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Relationships between utilisation of human resources and academic performance in engineering in Technical and Vocational Institutions in Nakuru County, Kenya

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Abstract
The purpose of this article was to analyse the relationships between the utilisation of human resources and academic performance in engineering at technical and vocational institutions in Nakuru County, Kenya. The problem that the study addressed was the high failure rate of students in engineering. The study used a descriptive survey design utilising closed-ended questionnaires and interview schedules. The sample consisted of 331 students, 11 technicians, and 22 Administrators (11 Heads of Departments, 7 Deputy Principals, and 4 Principals). A proportionate sampling technique was used to obtain student samples per institution. Participants were selected through simple random sampling. The hypothesis was tested and established that there was a positive and statistically significant relationship between utilisation of human resources and academic performance in engineering ($p=0.000<p=0.05$), concluding that ineffective utilisation of human resources in the TVET institutions contributes to the observed low performance in engineering programs. The study recommended that institutions implement a trainer monitoring system, prioritise data-driven assessment of teaching methods, provide ongoing professional development, and establish formative assessments with clear metrics to enhance training quality and student performance in engineering.

Key words: Academic performance, human resources, technical and vocational training, utilisation.

INTRODUCTION

Technical and Vocational Education and Training (TVET) is essential in developing a skilled workforce to advance Kenya's economic goals, particularly toward achieving Vision 2030. The TVET sector aims to prepare skilled, competitive, and employable individuals with the attitudes and values needed to support the growth and success of various economic sectors. TVET plays a vital role in the country's social, economic, and technological progress by providing foundational vocational skills, promoting entrepreneurial abilities and a positive work ethic, and offering practical, relevant training that aligns with Kenya's sustainable economic and industrial needs (Mwancha, 2023).

TVET plays a crucial role in addressing Kenya's unemployment crisis by providing specialised training and fostering marketable skills (Md Yusoff et al., 2020). TVET programs offer skills in technology and serve as a stepping stone to higher education and direct work (Okun & Abiola, 2023). The Kenyan government has provided funding for state-of-the-art equipment, higher education, and competent managers (Osidipe, 2019). However, there is a gap in practical usage, and underutilisation of resources could hinder the alignment of education with workforce demands (Stella et al., 2022). Solving underutilisation challenges is essential for TVET's efficiency and promotion of economic growth.

Utilisation is the art of appropriately using resources, whether they are intangible or tangible. The use of any tool or service that will improve performance is referred to as utilisation (Eze & Eziolisa, 2022). According to Likoko et al. (2023), utilisation refers to the fair use of an organisation's resources, particularly in the education sector, to ensure that the curriculum is implemented effectively. Resource utilisation is a significant factor in the quality of education offered in TVET institutions. Administrators in TVET institutions implement human resource management practices to achieve results through people, including trainers, administrative staff, and non-academic staff. Trainers are the most crucial element in institutions, and their support is essential for their proficiency in training (Likoko et al., 2023). Among other things, highly trained and knowledgeable employees are necessary for the effective and efficient use of inadequate resources. Ineffective human resource management by different organisations results from a failure to plan and train employees to achieve institutional goals (Okon, 2020).

Human resource utilisation in TVET institutions has a direct impact on academic performance through specific roles and responsibilities of trainers and technicians. Consistent trainer attendance, as emphasised by Kassarnig et al. (2018), ensures that students receive uninterrupted instruction, which helps them build foundational knowledge and skills. When trainers are consistently available, students benefit from a stable learning environment that enhances their academic performance through regular reinforcement of concepts and timely support. Similarly, formative assessments, according to Brown (2019), allow trainers to tailor their teaching strategies to meet the unique needs of each student. By providing immediate and relevant feedback, trainers help students understand their strengths and areas for improvement, fostering better engagement and comprehension, which are crucial for academic success.

Globally, countries are resolving to accomplish sustainable development Goal 4 (S.D.G. 4) by 2030, emphasising guaranteeing education for all. Nevertheless, education systems worldwide have faced significant challenges in the 21st century, especially in underdeveloped nations where problems like poor academic performance and limited access to quality education are still prevalent. Education is often recognised to profoundly affect individuals and society, acting as a powerful instrument to promote economic productivity, alleviate poverty, and propel social progress (Jevons, 2022). The significance of higher education, extending beyond secondary school, is underscored as a pivotal phase in the learning journey, occurring in various institutions such as universities, colleges, and technical institutes (Chankseliani & McCowan, 2021). This recognition emphasises the crucial role that advanced education plays in shaping the trajectory of individuals and contributing to broader societal progress (Žalėnienė & Pereira, 2021).

In the United States, Nagahi et al. (2020) explored the influence of systems thinking skills and proactive personality on the academic performance of engineering students. Their research emphasised the ongoing attention given to the academic performance of college students, especially those pursuing engineering, due to their average performance and the imperative to meet the engineering demands of the national economy. The authors recommended a continuous assessment of academic performance to address gaps proactively. However, a notable gap in the literature is the need for a direct link between the utilisation of resources and academic performance in engineering courses. Additionally, it is crucial to highlight that the referenced study was conducted in a different context, focusing on TVET institutions. It leaves a gap in understanding the specific dynamics of resource utilisation and academic performance in engineering within TVET.

In Qatar, Al-Sheeb et al. (2019) observed that students enrolled in engineering majors encounter a wide array of challenges, contributing to attrition and a subsequent reduction in their college Grade Point Average (G.P.A.). The study highlighted that the rigorous nature of engineering curricula often compels students to switch to a different major, withdraw from the university entirely, or extend their time to graduation. They reported that only 60 per cent of students who initially pursued an engineering major successfully graduated within six years. However, the study needed to clarify the factors contributing to these students' prolonged graduation periods and lower grades. Conducting further research in this area could illuminate how resource utilisation influences engineering students' performance.

Another study was done in Ghanaian technical universities by Lassong et al. (2022), which investigated the factors that influence engineering mathematics performance and revealed that several factors influence students' performance in engineering mathematics, including age, terrible strain, and level of interest. Furthermore, it was established that students from senior high school like engineering mathematics, while those from technical old high school do not like engineering mathematics due to their poor background in mathematics. They suggest that Ghanaian technical universities have established mechanisms to reinvigorate students' performance. However, the study was conducted in universities in Ghana and focused on engineering mathematics. In contrast, the present study relates to the utilisation of resources and low performance in engineering in TVET institutions in Kenya.

In Nigeria, Mbatha (2021) noted that the administration, particularly managers, need help optimising limited resources like workforce, equipment, buildings, and time resources for effective student learning. Ekundayo et al. (2022), in a research carried out in Nigeria, emphasise the importance of resource utilisation in educational institutions, highlighting its role in ensuring efficiency, minimising waste, and contributing to project success. Research by Kuku (2022) found that teacher preparation and advancement had a substantial bearing on student achievement. The study suggested government-run programs like frequent seminars and workshops to increase teacher productivity. This study is connected to the work of Amie-Ogan et al. (2021), who investigated how H.R.M. affected student achievement in Nigerian public high schools in Rivers. According to the study's authors, human resource management substantially affects pupils' performance in public senior secondary schools in Nigeria, regardless of gender. Nevertheless, there is still a lack of knowledge regarding how utilising human resources affects academic achievement in engineering.

