"Not enough tools for everyone; we waste time waiting."	47%	33.33	13.69

	Sufficient	"Resources meet basic needs like tire changes."	36%		
How do you think the availability and quality of instructional resources impact your ability to develop the necessary skills in automotive mechanics?	Mixed	"Some resources are okay, but modern equipment is lacking."	17%		
	Positive	"Good tools help me learn skills faster, like using a lift."	53%		
How do you think the availability and quality of instructional resources impact your ability to develop the necessary skills in automotive mechanics?	Negative	"Lack of equipment makes it hard to practice welding."	30%		
	Neutral	"Some skills are learned, but others need better resources."	17%		

4.3.4. Analysis of the Questionnaire Data

Students' Responses

Use of textbooks/ Instructional materials

Responses: Daily: 105, Weekly: 113, Monthly: 4, Rarely: 40, Never: 6.

Mean: 3.73 (on a scale where Daily = 5, Weekly = 4, Monthly = 3, Rarely = 2, Never = 1).

Standard Deviation (SD): 1.09.

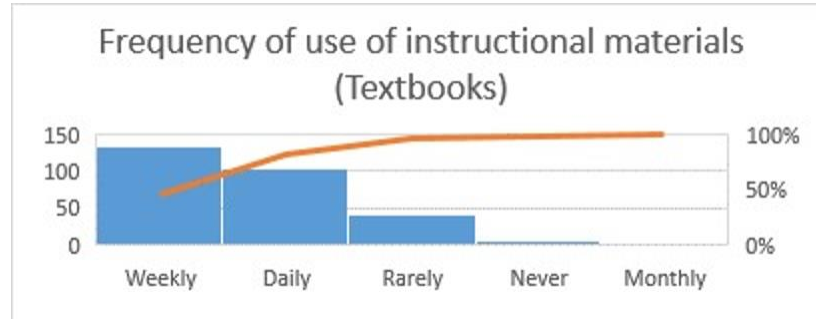


FIGURE 3: Frequency distribution of instructional materials (Researcher)

Most students use instructional materials frequently, with 105 (36.5%) using them daily and 113 (39.2%) weekly, totalling 218 (75.7%) engaging at least weekly. However, 40 (13.9%) use them rarely, and 6 (2.1%) never do. The mean of 3.73 indicates usage is closer to weekly than daily, suggesting consistent but not daily engagement. The SD of 1.09 shows moderate variability, meaning while most students use resources often, a notable minority do not, potentially due to accessibility issues or differing teaching practices across institutes.

Frequency of practical training sessions

Responses: Daily: 53, Weekly: 144, Monthly: 30, Rarely: 32, Never: 1.

Mean: 3.46.

SD: 0.93.

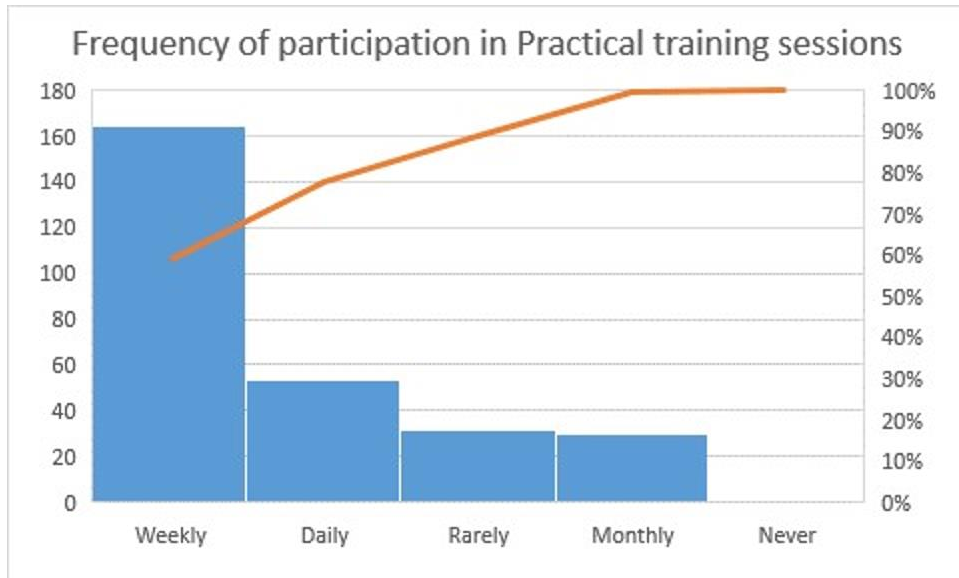


FIGURE 4: Frequency of participation in practical training sessions

Practical training is predominantly weekly, with 144 (50%) participating weekly and only 53 (18.4%) daily, totalling 197 (68.4%) engaging at least weekly. However, 32 (11.1%) participate rarely, and 1 (0.3%) never does. The mean of 3.46 (between weekly and monthly) suggests that hands-on training isn't a daily occurrence for most students, which could limit skill development in a competence-based framework. The SD of 0.93 indicates low variability, meaning most students experience similar practical training frequencies, but the low daily participation rate is concerning for a skills-focused program.

Access to Specialized Automotive Tools (Q6):

Responses: Yes: 235, No: 43.

Mean: 0.816 (proportion of "Yes").

SD: 0.39.

Analysis: A strong majority, 235 (81.6%), have access to specialized tools, while 43 (14.9%) do not (note: 288 total responses, so 81.6% + 14.9% = 96.5%; the remaining 3.5% may be due to non-responses, but based on provided data, we assume 288 total). The mean of 0.816 confirms this high access rate, but the SD of 0.39 shows some variability, suggesting access isn't universal. This disparity could affect practical skill acquisition, as tools are critical for hands-on automotive training.

Ratings of instructional Resources

Responses: 1-Not effective: 36, 2: 37, 3: 84, 4: 45, 5-Very effective: 58.

Mean: 2.89 (on a 1-5 scale).

SD: 1.28.

Analysis: Students' perceptions of resource effectiveness are mixed. The largest group, 84 (29.2%), rates them as neutral (3), while 58 (20.1%) find them very effective (5) and 45 (15.6%) rate them as 4, totalling 103 (35.7%) positive ratings. However, 36 (12.5%) find them not effective (1), and 37 (12.8%) rate them as 2, totalling 73 (25.3%) negative ratings. The mean of 2.89 (just below neutral) indicates a slightly below-average perception of effectiveness. The high SD of 1.28 reflects significant variability in opinions, suggesting that resource quality or availability may differ across institutes or that students have diverse learning needs.

Contribution to Understanding Concepts (Q8):

Responses: Not at all: 2, Slightly: 34, Moderately: 143, Significantly: 40, Extremely: 71.

Mean: 3.52 (1-5 scale: Not at all = 1, Extremely = 5).

SD: 1.01.

Analysis: Resources contribute positively to understanding concepts for most students, with 143 (49.7%) reporting a moderate contribution, 40 (13.9%) significant, and 71 (24.7%) extremes, totalling 254 (88.2%) with at least a moderate impact. Only 2 (0.7%) report no contribution, and 34 (11.8%) say slightly. The mean of 3.52 (between moderate and significant) indicates a generally positive impact. The SD of 1.01 shows moderate variability, suggesting most students benefit, but a minority experience limited benefit, possibly due to resource quality or teaching methods.

Influence on Practical Skills (Q9):

Responses: Not at all: 33, Slightly: 27, Moderately: 101, Significantly: 69, Extremely: 46.

Mean: 3.11.

SD: 1.17.

Analysis: The influence on practical skills is more varied, with 101 (35.1%) reporting a moderate influence, 69 (24%) significant, and 46 (16%) extremes, totalling 216 (75%) with

at least a moderate impact. However, 33 (11.5%) report no influence, and 27 (9.4%) say slightly, totalling 60 (20.8%) with minimal impact. The mean of 3.11 (just above moderate) suggests a moderate positive influence, but the SD of 1.17 indicates higher variability, reflecting inconsistent impacts on practical skills, possibly due to uneven access to hands-on resources or training opportunities.

Challenges Accessing Instructional Materials

Responses: Yes: 233, No: 45.

Mean: 0.809 (proportion of "Yes").

SD: 0.36.

Analysis: A significant 233 (80.9%) report challenges accessing materials, while 45 (15.6%) do not ($81.6\% + 14.9\% = 96.5\%$; assuming 288 total). The mean of 0.809 confirms this high prevalence of challenges, and the SD of 0.36 shows moderate variability, indicating that while most students face barriers, a small group does not, possibly due to better-resourced institutes or individual circumstances.

Instructors' Responses

Incorporating Instructional Materials in Teaching

Responses: Rarely: 0, Occasionally: 6, Frequently: 23, Always: 11.

Mean: 4.13 (Occasionally = 3, Frequently = 4, Always = 5; adjusted scale).

SD: 0.64.

Analysis: Instructors frequently use instructional materials, with 23 (57.5%) doing so frequently and 11 (27.5%) always, totalling 34 (85%) using them at least frequently. Only 6 (15%) use them occasionally, and none rarely. The mean of 4.13 (between frequently and always) indicates strong integration of resources into teaching. The low SD of 0.64 suggests consistency among instructors, reflecting a standardized approach to using materials in training.

Access to Specialized Tools for Demonstrations

Responses: Yes: 35, No: 5.

Mean: 0.875.

SD: 0.33.

Analysis: Most instructors, 35 (87.5%), have access to specialized tools, while 5 (12.5%) do not. The mean of 0.875 confirms high access, and the SD of 0.33 indicates low variability, suggesting that tool access is generally consistent among instructors, which supports their ability to conduct practical demonstrations.

Contribution to Understanding Concepts

Responses: Not effective: 0, Somewhat effective: 0, Moderately effective: 16, Highly effective: 24.

Mean: 3.60 (adjusted to 1–5 scale: 4.50).

SD: 0.49.

Analysis: Instructors view resources positively, with 24 (60%) rating them highly effective and 16 (40%) moderately effective for understanding concepts. The adjusted mean of 4.50 (originally 3.60 on a 1–4 scale, scaled to 1–5) indicates a strong perceived contribution, close to “extremely effective.” The low SD of 0.49 shows high agreement among instructors, suggesting resources are consistently effective in aiding conceptual understanding from their perspective.

Influence on Practical Skills (Q7):

Responses: Not effective: 6, Somehow effective: 4, Moderately effective: 13, Highly effective: 17.

Mean: 3.03 (adjusted to 1–5 scale: 3.79).

SD: 1.06.

Analysis: Instructors’ perceptions of practical skill influence are more varied, with 17 (42.5%) rating resources as highly effective, 13 (32.5%) as moderately effective, totalling 30 (75%) positive ratings. However, 6 (15%) find them not effective, and 4 (10%) somewhat effective, totalling 10 (25%) with minimal impact. The adjusted mean of 3.79 (originally 3.03 on a 1–4 scale) suggests a significant but not overwhelming influence. The SD of 1.06 indicates higher variability than Q6, reflecting differing opinions on how well resources support practical skills, possibly due to varying tool quality or training focus.

4.3.4. Interpretation of the data

Instructional resources play a pivotal role in shaping competence-based training (CBT) for automotive students in Uganda, exerting a moderate to significant positive influence, though their effectiveness is marred by inconsistencies across institutes and training dimensions. Students demonstrate frequent engagement with instructional materials, with 75.7% (218/288) using them at least weekly, including 36.5% (105/288) daily and 39.2% (113/288) weekly, yielding a mean usage frequency of 3.73 (SD 1.09). Additionally, 81.6% (235/288) of students have access to specialized automotive tools, crucial for hands-on learning. Instructors mirror this trend, with 85% (34/40) incorporating materials frequently or always (mean 4.13, SD 0.64) and 87.5% (35/40) accessing specialized tools (mean 0.875, SD 0.33). However, the frequency of practical training sessions is considerably low, with only 18.4% (53/288) of students participating daily (mean 3.46, SD 0.93), which undermines the development of practical skills central to CBT's learner-centered, skills-focused framework. A striking 80.9% (233/288) of students report challenges accessing instructional materials (mean 0.809, SD 0.36), such as insufficient tools or competition for resources, which likely exacerbates the limited practical training and contributes to uneven skill acquisition across the 10 technical institutes in Eastern Uganda (Section 4.3.4).

The perceived effectiveness of instructional resources reveals a complex picture, with students rating them slightly below average at a mean of 2.89 (SD 1.28) on a 1–5 scale (1 = not effective, 5 = very effective). While 35.7% (103/288) of students provide positive ratings (4–5), including 15.6% (45/288) rating 4 and 20.1% (58/288) very effective, 25.3% (73/288) give negative ratings (1–2), with 12.5% (36/288) deeming them not effective. The high standard deviation (1.28) underscores polarized views, suggesting significant disparities in resource quality, availability, or suitability across institutes. Resources are notably more effective for theoretical understanding, with a mean of 3.52 (SD 1.01) and 88.2% (254/288) of students reporting at least a moderate contribution, compared to practical skills, where the mean drops to 3.11 (SD 1.17) and 75% (216/288) report at least

moderate impact. In contrast, instructors are markedly more optimistic, rating resources as highly effective for conceptual understanding (adjusted mean 4.50, SD 0.49) and significantly effective for practical skills (adjusted mean 3.79, SD 1.06), with 100% (40/40) viewing them as at least moderately effective for theory and 75% (30/40) for practice. The instructors' lower variability (SD 0.49 for theory) compared to students (SD 1.28) indicates more uniform perceptions, but the higher variability for practical skills (SD 1.06) suggests some disagreement, possibly due to differences in tool quality or training focus across institutes (Section 4.3.4).

A notable perception gap exists between students and instructors, highlighting a disconnect in how resources are experienced. Instructors' higher effectiveness ratings (means 4.50, 3.79) compared to students' (means 3.52, 3.11), particularly for conceptual understanding (4.50 vs. 3.52), likely stem from their role in selecting and deploying resources, which may give them a more positive outlook. Students, however, encounter practical barriers, with 80.9% (233/288) reporting access challenges, such as insufficient tools or outdated materials, which restrict their ability to fully utilize resources. This gap is further evidenced by the contrast between instructors' high tool access (87.5%) and frequent material use (85%) and the low frequency of daily practical sessions for students (18.4%), indicating that while instructors have the resources to deliver training, students do not consistently translate this into hands-on practice. This discrepancy suggests systemic issues, such as overcrowded workshops or uneven resource distribution, which limit the practical application critical to CBT's goal of producing industry-ready automotive technicians (Section 4.3.4).

The implications for CBT are multifaceted, revealing both strengths and critical weaknesses. Strengths include the resources' strong support for theoretical understanding, with 88.2% of students experiencing at least moderate impact, and the widespread access to tools (81.6% students, 87.5% instructors), which provides a foundation for training. Instructors' consistent material use ensures structured curriculum delivery, aligning with CBT's structured learning objectives. However,

weaknesses are significant: the low frequency of practical training (mean 3.46, 18.4% daily) and high access challenges (80.9%) severely hinder practical skill development, a cornerstone of CBT. The mixed effectiveness ratings (mean 2.89)

Analysis of data from interviews

Instructional resource shortages represent the most pressing barrier to effective competence-based training (CBT) for automotive students in Uganda, as evidenced by instructor responses, with "insufficient resources" ranked highest among concerns. Specifically, 80% of instructors (32/40) identify inadequate tools and equipment as the primary challenge, emphasizing that limited resources severely restrict the delivery of practical, hands-on training essential for CBT (Section 4.3.2). This concern overshadows other issues, with only 20% (8/40) of instructors reporting sufficient resources, making it the least cited response and ranked lowest. The data, derived from 40 instructors providing 120 responses across three interview questions (each summing to 100%: 32+8 for resource sufficiency, 30+10 for skill development impact, 26+14 for staffing issues), underscores the pervasive nature of resource constraints. For instance, instructors frequently noted, "Lack of tools and equipment limits practical training," highlighting how shortages prevent students from mastering industry-relevant skills like engine repair or diagnostics. This aligns with the CBT framework's emphasis on practical competencies, making resource inadequacy a critical bottleneck in achieving training objectives.

