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Enhancing green learning in education and training in TVET for sustainable development through e-Libraries in Kenya

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Abstract

Technical and vocational education and training (TVET) systems play a crucial role in equipping the youth and adults with the skills required for employment, decent work, entrepreneurship and lifelong learning. This paper discusses how the e-libraries can enhance green learning in education and training in TVET colleges in order to contribute towards sustainable development. Exploratory and descriptive research designs were adopted. The study was carried out in two TVET colleges in Murang'a County. Purposive sampling was used to select the two colleges and random sampling to select the sample size of 100 instructors from the targeted population. Questionnaire was used to collect the data which was analyzed descriptively. The findings indicate that majority of the instructors have not embraced e-libraries for green learning in TVET programmes in their institutions butbelieve that if accessed it will improve the understanding of sustainable concepts and provide a wide range of learning resources.

Keywords: *Green learning education and training, e-libraries; green skills, sustainable development*

Introduction

Sustainable development (SD) accelerates the process of addressing social, economic, and environmental challenges associated with development. In the pursuit of sustainable development, nations across the globe are recognizing the pivotal role ofeducation in fostering environmental consciousness and promoting green practices (UNESCO, 2014). Education is considered to be a set of knowledge, skills, values, and attitudes (Schmidt, 2018). Moreover, it is an essential human right vital for sustainable development. However, until now reaching and teaching sustainability is a prevailing challenge (UNESCO, 2023). Green learning involves integrating sustainability principles into education to raise awareness and promote responsible environmental practices.

TVET play a crucial role in preparing the workforce for green jobs and sustainable

development. E-libraries refer to digital libraries that provide access to a wide range of educational resources, including e-books, academic journals, videos, and other digital content. They offer a platform for students and educators to access up-to-date information on green technologies, sustainable practices, and environmental studies. For Kenya, a nation endowed with rich biodiversity and facing the challenge of climate change, integrating Green Learning into Technical and Vocational Education and Training (TVET) is not only imperative but also a strategic investment in the future (Republic of Kenya, 2017). Further, the greening of TVET through e-libraries in competency based education and training (CBET) can not only add value to the normal institutional development process; it can stimulate progress towards learning and evolving community. Further, it can ensure that TVET have access to the latest research and developments in green technologies and sustainable practices. E-libraries allow students to access materials anytime and anywhere, promoting self-paced learning. Multimedia content in e-libraries engages students effectively and promote better understanding of green concepts. Finally, it can enable TVET to connect with other institutions worldwide, fostering international collaboration on green initiatives. In this context, the utilization of e-libraries emerges as a transformative tool, offering a dynamic platform to enhance the educational landscape by providing accessible and comprehensive resources for sustainable development (Kumar & Sahana, 2018). Moreover, greening TVET through e-libraries in CBET and the skills development initiatives will play a significant role not only in developing human and social capital, but also in promoting necessary skills, knowledge and expertise needed for more sustainable societies and greener economies.

Kenya's commitment to sustainable development is evident in its Vision 2030, which emphasizes economic, social, and environmental pillars (Republic of Kenya, 2017). TVET, as a critical component of this vision, plays a central role in equipping the workforce with practical skills and knowledge (Mokaya, 2016). By infusing Green Learning principles into TVET curricula, the educational system can contribute significantly to a workforce that understands, values, and practices sustainability (ILO, 2015). Moreover, the incorporation of e-libraries as a technology-driven educational resource can amplify the impact, making learning not only greener but also more accessible and adaptable to the evolving needs of the digital era (UNESCO, 2017).

Green learning aims to integrate environmental education and sustainable development principles into teaching and learning processes. In the context of TVET, green learning focuses on equipping students with the skills and knowledge to support sustainable practices in various industries (Oloo & Ng'ethe; 2020). This means incorporating green learning into the curriculum to ensure that students gain knowledge and skills related to sustainability and environmental stewardship. To achieve this requires introducing subjects focused on environmental science, climate change, and sustainable development (UNESCO, 2018). This includes E-libraries which play a crucial role in enhancing green

learning by providing accessible, up-to-date resources that support both educators and learners.