Khajeha (2017) looked at how the amenities at Kenya's National Polytechnics affected learners' performance in engineering classes. Their research showed that the outcome was poor, with only 6.2 per cent receiving credits in the last decade, though they acknowledged that engineering courses are resource-dependent. Only one per cent of students who did not major in engineering received honours, indicating a significant achievement difference. The study highlighted the critical need for better academic results, highlighting that such school resources explained only 4.2 per cent of the variance in students' engineering course grades. Improving resource utilisation and academic achievement in engineering depends on addressing this gap. The high failure rates in engineering show that the

expansion of TVET institutions in Nakuru County has not yet translated into improved academic performance. In comparison to fields such as applied technology, business, and the applied sciences, engineering programs have an average failure rate of 60.31 per cent, according to a survey of public vocational and technical institutions that offer engineering courses. The graduation rate for engineering programs is below 50 per cent. A summary of failure rates in Kenya National Examination Council (KNEC) Examination in sampled TVET institutions in Nakuru County over the past four years is shown in Table 1.

Table 1: A Summary of Failure Rates in the Kenya National Examination Council (KNEC)

	2020	**2021**	**2022**	**2023**	**Average**
Department	Fail (%)	Fail (%)	Fail (%)	Fail (%)	Fail (%)
Engineering	63.5	66.48	57.15	55.59	60.31
Applied Technology	34.9	31.61	32.26	29.26	31.33
Applied Science	37.16	51.66	48.23	35.41	43.14
Business	42.45	34.68	37.49	27.54	34.92

Source: County Director TVET, Nakuru (2023)

Table 1 shows a high failure rate of academic performance of trainees in engineering courses: 61.21 per cent in 2018, 57.94 per cent in 2019, 63.50 per cent in 2020, 66.48 per cent in 2021, 57.15 per cent in 2022 and 55.59 per cent in 2023. On average, the failure rate of engineering trainees is 60.31 per cent compared to 31.33 per cent in applied technology, 43.14 per cent in applied science, and 34.92 per cent in business. This demonstrates that 60.31per cent of the students fail to attain the KNEC pass mark of 40 per cent, which is a challenge for TVET institutions in Nakuru County, Kenya. Over 50per cent of the students have failed in the last six years, showing a negative skewness of performance. The performance is expected to obey the standard curve whereby few students pass highly, most students in the middle pass, and few students fail.

The problem that the study addressed was the high failure rate of students in engineering in TVET institutions in Nakuru County, Kenya. It is evidenced by consistently high failure rates, posing a critical challenge to attaining educational and economic goals. The failure rate, as shown in Table 1, exemplified by a 60.31 per cent average failure rate of students in engineering compared to other disciplines, not only falls below the 40 per cent pass mark set by KNEC but also deviates from the standard curve. If unaddressed, this alarming situation threatens to exacerbate issues such as increased dropout rates, financial burdens on government and stakeholders, and a shortage of skilled workers in the industry, jeopardising the government's commitment to achieving Vision 2030. Despite the recognition of TVET institutions as pivotal economic drivers, their rapid growth over the last decade has yet to translate into optimal academic performance due to challenges such as suboptimal resource utilisation and low completion rates. Addressing this problem was crucial for aligning technical and vocational institutions with the market and industry demands, fostering economic development, ensuring students' success in STEM courses, and producing skilled professionals contributing to infrastructure, technology, and innovation. The study sought to analyse the relationships between the utilisation of human resources and academic performance in engineering

in technical and vocational institutions in Nakuru County, Kenya.

LITERATURE REVIEW

Human resource management, as defined by Francis (2018), involves key functions such as planning, recruitment, selection, training, and motivation, all directed at building and maintaining an organisation's workforce. This perspective highlights human resources as a vital investment for the stability and success of any organisation. Relating this to trainers' performance, effective human resource management practices ensure trainers are well prepared and motivated to deliver quality education, ultimately improving student outcomes. The performance of trainers, like other employees, reflects attitudes, behaviours, and outcomes tied directly to the support and development opportunities they receive, aligning with Merlo's (2022) view of performance as integral to achieving educational goals. Therefore, by investing in trainers' skills and motivation, institutions can enhance teaching effectiveness, resulting in a productive learning environment and contributing to overall organisational growth and stability.

Various studies have examined the academic performance of engineering students, revealing both contextual differences and overarching challenges in the field. For instance, Nagahi et al. (2020) in the U.S. found that systems thinking skills and proactive personalities contribute to better academic outcomes among engineering students, emphasising the importance of assessing student traits in academic support programs. However, they did not address how resource utilisation directly affects performance. In Qatar, Al-Sheeb et al. (2019) observed that rigorous engineering curricula often lead to high attrition rates, with only 60per cent of students graduating within six years. Despite identifying curriculum rigour as a barrier, the study left a gap in understanding the role of resources in supporting students through challenging coursework, particularly within TVET institutions.

Further research in African contexts reinforces the complexity of engineering education. For example, Govindasamy (2021) identified that poor performance in South African TVET institutions persists despite significant government investment, largely due to motivation and resource challenges. Similarly, Ojera et al. (2021) in Kenya linked unsatisfactory engineering results to inadequate facilities, with only 4.2 per cent of academic performance variation attributed to these resources. While these studies highlight that resources are critical, they reveal a gap in analysing how efficiently utilising these resources can improve academic outcomes. The present study aims to address this gap by examining the relationship between resource utilisation and engineering performance in Nakuru County's TVET institutions.

Experiential learning roles, such as organising workshops and academic trips, also play a significant role in enhancing academic performance. Well-prepared workshops, as highlighted by Le and Do (2019), provide hands-on learning opportunities that strengthen students' practical skills, making them more adept in their fields. This hands-on experience directly improves students' academic outcomes by allowing them to apply theoretical knowledge, thus solidifying their understanding. Additionally, academic trips, as supported by Carbone et al. (2020), expose students to real-world applications of their studies, improving retention and contextual comprehension. Academic advising, as Gogates (2024) found, further boosts academic success by guiding students through their educational journey, helping them make informed decisions and accessing resources that enhance their learning. Through these targeted roles, trainers contribute to a well-rounded academic experience that promotes both theoretical knowledge and practical skills.