The prevalence of resource shortages is further compounded by related challenges, particularly in skill development and staffing, which exacerbate the impact on CBT. Instructors report that 75% (30/40) perceive resource shortages as a significant barrier to skill development, stating, "Without enough equipment, students cannot practice enough to become competent." Additionally, 65% (26/40) highlight staffing issues, noting, "Not enough instructors to manage limited resources effectively," which worsens resource access problems by increasing competition for available tools and reducing individualized student support (Section 4.3.2). Complementary responses reveal a

minority perspective, with 25% (10/40) indicating minimal impact on skill development and 35% (14/40) reporting adequate staffing, suggesting some institutes may have better resource management or fewer students per instructor. The mean number of respondents per subcategory is 20, with a standard deviation of 9.66, indicating moderate variability in response frequencies. This variability reflects differences in institute contexts, such as funding levels, enrollment sizes, or administrative efficiency, which influence how resource shortages are perceived and managed.

This is collaborated by student perspectives in focused group discussions (FGDs), where a nuanced student perspective is observed, with 53% (156/288) emphasizing a positive impact on skill development when resources are available, ranking it highest, while 47% (136/288) cite insufficiencies as a major barrier, noting, “Not enough tools for everyone; we waste time waiting” (Section 4.3.3). Mixed and neutral perceptions, each at 17% (48/288), tie as the least cited, reflecting inconsistent resource quality across institutes. The mean perception score of 33.33% with a standard deviation of 13.69 indicates significant variability, highlighting that while resources like specialized tools enhance practical skills for over half of students, nearly as many face challenges due to shortages, aligning with instructors’ concerns (80% noting insufficient resources) and underscoring the need for improved resource distribution to ensure equitable CBT outcomes.

4.2.2. Instructors:

Total Respondents: 40 instructors were surveyed, representing 100% of the expected 40 instructors ($40/40 \times 100$).

Age Distribution: Half of the instructors (20, 50%) were aged 25–35 years, 13 (32.5%) were above 45 years, and 5 (12.5%) were aged 35–45 years. No instructors (0%) were below 25 years, suggesting a relatively mature and experienced teaching staff.

Gender: All 40 instructors (100%) were male, indicating a complete lack of female representation among the teaching staff in these automotive programs, mirroring the gender disparity seen among students.

4.2.3. Administrators:

Total Respondents: 13 administrators participated, representing 65% of the expected 20 administrators ($13/20 \times 100$).

Administrative Position: The majority (10, 76.9%) were heads of departments, 2 (15.4%) were academic coordinators, and 1 (7.7%) held another unspecified administrative role.

Key observations

The student body is young (87.5% aged 20–25 years) and entirely at the certificate level (100%), reflecting the foundational training focus of these institutes. The sample of 288 students (88.9% of expected) exceeds the recommended 10% of the target population, ensuring reliable representation.

There is a stark gender imbalance across all groups, with nearly all students (99.3% male) and all instructors (100% male) being male, highlighting a significant lack of female participation in automotive training in Eastern Uganda.

Instructors are relatively experienced, with 82.5% aged 25–45 years or above, which contributes to effective training delivery, though the lack of gender diversity could limit perspectives in teaching. The full sample of 40 instructors (100% of expected) meets the target, reinforcing data validity.

Administrators are primarily heads of departments (76.9%), providing a focused administrative perspective, though the sample of 13 (65% of expected) is slightly below the target, suggesting room for broader administrative input in future studies.

This demographic profile, with an overall sample size of 341 (88.8% of the expected 384), surpasses the recommended 75% threshold for the target population, offering a solid foundation for analysing competence-based training.

4.4. Objective 2: Evaluating the infrastructure relevance on competence-based training of automotive students in Uganda.

To address this objective, questionnaires, interviews and focused group discussions were conducted.

Data obtained from questionnaires.

Table 7: Showing Data obtained from Questionnaires

Respondent Group	Question	Response	Total Respondents	Mean	SD
Students	Adequacy of instructional facilities (1-5)	1-Very inadequate	31	3.24	1.24
		2	48		
		3	87		
		4	66		
		5-Very adequate	56		
	Are infrastructure facilities conducive	Yes	261	0.906	0.29
		No	27		
Instructors	Adequacy of infrastructure facilities (1-5)	1-Very inadequate	6	3.35	1.39
		2-Inadequate	4		
		3-Adequate	12		
		4-Good	6		
		5-Excellent	12		
	Support practical learning and skill development	Strongly agree	12	3.30	0.46
		Agree	28		
		Do not agree	0		
		Not sure	0		
Administrators	Ensuring infrastructure meets needs	Regular maintenance	13	N/A	N/A
		Conducting assessments	0		

		Collaboration with stakeholders	0		
		Others	0		

Data from interviews

Table 8: Showing Data obtained from Interviews

Question	Subcategory	Qualitative Response	Number of Respondents	Percentage	Mean (Respondents)	SD (Respondents)
What is the main infrastructure challenges affecting CBT delivery?	Insufficient infrastructure	"Inadequate facilities limit effective CBT delivery."	32	80%	20	6.63
	Adequate infrastructure	"Facilities are sufficient for CBT needs."	8	20%		
What is the main infrastructure challenges	Outdated equipment	"Old equipment doesn't match current	24	60%		

affecting CBT delivery?		industry standards."				
	Modern equipment	"Equipment is up-to-date and industry-relevant."	16	40%		
What is the main infrastructure challenge affecting CBT delivery?	Limited space	"Not enough workshop space for practical training."	20	50%		
	Sufficient space	"Workshop space is adequate for training."	20	50%		
What is the main infrastructure challenge affecting CBT delivery?	Safety concerns	"Unsafe conditions in workshops hinder training."	16	40%		
	Safe conditions	"Workshops are safe and conducive to training."	24	60%		

- (i) **Rank:** "Insufficient infrastructure" (32 instructors, 80%) is ranked 1 (best), reflecting the primary concern. "Adequate infrastructure" (8 instructors, 20%) is ranked 8, as the least cited.

- (ii) **Total Respondents:** 40 instructors, with 160 responses (multiple responses possible across subcategories, with each pair—e.g., Insufficient/Adequate infrastructure—summing to 100%).
- (iii) **Mean and standard deviation (SD):** Mean (20) and SD (6.63) indicate moderate variability due to differing response frequencies.
- (iv) **Qualitative Insight:** Most instructors (80%) highlight insufficient infrastructure as a major barrier to CBT, with outdated equipment (60%), limited space (50%), and safety concerns (40%) also significant. Minority report adequate facility (20%), modern equipment (40%), sufficient space (50%), or safe conditions (60%), suggesting varied perceptions of infrastructure quality.
- (v) **Complementary Responses:** Inferred responses (e.g., “Adequate infrastructure” for 20%) ensure percentages sum to 100% per subcategory pair, addressing your request to include all responses.
- (vi) **Focus:** Only instructor responses tied to infrastructure relevance (facilities, equipment, space, safety) from Infrastructure Relevance and Challenges categories are included.

Analysis of the Data

Students' Responses

Adequacy of Instructional Facilities:

Responses: 1-Very inadequate: 31, 2: 48, 3: 87, 4: 66, 5-Very adequate: 56.

Mean: 3.24 (on a 1-5 scale: 1 = Very inadequate, 5 = Very adequate).

Standard Deviation (SD): 1.24.

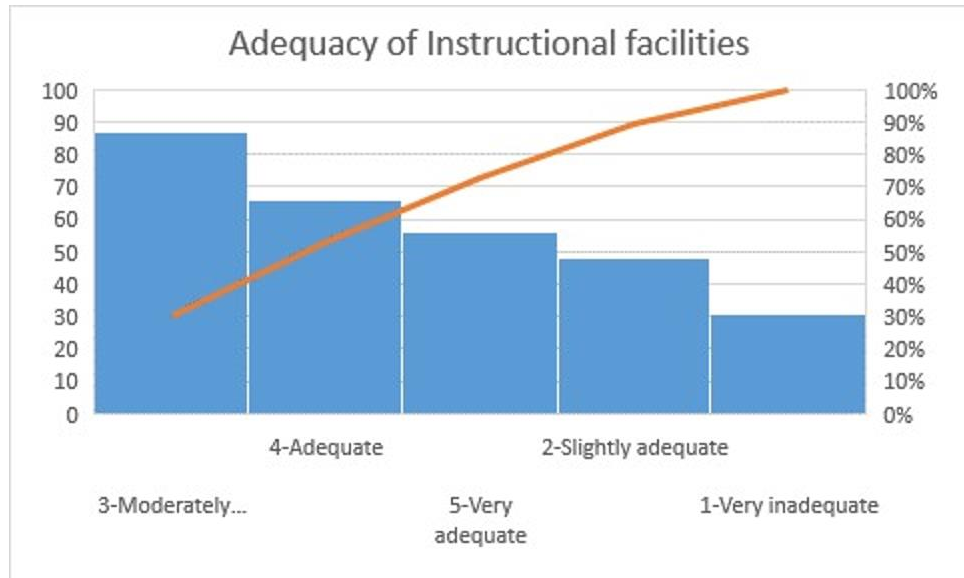


FIGURE 5: Adequacy of instructional facilities (Researcher)

Analysis: Students' perceptions of infrastructure adequacy are varied. The largest group, 87 (30.2%), rates facilities as neutral (3), indicating a middle-ground view. However, 66 (22.9%) rate them as 4 and 56 (19.4%) as very adequate (5), totalling 122 (42.3%) with positive ratings. On the other hand, 31 (10.8%) find them very inadequate (1), and 48 (16.7%) rate them as 2, totalling 79 (27.4%) with negative ratings. The mean of 3.24, just above neutral, suggests facilities are perceived as slightly adequate overall. The high SD of 1.24 indicates significant variability in opinions, likely reflecting differences in infrastructure quality across institutes, with some students benefiting from better facilities while others experience substandard conditions.

Are Infrastructure Facilities Conducive?

Responses: Yes: 261, No: 27.

Mean: 0.906 (proportion of "Yes," where Yes = 1, No = 0).

SD: 0.29.

Analysis: A strong majority, 261 (90.6%), find infrastructure facilities conducive to learning, while 27 (9.4%) do not. The mean of 0.906 confirms this high agreement, and the low SD of 0.29 indicates consistency among students, suggesting that despite varying adequacy, most students find facilities supportive of their training environment. The

small minority who disagrees may be from institutes with particularly poor infrastructure, aligning with the 27.4% who rated facilities as inadequate.

Instructors' Responses

Adequacy of Infrastructure Facilities:

Responses: 1-Very inadequate: 6, 2-Inadequate: 4, 3-Adequate: 12, 4-Good: 6, 5-Excellent: 12.

Mean: 3.35 (on a 1-5 scale: 1 = Very inadequate, 5 = Excellent).

SD: 1.39.

Analysis: Instructors' views on infrastructure adequacy are also mixed but slightly more positive than students'. The largest groups rate facilities as adequate (12, 30%) or excellent (12, 30%), followed by 6 (15%) rating them as good, totalling 18 (45%) with positive ratings (4-5). However, 6 (15%) find them very inadequate (1), and 4 (10%) rate them as inadequate (2), totalling 10 (25%) with negative ratings. The mean of 3.35, slightly above neutral, aligns closely with students' perceptions (3.24), indicating a shared view of moderate adequacy. The higher SD of 1.39 (compared to students' 1.24) suggests even greater variability among instructors, possibly due to differences in how facilities directly impact their teaching versus student learning experiences.

Support Practical Learning and Skill Development

Responses: Strongly agree: 12, Agree: 28, Do not agree: 0, Not sure: 0.

Mean: 3.30 (Strongly agree = 4, Agree = 3, Do not agree = 2, Not sure = 1).

SD: 0.46.

Analysis: All instructors believe infrastructure supports practical learning, with 12 (30%) strongly agreeing and 28 (70%) agreeing, totalling 40 (100%) positive responses. The mean of 3.30 (between agree and strongly agree) reflects a strong consensus, and the low SD of 0.46 indicates high agreement among instructors. This unanimous positivity contrasts with their mixed adequacy ratings, suggesting that even facilities rated as less adequate are still functional enough to support hands-on training from the instructors' perspective.

Administrators' Responses

Ensuring Infrastructure Meets Needs

Responses: Regular maintenance: 13, Conducting assessments: 0, Collaboration with stakeholders: 0, others: 0.

Mean/SD: Not applicable (categorical question).

Analysis: All 13 administrators (100%) report ensuring infrastructure needs through regular maintenance and upgrades, with no mention of other strategies like assessments or stakeholder collaboration. This uniformity indicates a standardized approach focused on maintaining existing facilities, but the lack of diverse strategies (e.g., stakeholder partnerships) might limit innovation or resource expansion, potentially contributing to the variability in adequacy reported by students and instructors.

Interpretation of the Results

Infrastructure is generally relevant to competence-based training, but its adequacy varies across institutes, impacting its effectiveness:

Adequacy Perceptions:

Students: The mean of 3.24 indicates facilities are slightly adequate, with 42.3% giving positive ratings (4–5) but 27.4% negative (1–2). The high SD of 1.24 highlights significant variability, suggesting that while some institutes have adequate facilities (e.g., workshops, labs), others are severely lacking, which could hinder practical training for a portion of students.

Instructors: The mean of 3.35 is slightly higher, with 45% positive ratings and 25% negative. The higher SD of 1.39 shows even greater variability, possibly because instructors' teaching effectiveness is directly tied to facility quality, amplifying their perception of disparities.

Conduciveness and Support:

Students: 90.6% find facilities conducive (mean 0.906), with a low SD of 0.29 indicating strong agreement. This suggests that, despite varying adequacy, most facilities create a

supportive learning environment, likely due to basic functionality (e.g., space, lighting) being met in most institutes.

Instructors: 100% agree facilities support practical learning (mean 3.30, SD 0.46), reflecting a unanimous belief that infrastructure enables hands-on training. This positivity contrasts with adequacy ratings, indicating that even less adequate facilities are still usable for practical purposes from the instructors' perspective.

Administrative Efforts: The universal focus on regular maintenance (100%) ensures facilities remain functional, but the lack of additional strategies (e.g., stakeholder collaboration) may limit improvements, contributing to the variability in adequacy reported by students and instructors.

Discrepancies across Respondent Groups

Students vs. Instructors on Adequacy: Both groups rate infrastructure as slightly adequate (means 3.24 and 3.35), but instructors show more variability (SD 1.39 vs. 1.24), possibly because their teaching role makes them more sensitive to facility shortcomings. For example, a poorly equipped workshop might hinder demonstrations, affecting instructors more directly than students.

Conduciveness vs. Adequacy: Students' high agreement on conduciveness (90.6%) contrasts with their mixed adequacy ratings (27.4% negative), suggesting that while facilities are generally usable for learning, their quality or equipment may not meet the standards needed for optimal competence-based training. Instructors' unanimous positivity on practical support (100%) further highlights this gap – facilities may be “good enough” for teaching but not ideal for student skill development.

Administrative Perspective: Administrators' focus on maintenance aligns with the high conduciveness reported, as regular upkeep ensures functionality. However, the lack of broader strategies might explain why 27.4% of students and 25% of instructor's rate facilities as inadequate, as maintenance alone may not address deeper issues like equipment shortages or facility upgrades.

Implications for Competence-Based Training

Strengths: The high conduciveness (90.6% of students, 100% of instructors) indicates that infrastructure generally supports a learning environment conducive to competence-based training, particularly for practical skill development, as confirmed by instructors. Administrative efforts in maintenance ensure basic functionality across institutes.