The Role of TVET in Sustainable Development

TVET is critical for sustainable development as it equips individuals with practical skills and knowledge essential for the green economy. TVET institutions can lead in promoting environmental sustainability by incorporating green skills into their curricula (UNESCO, 2017). Integrating sustainability into TVET programmes helps produce a workforce capable of addressing environmental challenges and promoting sustainable practices across various sectors (UNEVOC, 2019). Technical and Vocational Education and Training (TVET) plays a pivotal role in fostering sustainable development. It equips learners with the skills and knowledge necessary to meet the demands of the labor market and supports the transition to a green economy. This section delves into how TVET contributes to sustainable development by promoting environmental stewardship, economic growth, and social equity.

TVET programs are increasingly incorporating green skills and environmental awareness into their curricula. These programmes focus on sustainable practices, such as renewable energy technologies, waste management, and resource efficiency, which are essential for mitigating environmental degradation (UNESCO-UNEVOC, 2017). By educating students on sustainable practices, TVET institutions help create a workforce that can contribute to reducing the ecological footprint of various industries. For example, courses on renewable energy systems, eco-friendly construction techniques, and sustainable agriculture equip learners with the skills needed to implement and maintain sustainable practices in their respective fields. This not only benefits the environment but also promotes the adoption of green technologies and innovations (UNESCO, 2018).

TVET is crucial for economic development as it provides individuals with the technical skills needed for employment in various sectors, including emerging green industries. By aligning training programs with the needs of the green economy, TVET institutions help bridge the skills gap and enhance employability (ILO, 2019). This, in turn, contributes to economic growth and the creation of sustainable jobs. Moreover, TVET programs can drive entrepreneurship by equipping individuals with the skills to start and manage sustainable businesses. This entrepreneurial aspect of TVET supports local economies and encourages the development of innovative solutions to environmental challenges (Afeti, 2018).

TVET plays a significant role in promoting social equity by providing access to quality education and training for all, including marginalized and disadvantaged groups. This inclusivity ensures that everyone has the opportunity to acquire the skills needed for decent work, thereby reducing inequality and promoting social cohesion (UNESCO, 2015). In addition, TVET programmes often focus on empowering women and youth, who are disproportionately affected by unemployment and underemployment. By

providing targeted training and support, TVET institutions can help these groups gain meaningful employment and contribute to sustainable development (ILO, 2020).

E-Libraries and Green Learning

E-libraries are digital repositories that provide access to a wide range of educational resources, including e-books, journals, research papers, and multimedia content. In the context of Technical and Vocational Education and Training (TVET), e-libraries offer significant potential for enhancing green learning by providing resources that support sustainable practices and environmental education.

E-libraries play a crucial role in promoting green learning by making a wealth of information on sustainable practices and environmental issues readily accessible to students, educators, and researchers. The integration of e-libraries into TVET can enhance the learning experience and support the development of a workforce skilled in green technologies and sustainable practices such as: E-libraries provide access to up-to-date information such as the latest research, case studies, and best practices related to sustainability. This ensures that learners and educators are informed about the newest developments in green technologies and sustainable practices (UNESCO, 2018), digital libraries reduce the need for physical textbooks and printed materials, thereby minimizing paper usage and contributing to resource efficiency. This aligns with the principles of sustainability by reducing the environmental footprint of educational institutions (Kavulya, 2019), e-libraries often include interactive resources and engaging content such as videos, simulations, and quizzes. These tools can enhance understanding and engagement with green concepts, making learning more effective and enjoyable (Ndung'u, 2020) and e-libraries facilitate collaboration and knowledge sharing among institutions and individuals worldwide. This global exchange of information can foster innovation and the adoption of best practices in green learning (Mutisya & Makokha, 2016).