In the U.S.A., Wolff et al. (2021) emphasise that trainers significantly impact classroom conditions and learning outcomes, working within an environment shaped by the administration, curriculum, infrastructure, and available resources. This support network influences the quality of education, where the direct effectiveness of teachers is tied to student achievement. Adriani and Hikmah (2022) add that employee performance, synonymous with work achievement, derives from the quality and quantity of tasks completed. However, the complex relationship between teacher performance and student success remains underexplored. In Indonesia,

Pusvitasari (2021) highlights how strategic human resource management focused on planning and development can elevate educational quality, although this research didn't extend to TVET institutions. Similarly, Ahmad and Essien (2021) emphasise ongoing training for TVET teachers in Malaysia, proposing practical, industry-based retraining as essential for performance improvement. Despite these studies, there's limited research connecting human resource strategies to student performance, particularly in engineering education, motivating this study's focus.

In Indonesia, Adriani and Hikmah (2022)found that while teachers develop learning materials, many rely on standardised content due to concerns that overly detailed materials could complicate students' understanding of core concepts. Limited learning resources and insufficient material development skills also hinder the creation of quality resources. Performance issues, such as late arrival to class and reluctance to address student behaviour, were noted, though the study focused on teacher competence, not the broader utilisation of human resources. Adrian and Hikmah further highlighted the role of training and motivation in enhancing teacher performance. Similarly, Kemal and Rosyidi (2019) and Anwar and Abdullah (2021) stressed that human resource management (H.R.M.) aligns with institutional objectives to improve performance, though these studies didn't address TVET institutions or link H.R.M. practices to academic performance. Aris et al. (2023) and others underscored H.R.M.'s role in educational quality but lacked focus on TVET engineering performance, which this study seeks to explore.

The literature reveals a compelling need to understand resource utilisation and teacher attributes in technical and vocational education, particularly for advancing academic performance in engineering programs. Nuzli et al. (2023) show that effective resource use in Indonesia's secondary education improves teacher productivity but does not directly link to engineering outcomes. Similarly, Djazilan et al. (2022) emphasise the importance of teacher self-discipline and self-efficacy in improving classroom success, yet they fall short of addressing technical programs, underscoring a gap in exploring how these factors affect engineering disciplines within TVET settings. This study will address this critical gap by examining the unique resource dynamics influencing technical education outcomes.

Studies from Croatia and India, such as Lacmanović (2017) and Kapur (2019), illustrate broader organisational benefits of proactive traits and resource allocation, yet they overlook the specific needs of TVET institutions. Kapur's insights on the necessity of resource efficiency for institutional growth further highlight the urgency of understanding resource utilisation in regions facing diverse challenges, like Nakuru County. By investigating how resource and human resource utilisation influence performance in Kenyan TVET engineering programs, this research aims to fill the overlooked connection between these essential factors and academic achievement in technical education.

The literature on resource utilisation in Sub-Saharan Africa underscores its critical role in educational outcomes but leaves significant gaps regarding technical education. (Buckley & Lee, 2021) associates material and human resources with academic performance in Sub-Saharan primary schools, revealing both positive impacts and challenges from structural factors. Yet, the study does not explore how resource use affects technical education, particularly in engineering, within TVET contexts. Similarly, while Amoo (2021) highlights South Africa's low engagement levels among TVET employees, the focus is on general workforce dedication rather than linking resource utilisation to student performance outcomes in technical fields, thus warranting further research.

Nigerian studies such as those by Kuku (2022) and Chiedozie et al. (2018) reveal that human resource management practices, like teacher recruitment and training, positively impact secondary school performance but lack insights into engineering programs within TVET. Additionally, Francis (2018) and Kuswati (2020) emphasise resource utilisation's role in reducing wastage and sustaining productivity, yet they fall short of correlating these benefits with academic performance. To address these gaps, this study will examine how resource utilisation

influences academic achievement in engineering programs within Kenyan TVET institutions, thus filling an essential void in understanding the effectiveness of human capital management in the technical education sector.

The literature reveals a consistent call for pedagogical and resource-focused improvements to enhance academic performance across educational contexts. In Uganda, Eton et al. (2019) highlight a strong correlation between teacher competence and primary students' performance, recommending pedagogical skill enhancement and supportive appraisals to improve teaching effectiveness. This insight underscores the importance of developing and acknowledging teacher skills to maintain a conducive learning environment, a point also raised comprehensively by Agnetta et al. (2022) in their study of secondary schools in Kenya. They emphasise the need for better teacher resource utilisation to improve student outcomes in KCSE exams. Yet, both studies neglect the specialised demands of TVET engineering programs, where hands-on resource management in workshops and labs is crucial.

In the context of Kenyan TVET institutions, Okemwa et al. (2022) underscore the impact of laboratory and equipment management on skill acquisition in electronics programs. Their findings suggest moderate influence due to neglect in managing electronic laboratories, recommending increased investment to bolster training quality. However, their focus on skills rather than academic performance leaves a gap in understanding how resource management correlates with student achievement in TVET engineering programs.

Further insights from H.R. practices in education reveal that proper human resource management is foundational to enhancing academic performance. Kirui et al. (2022) explores the impact of effective recruitment, training, and motivation on teacher commitment in secondary schools, suggesting that well-managed human resources significantly improve organisational and educational outcomes. However, as with previous studies, their findings are not directly applied to TVET settings, where engineering students' practical skills and academic performance may be particularly influenced by resource availability and management.

The study employed two theories to examine the influence of human resources on academic performance in TVET institutions offering engineering courses: Resource Dependency Theory (R.D.T.) and Equity Theory. R.D.T. emphasised the importance of securing skilled human resources, such as experienced trainers, as critical to ensuring quality education. In the context of engineering programs, a lack of qualified trainers can hinder students' understanding and application of technical concepts, ultimately affecting academic success. Therefore, R.D.T. highlights the need for institutions to effectively manage and allocate human resources to optimise student outcomes (Celtekligil, 2020). Equity Theory, on the other hand, focuses on the perceived fairness of resource distribution. In TVET institutions, students assess the balance between their efforts and the rewards they receive, such as access to skilled trainers and individualised support. When students feel that human resources are distributed equitably, they are more motivated and engaged, leading to improved academic performance. Thus, both theories underscore the vital role of human resources in fostering an environment conducive to student success (Hatfield et al., 2023).

This research aims to bridge the gap by exploring the relationship between human resource utilisation and engineering students' academic performance in TVET institutions in Nakuru County, Kenya. It will build on existing studies by focusing specifically on how resource management practices in workshops and labs impact students' academic outcomes, recognising the unique demands of TVET programs in engineering.