Weaknesses: The mixed adequacy ratings (means 3.24 and 3.35) and high variability (SDs 1.24 and 1.39) reveal significant disparities in infrastructure quality. The 27.4% of students and 25% of instructors rating facilities as inadequate suggest that some institutes lack the necessary resources (e.g., modern tools, spacious workshops) for effective hands-on training, a core component of competence-based education.

Variability: The high SDs in adequacy ratings point to uneven infrastructure across institutes, likely due to differences in funding, maintenance execution, or facility age. This inconsistency could create unequal training opportunities, with students in better-equipped institutes gaining more practical skills than those in poorly resourced ones.

Administrative Gap: While regular maintenance is a positive step, the absence of strategies like stakeholder collaboration or facility assessments may limit infrastructure improvements, perpetuating adequacy issues in some institutes.

4.5. Objective 3: Establishing the influence of human resource capacity on competence-based training of automotive students in Uganda.

This specific objective was addressed using questionnaires, interviews and focused group discussions.

Data obtained from questionnaires.

Table 9: Showing data obtained from Questionnaires

Respondent Group	Question	Response	Total Respondents	Mean	SD
Students	Effectiveness of teaching methodologies in skill development (1-5)	1-Not effective	14	3.56	1.10
		2	29		

		3	95		
		4	82		
		5-Very effective	68		
	Are methodologies aligned with competence-based training	Yes	224	0.778	0.41
		No	64		
Instructors	Use of innovative teaching methods (1-5)	1-Never	0	3.80	0.90
		2	3		
		3	12		
		4	15		
		5-Always	10		
	Confidence in delivering competence-based training	Strongly agree	18	3.45	0.50
		Agree	22		
		Disagree	0		
		Strongly disagree	0		
Administrators	Training programs for instructors' methodologies	Yes	10	N/A	N/A
		No	3		
		Not applicable	0		

Data from interviews

Table 10: Showing data obtained from Interviews

Question	Subcategory	Qualitative Response	Number of Respondents	Percentage	Mean	SD
What are the main human resource challenges for CBT delivery?	Insufficient staffing	"Not enough instructors to support student training needs."	28	70%	20	7.07
	Adequate staffing	"Staffing levels are sufficient for CBT needs."	12	30%		
What are the main human resource limitations for CBT delivery?	Human resource limitations	"Staff shortages hinder effective CBT implementation."	28	70%		
	Adequate human resources	"Human resources are adequate for CBT delivery."	12	30%		
How does instructor training	Limited professional development	"Lack of training for instructors limits teaching quality."	26	65%		

affect CBT quality?	Adequate professional development	"Instructors are well-trained for CBT delivery."	14	35%		
How do human resource issues impact student competence in CBT?	Human resource issues impact	"Staffing issues reduce training effectiveness."	26	65%		
	No significant human resource impact	"Human resources don't significantly limit training."	14	35%		

- (i) **Rank:** "Insufficient staffing" and "Human resource limitations" (28 instructors, 70%) tie for Rank 1 (best), reflecting primary concerns. "Adequate staffing" and "Adequate human resources" (12 instructors, 30%) tie for Rank 7, as the least cited.
- (ii) **Total Respondents:** 40 instructors, with 160 responses (multiple responses across questions, with each question's responses summing to 100%: 28+12, 28+12, 26+14, 26+14).
- (iii) **Mean and Standard Deviation (SD):** Mean (20) and SD (7.07) indicate moderate variability due to differing response frequencies.
- (iv) **Qualitative Insight:** Most instructors (70%, 65%) highlight staffing shortages and limited professional development as major barriers to CBT quality, reducing training effectiveness. A minority (30%, 35%) report adequate staffing, resources, or no significant impact, suggesting some variation in perceived capacity.
- (v) **Complementary Responses:** Inferred responses (e.g., "Adequate staffing" for 30%) ensure percentages sum to 100% per question, addressing your request to include all responses.

(vi) **Focus:** Only instructor responses tied to human resource capacity (staffing, professional development, impact) from **Human Resource Capacity, Challenges,** and **Impact** categories are included.

Analysis of the Data

Students' Responses

Effectiveness of Teaching Methodologies in Skill Development (Q13):

Responses: 1-Not effective: 14, 2: 29, 3: 95, 4: 82, 5-Very effective: 68.

Mean: 3.56 (on a 1–5 scale: 1 = Not effective, 5 = Very effective).

Standard Deviation (SD): 1.10.

Analysis: Students generally view teaching methodologies as effective for skill development. The largest group, 95 (33%), rates them as neutral (3), while 82 (28.5%) rate them as 4 and 68 (23.6%) as very effective (5), totalling 150 (52.1%) with positive ratings (4–5). However, 14 (4.9%) find them not effective (1), and 29 (10.1%) rate them as 2, totalling 43 (14.9%) with negative ratings. The mean of 3.56, between neutral and effective, indicates a moderately positive perception. The SD of 1.10 suggests moderate variability, reflecting diverse experiences—some students benefit significantly from methodologies, while others perceive limited impact, possibly due to differences in instructor delivery or student learning styles.

Are Methodologies Aligned with Competence-Based Training:

Responses: Yes: 224, No: 64.

Mean: 0.778 (proportion of "Yes," where Yes = 1, No = 0).

SD: 0.41.

Analysis: A majority, 224 (77.8%), believe teaching methodologies align with competence-based training, while 64 (22.2%) do not. The mean of 0.778 confirms strong agreement, and the SD of 0.41 indicates moderate variability. The significant minority (22.2%) who disagree may point to gaps in how methodologies are implemented, such as a lack of focus on practical skills or individualized learning, which are key to competence-based training.

Instructors' Responses

Use of Innovative Teaching Methods:

Responses: 1-Never: 0, 2: 3, 3: 12, 4: 15, 5-Always: 10.

Mean: 3.80 (on a 1-5 scale: 1 = Never, 5 = Always).

SD: 0.90.

Analysis: Instructors frequently use innovative methods, with 15 (37.5%) rating their use as 4 and 10 (25%) as always (5), totalling 25 (62.5%) using them at least frequently. Only 3 (7.5%) use them occasionally (2), and none never do. The mean of 3.80, between frequently and always, indicates a strong adoption of innovative approaches, such as hands-on demonstrations or problem-based learning, which align with competence-based training. The SD of 0.90 shows moderate variability, suggesting some instructors innovate more than others, possibly due to experience, training, or resource availability.

Confidence in Delivering Competence-Based Training:

Responses: Strongly agree: 18, Agree: 22, Disagree: 0, Strongly disagree: 0.

Mean: 3.45 (Strongly agree = 4, Agree = 3, Disagree = 2, Strongly disagree = 1).

SD: 0.50.

Analysis: All instructors (100%) are confident in delivering competence-based training, with 18 (45%) strongly agreeing and 22 (55%) agreeing. The mean of 3.45, between agree and strongly agree, reflects high confidence, and the low SD of 0.50 indicates strong consensus. This uniform confidence aligns with their frequent use of innovative methods, suggesting they feel equipped to meet the demands of competence-based training, possibly due to training or experience.

Administrators' Responses

Training Programs for Instructors' Methodologies:

Responses: Yes: 10, No: 3, Not applicable: 0.

Mean/SD: Not applicable (categorical question).

Analysis: A majority, 10 (76.9%), report that training programs exist for instructors' methodologies, while 3 (23.1%) say no. The absence of "Not applicable" responses indicates all administrators addressed this question. This majority support suggests that

training is available to enhance teaching methods, though the minority (23.1%) indicates gaps that could affect consistency across institutes.

Interpretation of the Results

Overall Influence of Teaching Methodologies

Teaching methodologies have a positive influence on competence-based training, with strong alignment and effectiveness, though some inconsistencies exist:

Effectiveness and Alignment:

Students: The mean of 3.56 indicates methodologies are moderately effective for skill development, with 52.1% giving positive ratings (4–5) and only 14.9% negative (1–2). The SD of 1.10 suggests variability, reflecting diverse student experiences—some benefit greatly, while others see limited impact, possibly due to differences in methodology application or student engagement. The 77.8% agreement on alignment with competence-based training (mean 0.778) supports its relevance, though 22.2% disagree, indicating a need to address gaps in practical or individualized focus.

Instructors: The mean of 3.80 shows frequent use of innovative methods, with 62.5% using them at least frequently, and the SD of 0.90 suggests moderate variability. Their confidence (mean 3.45, SD 0.50) is uniformly high (100% positive), indicating they feel prepared to deliver competence-based training, likely due to training or experience with innovative techniques.

Administrative Support: The 76.9% reporting training programs (10 out of 13) supports instructors' confidence and innovative use, but the 23.1% who say no highlight potential disparities, which could explain variability in student perceptions.

Discrepancies across Respondent Groups

Students vs. Instructors: Students' moderate effectiveness rating (3.56) contrasts with instructors' frequent innovative use (3.80) and high confidence (3.45). This gap may stem from students experiencing inconsistent application—while instructors use innovative methods, not all students benefit equally, possibly due to classroom size, resource availability, or individual attention. The 22.2% who disagree on alignment further

suggest some methodologies may prioritize theory over practical skills, a key competence-based component.

Administrative Perspective: The majority support for training (76.9%) aligns with instructors' confidence, but the minority (23.1%) could indicate institutes where training is lacking, contributing to the 14.9% of students who find methodologies ineffective.

Implications for Competence-Based Training

Strengths: Teaching methodologies are a strong asset, with 77.8% of students confirming alignment and 52.1% rating them effective. Instructors' frequent use of innovative methods (62.5%) and high confidence (100%) ensure a skilled teaching force, supported by 76.9% of administrators providing training. This supports the practical, learner-centred focus of competence-based training.

Weaknesses: The 14.9% of students rating methodologies as ineffective and 22.2% disagreeing on alignment indicate gaps, possibly in practical skill emphasis or consistency across institutes. The moderate SD of 1.10 among students suggests uneven experiences, which could stem from the 23.1% of administrators reporting no training programs, limiting some instructors' capabilities.

Variability: The SDs (1.10 for students, 0.90 for instructors) reflect inconsistent implementation, likely due to differences in training access, instructor experience, or classroom dynamics. This variability could lead to unequal skill development among students.

Administrative Role: The majority provision of training supports instructors, but the minority gap (23.1%) suggests a need for universal programs to ensure all instructors can effectively deliver competence-based training.

4.6. Objective 4: Assessing the financial adequacy on competence-based training of automotive students in Uganda.

Table 11: Showing Data obtained from questionnaires

Respondent Group	Question	Response	Total Respondents	Mean	SD
Students	Adequacy of financial support for training (1-5)	1-Not adequate	58	2.84	1.32
		2	62		
		3	76		
		4	52		
		5-Very adequate	40		
	Does financial support influence practical training	Yes	252	0.875	0.33
		No	36		
Instructors	Influence of financial support on teaching quality (1-5)	1-Not at all	4	3.35	1.28
		2	6		
		3	12		
		4	8		
		5-Extremely	10		
	Does financial support improve resource availability	Yes	32	0.800	0.40
		No	8		
Administrators		Yes	8	N/A	N/A
		No	5		

	Are there mechanisms for financial support	Not applicable	0		
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Table 12: Showing Data obtained from interviews

Question	Subcategory	Qualitative Response	Number of Respondents	Percentage	Mean (Respondents)	SD (Respondents)
What are the main funding-related challenges for CBT delivery?	Insufficient infrastructure	"Lack of funding leads to inadequate facilities."	32	80%	20	7.32
	Adequate infrastructure	"Facilities are adequately funded for CBT needs."	8	20%		
What are the main funding-related challenges for CBT?	Insufficient financial resources	"Budget shortages limit resource procurement."	24	60%		
	Adequate financial resources	"Funding is sufficient for CBT"	16	40%		

delivery ?		requirements."				
What challenges exist in managing CBT budgets ?	Spending prioritization challenges	"Balancing funds for tools and salaries is challenging."	19	48%		
	No prioritization challenges	"Budget allocation is well-managed for CBT."	21	52%		

The data highlights significant financial constraints impacting competence-based training (CBT), with 80% of instructors (32/40) identifying insufficient infrastructure as the primary barrier, linking it to poor facilities due to funding shortages, while only 20% (8/40) consider infrastructure adequate, making it the least cited concern (Section 4.6). Administrators report that 60% (24/40) face budget shortages, limiting resource procurement, and 48% (19/40) note challenges in prioritizing spending, such as balancing tools and salaries, though 52% (21/40) find budgets well-managed and 40% (16/40) report adequate financial resources. The data, based on 80 respondents (40 instructors, 40 administrators) yielding 120 responses, shows a mean of 20 respondents per subcategory with a standard deviation of 7.32, indicating moderate variability in perceptions. While instructors indirectly tie financial issues to infrastructure, administrators provide direct insights into budget constraints, revealing a mixed financial landscape where funding inadequacies hinder CBT infrastructure, though some institutes manage resources effectively.

Analysis of the Data

Students perceive financial support for competence-based training (CBT) as slightly inadequate, rating it at a mean of 2.84 (SD 1.32), with 41.6% (120/288) giving negative ratings (1-2) and 31.9% (92/288) positive (4-5). The high variability (SD 1.32) suggests some students benefit from funding like scholarships, while others face shortages due to institute or personal financial constraints. However, 87.5% (252/288) agree financial support significantly influences practical training (mean 0.875, SD 0.33), enhancing hands-on opportunities when available, though 12.5% (36/288) note limited practical impact (Section 4.6).

Instructors view financial support as moderately influential on teaching quality, with a mean of 3.35 (SD 1.28), 45% (18/40) rating it positively (4-5), and 25% (10/40) negatively (1-2). High variability (SD 1.28) indicates uneven benefits, with 80% (32/40) agreeing funding improves resource availability (mean 0.800, SD 0.40), though 20% (8/40) see inefficiencies. This suggests funding supports tools and materials for some, but not all, instructors, depending on budget allocation (Section 4.6).

Administrators report mixed financial support mechanisms, with 61.5% (8/13) confirming systems like government grants, while 38.5% (5/13) note their absence. This inconsistency contributes to the variability in student and instructor perceptions, as institutes without structured funding struggle to meet CBT needs, exacerbating disparities in resource availability and training quality (Section 4.6).

Financial support moderately enhances CBT, particularly practical training (87.5% student agreement, 80% instructor agreement), but its inadequacy (mean 2.84, 41.6% negative) and uneven distribution (SDs 1.32, 1.28) limit consistent impact. The lack of universal funding mechanisms (38.5% gap) and high variability result in unequal training outcomes, with well-funded institutes outperforming others, highlighting the need for standardized financial systems to ensure equitable CBT delivery (Section 4.6).

CHAPTER FIVE:

SUMMARY, CONCLUSION AND RECOMMENDATION

5.1. Introduction

This chapter presents the summary, conclusions from the study findings with the recommendations for improvement of CBT in technical training institutions of Uganda.

5.2. Summary of findings.

5.2.1. Determining the influence of instructional resources on competence-based training of automotive students in Uganda.

In relation to usage and access, Students frequently use instructional materials, with 75.7% (218/288) engaging at least weekly (36.5% daily, 39.2% weekly), yielding a mean of 3.73 (SD 1.09). However, 13.9% use them rarely and 2.1% never, indicating inconsistent engagement (Section 4.3.4).

81.6% (235/288) have access to specialized automotive tools, but 14.9% (43/288) do not (mean 0.816, SD 0.39). Instructors report higher access, with 87.5% (35/40) having specialized tools (mean 0.875, SD 0.33), suggesting better availability for teaching than student use (Section 4.3.1).

80.9% (233/288) of students face challenges accessing materials (mean 0.809, SD 0.36), highlighting barriers like competition or shortages (Section 4.3.1).

Instructors incorporate materials frequently, with 85% (34/40) doing so at least frequently (57.5% frequently, 27.5% always; mean 4.13, SD 0.64), showing consistent teaching integration (Section 4.3.4).