E-libraries offer significant potential for enhancing green learning in TVET such as providing a diverse range of learning materials that can cater to different learning styles and needs. This flexibility can improve the overall learning experience for TVET students (Njenga & Fourie, 2016), reducing the need for physical copies of textbooks and other learning materials, e-libraries offer a cost-effective solution for resource provision. This can be particularly beneficial for TVET institutions with limited budgets (Kavulya, 2019), they can be accessed from anywhere with an internet connection, making educational resources more accessible to students in remote or underserved areas. This promotes inclusivity and ensures that all students have the opportunity to benefit from quality educational materials (Njenga & Fourie, 2016) and they provide resources that support lifelong learning and continuous professional development. This is crucial in fields related to sustainability, where ongoing education and training are necessary to keep up with evolving technologies and practices (Mutisya & Makokha, 2016).

This study therefore aimed at establishing the extent to which sustainable development in Kenya's TVET sector was done by leveraging through e-Libraries to enhance green learning in education and training in Kenya.

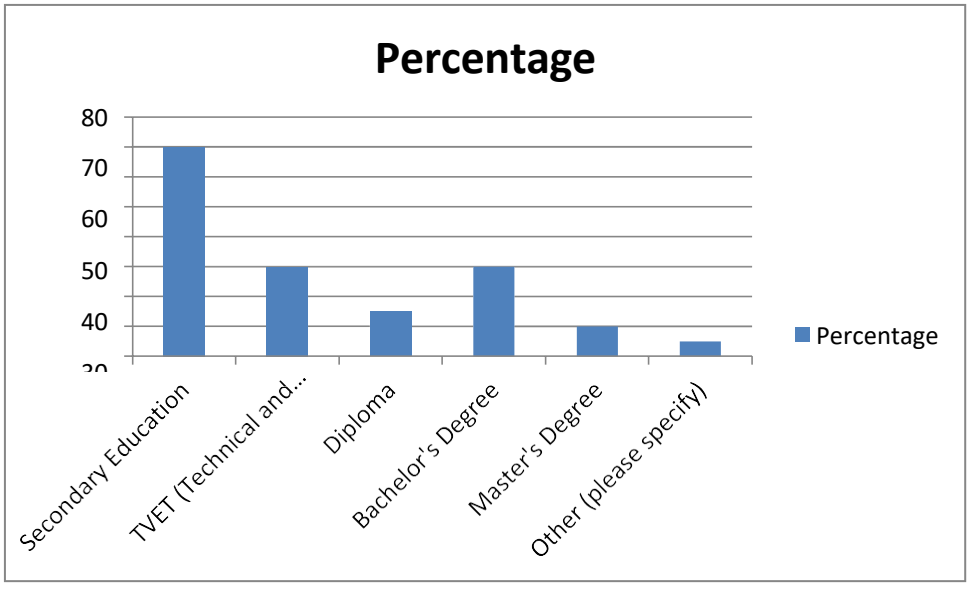
Methodology

The study adopted exploratory and descriptive research designs. Exploratory design in the study was adopted to help bring out information on e-libraries to enhance green learning (Tegan, 2023). Purposive sampling was used to select the 2 colleges in Murang'a county. Random sampling was used to sample 100 instructors from the targeted population in the TVET institutions. The data collected using questionnaires was analyzed descriptively. The findings are discussed and recommendations made to various concerned stakeholders. The study was carried out in in the months of August and September 2023. All the instructors were in session by the time of data collection and it eased the data collection procedures.

Findings

The study sought to establish the level of education of the instructors. This was an approach which allowed for a more comprehensive assessment of how green learning can be effectively be integrated into technical and vocationaleducation for sustainable development in Kenya**.** The level of education of the instructors played a significant role in understanding the impact and success of integrating green learning initiatives in TVET through e-libraries. The findings of the instructors' level of education is as shown in table no 1.