METHODOLOGY

The study employed a descriptive survey design to collect both qualitative and quantitative data, providing a broad and detailed understanding of the subject (Asenahabi, 2019). The location of the study was Nakuru County. The target population included 2,386 engineering students, 11 administrators (4 principals, 7 deputy principals, 11 heads of departments (HoDs)), and 11 technicians. Purposive sampling was used to select the institutions, and a

census method was employed for staff respondents (Campbell et al., 2020). For the students, proportionate random sampling was utilised, guided by Krejcie and Morgan's (1970) table to get a sample of 331 students. Data collection instruments included structured questionnaires for students and technicians and interview schedules for administrators (principals, deputy principals, and HoDs). The questionnaires incorporated Likert scales to measure attitudes and perceptions, ensuring a systematic approach to data collection. The instruments were evaluated for content validity. The items' clarity and content were examined, ideas were discussed, and the supervisors checked the items' conformity with the study objectives. The researcher conducted a pilot study within the scope of the study, taking 10per cent of the respondents and ensuring that the respondents who participated in the pilot study were not involved in the final study (Gathii et al., 2019). Data analysis was performed using Statistical Packages for Social Sciences (SPSS) version 29 for quantitative data. The study utilised NVivo to code themes by importing qualitative data, creating nodes for emerging themes, and assigning relevant text segments to these nodes. As the analysis progressed, nodes were refined, and NVivo's tools, including queries and visualisations, were used to explore patterns and relationships within the coded data. Ethical considerations, such as obtaining informed consent, ensuring anonymity, and promoting voluntary participation, were rigorously observed throughout the study to maintain the integrity and ethical standards of the research (Mugenda & Mugenda, 2012).

RESULTS AND FINDINGS

Students' Academic Performance

TVET institutions administer national examinations through the Kenya National Examinations Council (KNEC). Upon release to the institutions, the KNEC results are analysed by each department within the institution and presented in tables and percentages. During data collection, the Heads of Departments (HoDs) in engineering provided data on students' academic performance who passed between 2020 and 2023. The mean percentage pass for each year was computed and transformed into the overall percentage pass for that period, as shown in Table 2.

Table 2: Student's Academic Performance for the Years 2020 to 2023

Year	N	Percentage mean pass	S.D.
Performance in 2020	10	36.5	6.17
Performance in 2021	10	33.52	9.07
Performance in 2022	10	42.85	11.30
Performance in 2023	10	44.41	6.53
Average performance for the 4 years	10	38.73	5.84

Table 2 indicates that the performance data from 2020 to 2023 highlights a significant issue with students' academic achievement in engineering programs within TVET institutions in Nakuru County. The average pass rate of 38.73 per cent over the four years, below the Kenya National Examinations Council (KNEC) pass mark of 40 per cent, confirms the high failure rates highlighted in the study's problem of low performance. In 2020 and 2021, the pass rates were particularly low, standing at 36.5per cent and 33.52 per cent, respectively. These figures reflect a critical challenge, as most students do not meet the minimum required standards. This failure contributes to issues such as increased dropout rates, added financial burdens on the government and stakeholders, and an insufficient supply of skilled workers in the engineering field, which threatens the achievement of Kenya's Vision 2030 goals. While there was some improvement in the pass rates in 2022 and 2023, reaching 42.85per cent and 44.41 per cent, respectively, these gains were marginal and insufficient to indicate a resolution of the underlying issue. The slight gains above the 40 per cent pass mark do not represent a

significant shift, as nearly 60 per cent of students continue to underperform.

Furthermore, the variability in the data, as shown by the high standard deviations in 2022 (SD = 11.30) and 2023 (SD = 6.53), indicates that the improvement is uneven, with many students still struggling to meet basic academic requirements. Temporary adjustments, rather than a fundamental change in resource utilisation, may have contributed to the rise in pass rates in the latter two years. The study's objectives focus on analysing the relationship between the utilisation of human, I.C.T., resource and academic performance. The data indicates that the effective use of this resource to enhance learning outcomes remains a challenge. Even with the slight upward trend in performance, the institutions have not achieved consistent improvements in the academic success of engineering students. The continued low average pass rate over the four years confirms that resource challenges remain a barrier to optimal performance, demonstrating that, despite recent increases, the fundamental issues affecting student achievement are still prevalent.

Utilisation of Human Resources

The following information shows data on the utilisation of human resources provided by the respondents. It includes descriptive statistics from the trainers, students, and Technicians and qualitative analysis from the administrators (principals, deputy principals, H.O.D.s).

Students' Descriptive Statistics on Utilisation of Human Resources

Data on the utilisation of human resources was analysed using frequencies and percentages from the students. They rated how frequently students responded to the trainer's 10 specified responsibilities based on a scale: Never (N.E.), Rarely (R.A.), Sometimes (S.T.), Frequently (F.R.), and Always (A.L.). During data interpretation, the Likert scale categories were combined into high (Always, Frequently) and low (Sometimes, Rarely, Never) engagement levels to simplify data interpretation, enhance statistical power, improve result clarity, and emphasise practical relevance. This combination is critical, as high engagement is essential in engineering practices; low engagement can adversely impact academic performance, underscoring the need for consistent resource utilisation. Table 3 presents a summary of their responses.

Table 3: Students' responses to items on the Utilisation of Human Resources

Item	N	AL	FR	ST	RA	NE
Trainers attend lessons	262	49.8	28.7	15.1	5.3	1.1
Trainers assess learners as and when required	262	33.5	20.8	28.7	9.8	7.2
Trainers ensure the workshop is prepared for practical before lessons	262	36.0	11.7	22.7	14.4	15.2
Trainers plan for relevant academic trips	262	11.0	5.7	12.9	17.0	53.4
Trainers provide course outlines	262	55.8	14.0	15.8	5.7	8.7
Trainers give feedback on performance in examinations	262	38.5	15.5	19.6	7.5	18.9
Trainers provide academic advice to support studies	262	34.8	13.3	23.9	14.4	13.6
Training lessons are interactive	262	37.4	18.1	27.9	10.9	5.7
Trainers provide relevant learning materials	262	30.0	14.6	24.0	13.8	17.6
Trainers supervise students' projects	262	43.7	20.5	19.8	5.4	10.6

Table 3 indicates that (21.5 per cent) of the students reported that the trainer did not attend lessons. This inconsistency in attendance has significant implications for the learning process. According to Kassarnig et al. (2018), regular attendance by trainers is crucial for maintaining learning continuity and improving academic performance. Inconsistent attendance disrupts the learning process, potentially causing gaps in students' understanding and engagement with the course material. Institutions must ensure that trainers maintain consistent attendance to provide students with a steady learning experience. However, (78.5per cent) of students reported that trainers always attend lessons, suggesting that there is a considerable number of trainers who maintain a regular teaching schedule, which positively impacts learning outcomes.

A concern (45.7%) of the students indicated that trainers do not assess them as required. The lack of regular assessments is detrimental to students' academic progress as it limits their ability to receive timely feedback on their performance. Brown (2019) emphasises that formative assessments play a key role in guiding students through personalised learning experiences. Without frequent assessments, students may be unable to identify their areas of strength and weakness, hindering targeted improvement and academic achievement. Nevertheless, (54.3%) of the students reported that trainers regularly assess learners as required, indicating that some trainers adhere to effective assessment practices.