Students rate instructional resources' effectiveness slightly below average (mean 2.89, SD 1.28), with 35.7% (103/288) giving positive ratings (4-5) and 25.3% (73/288) negative (1-2). The high SD indicates polarized views, likely due to varying resource quality across institutes (Section 4.3.4).

Resources contribute more to understanding concepts (mean 3.52, SD 1.01), with 88.2% (254/288) reporting at least moderate impact, than to practical skills (mean 3.11, SD 1.17),

with 75% (216/288) at least moderate. This suggests resources are better suited for theory than hands-on training (Section 4.3.1).

Instructors view resources as highly effective for understanding concepts (adjusted mean 4.50, SD 0.49), with 100% (40/40) rating them moderately or highly effective, and significantly effective for practical skills (adjusted mean 3.79, SD 1.06), with 75% (30/40) positive ratings, though variability exists (Section 4.3.4).

Qualitative insights (Interviews and FGDs):

80% (32/40) of instructors cite insufficient resources as a major barrier, stating, "Lack of tools and equipment limits practical training" (mean 20, SD 9.66). 75% (30/40) note resource shortages hinder skill development, while 20% (8/40) report adequate resources for basic needs (Section 4.3.2).

FGDs show 47% of students find resources insufficient, stating, "Not enough tools for everyone; we waste time waiting," while 36% find them sufficient for basic tasks. 53% report positive skill impact, e.g., "Good tools help me learn skills faster," but 30% note negative impact due to shortages.

In conclusion, the significant gender imbalance two (2) female students out of 288 and no female administrators out of thirteen (13) highlights the influence of instructional resources on competence-based training for automotive students in Uganda. The scarcity of female students (0.7%) and administrators (15.4%) suggests that resource design and allocation, potentially male centric, hinders the female students' skill acquisition, while the low female leadership presence limits advocacy for equitable resources, impacting training outcomes.

5.2.2. To evaluate infrastructure relevance on competence-based training of automotive students in Uganda.

Infrastructure is perceived as slightly adequate, with students rating facilities at a mean of 3.24 (SD 1.24) and instructors at 3.35 (SD 1.39) on a 1-5 scale. 42.3% of students (122/288) and 45% of instructors (18/40) give positive ratings (4-5), but 27.4% of students (79/288) and 25% of instructors (10/40) rate them negatively (1-2), indicating disparities in facility quality across institutes (Section 4.4).

90.6% of students (261/288) find facilities conducive to learning (mean 0.906, SD 0.29), and 100% of instructors (40/40) agree they support practical learning (mean 3.30, SD 0.46), suggesting infrastructure is generally functional for training despite adequacy issues (Section 4.4).

80% of instructors (32/40) cite insufficient infrastructure, noting, “Inadequate facilities limit effective CBT delivery.” Key issues include outdated equipment (60%, 24/40), limited workshop space (50%, 20/40), and safety concerns (40%, 16/40). Complementary responses indicate 20% (8/40) find infrastructure adequate, 40% (16/40) report modern equipment, 50% (20/40) sufficient space, and 60% (24/40) safe conditions (mean 20 respondents, SD 6.63) (Section 4.4).

Administrative Efforts: All administrators (13/13) focus on regular maintenance to ensure infrastructure functionality, but the lack of strategies like stakeholder collaboration limits improvements, contributing to adequacy gaps (Section 4.4).

High conduciveness (90.6% students, 100% instructors) and maintenance efforts support a functional environment for CBT’s practical focus.

Significant infrastructure gaps (80% insufficient, 60% outdated equipment) and high negative adequacy ratings (27.4% students, 25% instructors) hinder effective skill development.

High SDs (1.24 students, 1.39 instructors) reflect uneven infrastructure quality, leading to unequal training opportunities across institutes (Section 4.4).

5.2.3. To establish the influence of human resource capacity on competence-based training of automotive students in Uganda.

Effectiveness and Alignment of Teaching Methodologies: Students perceive teaching methodologies as moderately effective for skill development, with a mean of 3.56 (SD 1.10) on a 1–5 scale. 52.1% (150/288) rate them positively (4–5), with 28.5% (82/288) rating 4 and 23.6% (68/288) very effective, but 14.9% (43/288) give negative ratings (1–2), including 4.9% (14/288) not effective. 77.8% (224/288) agree methodologies align with

competence-based training (CBT) (mean 0.778, SD 0.41), though 22.2% (64/288) disagree, suggesting gaps in practical or individualized focus (Section 4.5).

Instructor Practices and Confidence: Instructors frequently use innovative teaching methods, with a mean of 3.80 (SD 0.90). 62.5% (25/40) use them at least frequently, with 37.5% (15/40) rating 4 and 25% (10/40) always (5). All instructors (100%) are confident in delivering CBT (mean 3.45, SD 0.50), with 45% (18/40) strongly agreeing and 55% (22/40) agreeing, reflecting strong preparation for CBT's demands (Section 4.5).

Human Resource Challenges: 70% (28/40) of instructors report insufficient staffing and human resource limitations, stating, "Not enough instructors to support student training needs" and "Staff shortages hinder effective CBT implementation." 65% (26/40) note limited professional development, saying, "Lack of training for instructors' limits teaching quality," and 65% (26/40) link staffing issues to reduced training effectiveness. Complementary responses indicate 30% (12/40) find staffing and resources adequate, and 35% (14/40) report adequate professional development or no significant impact (mean 20 respondents, SD 7.07) (Section 4.5).

Administrative Support: 76.9% (10/13) of administrators confirm training programs exist for instructors' methodologies, but 23.1% (3/13) report none, highlighting inconsistencies that may affect teaching quality across institutes (Section 4.5).

Discrepancies Across Respondent Groups: Students' moderate effectiveness rating (mean 3.56) and 22.2% disagreement on CBT alignment contrast with instructors' frequent use of innovative methods (mean 3.80) and high confidence (100%). This gap suggests inconsistent student experiences, possibly due to staffing shortages (70%) or limited instructor training (65%). The 23.1% of administrators reporting no training programs aligns with instructors' concerns about professional development, potentially explaining variability in student perceptions (Section 4.5).

Implications for Competence-Based Training:

Strengths: Strong methodology alignment (77.8% students), frequent use of innovative methods (62.5% instructors), and high instructor confidence (100%) support CBT's

practical, learner-centered approach, bolstered by 76.9% of administrators providing training programs.

Weaknesses: Staffing shortages (70%) and limited professional development (65%) reduce training effectiveness, as noted by instructors. The 14.9% of students rating methodologies ineffective and 22.2% disagreeing on alignment indicate gaps in practical skill delivery or consistency.

Variability: Moderate SDs (1.10 students, 0.90 instructors) reflect uneven methodology implementation, likely due to staffing constraints or training disparities, leading to unequal skill development across institutes (Section 4.5).

5.2.4. To assess the financial adequacy on competence-based training of automotive students in Uganda.

Adequacy Perceptions: Students perceive financial support as slightly inadequate, with a mean of 2.84 (SD 1.32) on a 1-5 scale (1 = not adequate, 5 = very adequate). 41.6% (120/288) give negative ratings (1-2), with 20.1% (58/288) rating it not adequate and 21.5% (62/288) rating 2, while 31.9% (92/288) give positive ratings (4-5), including 18% (52/288) rating 4 and 13.9% (40/288) very adequate. The high SD (1.32) indicates significant variability, suggesting some students benefit from funding (e.g., scholarships, tools), while others face shortages (Section 4.6).

Influence on Training: 87.5% (252/288) of students agree financial support influences practical training (mean 0.875, SD 0.33), with only 12.5% (36/288) disagreeing, showing its critical role in enabling hands-on learning. Instructors report a moderate influence on teaching quality (mean 3.35, SD 1.28), with 45% (18/40) giving positive ratings (4-5) and 25% (10/40) negative (1-2). 80% (32/40) agree financial support improves resource availability (mean 0.800, SD 0.40), though 20% (8/40) disagree (Section 4.6).

Funding Challenges: Instructors (80%, 32/40) link funding shortages to inadequate infrastructure, stating, "Lack of funding leads to inadequate facilities." Administrators report 60% (24/40) cite insufficient financial resources ("Budget shortages limit resource procurement") and 48% (19/40) note spending prioritization challenges ("Balancing

funds for tools and salaries is challenging”). Complementary responses indicate 20% (8/40) find infrastructure adequately funded, 40% (16/40) report sufficient financial resources, and 52% (21/40) see no prioritization issues (mean 20 respondents, SD 7.32) (Section 4.6).

Administrative Support: 61.5% (8/13) of administrators report mechanisms for financial support (e.g., government grants, sponsorships), but 38.5% (5/13) indicate none, highlighting inconsistent funding systems across institutes (Section 4.6).

Discrepancies Across Respondent Groups: Students’ lower adequacy rating (mean 2.84) contrasts with instructors’ moderate influence rating (mean 3.35), reflecting students’ direct financial burdens (e.g., fees, materials) versus instructors’ indirect benefits (e.g., resource availability). High agreement on practical training impact (87.5% students, 80% instructors) contrasts with negative adequacy perceptions (41.6% students), suggesting funding is critical but often insufficient. Administrators’ mixed responses (61.5% yes, 38.5% no) align with the variability in perceptions (Section 4.6).

Implications for Competence-Based Training:

Strengths: Financial support significantly enhances practical training (87.5% students) and resource availability (80% instructors) when present, supported by 61.5% of administrators reporting funding mechanisms, facilitating CBT’s hands-on focus.

Weaknesses: Low adequacy (mean 2.84, 41.6% negative) and absence of mechanisms in 38.5% of cases limit access to tools and training opportunities. Moderate teaching quality impact (mean 3.35) and high variability (SD 1.28) indicate inconsistent benefits across institutes.

Variability: High SDs (1.32 students, 1.28 instructors) reflect uneven funding distribution, likely due to differences in institute budgets or external support, leading to disparities in training quality (Section 4.6).

5.3 Conclusion

5.3.1. Influence of instructional resources on competence-based training.

Instructional resources were found to be insufficient, outdated, and misaligned with current industry practices. More than half of students (55%) and administrators (60%) reported that available tools and learning materials fail to adequately support the development of practical competencies. Limited access to modern instructional resources during practical sessions weakens students' skill acquisition and industry readiness.

5.3.2. Infrastructure relevance to competence-based training

Infrastructure deficiencies also emerged as a critical barrier. Approximately 60% of instructors and 70% of students cited inadequate workshops, limited space, and obsolete equipment as major obstacles to hands-on learning. Administrators confirmed that existing facilities, though partly relevant, are inadequate for the full realization of competence-based training objectives.

5.3.3. Influence of human resource capacity on competence-based training

Human resource capacity was another area of concern. A majority of administrators (65%) and instructors (70%) highlighted shortages of qualified trainers and insufficient opportunities for professional development. Students echoed challenges related to limited guidance due to understaffing. These capacity gaps reduce instructional quality and hinder the consistent delivery of competency-oriented learning education.

5.3.4. Financial adequacy and competence-based training

Financial inadequacy was identified as an overarching constraint affecting all other areas. Around 60% of administrators and 75% of instructors noted insufficient funding for infrastructure upgrades, instructional materials, and staff training. Budgetary shortfalls limit the acquisition of modern resources and compromise training quality.

5.4 Recommendation

To strengthen competence-based training, institutions should modernize tools, equipment, and textbooks to match industry standards while ensuring equitable access. Regular practical sessions must be emphasized for hands-on learning. Collaboration with automotive companies and industry stakeholders, alongside routine assessments to identify and address resource gaps, will enhance relevance, effectiveness, and alignment with evolving industry needs.

To enhance infrastructure relevance, institutions need to invest in expanding and upgrading training facilities, such as workshops, classrooms, and laboratories, to better support the demands of competence-based learning. Safety measures must also be enhanced to provide a secure environment for both students and instructors. Routine maintenance and aligning infrastructure improvements with evolving industry requirements are essential to ensure that students are well-prepared for real-world challenges.

For addressing human resource capacity, it is essential to recruit more qualified instructors and support staff to mitigate current staffing shortages. Institutions should provide ongoing professional development opportunities, including certifications, workshops, and industry exposure programs, to ensure instructors remain aligned with current trends and standards. Additionally, fostering strong collaboration between educational institutions and industry stakeholders can bridge knowledge gaps and enhance the delivery of competence-based training.

To improve financial adequacy, institutions must advocate for increased budget allocations and explore alternative funding sources, such as government grants, donor support, and partnerships with private sector stakeholders. Efficient budget management practices should be implemented to prioritize spending on critical areas like infrastructure upgrades, instructional resources, and staff development. Diversifying

funding streams and ensuring transparency in financial decisions will enable institutions to overcome budgetary constraints and elevate the overall quality of training programs.

5.5 Recommendations for Future Research

Based on the findings of the study, conclusion and recommendations, the study proposes the following to be done in future to further knowledge on competency-based training of automotive students in Technical Training Institutions of Uganda.

- (i) Similar research needs to be conducted in the private TVET institutions in Uganda.
- (ii) Future research should incorporate the views of industry players and employers on the competence levels of Automotive CBT graduates. This would help determine the relevance of training to real-world job requirements.
- (iii) There is a need for longitudinal research to assess the long-term impact of CBT on graduates' employability, skill retention, and career progression. This can help track the real-world effectiveness of CBT over time.
- (iv) There is a need to investigate the participation and performance of underrepresented groups (e.g., female students, students with disabilities) in automotive CBT programs, to inform inclusive policy and practice.
- (v) Research could explore how emerging technologies (e.g., electric vehicles, diagnostics software, and hybrid engines) are being integrated into CBT curricula and their impact on training relevance.

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APPENDIX 1: ADMINISTRATORS QUESTIONNAIRE

DATA COLLECTION TOOLS USED

1. QUESTIONERS

Version 2.0

Questioners for the Administrators to be conducted by either the research supervisor or a trained research Assistant in the selected TVET institutions and this is to be done any time between 8:00Am - 4:00Pm.

Title: Competence-Based Training and skill acquisition of Automotive Students in Technical Training Institutes in Eastern Region of Uganda.

Researcher:

Institution:

Department:

Supervisor:

Date:

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Phone: +256782249808

Purpose of the Study:

This study aims to evaluate the effectiveness of competence-based training programs and skill acquisition for automotive students in technical training institutes in the Eastern Region of Uganda. The findings will contribute to improving the quality of automotive education and training.

Confidentiality Statement:

All responses will be kept strictly confidential. The data collected will be used solely for academic purposes and will not be shared with any third parties.

Acknowledgements:

I would like to thank all participants for their time and valuable insights. Your contributions are greatly appreciated and will significantly aid in the success of this research.

To be filled by administrators in technical training institutions (Principles and Heads of Department)

Influence of Instructional Resources on competency-based training.

Section A: Demographic Information

1. What is your age?

Below 25

25-35

36-45

Above 45

2. What is your gender?

Male

Female

3. What is your position in the technical training institute?

Principal/Head of Institution

Department Head

Academic Coordinator

Other (please specify)

.....

4. How many years have you been involved in the administration of technical training programs?

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5. Have you observed any challenges in providing adequate instructional resources for automotive education? If yes, please specify.

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Examination of Infrastructure Relevance

Section C: Infrastructure Management

6. How do you ensure that infrastructure facilities (e.g., workshops, laboratories) meet the needs of automotive education?

- Regular maintenance and upgrades
- Conducting facility assessments
- Collaboration with stakeholders
- Other (please specify)

7. **What strategies are in place to address any deficiencies or shortcomings in infrastructure facilities for automotive education?**

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Influence of Human Resource Capacity

Section D: Instructor Management

8. How do you assess the qualifications and competence of automotive instructors within the institute?

- Formal evaluations**
- Observations of teaching practices**
- Feedback from students**
- Other (please specify)**

9. **Are there any initiatives or programs in place to support professional development for automotive instructors? If yes, please describe.**

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Influence of Financial Resources:

10. What is the annual budget allocated specifically for the automotive department or program?

- Less than 1,000,000
- Ugx 1,000,000 – Ugx 3,000,000
- Ugx 3,000,000 – 5,000,000
- More than Ugx 5,000,000
- Not sure

11. How do you allocate funds within the automotive department? (Check all that apply)

- Salaries for instructors
- Purchase of automotive equipment and tools
- Maintenance and repair of automotive facilities
- Training materials and supplies
- Other (please specify):

.....
.....