Table 1: Level of education of instructors in TVET colleges



The results in Table 1 indicate that 70% of the instructors in TVT colleges had secondary education, 30% had TVT certificate, 10% had masters' degree and about 5%

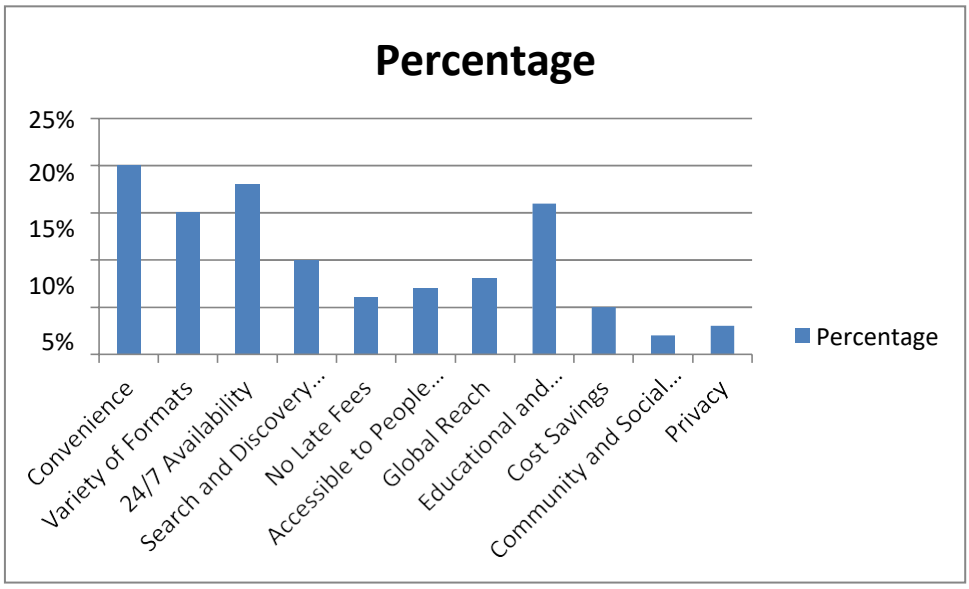
could not specify their level of education. The level of education is a key indicator of the participants' baseline knowledge of green learning and sustainability and implied different levels of awareness and understanding of these concepts in terms of curriculum relevance, teaching methods and resources and barriers and challenges. From the findings and the level of the education programme, the instructors require frequent retooling in modern contemporary pedagogies to be equipped with proper skills that are in line with the 21st century and new trends in education and therefore higher qualification is required. The retooling is likely to increase the instructors' knowledge, skills, values and attitudes (Schmidt, 2018).

The study further explored on the length of time one had worked in TVET because it often correlates with a wealth of experience, knowledge, and connections that can inform and drive the success of sustainable development initiatives. Out of 100 respondents, 15 instructors had worked for less than one year, 30 instructors has worked between one and three years, 20 instructors had worked between 3 and 5 years, 25 instructors had worked between and ten years and 10 instructors had worked more than ten years. More experienced professionals had a deeper understanding of the challenges and opportunities within TVET, which was essential for devising effective strategies for enhancing green learning in the context of sustainable development through e-libraries as pointed by Williams (2018). However, it's was also crucial to complement this experience with contemporary insights and innovative thinking to address evolving challenges and opportunities in the field. Professionals who had worked in TVET foran extended period may have been involved in shaping policies and advocating for changes in the and their insights into policy development and advocacy efforts was valuable for advancing green learning in TVET through e- libraries. This concurs with a study by Smith (2020) on the impact of TVET professionals on policy development in green learning initiatives.