The findings show that (52.3%) of the students reported that trainers do not ensure the workshops were prepared for practical lessons, with (22.7%) stating this occurs sometimes, (14.4%) rarely, and (15.2%) noting it never happens. This lack of preparation compromises the effectiveness of practical lessons, which are critical in technical education. Le and Do (2019) highlight the importance of well-prepared practical sessions in developing students' hands-on skills. The absence of workshop preparedness limits students' opportunities to apply theoretical knowledge in real-world scenarios, diminishing the quality of their education. However, (47.7%) of students reported that trainers consistently ensure workshop preparedness, which facilitates better hands-on learning experiences for those students.

A significant (83.3%) of students reported that trainers rarely or never plan academic trips, with (17%) stating this occurs rarely and (53.4%) indicating it never happens. Academic trips provide students with essential experiential learning opportunities, which enable them to apply theoretical knowledge to real-world contexts. According to Carbone et al. (2020), such trips enrich learning experiences and enhance students' comprehension and retention of course material. The lack of academic trips limits students' exposure to practical learning environments, which negatively impacts their overall learning experience. On the other hand, (16.7%) of the students reported that their trainers plan relevant academic trips, offering some students experiential learning opportunities.

A considerable (30.2%) indicated that they do not receive them consistently. Course outlines are essential for providing students with a clear understanding of course objectives, content, and expectations. Marquis et al. (2017) found that clear course outlines help students plan their studies effectively, manage their time, and stay focused on key concepts. The absence of regular course outlines may lead to confusion and poor time management, negatively impacting academic performance. However, (69.8%) reported receiving course outlines regularly, aiding their academic planning and goal setting.

The findings reveal that (46%) of the students reported not receiving regular feedback on their examination performance. Timely feedback is essential for helping students understand their performance and make necessary improvements. Olave-Encina et al. (2021) highlight that feedback is critical in guiding student learning and enhancing academic achievement. Without regular feedback, students may struggle to identify their weaknesses and improve their learning strategies. Nonetheless, (54%) of the students indicated that they receive feedback on their examinations consistently, which supports their academic development.

A large percentage of students (51.9%) reported that they rarely or never receive academic advice from their trainers to support their studies. Academic advising is critical for helping students navigate their educational journey, make informed decisions, and stay motivated. Gogates (2024) asserts that students who receive regular academic advice are better equipped to make decisions that positively impact their academic performance. The lack of consistent academic advice may lead to poor decision-making, reduced motivation, and lower academic achievement. However, (48.1%) of students indicated that they receive academic advice regularly, which supports their educational progression and decision-making.

The findings show that (44.5%) of students reported that their lessons were occasionally interactive. Interactive lessons are essential for fostering active learning and critical thinking, which are crucial for academic success. Ullah and Anwar (2020) emphasise that interactive lessons engage students more deeply in the learning process, leading to better comprehension and academic outcomes. Without interactive teaching, students may become passive learners, which limits their engagement and understanding of course material. However, (55.5%) of the students indicated that their lessons are always interactive, promoting active participation and deeper learning.

A concern (55.4%) of students reported that they do not receive relevant learning materials consistently. Access to relevant learning materials is critical for enabling students to engage with course content effectively. This is in line with Miller (2019), who notes that a lack of learning resources can hinder students' understanding of complex concepts, leading to lower academic performance. The inconsistent provision of learning materials places students at a disadvantage, limiting their ability to study effectively and grasp course content. However, (44.6%) of the students reported receiving learning materials regularly, which enhances their ability to engage with course material.

The findings reveal that (35.8%) of students reported inconsistent supervision of their projects, which indicated trainers never supervise students' projects. Adequate supervision is crucial for ensuring that students apply theoretical knowledge effectively in their projects, as emphasised by (Stevenson et al., 2020). Poor supervision can lead to substandard project outcomes and limit students' ability to develop practical skills. However, (64.2%) of students indicated that their trainers consistently supervise their projects, providing valuable guidance and support for their practical work.

Technicians' Descriptive Statistics on Utilisation of Human Resources

Technicians in TVET institutions work closely with trainers to conduct practical lessons. Trainers schedule these lessons and instruct technicians to prepare materials and set up equipment. Since trainers lead the practicals, technicians are well positioned to observe and report on trainers' performance. The technicians provided data on human resources utilisation, which was also analysed. They were asked to rate how frequently trainers performed 10 responsibilities as instructors. The rating was done using the scale Never (N.E.), Rarely (R.A.), sometimes (S.T.), Frequently (F.R.), and Always (A.L.). During data interpretation, the Likert scale categories were combined into high (Always, Frequently) and low (Sometimes, Rarely, Never) engagement levels to simplify data interpretation, enhance statistical power, improve result clarity, and emphasise practical relevance. This combination is critical, as high engagement is essential in engineering practices; low engagement can adversely impact academic performance, underscoring the need for consistent resource utilisation. Their responses were summarised using frequencies and percentages, as indicated in Table 4.

Table 4: Technicians' Responses to Items on Utilisation of Human Resources

Item	N	AL	FR	ST	RA	NE
Trainers attend lessons	10	33.4	25.6	20.7	10.3	10
Trainers assess learners as and when required	10	45.4	36.4	18.2	-	-
Trainers ensure the workshop is prepared for practicals before lessons	10	36.3	18.2	36.4	-	9.1
Trainers plan for relevant academic trips	10	36.4	27.2	9.1	-	27.3
Trainers provide course outlines	10	60.0	20.0	10.0	-	10.0
Trainers give feedback on performance in examinations	10	54.5	27.3	9.1	-	9.1
Trainers provide academic advice to support studies	10	27.3	45.4	9.1	18.2	-
Trainers' lessons are interactive	10	54.5	36.4	9.1	-	-
Trainers provide relevant learning materials	10	66.7	11.1	11.1	11.1	-
Trainers supervise students' projects	10	54.5	9.1	27.3	9.1	-

Table 4 shows that technicians (41%) that trainers do not attend lessons. The findings reveal a lack of consistent attendance by trainers. This inconsistency disrupts the learning process and negatively affects students' academic performance. Werang et al. (2019) emphasise that consistent teacher attendance is essential for enhancing student performance, as it provides stability and ongoing instructional support. Irregular attendance hinders students from maintaining academic momentum, contributing directly to low performance in engineering programs. Technicians reported that (59%) of trainers attend lessons frequently or always.

A significant portion of technicians (18.2%) noted that trainers do not consistently assess learners as and when required. The lack of regular assessments prevents students from receiving timely feedback, which is essential for their academic progress. Qadir et al. (2020) argue that regular formative assessments are crucial for improving student performance, especially in engineering education. When assessments are not conducted regularly, students lack critical insights into their performance, which affects their ability to identify areas for improvement. Technicians also reported that (81.8%) of trainers assess learners frequently or always.