12. What are the primary financial challenges faced by the automotive department in providing skill acquisition programs? (Check all that apply)

- Limited budget allocation
- Insufficient funding for equipment and tools
- High operational costs
- Difficulty in accessing funding/grants
- Lack of financial transparency/accountability
- Other (please specify):

.....
.....

13. How do these financial challenges impact the quality of skill acquisition programs for automotive students?

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.....

14. Do you offer financial assistance or scholarships specifically for automotive students?

- Yes**
- No**
- Not sure**
- If yes, please specify the type of financial assistance available and the eligibility criteria.**

.....
.....

15. Are there any partnerships or collaborations with industry stakeholders to support skill acquisition programs for automotive students?

- Yes
- No
- Not sure

If yes, please describe the nature of these partnerships and their impact on the automotive department.....

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16. What measures do you believe can improve the financial adequacy of skill acquisition programs for automotive students in Uganda?

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17. Any additional comments or suggestions related to the financial sustainability of the automotive department.

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Overall Program Evaluation

18. How do you evaluate the overall effectiveness of the automotive education program in preparing students for the industry?

Graduates' employment rates

Feedback from employers

Student performance assessments

Other (please specify)

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19. What measures are taken to address any identified gaps or areas for improvement in the automotive education program?

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APPENDIX II: INSTRUCTOR QUESTIONNAIRE

Version 2.0

Questionnaire for the Instructors to be conducted by either the research supervisor or a trained research Assistant in the selected TVET institution and this is to be done any time between 8:00Am – 4:00Pm.

Title: Competence-Based Training and skill acquisition of Automotive Students in Technical Training Institutes in Eastern Region of Uganda.

Researcher:

Institution:

Department:

Supervisor:

Date:

Contact Information:

Email: okungsamson@gmail.com

Phone: +256782249808

Purpose of the Study:

This study aims to evaluate the effectiveness of competence-based training programs **and skill acquisition** for automotive students in technical training institutes in the Eastern Region of Uganda. The findings will contribute to improving the quality of automotive education and training.

Confidentiality Statement:

All responses will be kept strictly confidential. The data collected will be used solely for academic purposes and will not be shared with any third parties.

Acknowledgements:

I would like to thank all participants for their time and valuable insights. Your contributions are greatly appreciated and will significantly aid in the success of this research.

To be filled by instructors in technical training institutions

Influence of Instructional Resources on Skill Acquisition

Section A: Demographic Information

1. What is your age?

- Below 25
- 25-35
- 36-45
- Above 45

2. What is your gender?

- Male
- Female

3. How many years of experience do you have in teaching automotive subjects?

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.....

4. Which technical training institutes are you affiliated with?

.....
.....

Section B: Utilization of Instructional Resources

5. How often do you incorporate textbooks or study materials in your automotive teaching curriculum?

- Rarely
- Occasionally
- Frequently
- Always

6. How frequently do you conduct practical workshops or hands-on training sessions for automotive students?

- Rarely
- Occasionally
- Frequently

Always

7. Do you have access to specialized automotive tools and equipment for practical demonstrations and training?

Yes

No

Section C: Perceived Impact on Student Skill Acquisition

8. In your opinion, how do instructional resources contribute to students' understanding of automotive concepts and techniques?

Not Effective

Somewhat Effective

Moderately Effective

Highly Effective

9. How do instructional resources influence students' practical skills development in automotive tasks?

Not Effective

Somewhat Effective

Moderately Effective

Highly Effective

Objective 2: Examination of Infrastructure Relevance

Section D: Infrastructure Facilities

10. Assess the adequacy of infrastructure facilities (e.g., workshops, laboratories) in your technical training institute for automotive education on a scale of 1 to 5.

1 (Very Inadequate)

2 (Inadequate)

3 (Adequate)

4 (Good)

5 (Excellent)

11. Do you believe that infrastructure facilities adequately support practical learning and skill development in automotive tasks? Please elaborate.

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Objective 3: Influence of Human Resource Capacity

Section E: Instructor Effectiveness

12. How do you contribute to students' skill acquisition and proficiency in automotive tasks?

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13. In your experience, how does the expertise and experience of instructors impact students' learning outcomes in automotive education?

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APPENDIX III: STUDENT QUESTIONNAIRE

Version 2.0

Questioners for the students to be conducted by either the supervisor or a trained research Assistant in the selected TVET insisted and this is to be done any time between 8:00Am – 4:00Pm.

Title: Competence-Based Training and skill acquisition of Automotive Students in Technical Training Institutes in Eastern Region of Uganda.

Researcher:

Institution:

Department:

Supervisor:

Date:

Contact Information:

Email: okungsamson@gmail.com

Phone: +256782249808

Purpose of the Study:

This study aims to investigate the effectiveness of competence-based training programs and skill acquisition for automotive students in technical training institutes in the Eastern Region of Uganda. The findings will contribute to improving the quality of automotive education and training.

Confidentiality Statement:

All responses will be kept strictly confidential. The data collected will be used solely for academic purposes and will not be shared with any third parties.

Acknowledgements:

I would like to thank all participants for their time and valuable insights. Your contributions are greatly appreciated and will significantly aid in the success of this research.

To be filled by automotive students in technical training institutions

Influence of Instructional Resources on competence bases training.

Section A: Demographic Information

1. What is your age?

Below 20

20-25

26-30

Above 30

2. What is your gender?

Male

Female

3. Which technical training institutes are you enrolled in?

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4. What is your current level of study?

Certificate

Diploma

Bachelor's Degree

Section B: Utilization of Instructional Resources

5. How often do you use textbooks or study materials provided in your automotive training?

Daily

Weekly

Monthly

Rarely

Never

6. How frequently do you participate in practical workshops or hands-on training sessions?

- Daily
- Weekly
- Monthly
- Rarely
- Never

6. Do you have access to specialized automotive tools and equipment for practical learning activities?

- Yes
- No

6. Rate the effectiveness of instructional resources (e.g., textbooks, workshops, equipment) in enhancing your automotive skills on a scale of 1 to 5:

- 1 (Not Effective)
- 2
- 3
- 4
- 5 (Very Effective)

Section C: Perceived Impact on Skill Acquisition

7. To what extent do instructional resources contribute to your understanding of automotive concepts and techniques?

- Not at all
- Slightly
- Moderately
- Significantly
- Extremely

8. How do instructional resources influence your practical skills development in automotive tasks?

- Not at all
- Slightly
- Moderately
- Significantly
- Extremely

9. Have you faced any challenges or limitations in accessing or utilizing instructional resources?

If yes, please specify.

Examination of Infrastructure Relevance

Section D: Infrastructure Facilities

10. Assess the adequacy of infrastructure facilities (e.g., workshops, laboratories, classrooms) in your technical training institute for automotive education on a scale of 1 to 5:

- 1 (Very Inadequate)
- 2
- 3
- 4
- 5 (Very Adequate)

11. Are the infrastructure facilities conducive to practical learning and skill development in automotive tasks? Please elaborate.

Human Resource Capacity

Section E: Instructor Support

12. Rate the effectiveness of instructors in delivering automotive training and providing guidance and support on a scale of 1 to 5:

- 1 (Not Effective)
- 2
- 3
- 4
- 5 (Very Effective)

13. Do instructors demonstrate sufficient expertise and experience in automotive subjects to facilitate effective learning?

- Yes
- No

14. How do instructors contribute to your skill acquisition and proficiency in automotive tasks?

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APPENDIX IV: IN-DEPTH INTERVIEWS GUIDES FOR STUDENTS

Version 2.0

In-depth interview guide for the students to be conducted by either the supervisor or a trained research Assistant in the selected TVET insisted and this is to be done any time between 8:00Am – 4:00Pm.

Title: Competence-Based Training and skill acquisition of Automotive Students in Technical Training Institutes in Eastern Region of Uganda.

Researcher:

Institution:

Department:

Supervisor:

Date:

Contact Information:

Email: okungsamson@gmail.com

Phone: +256782249808

Purpose of the Study:

This study aims to investigate the effectiveness of competence-based training programs for automotive students in technical training institutes in the Eastern Region of Uganda. The findings will contribute to improving the quality of automotive education and training.

Confidentiality Statement:

All responses will be kept strictly confidential. The data collected will be used solely for academic purposes and will not be shared with any third parties.

Acknowledgements:

I would like to thank all participants for their time and valuable insights. Your contributions are greatly appreciated and will significantly aid in the success of this research.

Interview Questions:

1. Background Information
 - (i) Can you tell me about your background and how you chose to study automotive mechanics?
 - (ii) How long have you been studying at this institution?
2. Understanding Competence-Based Training
 - (i) How would you describe competence-based training in your own words?
 - (ii) What aspects of your training do you consider most important for developing competence in automotive mechanics?
 - (iii) How do you feel about the level of practical training you receive compared to theoretical knowledge?
3. Instructional Resources
 - (i) What instructional resources (tools, equipment, textbooks, etc.) are available to you during your training?
 - (ii) How often do you get the opportunity to use these resources in your practical sessions?
 - (iii) In your opinion, are the available instructional resources adequate for your learning needs? Why or why not?
 - (iv) Can you describe a time when a lack of resources affected your ability to learn or practice a skill?
4. Quality and Accessibility of Resources
 - (i) How would you rate the quality of the tools and equipment provided for your training? (Probe: Are they modern, functional, and relevant to current industry standards?)
 - (ii) Are the instructional resources easily accessible to all students? (Probe: Are there enough resources for everyone? Do some students struggle to access them?)
 - (iii) How do the instructors utilize these resources during your training sessions?

5. Challenges and Recommendations

- (i) What challenges do you face in accessing or using instructional resources?
- (ii) How do you think these challenges could be addressed to improve your training experience?
- (iii) What recommendations would you make to improve the availability and use of instructional resources in your institute?

6. Impact on Competence Development

- (i) How do you think the availability and quality of instructional resources have impacted your competence in automotive mechanics?
- (ii) Have you ever felt that the lack of resources limited your ability to achieve certain competencies? If so, can you provide an example?

7. Overall Experience

- (i) How satisfied are you with the overall competence-based training you are receiving?
- (ii) If you had the chance to improve any aspect of your training, what would it be and why?

Conclusion:

- (i) Thank the interviewee for their time and insights.
- (ii) Reiterate the confidentiality of the information shared.
- (iii) Inform the interviewee that they can reach out if they have any additional thoughts or questions.

APPENDIX V: IN-DEPTH INTERVIEW GUIDE FOR ADMINISTRATORS

Version 2.0

In-Depth Interview Guide for Administrators to be conducted by either the research supervisor or a trained research Assistant in the selected TVET institution and this is to be done any time between 8:00Am – 4:00Pm.

Title: Competence-Based Training and skill acquisition of Automotive Students in Technical Training Institutes in Eastern Region of Uganda.

Researcher:

Institution:

Department:

Supervisor:

Date:

Contact Information:

Email: okungsamson@gmail.com

Phone: +256782249808

Purpose of the Study:

This study aims to evaluate the effectiveness of competence-based training programs and skill acquisition for automotive students in technical training institutes in the Eastern Region of Uganda. The findings will contribute to improving the quality of automotive education and training.

Confidentiality Statement:

All responses will be kept strictly confidential. The data collected will be used solely for academic purposes and will not be shared with any third parties.

Acknowledgements:

I would like to thank all participants for their time and valuable insights. Your contributions are greatly appreciated and will significantly aid in the success of this research.

Interview Questions:

1. Background Information

- (i) Can you provide an overview of your role and responsibilities as an administrator in this institution?
- (ii) How long have you been in this position, and what is your experience in managing technical training programs?

2. Human Resource Capacity

- (i) How would you describe the current staffing levels in the automotive department? (Probe: number of instructors, support staff, etc.)
- (ii) What qualifications and experience do the instructors in the automotive department typically possess?
- (iii) How do you evaluate the effectiveness of the current human resource capacity in delivering competence-based training?
- (iv) What steps does the institution take to ensure continuous professional development for instructors? (Probe: workshops, training programs, industry exposure)
- (v) In your opinion, are there any gaps in the current human resource capacity that affect the quality of competence-based training? If so, what are they, and how could they be addressed?

3. Financial Adequacy

- (i) Can you provide an overview of the financial resources allocated to the automotive training program?
- (ii) How do you prioritize spending to ensure that the automotive department has the necessary resources for competence-based training? (Probe: infrastructure, instructional materials, staff salaries, student support)
- (iii) In your view, is the current financial allocation sufficient to meet the needs of a competence-based curriculum? Why or why not?

- (iv) What challenges do you face in securing adequate funding for the automotive training program? (Probe: budget constraints, government funding, donor support)
- (v) How do financial limitations impact the quality of training, particularly in terms of infrastructure, instructional resources, and human resource capacity?

4. Influence of Financial and Human Resource Capacity on Training Outcomes

- (i) How do you believe the adequacy of financial resources influences the development of competencies among automotive students?
- (ii) In what ways does the human resource capacity affect student outcomes in terms of skill acquisition and readiness for the job market?
- (iii) Can you share any specific examples where financial or human resource limitations have affected the competence-based training outcomes?

5. Challenges and Strategic Solutions

- (i) What are the primary challenges you face in managing the human resource and financial aspects of the automotive training program?
- (ii) What strategies have you implemented to overcome these challenges?
- (iii) What additional support (e.g., from government, industry, donors) would you find beneficial to enhance the competence-based training program?

6. Recommendations for Improvement

- (i) What recommendations would you make to improve the human resource capacity in your institution?
- (ii) What steps do you believe should be taken to ensure financial adequacy for the automotive training program?
- (iii) How can the institution better align its financial and human resource strategies to improve competence-based training outcomes?

7. Overall Perspective

- (i) From your perspective as an administrator, how would you rate the overall effectiveness of the competence-based training program in your institution?
- (ii) If you could make one significant change to enhance the competence-based training of automotive students, what would it be and why?

Conclusion:

- Thank the administrator for their time and valuable insights.
- Reassure them of the confidentiality of their responses.
- Let them know that they can contact you if they have any further thoughts or questions.

APPENDIX VI: IN-DEPTH INTERVIEW GUIDE FOR THE INSTRUCTORS

Version 2.0

In-depth interview guide for the instructors to be conducted by either the research supervisor or a trained research Assistant in the selected TVET institution and this is to be done any time between 8:00Am – 4:00Pm.

Title: Competence-Based Training and skill acquisition of Automotive Students in Technical Training Institutes in Eastern Region of Uganda.

Researcher:

Institution:

Department:

Supervisor:

Date:

Contact Information:

Email: okungsamson@gmail.com

Phone: +256782249808

Purpose of the Study:

This study aims to evaluate the effectiveness of competence-based training programs **and** skill acquisition for automotive students in technical training institutes in the Eastern Region of Uganda. The findings will contribute to improving the quality of automotive education and training.

Confidentiality Statement:

All responses will be kept strictly confidential. The data collected will be used solely for academic purposes and will not be shared with any third parties.

Acknowledgements:

I would like to thank all participants for their time and valuable insights. Your contributions are greatly appreciated and will significantly aid in the success of this research.

Interview Questions:

1. Background Information

- (i) Can you tell me about your background and experience in teaching automotive mechanics?
- (ii) How long have you been teaching at this institution?

2. Understanding Competence-Based Training

- (i) How would you define competence-based training in the context of automotive education?
- (ii) What are the key competencies that you aim to develop in your students?