The study went further to establish whether the instructors were aware of the availability of e-libraries for green learning the findings showed that all (100%) instructors were not aware even though the integration of technology and online resources in education, including TVET, was a growing trend. However, many educational institutions were exploring digital libraries and e-learning platforms to enhance learning experiences, including those related to environmental sustainability and "green" topics. The study also established that majority 100% had not used e-libraries for green learning in their TVET programmes. The study concluded that the adoption of e-libraries for green learning will vary widely depending on the institution, region and specific programme when finally embraced. This finding concurs with UNESCO (2020) that highlights some of the features of educational learning that enhances contemporary strategies. Respondents' were required to give their own opinion on their experiences and the resources they will find most helpful if e-libraries was used to enhance green learning in education and training. The results showed that out of 100 respondents, 20% pointed convenience in accessing books and resources

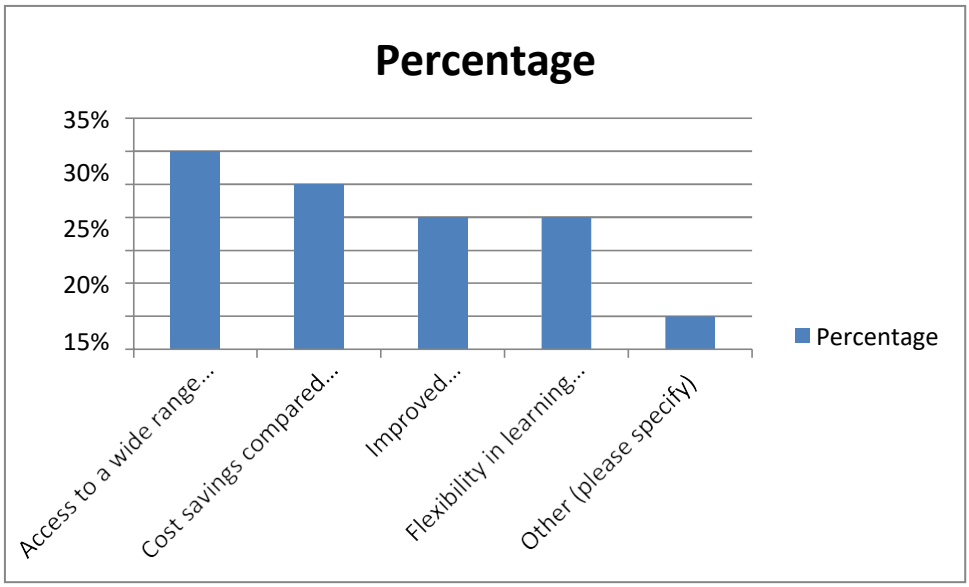
from the comfort of their homes and therefore, reducing the need for a physical visit. 15% were of the opinion that it will provide a variety of formats, 18% opined that it will be possible to access it anytime, 16% thought that it could provide educational and research resources while 10% thought that it will provide search and discovery tools. A minimal percentage 'of instructors' opinion was that if used there will be no late payment of fees by students as digital items will be automatically returned reducing financial stress for users. They also thought that it will be accessible to students with disabilities, global reach, cost saving, privacy, sync across devices and will lead to community and social features. The results on instructors' opinion are summarized in Table 2.