Workshop preparedness is a major concern, with (45.5%) of technicians indicating that trainers do not prepare workshops for practicals before lessons. This unpreparedness of workshops negatively impacts the hands-on learning experiences crucial in engineering education. Practical lessons provide opportunities for students to apply theoretical knowledge, and without adequate preparation, these opportunities are missed. Kintu et al. (2019) support this finding, noting that practical readiness is necessary for developing skills critical for industrial training and future employment. Technicians indicated that (54.5%) of trainers ensure workshop preparedness frequently or always.

Technicians indicated that (36.4%) of trainers never plan academic trips, which are essential for providing students with real-world learning experiences. The failure to plan academic trips limits students' exposure to practical applications of engineering concepts, affecting their ability to contextualise theoretical knowledge. Chavan and Carter (2018) highlight the importance of experiential learning in enhancing student

performance, noting that such experiences deepen students' understanding and improve academic outcomes. Technicians reported that (63.6%) of trainers plan academic trips frequently or always.

Trainers do not provide course outlines, (20%) of technicians reported that trainers fail to do so. Course outlines are vital for guiding students through the semester, ensuring that they understand the course structure, objectives, and expectations. Without clear outlines, students may struggle to organise their studies effectively, leading to gaps in understanding and poor academic performance. Stephen and Rockinson-Szapkiw (2021) argue that course outlines enhance students' self-regulation, which is critical for academic success. Technicians also indicated that (80%) of trainers provide course outlines frequently or always.

Feedback on examination performance is another area with significant gaps, as (18.2%) of technicians reported that trainers rarely provide feedback. Without feedback, students cannot accurately assess their progress or identify areas for improvement. The findings agree with Kim and Lee (2019), who concluded that verbal feedback impacts students' self-assessment accuracy, emotional responses, and self-efficacy. It implies that positive feedback leads to higher self-assessment scores, positive emotions, and self-efficacy than negative feedback, though negative feedback improves self-assessment accuracy. Technicians reported that (81.8%) of trainers provide feedback on examination performance frequently or always.

Trainer's provision of academic advice to support studies is inconsistent, with (18.2%) of technicians stating that trainers rarely offer academic support, while (9.1%) reported that such advice is only offered occasionally. Regular academic advising is critical for helping students navigate their studies and address challenges, and the absence of this support can negatively impact student performance. Idrus et al. (2018) emphasise that academic advising plays a key role in guiding students toward academic success, particularly in complex and demanding fields like engineering. Technicians also reported that (72.7%) of trainers provide academic advice frequently or always.

A notable portion of technicians (22.2%) reported that trainers fail to provide relevant learning materials. Learning materials are essential for effective learning, as they help students engage with the course content and reinforce key concepts. Bukoye (2019) highlights that the availability of instructional materials significantly impacts student performance, and the lack of these resources can hinder students' ability to succeed academically. Technicians indicated that (77.8%) of trainers provide relevant learning materials frequently or always.

Project supervision is inconsistent, with (36.4%) of technicians stating that trainers do not consistently supervise students' projects. Proper supervision is important in ensuring that students can apply theoretical knowledge in practical projects, which is a key component of engineering education. Rees et al. (2020) argue that active supervision is crucial for enhancing student engagement and improving academic performance. Technicians reported that (63.6%) of trainers supervise student projects frequently or always.

A percentage of technicians (9.1%) indicated that trainers do not consistently conduct interactive lessons. Interactive teaching methods promote active student engagement and improve learning outcomes, making their absence detrimental to academic performance. Tuma (2021) stresses that interactive learning environments foster greater student participation, which is crucial for understanding complex subjects like engineering. Technicians also reported that (90.9%) of trainers conduct interactive lessons frequently or always.

Administrators' Qualitative Responses (Principals, Deputy Principals, HoDs)

The administrators implemented a variety of strategies to guarantee class attendance, although they continue to encounter issues with trainers missing lessons. Among the strategies is the use of monitoring tools such as random checks, impromptu visits, attendance registers, class representative reports, and records of work (83.3%). The other strategies that were implemented included the timely preparation of the timetable (11.1%) and the

availability of instructional materials (22.2%). One of the principals from Institution R stated,
"We occasionally carry out random checks and use attendance registers to confirm that trainers are in class as scheduled; however, we believe that trainers take responsibility for attendance as per the timetable."
Although administrators assume trainers meet this responsibility, quantitative data reveals a gap, with 21.5% of students and 41% of technicians reporting inconsistent trainer attendance. This inconsistency may reduce students' motivation and engagement, which is crucial for academic success. These findings align with Hejji Alanazi (2019), who highlights how obstacles like unclear monitoring hinder pre-service teachers' lesson planning, ultimately impacting academic performance.

On the assessment of students and the entry of all marks into the system for students to monitor their progress, the administrators observed that despite employing various strategies, scores and classes remain unassessed. They informed the researcher that the strategies involved verifying the assessment process by reviewing examination attendance and marks sheets, class representative reports, and conducting impromptu visits to classes during the assessment (50.0%). It also involved the implementation of academic policy by preparing assessment timetables, setting, moderating, and submitting examinations, validating results (33.3%), and building the assessment capacity of trainers through training (16.7%). The deputy principal from Institution T noted,
"We sometimes check exam attendance and conduct spot checks during assessments to ensure everything is running smoothly."
The quantitative data reveals that students (45.7%) and technicians (18.2%) reported incomplete assessments. This suggests a need for clearer communication and expectations around assessment practices. Avcı and Ergün (2022) assert that students must be accustomed to navigating complex processes to obtain and share reliable information. The lack of consistent assessments could hinder students' ability to gauge their understanding and progress, negatively impacting their academic outcomes.

Ensuring timely preparation of workshop practicals is among the responsibilities of institution administrators because of the key role of hands-on experiences in imparting skills to trainees. An analysis of the administrators revealed that they ensured this by planning, including the practical sessions in the timetable, setting the objectives and outcomes (33.3%), providing resources (50.0%), and conducting inspections to confirm everything was in place (27.8%). They observed that the timely preparation of workshops before classes commence is hindered by the release of government capitation, procurement processes, and monitoring of workshop preparedness.
"We strive to obtain the necessary materials for the workshops during the practical lessons, but the procurement process is tedious, and we only receive training materials after classes have commenced," said a department head from Institution R. These findings agree with students (52.3%) who noted that trainers do not ensure workshop preparedness consistently, and technicians (45.5%) confirm that trainers do not prepare workshops before practical lessons. Mohzana et al. (2023) underscore the impact of resource availability on practical activities, suggesting that improper resource management could impede the learning process. Inadequate workshop preparedness can result in ineffective learning experiences, reducing students' engagement and their ability to apply theoretical knowledge to practical situations and thus affecting their overall performance.