3. Infrastructure Relevance

- (i) Can you describe the current infrastructure available at your institute for automotive training (e.g., workshops, laboratories, classrooms)?
- (ii) In your opinion, how relevant is this infrastructure to the needs of a competence-based curriculum?
- (iii) Are there any gaps in the infrastructure that hinder the effectiveness of competence-based training? (Probe: outdated equipment, lack of space, inadequate safety measures)
- (iv) How do you think the infrastructure could be improved to better support competence-based training?

4. Human Resource Capacity

- (i) How would you describe the current staffing levels in the automotive department? (Probe: Are there enough instructors, support staff, etc.?)
- (ii) What is the level of expertise and experience among the teaching staff in the automotive department?
- (iii) How do you ensure that your own skills and knowledge stay current with industry standards?

- (iv) In your opinion, does the current human resource capacity (instructors, support staff) adequately support competence-based training? Why or why not?
- (v) Are there any professional development opportunities available to you and your colleagues? If so, how do they contribute to your ability to deliver competence-based training?

5. Challenges and Recommendations

- (i) What challenges do you face in delivering competence-based training, particularly related to infrastructure and human resources?
- (ii) How do you address these challenges in your teaching practice?
- (iii) What recommendations would you make to improve the infrastructure and human resource capacity in your institute to enhance competence-based training?

6. Impact on Student Competence Development

- (i) In your experience, how does the current infrastructure impact students' ability to develop key competencies in automotive mechanics?
- (ii) How does the human resource capacity influence the quality of training and the competence of students?
- (iii) Can you share any examples of how infrastructure or human resource limitations have affected student outcomes?

7. Overall Experience

- (i) How satisfied are you with the overall competence-based training environment at your institution?
- (ii) If you could implement one significant change to improve competence-based training at your institute, what would it be and why?

APPENDIX VII: FOCUSED GROUP DISCUSSION GUIDE FOR STUDENT

Version 2.0

Focus Group Discussion Guide for Students to be conducted by either the supervisor or a trained research Assistant in the selected TVET insisted and this is to be done any time between 8:00Am – 4:00Pm.

Title: Competence-Based Training and skill acquisition of Automotive Students in Technical Training Institutes in Eastern Region of Uganda.

Researcher:

Institution:

Department:

Supervisor:

Date:

Contact Information:

Email: okungsamson@gmail.com

Phone: +256782249808

Purpose of the Study:

This study aims to investigate the effectiveness of competence-based training programs and skill acquisition for automotive students in technical training institutes in the Eastern Region of Uganda. The findings will contribute to improving the quality of automotive education and training.

Confidentiality Statement:

All responses will be kept strictly confidential. The data collected will be used solely for academic purposes and will not be shared with any third parties.

Acknowledgements:

I would like to thank all participants for their time and valuable insights. Your contributions are greatly appreciated and will significantly aid in the success of this research.

Discussion Questions:

1. Understanding Competence-Based Training
 - i) What does competence-based training mean to you?
 - ii) How do you think competence-based training differs from other forms of learning?
2. Instructional Resources Overview
 - i) What types of instructional resources are available to you in your automotive training program? (Probe: tools, equipment, textbooks, digital resources)
 - ii) How often do you use these resources in your practical and theoretical sessions?
3. Adequacy of Instructional Resources
 - i) Do you feel that the available instructional resources are sufficient for your learning needs? Why or why not?
 - ii) Are there any specific resources that you think are lacking or need improvement? (Probe: quality, quantity, relevance to modern industry practices)
4. Access to Instructional Resources
 - i) How accessible are the instructional resources to all students? (Probe: availability, ease of access, competition for resources)
 - ii) Have you ever faced challenges in accessing the resources you need for your training? If so, how did it affect your learning?
5. Impact on Competence Development
 - i) How do you think the availability and quality of instructional resources impact your ability to develop the necessary skills in automotive mechanics?
 - ii) Can you share an example of a time when the resources you had helped you successfully master a skill?

- iii) Conversely, can you share an experience where a lack of resources hindered your learning?
6. Suggestions for Improvement
- i) What improvements would you suggest for the instructional resources available in your program?
 - ii) How do you think these improvements would enhance your competence-based training experience?
7. Overall Experience
- i) How satisfied are you with the overall competence-based training provided at your institution, considering the instructional resources available?
 - ii) If you could change one thing about the resources or how they are used, what would it be and why?

Conclusion:

- (i) Thank the participants for their time and insights.**
- (ii) Reiterate the importance of their feedback for the study.
- (iii) Inform them that they can contact you if they have any further thoughts or questions after the discussion.

APPENDIX VII: COMMUNITY ENGAGEMENT PLANS

VERSION 2.0

COMMUNITY ENGAGEMENT PLAN

STUDY TITLE: Competence-based training **and** skill acquisition of automotive students in technical training institutes in the eastern region of Uganda

Principle Investigator: Okung Samson

Rationale of the study

The purpose of this research is to investigate the effectiveness of competence-based training and skill acquisition of automotive students in technical training institutes in the eastern region of Uganda.

General objective and specific objectives to be achieved

- (i) To determine the influence of instructional resources on competence-based training of Automotive students in Uganda.
- (ii) To evaluate infrastructure relevance on skill on competence-based training of Automotive students in Uganda.
- (iii) To establish the influence of human resource capacity on competence-based training of Automotive students in Uganda.
- (iv) To assess the financial adequacy on competence-based training of Automotive students in Uganda.

The objectives of the community engagement are to;

- (i) To sensitize the community and the stakeholders about the nature of the research and receive real time feedback.
- (ii) Provide clarity on the respective roles and responsibilities of the stakeholders involved in the study before, during and after the study.
- (iii) Address key ethical concerns of the research. These will include the benefits of the study to the affected community so that the community appreciates the value of the research, the consenting processes prior to the research and the rights of the

participants.

The key community stakeholders to be involved

State the stakeholders to be students, Instructors and Institutional administrators.

We will maintain constant engagement of stakeholders throughout the duration of the research,

The research team responsible for managing community engagement activities

S/N	Research Team	Technical abilities	Tasks/lead roles
1	Researcher Ap		Will lead the research team, coordinate and oversee the implementation of the Community engagement plan
2	Research assistants		Will issue questionnaires to the participants

Approaches, activities and mode of implementation

The approach to community engagement will involve formative consultations, existing community structures and community events as follows;

Formative Consultations: We will use formative consultations to understand the geographical nature of the areas, socio-cultural norms and practices, power influences, local perceptions of the target population related to the study. This will be undertaken through field visits to the study areas to gain sufficient familiarity with the geographical characteristics.

Community Stakeholders' Partnerships: Gaining community entry will require effective engagement of the community structure and stakeholders as follows;

S/N	Stakeholders	Roles/Involvement
1	Ministry of Education and sports	Policy maker
2	Instructional administrators	Implements policy
3	Automotive Instructors	Conducts training
4	Automotive students	Primary receiver of the policy that is implemented
5	Parents to Automotive students	Secondary beneficiary to the policy

Communication strategy for the engagement

Communication between the research team and the stakeholders will be conducted throughout the study period.

Prior, to the consultative meetings, we will contact the Institutional administrators of the study area by phone for an appointment for a meeting. During the meeting, the subject matter will be introduced.

Considering that the engagement will also include sharing the research results, we will produce leaflets and distribute to the participants during the focused group discussions to share results of the research findings, challenges encountered and steps taken to address them, lessons learned and recommendations.

Plan on mitigation of risks and conflicts

Risks and conflicts might arise before, during or after the conduct of research. The risks and conflicts have the potential to affect the research and the research outcomes. If they occur, they will be addressed as soon as they are detected. GUREC and UNCST will be notified of risks and conflicts of adverse nature. We anticipate the following risks and conflicts;

There is the risk of the spread of covid-19 virus which is presently a global and national health concern. The study team is well trained and will ensure that prevention measures such use of masks, washing hands is adhered to during the conduct of the study especially during the meetings and workshops both in the community and the health care facilities

Evaluation plan

Evaluation will be conducted prior to the conduct of the research, during the research and after the research. Field notes, minutes, documents generated, observations made during the community engagement with the different stakeholders and during the implementation of the research will be comprehensively reviewed and analyzed. Feedback will be considered as value information. Feedbacks that are considered as in disharmony with the study will be comprehensively in order to achieve the objectives of the community engagement and the research.

APPENDIX IX: PREVENTION & CONTROL OF RISK OF SPREAD OF COVID-19

Version 2.0

Measures for the Prevention and control of risk of spread of COVID-19 during the implementation of research

Study Title: Competence-based training and skill acquisition of automotive students in technical training institutes in the eastern region of Uganda

Principal Investigator: Okung Samson

Introduction:

The novel Corona-virus is transmitted from human to human through droplets and direct or close personal contact with an infected individual. Novel Coronavirus signs of infection include respiratory symptoms, fever, cough, shortness of breath, and breathing difficulties. In more severe cases, the infection can cause pneumonia, severe acute respiratory syndrome, kidney failure, and even death.

Implementation of the prevention and control measures

In the implementation of the research activities, the investigators are committed to ensuring the safety of its research team, research participants, and communities where the study will be conducted. The study team undertakes to comply with the Standard Operating Procedures issued by the Ministry of Health, and presidential directives to mitigate against the risk of infection of COVID-19, effectively respond to any COVID-19 case that may occur in the process of carrying out the study

Procedures to be followed during the implementation of the research.

A. Prior to data collection and training

1. Health guidance: There will be sensitization and awareness, to equip the research team and participants with knowledge of signs and symptoms of the COVID-19, and preventive measures such as hand hygiene before placing and removing the mask, as well as storage of the mask, social distancing.
2. Wearing face coverings: All researchers and research assistants and any other individuals engaged in research activities that require interaction with fellow researchers or research participants or the community members will have to wear a face mask that fully covers the mouth and nose in the situations required by the Health Ministry guidance. The study will provide face masks for individuals who do not have them.
3. Physical Distancing: There will be reasonable social distance during the training, meetings, community outreach
4. Good hygiene: All team members will be required to wash their hands or use hand sanitizers regularly. Hand washing equipment shall be supplied and made available at all times. All surfaces and equipment shall be sanitized frequently.

B. During data collection

1. Personal Protective Equipment (PPE): All research assistants involved in tracing of respondents and in in-person interviews and research participants will use a properly fitted face mask. Enumerators/Researchers and research participants will wash hands with soap and water or use hand sanitizer prior to the interview. Handshakes and hugging are prohibited.
2. Consent Process: The researchers will observe reasonable social distancing when taking consent upon arrival to the participant. Researchers and research participants will wash hands with soap and water or use hand sanitizer prior to the interview. As indicated in the informed consent form, participants will be sensitized on COVID-19 and presented with preventive measures.

3. Equipment sanitization: Devices used to record or capture data, namely tape recorders, shall be sanitized regularly.

C. During Dissemination/Community engagement

1. Community Engagement: Researchers and research participants will wear masks, wash hands with soap and water or use hand sanitizer prior to the event.
2. Equipment sanitization: Shared devices used during community engagements shall be sanitized regularly.

These preventive measures will be continuously reviewed based on new information and guidelines communicated by the Ministry of Health.

APPENDIX X: INFORMED ASSENT FORM

Version 2.0

INFORMED ASSENT FORM (FOR CHILDREN 8 YEARS TO 17 YEARS AND PERSONS INCAPABLE OF SELF DETERMINATION)

I am Okung Samson, Lecturer (Automotive mechanics) at National Instructors College Abilonino (NICA) and a student of Masters of Technology Education at University of Eldoret. My telephone contact is 0782249808/0751799663, and email address is okungsamson@gmail.com

I am conducting a study on competence-based training and skill acquisition of automotive students in technical training institutes in the eastern region of Uganda

Objectives of the study

This study seeks to determine the influence of instructional resources on competence-based training of Automotive students in Uganda, evaluate infrastructure relevance on skill on competence-based training of Automotive students in Uganda, establish the influence of human resource capacity on competence-based training of Automotive students in Uganda, assess the financial adequacy on competence-based training of Automotive students in Uganda. This will aid in determining measures for attaining competence-based training of automotive students in Eastern Uganda.

You have been identified as a participant for this study, and I kindly request you to take part.

Study procedure

The study will involve gathering the participant details like the age category, for the students; year of study for the course, year of study for the course, for the Instructors and administrators, it will capture the experience in the field of training and management. Data collection will be in form of interviews, questionnaires and focused grouped discussions.

Benefits

All research participants will be informed on the findings and progress of the study and any information that will have any impact, the participants will be informed.

Compensation

All students partaking in this study will be given notes books and pens as time compensation.

Risks

There is no foreseeable risk of harm or discomfort that will arise from your participation in this study. The only risk or discomfort will be the inconvenience in terms of time spent during the interview.

Confidentiality

Any information obtained from you that identifies you by name will be kept private and secure in a locked place and will be accessed only by the principle investigator, the research team or Gulu University Research and Ethics Committee (GUREC) members. We will not identify you by your name. The soft copy of the information obtained from you will be kept in a password- protected computer that is only accessible by the research team and the GUREC members.

Participants' rights

Your participation in this study is entirely voluntary and refusal to participate will not in any way make you be discriminated against. You are free to withdraw from the study at any stage in case you feel that your rights are not being respected or if you are not comfortable with the study procedure. If you choose to withdraw, all your information previously collected will be destroyed and not used as part of the data analysis or dissemination. In case you still have more questions regarding this study, you may call Okung Samson, Tel: 0782249808/0751799663, email: okungsamson@gmail.com. In case of any questions regarding confidentiality or your rights as a study participant please contact the Chairperson of Gulu University Research and Ethics Committee, Dr. Julaina A. Obika Tel: No., 0772964491; email: j.obika@gu.ac.ug ; or the Uganda National Council for Science and Technology, on plot 6 Kimera road, Ntinda, Kampala on Tel 0414705500

Assent statement

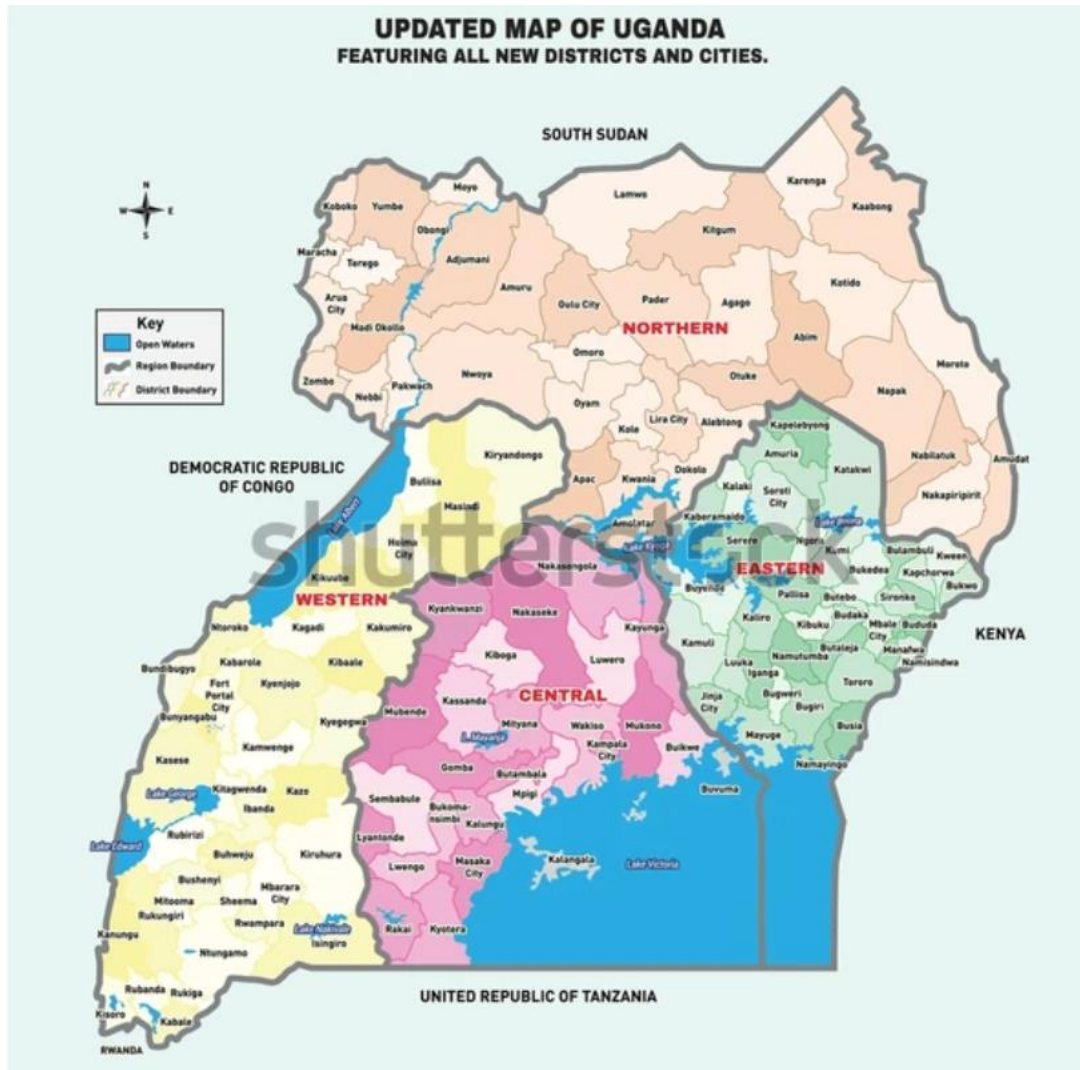
I have been informed of this study on competence-based training of automotive students in eastern Uganda. I have been given enough explanation about the study procedures, benefits, risks, and my rights as a participant in this study. I am aware that participation in this study is entirely voluntary and that I can withdraw, without prejudice, from the study at any stage in case I do not feel comfortable with the procedure or study. I understand that it will not affect my access to the healthcare that I will receive from this health facility or any other social services/facilities that I intend to access/visit. I therefore accept to take part in this study as a study participant.