Table 2: Instructors opinion on e-libraries and resources



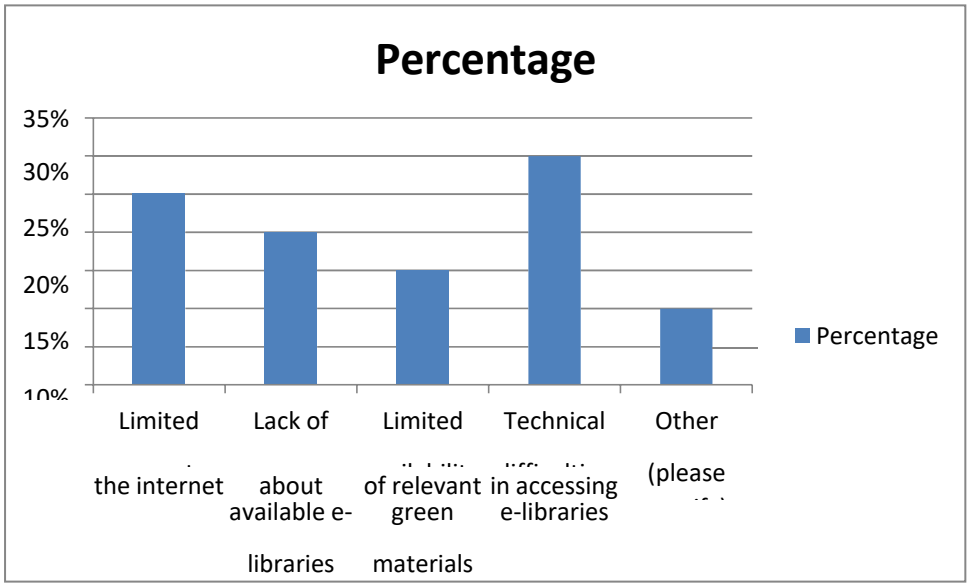
The study also explored the benefits of e-libraries in Green Learning. Out of 100 respondents, 30% revealed that e-libraries enable them access a wide range of resources, 25% were of the opinion that e-libraries lead to cost savings compared to traditional textbooks, 20% indicated that e-libraries lead to improved understanding of sustainability concepts. 20% indicated that e-libraries will lead to flexibility in learning schedules while 5% were not specific. The results are summarized in Table 3.

Table 3: Benefits of e-libraries in Green Learning



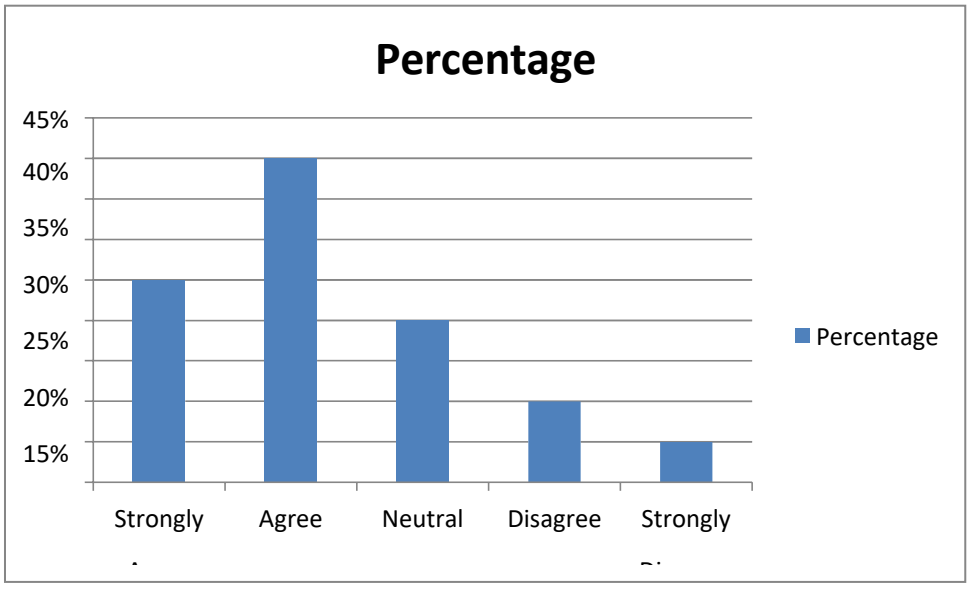
The study further, established the challenges encountered by instructors when using e-libraries for green learning. Out of 100 respondents, 25% pointed out limited access to the internet as the main challenge and 20% pointed out lack of awareness about availability of e-libraries. 15% indicated the challenge they encountered was limited availability of relevant green learning materials while 30% pointed out technical difficulties in accessing or using e-libraries. 10% were not sure of the challenges experienced. The results are summarized in Table 4.