Overseeing planning for academic trips is among the duties of institution administrators. They carried out this oversight function by interacting with trainers, coordinators, Heads of Departments, and industry (50.0%), ensuring that the trip aligned with the curriculum, learning objectives, and outcomes, and specifically targeted learning areas that needed reinforcement (50%). Several administrators reported receiving complaints from students who felt that the industries they visited did not align with the courses they were taking. This indicates a deficiency in the administrators' ability to oversee the entire process. A deputy principal from institution S highlighted this:
"The trip coordinator is responsible for organising academic trips. We sometimes strive to have

collaborations with industry that align with the curriculum objectives."

The quantitative data indicates that a significant number of students (83.3%) reported that trainers rarely plan such trips, highlighting the importance of experiential learning opportunities, whereas a significant proportion (34.4%) of technicians stated that they hardly or never planned trips. Nawi and Azmi (2018) affirm that effective educational field trips should follow a structured strategy, suggesting that they enhance students' engagement and learning outcomes. The lack of academic trips could diminish students' exposure to real-world applications of their studies, which can limit their practical understanding and reduce the overall effectiveness of their education.

During the interview, the administrators also deliberated on the importance of timely preparation of course outlines. They reported achieving this by delegating responsibilities to HoDs (11.1%), providing resources to trainers (22.2%), setting deadlines for submission (38.9%), and monitoring to ascertain that these directives were adhered to (44.4%). During the internal quality audit and quality assurance, it became evident that some classes were missing these crucial documents from their records. A principal from institution R said,

"We often give deadlines for submitting course outlines; however, mechanisms need to be put in place to ensure these deadlines are adhered to and records of documents submitted to students and HoDs are available."

The students (30.2%) and technicians (20.0%) indicated they do not receive course outlines regularly. According to Farrell and Ashcraft (2024), course outlines help students anticipate their term expectations, emphasising the importance of communication in ensuring students are well-prepared. The inconsistent availability of course outlines can lead to confusion and lack of direction for students, potentially resulting in lower academic performance due to inadequate preparation for assessments and projects.

The administrators occasionally verified whether trainers were providing students with feedback on their examination performance to aid in their learning. The strategies used by the administrators to ensure this included encouraging trainers to return marked scripts and upload marks in the students' portal (55.6%), using monitoring tools (complaints, examination audits, class conferences) (16.7%), holding staff examination analysis meetings (16.7%), and giving guidelines on how to provide feedback to learners (16.7%). During the interview, it was highlighted that feedback was done, though not to satisfactory levels. There was a need to monitor these activities to enhance student confidence and, in the long run, improve student performance. The head of a department from Institution U stated,

"We monitor how trainers provide feedback through examination audits, though there are still non-conformities of trainers not giving feedback to students. The issue of missing marks is still a concern."

The qualitative data supported the findings, revealing that students (46%) and technicians (81.8%) reported inconsistent feedback. Armson et al. (2019) discussed the importance of effective feedback that blends process and content skills, suggesting that relationship-building and communication techniques could enhance the feedback provided to students. The lack of timely and constructive feedback can interfere with student's ability to identify areas for improvement, ultimately impacting their academic progress and overall performance.

The administrators reported that learners had limited access to guidance and counselling services (72.2%). Strategies put in place for students to access the services included organised forums for discussing academic issues (50.0%) and inviting motivational speakers and experts (22.2%) to speak to students on academic advice for their studies. Some administrators mentioned that they occasionally organise support forums within their institutions; however, they have a challenge of resource-intensive nature and the challenge of reaching out to the entire population. As noted by the deputy principal from Institution T,

"We once in a while organise forums where students can discuss their academic issues; however, a small proportion of students attend these forums."

According to the quantitative data, 51.9% of students and 36.4% of technicians reported that they rarely receive such advice. Xerri et al. (2018) affirm that teacher-student relationships are crucial for academic

engagement, suggesting that enhancing these relationships could lead to improved support for students. The limited availability of academic advice can prevent students from receiving guidance on their studies, which may lead to confusion and a lack of focus on their academic goals and thus affect their performance.

The administrators also played a role in encouraging interactive learning during lessons by promoting the adoption of student-centred teaching methods such as practical, group work, question and answer, and role play (94.4%), integration of I.C.T. in instruction (11.1%), and creating a conducive environment where all students can participate in learning (11.1%). Administrators mention they remain unimplemented due to limited resources, an intensive curriculum, and exam-focused training.
"We occasionally encourage the use of group work, practicals, and role-playing to make learning more engaging, but we never practice it due to a lack of resources and congested programs that do not give learners and trainers adequate time to prepare," said one of the principals from institution R. The quantitative data supports these findings, as a significant number of students (44.5%) and a portion of technicians (9.1%) reported that trainers rarely used interactive techniques. Tuma et al. (2021) propose that enhancing engagement through active learning can significantly improve educational outcomes, indicating that further emphasis on interactive methods is necessary. The lack of interactive learning strategies can lead to decreased student motivation and engagement, potentially resulting in poorer academic outcomes.

The administrators participated in ensuring learning materials were available for students. The mechanisms they implemented to ensure this included budgeting and timely purchasing (61.1%), encouraging innovation, borrowing, and sharing when necessary (11.1%), writing correct specifications of required items (38.9%), and using I.C.T. to enhance procurement processes (16.7%). There is still a challenge in budgeting, correct specifications, and procurement of training materials on time. A department head from Institution R expressed,

"We strive to secure resources by closely collaborating with the procurement department to guarantee timely delivery and availability of learning materials."
The quantitative data supports this finding; 55.4% of students reported unavailability of materials, and 22.2% of technicians indicated that there are challenges faced in accessing necessary training materials. (Milligan et al., 2019) highlight the importance of learning materials in effective teaching, suggesting that addressing material availability could enhance the overall educational experience. Inadequate access to learning materials can severely limit the quality of instruction and learning, negatively impacting students' ability to perform academically.

Data from administrators' interviews revealed that they supervised class projects through the trainers to ensure they were aligned with objectives. They accomplished this by supervising project design and planning (27.2%), guaranteeing the presence of competent trainers (27.2%), and keeping track of project progress and milestones (22.2%). The implementation of these strategies remains a concern, as the quality and completeness of projects suffer due to inadequate supervision. There should be a monitoring policy and guidelines in place to guarantee effective supervision of all students working on projects. A deputy principal from Institution U reported,
"We still struggle with the implementation of strategies of supervising projects, and we periodically ensure that student projects are aligned with course objectives and that progress is monitored by trainers regularly."
The quantitative findings corroborate these findings, revealing that 35.8% of students reported insufficient supervision of their projects, while 36.4% of technicians reported a negative impact on project quality due to inconsistent oversight. Lau et al. (2018) argue that improving project supervision can foster better learning outcomes. Honig and Rainey (2019) also emphasised that effective mentoring is crucial for self-directed learning, suggesting that administrators should enhance their mentoring practices to support students better. Poor supervision of projects can lead to subpar student outcomes; insufficient guidance may prevent students from

fully understanding project objectives and standards, adversely affecting their overall academic performance.