Name of child/Respondent	Signature/ thumbprint	Date
.....

Investigator's/ research assistant's name	Signature	Date
.....

Name of Witness	Signature/thumbprint	Date
.....

APPENDIX XI: MAP OF STUDY AREA



Map of Uganda showing the eastern region

APPENDIX XII: STUDENTS' RESPONSES TO QUESTIONNAIRES

Frequency distribution of students' responses to questionnaires

S/N	QUESTION	RESPONSE	NUMBER OF RESPONDENTS PER INSTITUTION										
			A	B	C	D	E	F	G	H	I	J	
1	Age												
		Below 20	4										
		20-25	16	28	28	3	3	3	3	3	3	3	30
		26-30		2									
		Above 30											
2	Gender	M	20	30	26	3	3	3	3	3	3	3	30
		F	0		2								
3	Level of education	Certificate	20	30	28	3	3	3	3	3	3	3	30
		Diploma											
		Bachelor's Degree											
4	How often do you use textbooks or instructional materials provided?	Daily	8		16	8	1	1	1	1	1	1	9
		Weekly		28	8	1	1	1	1	1	1	1	16
		Monthly	4										
		Rarely	4	2	2	1		4	2	2	7	5	
		Never	4		2								
5	Frequency of participation in	Daily			12	2	1	8		8	4	7	

	practical training sessions	Weekly	2	28	16	1	1	1	2	1	2	16
		Monthly	4			0	8	6	0	8	0	
		Rarely	14	2		8			4	1		3
		Never							1			
6	Access to specialized automotive tools	Yes	14	28	26	1	2	2	2	3	2	26
		No	6	2	2	0	8	3	1		7	4
7	Ratings of instructional resources on enhancing automotive skills	1-Not effective			4	1					1	10
		2	8	8	4	2	1		3	2	8	1
		3	6	18	10	8	1	1	5		3	8
		4	4	4	2	2	1	6	7		3	3
		5-Very effective	2		8	8	3	1	1		4	8
Perceived Impact on Skill Acquisition												
8	Extent to which instructional resources contribute to understanding of automotive concepts	Not at all							2			
		Slightly	4			2	4	5	4	7	5	3
		Moderately	6	30	16	1	1	1	1	1	4	13
		Significantly	8		8	6	4	6	4	4		4
		Extremely	2		4	1	8	6	4	9	1	10

9	How do instructional resources influence your practical skill development	Not at all			16		1 2				1	4	
		Slightly		2		6	4	6	5	2		2	
		Moderately	12	22		1 2	1 2	1 2	1 0	1 6	1 1	6	
		Significantly	8	6	10	4		1 2	7	4	4	6	12
		Extremely			2	8	2		8	8	1 2	6	
10	Have you faced challenges limiting you from accessing instructional materials	Yes	8	28	28	2 0	2 8	2 7	2 6	2 2	2 0	26	
		No	2	2		1 0	2	3	4	8	1 0	4	
Examination of Infrastructure Relevance													
11	Adequacy of instructional facilities	1-Very inadequate			4	1 4	9					4	
		2	6	10	4	4	4	7	7	4		2	
		3	4	10	6		1 3	1 2	1 0	1 4	1 2	6	
		4	6	8	6	6		1 3	7	4	6	10	
		5-Very adequate	4	2	8	6	2		6	8	1 2	8	
12		Yes	14	30	28	2 6	2 8	2 6	2 7	2 4	2 8	30	

	Are infrastructure facilities conducive	No	6			4	2	4	3	6	2	
Human resource capacity												
13	Rate the effectiveness of Instructors	1-Not effective			2	4	1				2	10
		2	2	2	2	1	4	6	7	2		2
		3	8	20	10	2	1	1	1	1	6	6
		4	6	2	4	4		1	2	4	5	14
		5-Very effective	2	6	12	1	2		1	8	1	6
14	Do instructors demonstrate experience in facilitating Automotive skills	Yes	16	30	28	3	3	3	3	3	3	30
		No	4									

APPENDIX XIII: INSTRUCTOR'S RESPONSES TO QUESTIONNAIRES

Frequency distribution of instructor's responses to questionnaires

S/N.	QUESTION	RESPONSE	A	B	C	D	E	F	G	H	I	J	
1	AGE	BELOW 25											
		25-35	2	2	4	2	2	3	2	2		1	
		35-45								1		3	1
		Above 45	2	2		2	2	1	1	2	1	2	
2	Gender	M	4	4	4	4	4	4	4	4	4	4	
		F											
Utilization of Instructional Resources													
3	How often do you incorporate text books and other instructional materials in teaching automotive curriculum	Rarely											
		Occasionally	1	2				2		1			
		Frequently	1		3	4	1	1	3	2	4	4	
		Always	2	2	1		3	1	1	1			
4	How frequently do you conduct practical workshops or hands-on training sessions for automotive students	Rarely											
		Occasionally	1	2			2	2					
		Frequently	1			2				2		2	
		Always	2	2	4	2	2	2	4	2	4	2	
5	Do you have access to specialized automotive tools and equipment for	Yes	1	4	4	4	2	4	4	4	4	4	
		No	3				2						

	practical demonstrations and training?												
Impact on Student Skill Acquisition													
6	how do instructional resources contribute to students' understanding of automotive concepts and techniques	Not effective											
		Somewhat effective											
		Moderately effective		2	4			2	4		4		
		Highly effective	4	2		4	4	2		4		4	
7	How do instructional resources influence students' practical skills development in automotive tasks	Not effective				2				2		2	
		Somewhat effective						1	1		1	1	
		Moderately effective	2	2	4		1	1	2		2	1	
		Highly effective	2	2		2	3	2	1	2	1	2	
Examination of Infrastructure Relevance													
8	Assess the adequacy of infrastructure facilities (e.g., workshops, laboratories) in your technical training	1-Very inadequate				2				2		2	
		2-Inadequate		2				2					
		3-Adequate	4	2			4	2					
		4-Good			2				2		2		
		5-Excellent			2	2			2	2	2	2	2

	institute for automotive education on a scale of 1 to 5.											
9	Do you believe that infrastructure facilities adequately support practical learning and skill development in automotive tasks	Strongly agree			2	2			2	2	2	2
		Agree	4	4	2	2	4	4	2	2	2	2
		Do not agree										
		Not sure										

APPENDIX IV: ADMINISTRATORS' RESPONSES TO QUESTIONNAIRES

Frequency distribution of administrators' responses to questionnaires

S/N	QUESTION	RESPONSE	A	B	C	D	E	F	G	H	I	J	
1	Administrative position	Principal / Head of Institution											
		Head of department	1	1	1	1	1	1	1	1	1	1	
		Academic coordinator								1		1	
		Others			1								
Examination of Infrastructure Relevance													
2	How do you ensure that infrastructure facilities (e.g., workshops, laboratories) meet the needs of automotive education	Regular maintenance and upgrades	1	1	2	1	1	1	2	1	2	1	
		Conducting facility assessments											
		Collaboration with stake holders											
		Others											
Influence of Human Resource Capacity													
3	How do you assess the qualifications	Formal evaluations	1	1	2	1	1	1	2	1	2	1	

	and competence of automotive instructors within the institute	Observation of teaching practices										
		Feedback from students										
		Others										
Influence of Financial Resources:												
4	What is the annual budget allocated specifically for the automotive department or program	Less than 1,000,000										
		Ugx 1,000,000-3,000,000										
		Ugx 3,000,000-5,000,000										
		More than 5,000,000	1	1	2	1	1	1	2	1	2	1
		Not sure										
5	How do you allocate funds within the automotive department?	Salaries for instructors										
		Purchase of automotive equipment and tools	1		1	1	1		1	1		1
		Maintenance and repair of automotive facilities										

		Training materials and supplies		1	1			1	1		2	
		Others										
6	What are the primary financial challenges faced by the automotive department in providing skill acquisition programs? (Check all that apply)	Limited budget allocation	1		1	1	1		1	1	1	1
		Insufficient funding for automotive tools and equipment.		1	1			1	1		1	
		High operational costs										
		Difficulty in accessing funding/ grants										
		Lack of financial transparency / accountability										
		Others										
7	How do these financial challenges impact the quality of skill acquisition	No impact										
		Low impact										
		Average impact		1	1				1			
		Greatly impact	1		1	1	1	1	1	1	2	1

	programs for automotive students											
8	Do you offer financial assistance or scholarships specifically for automotive students?	Yes	1		2	1	1		2	1	2	1
		No		1				1				
		Not sure										
9	Are there any partnerships or collaborations with industry stakeholders to support skill acquisition programs for automotive students	Yes	1		2	1	1		2	1	2	1
		No		1				1				
		Not sure										
10	What measures do you believe can improve the financial adequacy of skill acquisition programs for automotive students in Uganda	Parent driven measures										
		Government driven measures										
		Public private partnership driven measures										
		All the above	1	1	2	1	1	1	2	1	2	1

11	How do you evaluate the overall effectiveness of the automotive education program in preparing students for the industry	Graduate's employment rates										
		Feedback from employers		1	1			1	1		1	
		Student performance assessments	1		1		1		1		1	
		Others										

APPENDIX XV: RESPONSES FROM FOCUSED GROUP DISCUSSIONS

Categorized responses from focused group discussions

(288 students from 10 institutions.)

Question category	Subcategory	Responses	Number of Students
1. Understanding Competence-Based Training			
i) Meaning of CBT	Skills-focused learning	"It's training that focuses on mastering practical skills, not just passing exams."	117
	Real-world application	"CBT means learning what we'll actually use in a garage, like fixing engines."	97
	Assessment by ability	"It's about proving you can do the job, not just memorizing stuff."	77
ii) Difference from other learning	Practical vs. theoretical	"Unlike regular classes, CBT is hands-on; we work on cars, not just read about them."	147
	Individual pace	"It lets you move at your own speed, not like lectures where everyone's on the same page."	87
	Outcome-driven	"Other methods focus on grades; CBT cares about what you can do after."	57
2. Instructional Resources Overview			
i) Types of resources	Tools/Equipment	"We have wrenches, diagnostic machines, and engines to practice on."	196
	Textbooks/Manuals	"There are repair manuals and automotive theory books in the library."	128

	Digital resources	"We use videos and online simulators for engine diagnostics."	87
ii) Frequency of use	Daily in practical sessions	"I use tools every day in the workshop; it's the main part of training."	174
	Weekly in theory	"Textbooks are mostly for weekly theory classes or homework."	99
	Rarely (digital)	"Digital stuff is only used sometimes because internet is slow."	19
3. Adequacy of Instructional Resources			
i) Sufficiency	Sufficient	"Yes, we have enough tools and machines for basic skills like tire changes."	115
	Insufficient	"No, there's not enough for everyone; we waste time waiting."	136
	Mixed	"Some things are okay, but we need more modern equipment."	48
ii) Lacking/Needs improvement	Quantity	"We need more workstations; only 5 for 30 students isn't enough."	127
	Quality	"Some tools are old and break easily; they don't work like industry standards."	94
	Relevance	"We're missing stuff for hybrid cars – everything's outdated for gas engines."	77
4. Access to Instructional Resources			
i) Accessibility	Generally accessible	"Tools are in the workshop and available if you book a slot."	135
	Limited access	"Not everyone gets a turn; popular tools are always taken."	112

	Unequal distribution	"Some students hog the equipment, and instructors don't enforce sharing."	54
ii) Challenges faced	Waiting times	"I waited a week to use the diagnostic machine, so I fell behind."	122
	Technical issues	"Computers for simulators crash a lot, so we lose practice time."	78
	No impact	"I've never had trouble getting what I need."	90
5. Impact on Competence Development			
i) Impact of resources	Positive	"Good tools help me learn faster – like using a real lift made lifting cars easy."	156
	Negative	"Without enough equipment, I struggle to practice skills like welding."	90
	Neutral	"It depends; some skills I get, but others I can't without better stuff."	51
ii) Positive example	Skill mastery	"Using the torque wrench taught me how to tighten bolts perfectly."	178
iii) Negative example	Hindered learning	"No oscilloscope meant I couldn't learn electrical diagnostics properly."	151
6. Suggestions for Improvement			
i) Suggested improvements	More equipment	"Add more tools and machines so we don't wait."	138
	Modern technology	"Get hybrid car kits and updated software for diagnostics."	86
	Better maintenance	"Fix broken tools faster and keep everything in good shape."	88
ii) Enhancement to CBT	Faster skill gain	"More resources would let me practice more and master skills quicker."	127

	Industry readiness	"Modern tools would prepare us better for real jobs."	117
7. Overall Experience			
i) Satisfaction	Satisfied	"I'm happy – it's practical and I'm learning useful stuff."	117
	Dissatisfied	"It's frustrating with limited resources; I'm not learning enough."	106
	Neutral	"It's okay, but could be way better with more tools."	65
ii) One change	More resources	"I'd add more equipment so everyone gets hands-on time."	148
	Updated materials	"I'd get new tech to match what's in garages today."	98
	Better access	"Make tools easier to book or share fairly."	48

APPENDIX XVI: GROUP DISCUSSION RESPONSES

Analysis of focused group discussion responses

Question Category	Sub Category.	Quantitative Insight	Qualitative Interpretation	Observations made
1. Understanding Competence-Based Training				
i) Meaning of CBT	Skills-focused learning	40%	"Focuses on mastering practical skills, not just exams."	Students see CBT as practical and skill-oriented, valuing tangible outcomes.
	Real-world application	33%	"Learning what we'll use in a garage, like fixing engines."	Emphasis on job relevance suggests alignment with industry needs.
	Assessment by ability	27%	"Proving you can do the job, not just memorizing."	Capability-based assessment is a recognized strength of CBT.
ii) Difference from other learning	Practical vs. theoretical	50%	"Hands-on; we work on cars, not just read about them."	Practical focus sets CBT apart, requiring strong resource support.