Table 4: Challenges encountered by instructors in using e-libraries for Green Learning



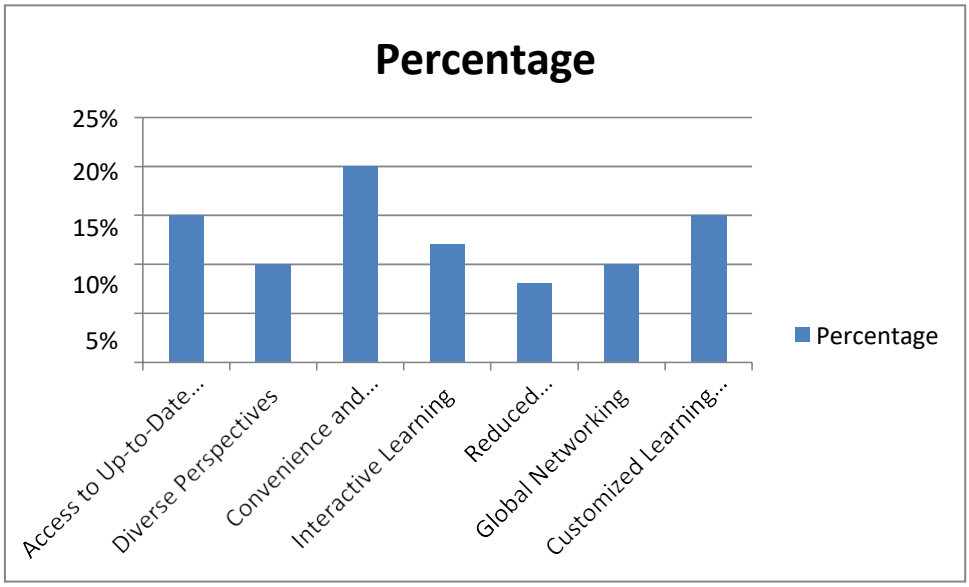
The study further sought to establish the impact of e-libraries use for green learning on Sustainable Development Knowledge. 1-5 Likert scale was used to establish the impact. Out of 100 respondents, 25% strongly agreed that using e-libraries for green learning will positively impact their knowledge for sustainable development in TVET while 40% agreed that using e-libraries for green learning will positively impact their knowledge for sustainable development in TVET. 20% were neutral that using e-libraries for green learning will positively impact their knowledge for sustainable development in TVET whereas 10% disagreed that using e-libraries for green learning will positively impact their knowledge for sustainable development in TVET and 5% strongly disagreed that using e-libraries for green learning will positively impact their knowledge for sustainable development in TVET. The results are as shown in Table 5.

Table 5: Positive impact on Sustainable Development Knowledge by the instructors



The study further sought to establish whether instructors' opinion on knowledge of sustainable development will change when using e-libraries for green learning. Out of 100 respondents, 20% indicated that using e-libraries for green learning will lead to convenience and accessibility while 15% indicated that using e-libraries for green learning will lead to access to up-to-date information. 15% revealed that using e-libraries for green learning will leadto customized learning paths while 12% revealed that using e-libraries for green learning will lead to diverse perspectives while 10% indicated that using e-libraries for green learning will lead to global networking, diverse perspectives cost savings respectively. The opinion of instructors concurs partially with Taylor (2016) assertions on building sustainable features and Smith (2020) on impact of TVT Professional's etiquette and adoption of new methods and techniques in teaching. The results areas shown on Table 6.

Table 6: Opinion on whether knowledge of sustainable development will change when using e-libraries for green learning