Relationship between Utilisation of Human Resources and Academic Performance in Engineering

The simple linear regression technique was used to determine whether the relationship between human resources and academic performance in engineering was statistically significant. It involved testing objective one, which stated that:

To analyse the relationship between the utilisation of human resources and academic performance in engineering in technical and vocational institutions in Nakuru County, Kenya.

The results of the regression test are presented in Table 5.

Table 5: Results of Regressing Utilisation of Human Resources on Engineering Students' Academic Performance

Scale	Unstandardised Coefficients		Standardised Coefficients	t-value	p-value
	B	Std. Error	Beta		
Constant	71.587	1.404		50.984	.000
Utilisation of human resources index	1.939	.392	.291	4.944	.000
R = .291, R2 = .084, F (1, 265) = 24.440, p = .000					

Table 5 shows that the relationship between the utilisation of human resources and academic performance was positive (r = 0.291). This factor accounted for 8.4 % (R2 = 0.084) in academic performance. The results further indicate that human resources utilisation is a key predictor of engineering students' academic performance. The constant is 71.587, indicating that when human resources utilisation is zero, performance measures 48.522 units. The coefficient for the human resources index is 1.939, signifying that for every unit increase in human resources usage, academic performance rises by 1.939 units.

The regression equation is:

$$Y = 71.587 + 1.939X_1 \ldots\ldots\ldots(1)$$

Let Y represent academic performance, and $\mathbf{X_1}$ denote the utilisation of human resources.

The results imply that the utilisation of human resources is a meaningful contributor to academic performance, explaining 8.4% of the variance. This highlights that while human resource utilisation positively impacts academic outcomes, additional factors also influence performance. Institutions should focus on optimising the deployment of human resources, as each unit increase in effective utilisation corresponds to a measurable improvement in student achievement, enhancing the academic success of engineering students. The findings align with Francis (2018), emphasising that strategic human resource utilisation through effective employment, training, and development supports institutional goals and reduces wastage. Kuswati (2020) highlights motivation's role in retention and productivity. Thus, optimising human resource practices can enhance academic performance and align with educational objectives.

Test of Hypothesis One

From Table 5, the regression analysis was used to test the null hypothesis, which stated that:

HO1: There is no statistically significant relationship between the utilisation of human resources and academic performance in engineering in technical and vocational institutions.

According to Dul et al. (2020), the null hypothesis can be accepted or rejected. The author further said at 95 % confidence level ($\alpha = 0.05$), the null hypothesis is rejected when the calculated value (P) is less than the critical value (α), $P < 0.05$, and it is accepted when the calculated value (P) is greater than the critical value, $P > 0.05$. From the findings, the calculated value($P = 0.000$) is less than the

critical value ($\alpha = 0.05$), meaning that the null hypothesis was rejected and did not support the first hypothesis, which stated that there is no statistically significant relationship between utilisation of human resources and academic performance. It, therefore, implies that there is a statistically significant relationship between the utilisation of human resources and academic performance in engineering in technical and vocational institutions in Nakuru County, Kenya. The findings align with Darmawan et al. (2020), who assert that the quality of human resources significantly influences academic outcomes. Training, empowerment, and regular performance appraisals improve H.R. skills, productivity, and motivation. This fosters a committed workforce, ultimately contributing to a more effective academic environment and improved performance.

The regression analysis suggests that improved management and utilisation of human resources could substantially enhance student performance, aligning with the study's objective to assess how resource utilisation impacts academic achievement. Thus, the findings offer a pathway to mitigating the broader issue of high failure rates.

Discussion

This study aimed to analyse the relationship between the utilisation of human resources and academic performance in engineering programs within technical and vocational institutions. Data collected from trainers, technicians, administrators, and students reveal significant insights into how human resources impact academic outcomes. The descriptive analysis highlights critical issues regarding human resource utilisation. Technicians reported inconsistencies in trainer attendance, assessments, and workshop preparedness, negatively affecting students' learning experiences. Only (59%) of trainers were reported to attend lessons, and (18.2%) failed to conduct assessments consistently. Additionally, trainers often lacked preparation for practical classes, with (36.4%) of workshops reported as unprepared. These findings suggest that irregular human resource utilisation, inconsistent lesson attendance, and inadequate workshop readiness impair student engagement and academic progress.

Furthermore, administrators recognised the importance of monitoring attendance, assessments, and feedback, yet gaps in implementation persist. For instance, only (50.2%) of students acknowledged consistent attendance, compared to the higher reports from administrators and technicians. This discrepancy highlights a disconnect in communication and monitoring practices. The regression analysis supports these observations, indicating a statistically significant relationship between human resource utilisation and academic performance, with a positive correlation of (r=0.291, p =0.000). Human resource utilisation accounts for (8.4%) of the variance in students' academic performance, revealing that for every unit increase in human resource utilisation, students' academic performance increases by 1.939 units. It confirms that using human resources through regular attendance, proper assessments, and workshop preparedness contributes to improved academic outcomes in engineering programs.

The study affirms a positive and significant relationship between the utilisation of human resources and academic performance, highlighting the importance of improved attendance, consistent assessments, workshop readiness, and timely feedback in fostering better academic performance in engineering programs.

CONCLUSIONS AND RECOMMENDATIONS

Conclusions: The study explored the relationship between utilising human resources and academic performance in engineering programs within technical and vocational institutions. The findings indicate a pressing issue of low academic performance among students, mainly attributable to the ineffective utilisation of these essential resources. In examining human resources, it was found that inconsistent trainer attendance and a lack of regular assessments severely hindered student engagement and learning experiences. The regression analysis highlighted a statistically significant relationship between human resource utilisation and academic performance ($r = 0.291$, $p = 0.000$), suggesting that ineffective human resource practices contribute to the observed low performance in engineering programs.

Recommendations: This study makes the following recommendations: Implementing a system for monitoring trainer attendance and engagement, coupled with professional development programs that reinforce the importance of punctuality and consistent assessment practices. Conducting ongoing assessments of teaching methodologies, resource utilisation, and student engagement strategies to identify effective practices and areas for improvement, adapting educational approaches based on data-driven insights. Establishing mandatory professional development programs for trainers to enhance their pedagogical skills and industry knowledge. This should include regular training sessions focused on the latest engineering practices and teaching methodologies to ensure trainers effectively support student learning. Implementing a comprehensive framework for continuous assessment that includes formative evaluations and timely feedback. Establish clear performance metrics to monitor student progress and provide targeted support, ensuring that students receive the guidance necessary to improve their academic performance in engineering programs. Conducting longitudinal studies to explore the relationship between trainer engagement levels (attendance, participation, and preparation) and student academic performance. This research can provide insights into how different aspects of trainer involvement directly influence learning outcomes in engineering programs.

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