	Individual pace	30%	"Move at your own speed, not like lectures."	Flexibility appeals to diverse learners, enhancing accessibility.
	Outcome-driven	20%	"Focuses on what you can do after, not grades."	Outcome orientation aligns with vocational goals, differing from traditional education.

2. Instructional Resources Overview

i) Types of resources	Tools/Equipment	67%	"Wrenches, diagnostic machines, engines to practice on."	Tools dominate, reflecting CBT's practical focus.
	Textbooks/Manuals	43%	"Repair manuals and theory books in the library."	Traditional resources support theory but are secondary.
	Digital resources	30%	"Videos and online	Digital tools are available but less prevalent,

			simulators for diagnostics."	possibly limited by infrastructure.
ii) Frequency of use	Daily in practical sessions	60%	"Use tools every day in the workshop."	Frequent tool use underscores hands-on training priority.
	Weekly in theory	33%	"Textbooks mostly for weekly theory classes."	Theory resources see moderate use, complementing practice.
	Rarely (digital)	7%	"Digital stuff used sometimes; internet is slow."	Low digital use suggests access or reliability issues.

3. Adequacy of Instructional Resources

i) Sufficiency	Sufficient	37%	"Enough for basic skills like tire changes."	Some find resources adequate for foundational skills.
	Insufficient	47%	"Not enough for everyone; we wait a lot."	Nearly half see shortages as a

				barrier to learning.
	Mixed	17%	"Some things okay, but need modern equipment."	Partial adequacy highlights specific gaps.
ii) Lacking/Needs improvement	Quantity	43%	"Need more workstations; 5 for 30 isn't enough."	Quantity is the top concern, limiting hands-on practice.
	Quality	33%	"Tools are old and break easily."	Poor quality hampers effective training.
	Relevance	23%	"Missing hybrid car stuff; outdated for gas engines."	Lack of modern tools misaligns with industry trends.
4. Access to Instructional Resources				
i) Accessibility	Generally accessible	47%	"Tools available if you book a slot."	Access works for some with planning, but not universally.
	Limited access	37%	"Popular tools always taken."	Competition restricts access for many.
	Unequal distribution	17%	"Some students hog equipment;	Fairness issues exacerbate

			no enforcement."	access problems.
ii) Challenges faced	Waiting times	40%	"Waited a week for the diagnostic machine."	Delays disrupt training progress.
	Technical issues	27%	"Computers for simulators crash a lot."	Equipment failures hinder learning opportunities.
	No impact	33%	"Never had trouble getting what I need."	A third face no barriers, indicating variability in experience.

5. Impact on Competence Development

i) Impact of resources	Positive	53%	"Good tools help me learn faster, like using a lift."	Resources enhance skill acquisition when available.
	Negative	30%	"Without enough, I struggle with welding."	Shortages directly limit competence development.
	Neutral	17%	"Depends; some skills I get, others I can't."	Impact varies by resource type and availability.

ii) Positive example	Skill mastery	60%	"Torque wrench taught me tightening perfectly."	Effective resources lead to specific skill gains.
iii) Negative example	Hindered learning	50%	"No oscilloscope; couldn't learn diagnostics."	Missing tools create measurable skill gaps.
6. Suggestions for Improvement				
i) Suggested improvements	More equipment	47%	"Add more tools so we don't wait."	Quantity increase is a priority to boost practice time.
	Modern technology	33%	"Get hybrid car kits and updated software."	Modernization aligns training with industry standards.
	Better maintenance	20%	"Fix broken tools faster."	Maintenance improves resource reliability.
ii) Enhancement to CBT	Faster skill gain	43%	"More practice means mastering skills quicker."	Increased resources accelerate learning pace.

	Industry readiness	40%	"Modern tools prepare us for real jobs."	Relevance enhances employability.
7. Overall Experience				
i) Satisfaction	Satisfied	40%	"Happy – it's practical and useful."	Practicality drives satisfaction for some.
	Dissatisfied	37%	"Frustrating with limited resources."	Resource issues fuel dissatisfaction.
	Neutral	23%	"Okay, but could be better with more tools."	Mixed feelings reflect partial success.
ii) One change	More resources	50%	"Add equipment for everyone to use."	Quantity tops change requests, echoing earlier concerns.
	Updated materials	33%	"New tech to match garages today."	Modernization is a key improvement area.
	Better access	17%	"Make tools easier to book or share."	Access improvements would enhance equity.

APPENDIX XVII: STUDENT’S INTERVIEWS RESPONSES

Question Category	Percentage of Responses	Summary of Responses	Interpretation and Conclusion
Background Information	70% chose automotive mechanics due to interest in the field. - 30% chose it for economic opportunities or parental influence. - 60% have been studying for over a year.	Most students are driven by passion, while a smaller proportion are motivated by external factors. Many have substantial time invested in their studies.	Passionate students are likely to succeed but may need additional motivation for long-term growth. Sustained commitment from those with external motivations could be nurtured.
Competence-Based Training	75% described competence-based training as practical, hands-on learning. - 65% valued practical over theoretical training. - 25% wanted better theoretical balance.	Students largely favor practical learning, seeing it as critical for developing competencies in automotive mechanics.	Current training methods align with student preferences, but adjustments to balance theoretical knowledge could enhance holistic competency development.
Instructional Resources	55% found instructional resources	Many students acknowledged resource gaps,	Improving resource availability and functionality is

	<p>somewhat adequate.
 - 45% felt resources were insufficient.</p> <p>
 - 40% reported infrequent access to resources during practical sessions.</p>	<p>citing issues such as outdated tools and textbooks. Some students noted inadequate access to resources for practice sessions.</p>	<p>crucial to meet student learning needs. Ensuring equitable access would elevate training effectiveness.</p>
<p>Quality and Accessibility of Resources</p>	<p>60% rated tools and equipment as outdated.
 - 50% said resources were not evenly accessible.
 - 70% noticed instructors improvising during training sessions.</p>	<p>Students view resource quality as needing modernization and better alignment with industry standards. Access inequality hampers collaborative learning.</p>	<p>Modernizing equipment and promoting equitable access to resources would enhance student preparedness for industry requirements.</p>
<p>Challenges and Recommendations</p>	<p>75% struggled with resource shortages.
 - 60% suggested more modern equipment.
 - 50% recommended better funding and</p>	<p>Students face persistent resource-related challenges that hinder skill development. They propose significant upgrades to existing facilities and tools.</p>	<p>Investment in state-of-the-art equipment and improved facility funding would resolve many challenges and strengthen</p>

	maintenance of facilities.		competence-based training outcomes.
Impact on Competence Development	70% felt resource availability significantly impacted their skills. - 65% reported inability to master certain competencies due to resource gaps.	Students believe resource limitations directly affect their ability to learn and practice key competencies in automotive mechanics.	Addressing these limitations would improve student confidence and readiness for professional settings.
Overall Experience	65% were satisfied with the current training environment. - 35% expressed dissatisfaction due to resource and infrastructure gaps. - 60% prioritized resources for improvement.	While most students find training satisfactory, there is a strong demand for resource and infrastructure enhancements to achieve excellence.	Focused improvements in resources and infrastructure would heighten student satisfaction and optimize training outcomes.

APPENDIX XVIII: INSTRUCTOR INTERVIEWS RESPONSES

Question Category	Percentage of Responses	Summary of Responses	Interpretation and Conclusion
Background Information	75% had over 5 years of teaching experience. - 25% had less than 5 years of teaching experience.	Most instructors are highly experienced, while a smaller portion are newer to teaching.	High instructor experience levels positively impact training quality, but less experienced instructors may benefit from support and mentorship.
Competence-Based Training	85% defined competence-based training as hands-on and skills-focused. - 15% provided a general or unclear definition.	The majority understand competence-based training principles, emphasizing practical learning.	Strong conceptual grasp ensures alignment with industry needs, though ongoing clarity for all instructors may be required.
Infrastructure Relevance	60% identified outdated equipment as a major issue. - 50% cited limited space as a challenge. -	Instructors highlighted gaps in infrastructure, such as equipment, space limitations, and inadequate safety measures.	Upgrading equipment, expanding facilities, and improving safety measures are essential to

	40% noted safety concerns.		enhance competence-based training effectiveness.
Human Resource Capacity	70% felt staffing levels were insufficient. - 65% believed professional development opportunities were limited.	Inadequate staffing and insufficient training opportunities for instructors were common concerns.	Addressing staffing gaps and increasing professional development opportunities are critical to meeting training demands and staying aligned with industry standards.
Challenges and Recommendations	80% mentioned insufficient infrastructure as the biggest challenge. - 70% noted human resource limitations as significant.	Key challenges include infrastructure inadequacies and insufficient human resources. Recommendations included facility upgrades and hiring additional staff.	Improvements in infrastructure and recruitment of skilled instructors are top priorities for advancing competence-based training.
Impact on Student Competence Development	75% reported that infrastructure gaps negatively	Poor infrastructure and staffing levels hinder students from	Addressing infrastructure and staffing challenges

	<p>impact student skills development.</p> <p>
 - 65% linked human resource issues to lower training quality.</p>	<p>acquiring key competencies and reduce training effectiveness.</p>	<p>would directly improve student outcomes and ensure they are well-prepared for the workforce.</p>
Overall Experience	<p>60% were moderately satisfied with the current training environment.</p> <p>
 - 40% expressed dissatisfaction.</p>	<p>Many instructors saw room for improvement, proposing better alignment between facilities and competence-based training goals.</p>	<p>Systematic improvements in infrastructure and human resources are necessary to create a more supportive and effective training environment for both instructors and students.</p>

APPENDIX XIX: ADMINSTRATOR’S INTERVIEWS RESPONSES

Question Category	Percentage of Responses	Summary of Responses	Interpretation and Conclusion
Background information	60% have over 5 years of experience managing technical training programs. - 40% are newer to the role (less than 5 years).	Most administrators are experienced and familiar with the challenges of managing technical programs, with some still in the process of adapting to their roles.	Experienced leadership contributes positively to program effectiveness, but newer administrators may need additional support or mentorship to enhance management capacity.
Human resource capacity	65% identified staffing levels as insufficient. - 70% highlighted the need for more professional development opportunities.	Administrators observed staffing shortages and varying expertise levels among instructors. Professional development is often limited or not prioritized sufficiently.	Addressing staffing gaps and prioritizing professional development will directly improve the quality of training delivery and ensure alignment with competence-based goals.
Financial adequacy	60% stated financial resources are insufficient. - 50% noted spending prioritization is	Financial allocations are often inadequate to fully meet program needs. Administrators	Increasing financial resources and improving budget management practices are essential to

	challenging due to resource constraints.	struggle with balancing infrastructure, instructional materials, and salaries.	enhance program delivery and resource adequacy.
Influence of financial and human resource Capacity	75% said financial limitations negatively affect student competencies. 70% felt human resource constraints impact skill development.	Financial and staffing constraints limit the ability to deliver quality training, with notable effects on student competency and readiness for employment.	Investments in financial resources and recruitment of skilled staff would greatly enhance student outcomes and industry preparedness.
Challenges and strategic solutions	70% noted major challenges in funding and human resource management. - 60% implemented cost-saving measures or external partnerships.	Administrators face significant challenges in securing adequate funding and managing staffing levels but employ creative strategies such as partnerships to mitigate this.	Expanding partnerships and seeking additional government or donor support could alleviate resource limitations and strengthen training programs.
Recommendations for improvement	75% recommended hiring more instructors and	Administrators strongly favor boosting human	Implementing these recommendations will bridge critical gaps

	support staff. - 70% suggested increasing budgets for modern tools and equipment.	resource capacity and financial support, emphasizing facility modernization as a priority.	and elevate the quality of competence-based training, fostering better learning outcomes.
Overall Perspective	65% rated the competence-based training program as moderately effective. - 35% identified significant room for improvement.	While many administrators see value in the current program, they acknowledge the need for strategic changes to address resource and staffing challenges.	Systematic improvements in financial and human resource management would greatly enhance the program's effectiveness and its alignment with industry standards.

APPENDIX XX: RESEARCH PERMIT



Uganda National Council for Science and Technology

(Established by Act of Parliament of the Republic of Uganda)

Our Ref: SIR434ES

14 February 2025

SAMSON OKUNG
Gulu University
Gulu

Re: Research Approval: COMPETENCE-BASED TRAINING OF AUTOMOTIVE STUDENTS IN TECHNICAL TRAINING INSTITUTES IN THE EASTERN REGION OF UGANDA

I am pleased to inform you that on **14/02/2025**, the Uganda National Council for Science and Technology (UNCST) approved the above referenced research project. The Approval of the research project is for the period of **14/02/2025** to **14/02/2026**.

Your research registration number with the UNCST is **SIR434ES**. Please, cite this number in all your future correspondences with UNCST in respect of the above research project. As the Principal Investigator of the research project, you are responsible for fulfilling the following requirements of approval:

1. Keeping all co-investigators informed of the status of the research.
2. Submitting all changes, amendments, and addenda to the research protocol or the consent form (where applicable) to the designated Research Ethics Committee (REC) or Lead Agency for re-review and approval **prior** to the activation of the changes. UNCST must be notified of the approved changes within five working days.
3. For clinical trials, all serious adverse events must be reported promptly to the designated local REC for review with copies to the National Drug Authority and a notification to the UNCST.
4. Unanticipated problems involving risks to research participants or other must be reported promptly to the UNCST. New information that becomes available which could change the risk/benefit ratio must be submitted promptly for UNCST notification after review by the REC.
5. Only approved study procedures are to be implemented. The UNCST may conduct impromptu audits of all study records.
6. An annual progress report and approval letter of continuation from the REC must be submitted electronically to UNCST. Failure to do so may result in termination of the research project.

Please note that this approval includes all study related tools submitted as part of the application as shown below:

No.	Document Title	Language	Version Number	Version Date
1	Translated consent	Kiswahili	2.0	23 September 2024
2	Informed Consent forms	English	2.0	23 September 2024
3	COVID-19 & EBOLA risk management plan	English	2.0	24 August 2024
4	Community Engagement plan	English	2.0	23 August 2024
5	Assent form	English	2.0	24 August 2024
6	Project Proposal	English	2.0	
7	Approval Letter	English		
8	Administrative Clearance	English		

Yours sincerely,



Hellen Opolot

For: Executive Secretary

UGANDA NATIONAL COUNCIL FOR SCIENCE AND TECHNOLOGY

APPENDIX XXI: PLAGIARISM TEST RESULT



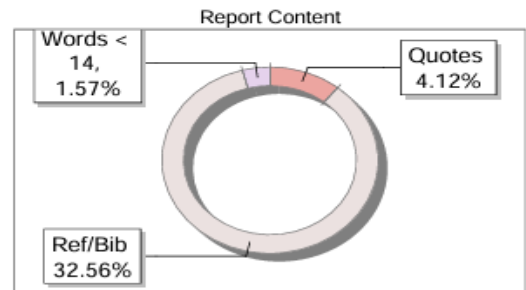
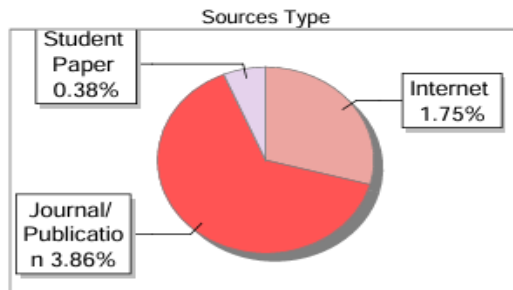
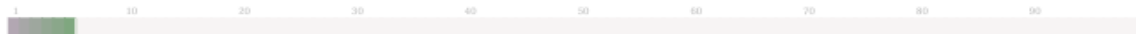
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Submission Information

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