Enhancing green learning in Technical and Vocational Education and Training (TVET) through e-libraries in competency based education and training (CBET) can be greatly beneficial for both learners and the environment. In this context, the study sought to establish what improvements or additional features that can be incorporated in e-libraries in Competency Based Education and Training (CBET) to enhance green learning in TVET. Out of 100 respondents, 25% pointed out interactive learning modules such as virtual labs, simulations and case studies to engage learners actively thus stimulate real-world scenarios in green technology applications. 20% pointed out collaborative platforms to encourage knowledge sharing and group projects that include discussion forums, virtual study groups and collaborative project spaces to enhance peer learning. 15% indicated green certification programmes on green skills and sustainability that motivate learners to acquire specific competencies related to environmentally friendly practices within their respective fields. 15% pointed out virtual reality (VR) and augmented reality (AR) technologies to create immersive learning experiences while another 15% pointed out community engagement by establishing online communities and partnerships with industry experts, environmental organizations and professionals that facilitates networking, mentorship and exposure to real-world green practices. 10% pointed out mobile learning which optimizes e-learning platforms such as mobile devices to facilitate learning. This flexibility will be crucial for learners in TVET programmes who may have practical training sessions and need access on the go. 10% pointed out resource efficiency information which include information on resource-efficient practices in course materials. This may involve highlighting best practices in resource management, energy efficiency and waste reduction within the context of TVET subjects. 10% pointed out

green innovation challenges which will encourage students to come up with sustainable solutions to real-world problems. This will foster creativity and problem solving skills while addressing environmental challenges, 10% pointed out real-time monitoring and feedback especially on energy and resource usage in the e-learning infrastructure whereas others in minimal percentages pointed out multilingual support. These are potential improvements and additional features that could enhance green learning in Technical and Vocational Education and Training (TVET) through e-libraries in competency based education and training (CBET) to enhance green learning in TVET.

Conclusion

Enhancing green learning in Technical and Vocational Education and Training (TVET) institutions for sustainable development through e-libraries in competence based training (CBET) in Kenya is a comprehensive initiative that aligns with the country's commitment to environmental conservation and sustainable development. The study concludes that enhancing green learning in education and training in Kenya is essential for fostering sustainable development. This can be done by integrating sustainability into curricula, providing professional development for educators, utilizing digital resources, forming collaborative partnerships, and ensuring policy and institutional support, Kenya can effectively promote green learning. Further, enhancing green learning through e-libraries in competence based training (CBET) is still at an infant stage. Therefore, TVET institutions are expected to address multiple demands of an economic, social, and environmental nature by helping the youth to develop the skills they need for employment, fulfilling work, and entrepreneurship, promoting equitable, inclusive and sustainable economic growth, and supporting transitions to digital and green economies for environmental sustainability thus making enhancing green learning in education and training in TVET for sustainable development through e-Libraries in Kenya. Finally, the study opined that overcoming challenges related to resource constraints, infrastructure, and stakeholder engagement will be critical to the success of these initiatives. With continued effort and investment, green learning can play a pivotal role in preparing Kenya's workforce for a sustainable future.

Recommendations

Enhancing green learning in TVET institutions through e-libraries in Kenya not only contributes to sustainable development but also empowers the future workforce with the knowledge and skills needed to address environmental challenges and promote eco-friendly practices across various industries. Based on the findings of the study the following recommendation are suggested:

That enhancing Green Learning in Education and Training in TVET for Sustainable Development through e-Libraries in Kenya requires policy makers, employers, workers, economic, social and environmental actors, educational and training institutions and individual citizens to make the right choices. The shift to low-carbon economies

requires not only new regulation, investment and institutional frameworks (UNESCO ,2023), but also TVET to engage more systemically in response to the changing job opportunities and skills needs that a green development agenda brings about.

TVET through e-libraries needs to anticipate and respond to skill changes needed for successful careers in low- carbon economies. This calls for TVET systems to prepare their learners for being responsible and well informed producers and consumers, and for being able to act competently, creatively and as agents for sustainability in their workplaces and in society at large.

There is need for investment in TVET in Competency Based Education and training (CBET) and skills development initiatives for the green transition which will enhance environmental awareness, competencies, innovation and entrepreneurship, and thus open new market opportunities for environmental goods and services, promote green innovation and green growth, and put Kenya on a more sustainable development path thus aligning with the UNESCO strategy 2022-2029 for TVET.

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